

Original article

Impact of Climate Change in Eastern India with emphasis on West Bengal: Perspectives of Human

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ABSTRACT

It is well-established that climate change is one of the major challenges before the survival of human races as well as wildlife throughout the world, India is not an exception. For the last few decades, consistent natural hazards and vulnerabilities related to economic, social and environmental circumstances pushed India as one of the disaster-prone countries of the world. Due to the diverse ecological settings, India is absorbing different kind of climate change risk as sea level rise, cyclonic activity and changes in temperature and precipitation patterns. The eastern part of India contains similar kind of diverse ecological set up. The great Himalayan Mountain is located in the north, whereas sea shore of the Bay of Bengal is situated in the southern part. The deep sub-tropical forests and the habitation of wildlife are located in the western part as well as Sub-Himalayan region of the Dooars region.

Besides this study also examine the habitat loss of wildlife of these regions and its impact on their survival. The secondary data from various sources along with primary survey were used. Results revealed that a huge socio-economic transformation is prevailed in the entire eastern India due to the impact of uneven climatic fluctuation for the last 30 years. Increasing temperature and decreasing monsoon rainfall resulted into low production of yield and forced the people to migrate in search of secondary livelihoods. Man-Elephants conflict is increasing specifically in Doors and western draught prone region of eastern India, which may be impact of habitat loss of wildlife due to climate impact. In the sea shore region, repeated cyclones and floods (e.g. Aila) may influence the people life and livelihoods in the form of increased salinity of the cultivable land and also submerge their settlements. Overall, the eastern India paid a high price for climate change consequences and people are searching the new socio-economic dimension for their survival.

Key words: Ethics, Behaviour, Ethnographic Fieldwork, Informed consent, Field study, Ethical Dilemma

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INTRODUCTION

Like any other geographical region, climate change is triggering cascade effect in India. Climate change is affecting India in several degrees like other Asian countries, but with greater magnitude, where increase of mean temperature is resulting in melting Himalayas which is facilitating rising sea level as well as growth in tropical disease infections. Changing pattern of cyclonic activity and precipitation is affecting millions (Malhotra, 2019).

Eastern part of India being as diverse as covering different kind of ecosystem from sub alpine in north to coastal in south. West Bengal shares international boundaries with Nepal, Bangladesh and Bhutan where political boundary within India is shared Sikkim, Assam, Jharkhand and Orissa. There are six kind of ecosystem are observed viz. coastal and marine ecosystem (approx. 650 sq. km along the coastline north to Bay of Bengal), Mangrove (Approx 4200 sq. km. mainly found at Sundarbans), wetlands (West Bengal has a diversified wetland system in the likes of swamps, *jheels*, ponds, terai of Gangetic plains as well as brackish waters and islands of Bay of Bengal), grassland (Jaldapara National Park and parts of Gorumara National Park, Buxa Tiger Reserve and Sunderbans Tiger Reserve), Tropical or evergreen forest (> 1200 meters altitudinal areas) and Alpine (Mountain) forest ecosystem that stretches up to 5500 meters. Each kind of ecosystem expresses different kind of flora and fauna where degree of endemism is also very high with unique biological integrity.

Input of several degrees of anthropogenic interventions like increase in human and livestock population, habitat encroachment, deforestation for increasing agriculture area as well as intensive agricultural practices, unsustainable use of bio resources not only damaged biodiversity but also have facilitated climate change in North East region of India (Rabindranath *et al* 2011).

According to an assessment by Indian Meteorological Department 2010, India had 0.56⁰C mean temperature rise from 1901- 2009, is way less than the expected rise in future by 2050's of 2- 4⁰ C(The National Communication of India to UNFCCC, 2004). The sea surface temperature of Bay of Bengal is also showing an increasing trend in temperature (Dash *et al* 2007).

Several natural calamities act as a crucial link on human migration where they tend to find more secure and well defined stability in life. This mass movement comes with great disparity as different factors correlate while unbalancing urban and rural structures with factors as diverse as food insecurity, ill management of land use. These situations can be categorized over different causation where climate change and climate processing are two different issues. Mass migration with greater degree happens with uncontrolled natural disasters like flood, droughts, rise of sea level and other climatic events. Climate processes includes a lower degree of effect on human migration that includes rise of temperatures or change of rainfall pattern which affects agricultural practices, hence contributing to the factors for occupation shifting. West Bengal being a predominantly agrarian state is no exception facing effects of climate change scenarios.

MATERIAL AND METHODS

Study site:

India has a total area of 3.287 million sq. km. with a population of 1.324 billion (2016).

Total area of east India (West Bengal; Assam; Arunachal Pradesh; Bihar; Jharkhand; Odisha; Andaman and Nicobar Islands) is 418, 323 sq. km with a population of 45 million which is 3.76% of whole India (Dikshit and Dikshit 2014).

Method:

Secondary data has been used for this study.

RESULTS AND DISCUSSION

Change of land use and over exploitation coupling with extreme decreased capacity of carbon sequestration and increased amount GHGs emission is going to expose world to face a maximum temperature rise observed over 740000 years and higher atmospheric CO₂ level over 650000 years (IPCC 4th Assessment Report, The Scientific Basis of Climate Change, 2007). Change of land use and increased adverse climatic conditions with population outburst is forcing migration from rural to urban areas in search of better shelter and food security that risks population of urban system and agendas for maintaining productivity and sustenance of rural system. Increased population in urban areas due to migration from rural areas,

misbalancing population distribution increases pressure on infrastructure as well as increasing conflict and hence developing low quality food, education and social system (Brown, 2007).

Change in Climatic Parameters (West Bengal SAPCC) Temperature

Statistical data acquired from Indian Meteorological Department shows decrease of maximum temperature as well as increase in minimum temperature in respect to six different agro climatic zones of West Bengal viz. hill zone, terai zone, new alluvial zone, old alluvial zone, the red lateritic zone and the saline coastal zone. Projected temperature rise by 2100 is expected to be 3.4°C

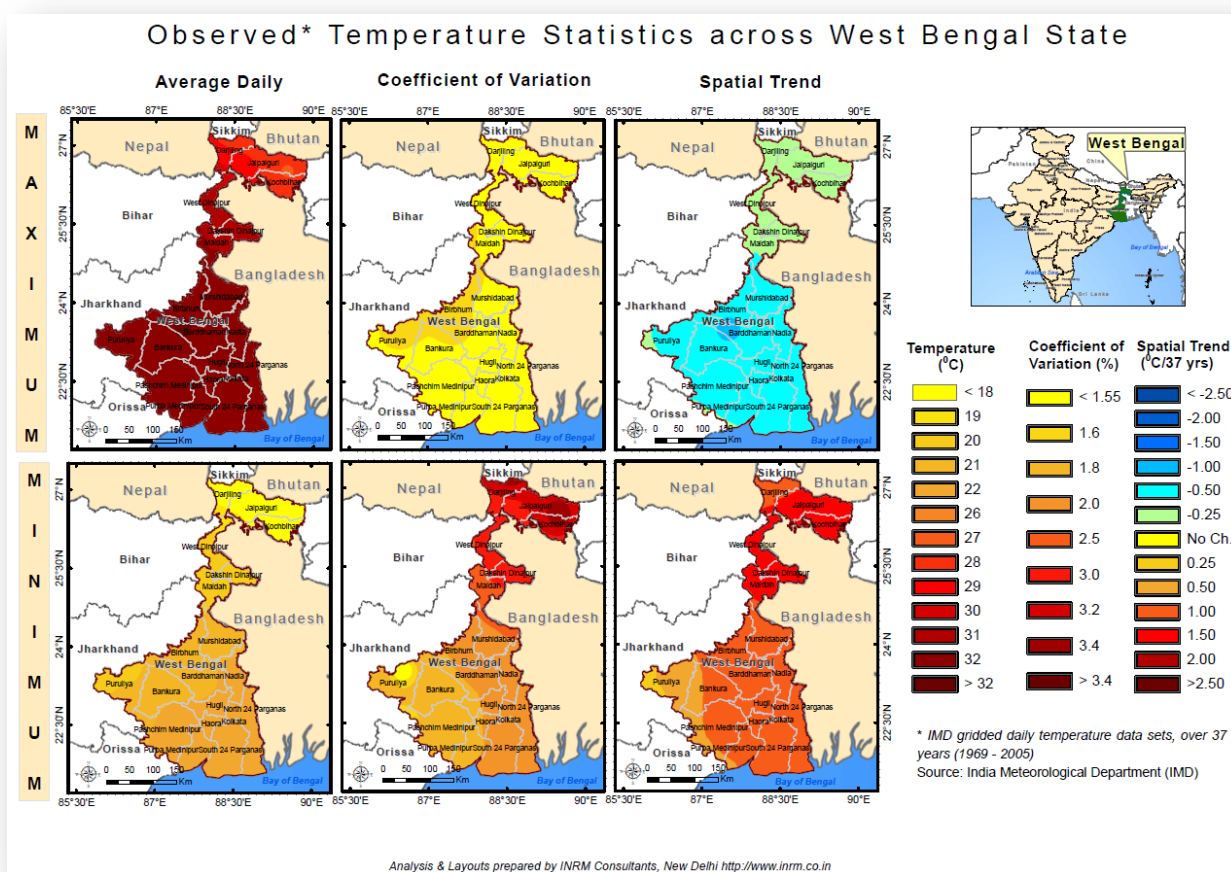


Fig 1: Observed changes in minimum and maximum temperatures in West Bengal

Source: Indian Meteorological Department (IMD) 1999- 2005

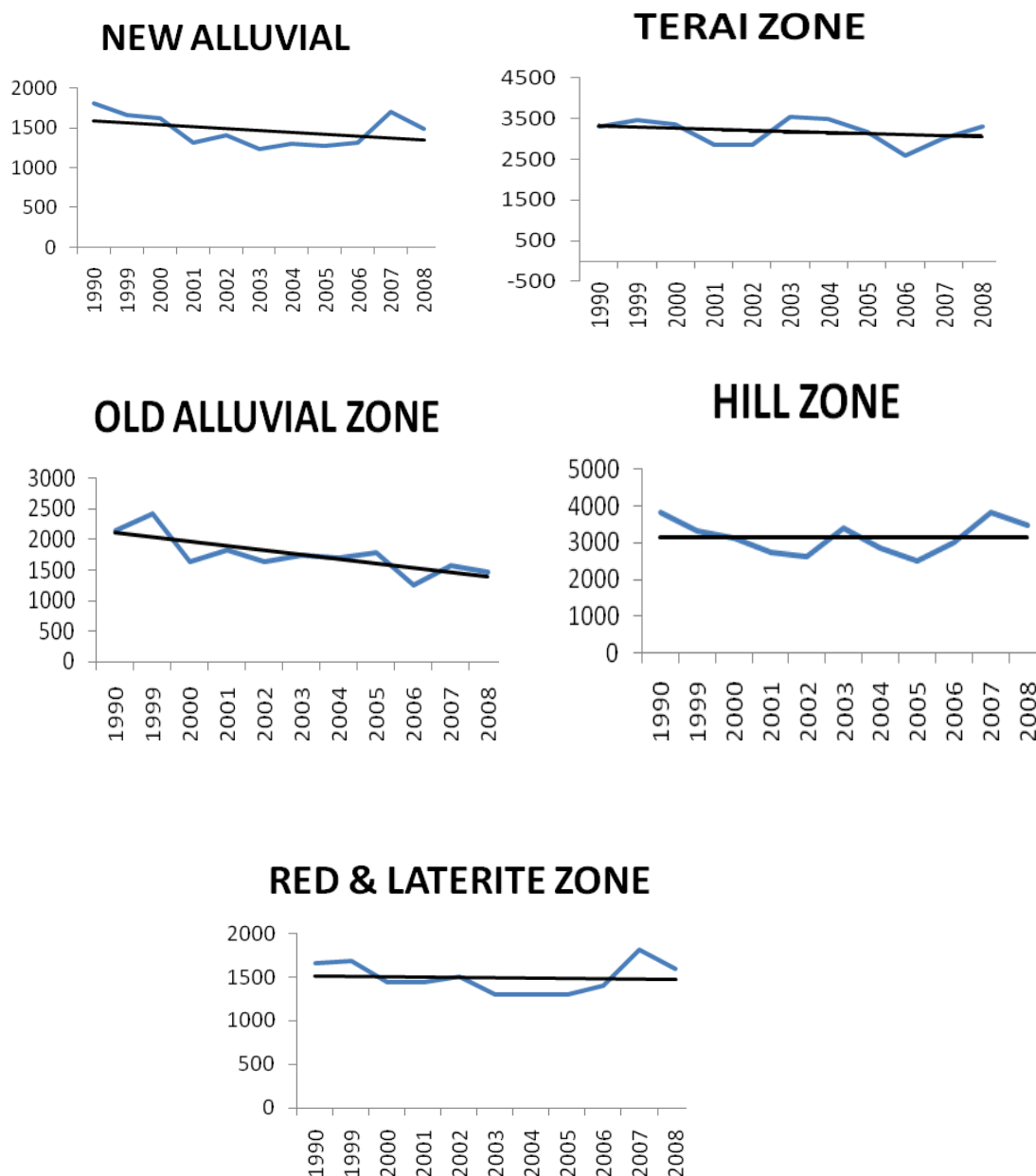


Figure 2: Trends of annual rainfall in different agro-climatic zones from 1990 to 2008

Source: West Bengal Statistical Handbook, 2009 and District Handbook

CYCLONIC ACTIVITY

1. Observation of data monitored from 1900- 2008 exhibits increased intensity in tropical storm formation as well as storm surge in Bay of Bengal. Cyclonic activities are dependent on several factors like wind speed, tidal situation, shape of coastline and contour variation along coastline resulting different water depth. These kind of diverse factors facilitate

cyclonic impact on shoreline as well as on human habitation. Such super cyclon storm surge spawned in Bay of Bengal in 2009 named as “Aila” resulted in severe human casualties as well as habitat destruction resulted in landslide in North Bengal which affected waterl supplies in that regions. Increase of almost 10-15 cyclone cycles are observed in Bay of Bengal is seen in relating with the data from 1970’s (Indian Network for Climate Change Assessment, 2010).

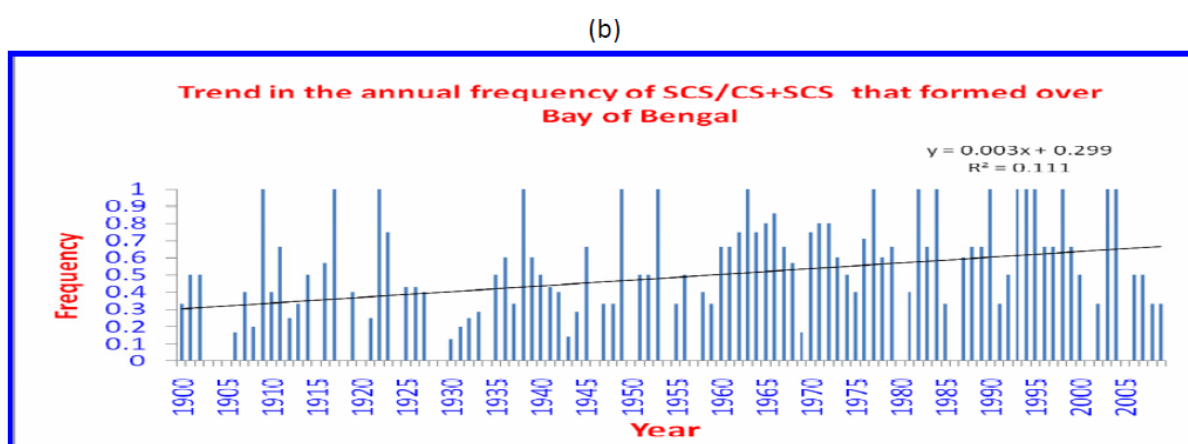


Figure 3: Increasing trends of severed cyclonic storm over the region of Bay of Bengal (Source: IMD, 2010)

SEA LEVEL

Average sea level rise in Indian seas coast is 1.3mm/ year (INCCA, 2010). Observation was done in Diamond Harbour of West Bengal however indicates an increased rate of sea level rise of almost 5.7mm/ year. According to, IPCC, 2007, Working Group I Report- the Physical Science Basis, a maximum of 0.48 msea rise is expected globally, that data must be base lined as regional data are unavailable.

Human migration is considered as adaptation against climate change (Black *et al* 2011) where avoidance is mostly adapted strategy rather than stressing on mitigation agendas.

RESEARCH GAPS AND FUTURE

Challenges in integrating development and climate change adaptation policies

1. Only ramifications of maintainable methodologies over environmental change do not finish up the issue. Measuring how effective the suggestions are going, should likewise be assessed.
2. Analyzing arrangement reactions.
3. Non climatic components for relocation viz. Government approaches, populace development should likewise be broke down to keep worry under control.

OPPURTUNITIES

- Energy recycling
- Decreasing degree of human intervention
- Reforestation
- Increased use of Renewable energy
- The ultimate objective of the UNFCCC is to maintain atmospheric GHGs concentrations to stabilize the climate system (UNFCCC (2002).
- Sustainable agriculture (Cattle, fertilizer, irrigation, tillage)

CONCLUSION

1. Enhancing energy efficiency.
2. Increasing the penetration of solar photo-voltaic and solar thermal in the field of energy.
3. Developing climate friendly sustainable habitats.
4. A water mission for integrated water resources management.
5. A mission on sustainable agriculture for making it more resilient to climate change.

6. A green mission for enhancing ecosystem services of forests and for enhancing its C Sequestration capacity.
7. A mission on Himalayan ecosystem for sustaining and safeguarding the Himalayan glacier and mountain ecosystems; and the last mission is aimed towards developing strategic knowledge base to address the concerns of climate change.

REFERENCES:

- Aromar R (2008) Climate change risk: an adaptation and mitigation agenda for Indian cities. *Environment and Urbanization* 20(1): 207-229.
- Brown O (2007) Climate change and forced migration: observations, projections and implications. *A background paper for the 2007 Human Development Report*. Geneva, UNEP.
- Das A, Ghosh PK, Choudhury BU, Patel DP, Munda GC, Ngachan SV, Chowdhury P (2009) Climate change in North East India: recent facts and events—worry for agricultural management. *Proceedings of the Workshop on Impact of Climate Change on Agriculture*.
- Dash SK, Jenamani RK, Kalsi SR, Panda SK (2007) Some evidence of climate change in twentieth-century India. *Climatic change* 85(3): 299-321
- Dikshit K R and Dikshit JK (2014) *North-East India: Land, People and Economy*. Springer Dordrecht
- IPCC 4th Assessment Report (2007) *The Scientific Basis of Climate Change: Impact, adaptation and vulnerability*, Cambridge University Press, Cambridge
- Jean-Marc B and Château J (2008) An overview of the OECD Env-linkages model. *OECD Economic Department Working Papers* 653 (2008): 0_1
- Malhotra A (2019) *Climate Change and India*, Ministry of External affairs, Govt. of India, , accessed on 5th July 2019 from <<http://www.mea.gov.in/distinguished-lectures-detail.htm?356>>

Ravindranath NH, Rao S, Sharma N, Nair M, Gopalakrishnan R, Rao AS, Malaviya S, Tiwari R, Sagadevan A, Munsu M, Krishna N and Bala G (2011) Climate change vulnerability profiles for North East India. *Current Science* 101(3): 384-394

Richard B, Bennett SRG, Thomas SM and Beddington JR (2011) Climate Change: Migration as Adaptation. *Nature* 478.7370: 447–49.

West Bengal Statistical Handbook (2009) *District Handbook*, Accessed on 9th August 2019 from < <http://wbplan.gov.in/htm/ReportPub/DistrictStatHandBook.htm> >