



Global climate change and Northeast India's concern: A Review

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ABSTRACT

The issue of climate change in the present day is a seeming reality, this reminds us James Hutton's concept of cyclic nature of earth's history among the other various factors responsible for climate change anthropogenic factor is the most discussed one in the present day due to its increasing contribution over the years. With each passing day the call for an action to adapt to or mitigate the climate change effects and impacts is increasing from the corners of the world. The most vulnerable societies are technologically least developed and island countries of the world, This article highlight's the northeast India's concern about the changing global climate and climate change induce migration.

KEYWORDS : Climate Change, Concerns, Impacts, Northeast India

Introduction

The issue of climate change in northeast India is not very seriously studied and most of the studies related to climate change are oriented to its causes and effects in the environment but there is also another dimension of social impacts which needs to be studied. The northeastern region is mostly a rural society with average 72.67 percent of its people living in rural (Census 2011) and the people are more dependent on the primary activities for their source of income and livelihood. Agriculture in this region is dependent on the monsoons and use of machineries and mechanized farming techniques are low. The industrialized and developed countries who are considered to be the main emitters of carbon dioxide and other greenhouse gases responsible for global warming and climate change are less vulnerable as they have technology, capital and alternative options to support their economy, the most vulnerable are the least developed countries whose emission level is low. Countries like Bhutan also has to face the impacts of global climate change directly or indirectly despite being a carbon negative country. One such is the northeastern region of India which has most of its area under the forest cover. One of the threats of global climate change is the rise in the sea level which may lead to submergence of many small island countries and low lying coastal regions. Many are expected to become climate change displaced people or refugees in the neighboring countries. The article also focuses on one such future problem of human mobility and migration due to the global climate change and sea level rise in the Bay of Bengal's water.

Global climate change is a reality

Climate change refers to drastic or secular changes in heat balance of the earth-atmosphere system, moisture, cloudiness and precipitation caused by either various external or internal factors. As per the report of the Intergovernmental Panel on Climate Change (IPCC, 2001) if the concentration of atmospheric CO₂ increases to 540-970 ppmv by the end of the 21st century, the average surface air temperature at global level would register an increase between 1°C to 5.8°C. Expressed as a global average, surface temperatures have increased by about 0.74°C over the past 100 years (Trenberth and others, 2007). O Mertz and others (2009) observes that the largest share of the increase (0.55°C) has occurred over the past 30 years and the largest temperature increases have occurred over land and in the arctic and subarctic regions. If this increase in temperature further continues at the present rate then there is every possibility of higher sea level rise in the future. Through the Climochronology and studies of climate change indicators and evidences it is known that our earth's climate has been changing and it was never static. The sea level have been also changing for many years resulting from glaciation and deglaciation or plate tectonics but the present day concern for global climate change and sea level rise is due to the fear of catastrophic effects on different spheres of man and future generations. As per the fifth Assessment Report (IPCC 2014) the projections for the global sea level rise are much higher than the

fourth Report. For high emissions IPCC now predicts a global rise by 52-98 cm by the year 2100 and with aggressive emissions reductions, a rise by 28-61 cm is predicted.¹ Though the predictions about the rate of sea level rise faced many criticisms and questions around the world and always remains a controversial issue we have to accept that certain parts of the world has started witnessing the change.

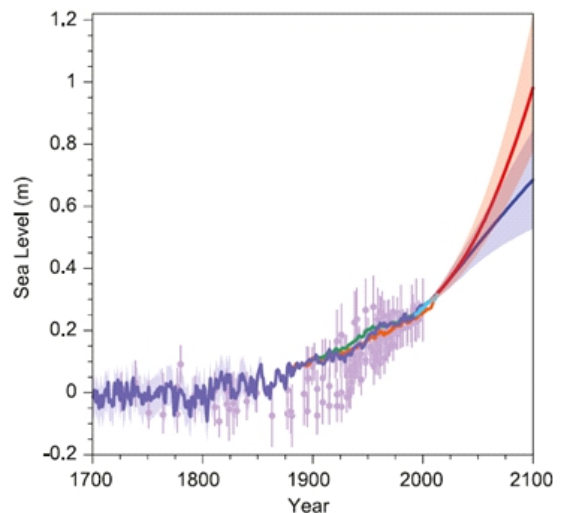


Fig.1. IPCC projections for very high emissions (red, RCP8.5 scenario) and very low emissions (blue, RCP2.6 scenario). Source: IPCCAR5 Fig. 13.27.

The mass balance of the Greenland Ice Sheet decreased in the late 1990s to -100 gigatonnes per year (Gt a⁻¹) or even <-200 (Gt a⁻¹) for the most recent observations in 2006.² There is no doubt that the Greenland Ice Sheet is losing mass and very likely on an accelerated path since the mid-1990s. The mass balance for Antarctica as a whole is close to balance, but with a probable net loss since 2000 at rates of a few tens of gigatonnes per year.

Within the uncertainty of the measurements, the following generalizations are justifiable. Since the mid-19th century, small glaciers have been losing mass at an average rate equivalent to 0.3-0.4 mm a⁻¹ of sea level rise, this rate has varied. There was a period of reduced loss between the 1940s and 1970s, with the average rate approaching zero in about 1970. We know with very high confidence that it has been accelerating since then and cannot now be near to zero. The best estimate of the current (2007) mass balance is near to -380 to -400 Gt a⁻¹, or nearly 1.1 mm SLE a⁻¹; this may be an underestimate if, as suspected, the inadequately measured rate of loss by calving outweighs the inadequately measured rate of gain by "internal" accumulation.

Sea-level rise, with associated effects such as increased frequency of severe storm surges, will be one of the greatest impacts of a warming world on human societies. Even if global warming stabilizes, the ice sheets will continue to add to sea level for many centuries into the future. The melting of ice sheets also freshens the ocean water, with consequent impacts on ocean circulation (and hence global climate), marine environments, and the rate at which the ocean absorbs greenhouse gases such as carbon dioxide from the atmosphere. From 1850–1899 to 2001–2005, average global surface air temperature increased by 0.76°C (IPCC, 2007) leading to warming of the oceans and melting of ice on land. Church and White (2006) used a combination of tide-gauge records and more recent satellite-altimeter data to reconstruct global sea level from 1870 to 2004, showing a global average rise of 0.17 m during the 20th century. The IPCC AR4 estimated that the two largest contributions to 20th century sea level rise were ocean thermal expansion and the melting of glaciers and ice caps.

Climate change projections

Indonesia being the world's third largest emitter of greenhouse gases is receiving world's attention, as the increase in greenhouse gases are the main causes of the present global climate change. Indonesia is the world's largest archipelago comprising up to 17000 islands and is known for its lush green natural beauty, forest, diverse species and resources, but the fast and continuing environmental degradation is becoming a problem. Unlike in most industrialized countries, Indonesia's greenhouse gas emissions are mostly the result of forest fires and environmental degradation (M. Measey 2010). For example, air pollution has cost the Indonesian economy approximately \$400 million per year (World Bank, 2010). Whereas downward trends in precipitation have been observed in the tropics from 10°S to 30°N since the 1970s (Trenberth and others 2007). It has become wetter in eastern parts of South America and northern and central Asia but drier in the Sahel, southern Africa, and parts of southern Asia. In accordance with this, more intense and longer droughts have been observed over wider areas since the 1970s, mostly in the dry tropics and subtropics (Dai and others 2004). These droughts have often been linked with prolonged heat waves. There have been substantial increases in heavy precipitation events in many land regions, even in regions with no change or reductions in total rainfall (Groisman and others 2005), where droughts might be exacerbated if the reduced rainfall is increasingly falling in heavy precipitation events.

Globally, estimates of potential destructiveness of tropical cyclones show a significant upward trend since the mid-1970s (Emanuel 2005), with a trend toward longer lifetimes and greater storm intensity (Emanuel 2005). This is strongly correlated with the higher tropical sea surface temperatures. Even though these observations depend critically on data quality and the choice of start date (Chan 2006), the data available suggest that the potential destructiveness has not previously been as high as now (Trenberth and others 2007). The largest increases in intense tropical cyclones have been observed in the North Pacific, Indian, and southwest Pacific Oceans (Trenberth and others 2007). The warming in Africa is projected to be above the global annual mean warming throughout the continent and in all seasons (Boko and others 2007). The annual rainfall is projected to decrease in much of the Mediterranean Africa, northern Sahara, and southern Africa. The mean annual rainfall in eastern Africa is likely to increase, whereas projections of changes in rainfall in the Sahel, the Guinean Coast, and the southern Sahara remain uncertain (Christensen and others 2007). The analysis of the tide gauge stations at four points along the Croatian Adriatic coast (Rovinj, Bakar, Split and Dubrovnik) showed very different trends. For example, in Rovinj and Split, sea-level is falling relative to the land by a rate of -0.50 mm/y and -0.82mm/y respectively, while in Bakar and Dubrovnik, sea-level is rising relative to the land by a rate of +0.53mm/y and +0.96mm/y, respectively (Dobra klima za promjene, 2008, 71). Warming is projected to be similar to global mean warming in Southeast Asia, stronger over South Asia and East Asia, and greatest in the continental interior of Asia (Cruz and others 2007). Precipitation is projected to increase in northern Asia, East

Asia, South Asia, and most of Southeast Asia but to decrease in central Asia (Christensen and others 2007). These changes will be associated with an increase in frequency of intense precipitation events in South Asia and East Asia, partly associated with likely increase in tropical cyclone intensity in East Asia, Southeast Asia, and South Asia.

Threat to northeast India

The northeast India comprises of eight states, which are known for their scenic beauty with lofty mountains and green valleys, namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura which constitutes only 7.98 percent of the country's total geographical area. Thin population and the love for the nature by more than hundred different tribal groups living here make this region account for nearly one fourth of country's forest cover (Forest Survey of India. 2013). The peripheral location of this region bordering with five countries has made it strategically important. This region is rich in biodiversity and harbors largest number of endemics and Schedule I species as compared to any other part of India (MacKinnon J, MacKinnon K. 1986). Because of its rich forest resources which include thousands of different species of flora, medicinal plants, endemic species and large biodiversity the region has been included among the eighteen biodiversity hotspots of the world; Eastern Himalaya and Indo-Burma biodiversity hotspot. The region has at least 7,500 species of flowering plants, including 700 orchids, 58 bamboos, and 64 citrus. Besides, it has over 28 conifers, 500 mosses, 700 ferns, and 728 lichen species.³ Nearly 50 percent of the total flowering plants recorded from India are found in this Northeastern Region of India (Mao, AA & Hynniewta, and TM. 2000). The region also has a rich faunal diversity here are found some endemic species that are not seen in any part of the world and are found only in their natural habitat. The beauty of the biodiversity of this region is made more attractive by the millions of migratory birds coming from different parts of the world crossing thousands of kilometers. Where there are so many richness in biodiversity in this region a threat to extinction of many such species, ecological and environmental degradation are also felt by people living in this part of the country. A slight change in the climatic conditions may lead to much destruction to those endemic species which are endangered and very sensitive to climate change which cannot adapt to the changing climate. Deforestation, lack of herbs on which these endemic species feed will automatically lead to the extinction of them with due course of time. Demand for land due to population growth, infrastructural development and the shifting cultivation are the reasons for clearing the forest, land encroachment is also one major reason in case of Assam (FSI. 2013).

Migration is a major challenge in the Indian sub-continent, it has millions of diaspora outside the country and on the other hand it receives millions of migrants from the neighboring countries. Sharing the similar cultures in the region it becomes easy for migrants to come and mix with the existing, sometimes it is also difficult to differentiate who is who. Migrants include the Bangladeshi, Nepalese which contribute the most, Tibetan and Bhutanese in small numbers. Problems of illegal migrants from Bangladesh to this region is a long standing issue and the influx do not seem to stop any sooner. In 2002 the Indian Ministry of Defense revealed that on average over 100,000 illegal immigrants from Bangladesh reach India every month. The entire socio-political and economic structure of this region has undergone drastic changes since the 1971 Liberation of Bangladesh war as a result it has generated conflicts among the different communities. Seasonal flooding alone displaces from 500,000 to 1 million people per year in Bangladesh: respectively, Warner et al. (2009) and Global IDP Project (2001). It is reported that by 2100 nearly 17% of the land area of Bangladesh will be under water and this will displace near about 18 million people (IPCC AR 1995). The region is the expected place of destination for these millions climate change induced migrants in the near future. The locals are already worried that they may be outnumbered by the illegal migrants in their own land, further which may lead to high biotic pressure and environmental degradation in the green northeast India.

Conclusion

Climochronology reveals that world's climate was never static the climate of earth have changed many times in the past and thus climate change is a reality. The anthropogenic accelerated climate change is considered to be the result of excess emission of greenhouse gases by the industrialized nations. However, the adverse effects of the climate change is expected to be faced by the least economically and technologically advanced countries. These countries are mainly depended on the primary sector they lack technological advancement to mitigate the climate change effects above all they are at beginning of industrialization, the option for green energy requires huge investment and technology. Sometimes the option for adaptation with the changing climate is hinted for the poorer countries whereas the mitigation process is considered for the developed countries. The Northeast India's concern to climate change is important to study and take up necessary steps timely. The number illegal migrants in the region's demography is fearing. The respective government needs to prepare themselves for the climate change induced migration in the region, to reduce its effect and prevent from uninvited adversities. Several programmes, mission, and innovation for slowing down and reducing the climate change effects needs to be implemented judiciously.

References:

- Ben Saul (2012). The security risk of climate change displacement in Bangladesh. *Journal of Human Security*, Forthcoming, Sydney Law School Research Paper No. 12/58 available at SSRN: <https://ssrn.com/abstract=2138006>
- Boko A, Niang I, Nyong A, Vogel C, Githeko A, Medany M, Osman Elasha B, Tabo R, Yanda P (2007). Africa. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE (eds) *Climate change 2007: impacts, adaptation and vulnerability*. Contribution of Working Group II to the fourth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge, pp 433–467.
- Chan JCL (2006). Comments on "Changes in tropical cyclone number, duration, and intensity in a warming environment". *Science* 311:1713.
- Christensen JH, Hewitson B, Busuioc A, Chen A, Gao X, Held I, Jones R, Kolli RK, Kwon W-T, Laprise R, Magan'a Rueda V, Mearns L, Mene'ndez CG, Ra'isa'nen J, Rinke A, Sarr A, Whetton P (2007). Regional climate projections. In: Solomon S, Qin D, Manning M, Chen Z, Marquis M, Averyt KB, Tignor M, Miller HL (eds) *Climate change (2007). The physical science basis*. Contribution of Working Group I to the fourth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge, pp 847–940.
- Church, J.A. and N.J. White (2006). A 20th century acceleration in global sea-level rise. *Geophysical Research Letters*, 33, L01602, DOI: 10.1029/2005GL024826.
- Cruz RV, Harasawa H, Lal M, Wu S, Anokhin Y, Punsalmaa B, Honda Y, Jafari M, Li C, Huu Ninh N (2007). Asia. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE (eds) *Climate change 2007: impacts, adaptation and vulnerability*. Contribution of Working Group II to the fourth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge, pp 469–506.
- Dai A, Trenberth KE, Qian T (2004). A global dataset of Palmer Drought Severity Index for 1870–2002: relationship with soil moisture and effects of surface warming. *Journal of Hydrometeorology* 5:1117–1130.
- Dobra klima za promjene: Klimatske promjene i njihove posljedice na društvo i gospodarstvo u cjelini (2008), Izvješće o društvenom razvoju Hrvatske, UNDP, Zagreb.
- Douglas K. Bardsley, Graeme J. Hugo (2010). Migration and Climate change: examining thresholds of change to guide effective adaptation decision-making, *Popul Environ* (2010) 32: pp 238–262 DOI 10.1007/s11111-010-0126-9.
- Emanuel K (2005). Increasing destructiveness of tropical cyclones over the past 30 years. *Nature* 436:686–688.
- Global IDP Project (2001). Background Information on the IDP Situation in Chittagong Hill Tracts (CHT) in Bangladesh. <http://reliefweb.int/report/bangladesh/background-information-idp-situation-chittagong-hill-tracts-cht-bangladesh> accessed on 10/6/2017.
- Groisman PY, Knight RW, Easterling DR, Karl TR, Hegerl GC, Razuvaev VN (2005). Trends in intense precipitation in the climate record. *Journal of Climate* 18:1326–1350.
- India State of Forest Report 2013: Forest Survey of India.
- Intergovernmental Panel on Climate Change (IPCC) (1995). *IPCC Second Assessment: Climate Change*.
- Jessica M Ayers, Saleemul Huq (2008). The value linking mitigation and adaptation: A case study of Bangladesh, *Environmental Management* 43: pp 753–764 DOI 10.1007/s00267-008-9223-2.
- Joze Peric, Zvonimira Sverko Grdic (2015). Economic impacts of sea level rise caused by climate change, *Tourism in Southern and Eastern Europe*, Vol. 3, pp. 285–294.
- Lia Rodriguez de la Vega (2015). International Migration in South Asia: Notes on the "Illegal Migration" from Bangladesh to India. *The Oriental Anthropologist*, Vol. 15, No. 2, pp 419–442.
- MacKinnon J, MacKinnon K (1986). Review of the Protected Areas System in the Indo-Malayan Realm. Gland: IUCN.
- Mao, AA & Hynniewta, TM (2000). Floristic diversity of North East India. *J. Assam Sci. Soc.* 41(4): 255–266.
- Mariah Measey (2010). Indonesia: A Vulnerable Country in the Face of Climate Change, *Global Majority E-Journal*, Vol. 1, No. 1, pp. 31–45.
- Migrants, politics and need for action in northeast. *The Hindustan Times*, New Delhi 10 September 2008.
- Ole. Mertz, Kirsten. Halsnaes, Jorgen E. Olesen, Kjeld Rasmussen (2009). Adaptation to Climate Change in Developing Countries. *Environmental Management* 43: pp 743–752 DOI 10.1007/s00267-008-9259-3.
- Position Analysis: Polar ice sheets and climate change: global impacts. (2009) © Copyright The Antarctic Climate & Ecosystems Cooperative Research Centre, PA04-090604 ISSN: 1835–7911.
- S. Jeffress Williams (2013). Sea level rise Implications for coastal regions, *Journal of Coastal Research* 63: pp 184–196.
- Trenberth KE, Jones PD, Ambenje P, Bojariu R, Easterling D, Klein Tank A, Parker D, Rahimzadeh F, Renwick JA, Rusticucci M, Soden B, Zhai P (2007). Observations: surface and atmospheric climate change. In: Solomon S, Qin D, Manning M, Chen Z, Marquis M, Averyt KB, Tignor M, Miller HL (eds) *Climate change 2007: the physical science basis*. Contribution of Working Group I to the fourth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge, pp 235–336.
- Warner, K. et al. (2009). In Search of Shelter: Mapping the Effects of Climate Change on Human
- Will illegal migrants outnumber northeast indigenous people in 30 years? *Asian Tribune*, Hallstavig 24 August 2014.