

Borderlands, environment and climate change in Northeast India

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Abstract

The Northeast India has suffered from a dismal lack of academic attention. It is being addressed through various disciplinary interventions. Northeast seeks to address the region through the framework of 'borderlands.' This conceptualization is especially relevant because of the region's location. There are many reasons to think of Northeast India as a borderland. First, in the colonial period it was the eastern frontier of British India: here the expanding British Empire encountered the Chinese and Burmese Empires. Second, the region reached independence as the eastern periphery of post-colonial India. Third, it became conceptualized as a liminal zone between the areas of 'South Asia' and 'Southeast Asia.' Fourth, it is now a dynamic crossroads of geopolitical reconfiguration involving China, Myanmar or Burma, Bangladesh, Burma, Nepal and India. North East borderlands in India are now prone to the environment and climate change risk. But impacts of climate change on Northeast borderlands are not much explored making this area more vulnerable to environment induced risks. The article addresses the environment and climate change risks of borderlands in Northeast India to understand the issues.

Key words : Northeast, India, environment, climate change, borderlands.

The world we see today is becoming increasingly indefinite, with changing climatic conditions, weather patterns, increasing temperatures, rainfall, and precipitation variability. Climate change is at the root of these variabilities, having a negative impact on the health, food, livelihood and security of the people. These vulnerabilities are further enhanced for developing countries like India, where people are highly dependent on climate

sensitive sectors and do not have the resilience-necessary resources and the adaptive skills to cope with the challenge of climate change. Vulnerability to climate change is the degree to which geophysical, biological and socio-economic systems are susceptible to and unable to cope with the adverse impacts of climate change whereas, resilience is the degree to which geophysical, biological and socio-economic systems rebound, recoup or

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recovers from adverse effects of climate change⁵. India is highly dependent on the environment for food and livelihood, which makes Indians highly susceptible to climate change. The impact of climate change and its associated costs will fall disproportionately on the developing countries threatening to undermine the achievement of the Sustainable Development Goals of No Poverty and Zero Hunger, as climate change will reduce access to drinking water, affect the health of the people, especially the poor and pose a threat to food security. According to the IPCC Report, “Climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further with 2°C⁶.” These effects are more likely to be felt by disadvantaged and vulnerable populations, indigenous people, and local communities’ dependent on agricultural or borderland livelihoods. The poor are more vulnerable as their capacity to adapt is low due to limited choices and opportunities, the small land holdings, and lack of access to markets.

The North-East borderland of India consists of eight States- Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura. This region is a biological diversity hotspot, accounting for more than one-third of the country’s total biodiversity and nearly 25 per cent of the total forest cover. The northeast region is riddled with problems of its own, like- hilly terrain, poor infrastructure, fragmented land holdings, jhum cultivation, extensive deforestation, land degradation- and climate change adds to it. It is highly vulnerable to climate change as 82 per cent of its people live in rural areas, depending

on natural resources for food and livelihood⁷.

Hence, agriculture plays a dynamic role in determining the economy of the region. The people depend on the southwest monsoon to fulfill their agricultural water requirements, putting their survival at the mercy of climate change. In recent years, the northeast region has been subject to several climate induced risks that adversely affect natural resources. The Brahmaputra and other transboundary river creates mayhem by causing floods, and climate change will only exacerbate it further.

On the other hand, deficit rainfall has also caused droughts in this borderland, especially in Assam, Arunachal Pradesh and Nagaland. Apart from extreme events, changes in the trends of the meteorological parameters are likely to impact the natural resources and the livelihoods of the dependent communities.

An extensive field survey was conducted in October 2022, to observing about the changing climate and environmental risk at the study site. The information regarding the environmental and climatic risk, etc. were collected through the unstructured interview with 30 randomly selected villagers who belongs from Bodo tribe and Adivasi peoples of Tamulpur and Baksa districts of Assam.

Conceptual Framework :

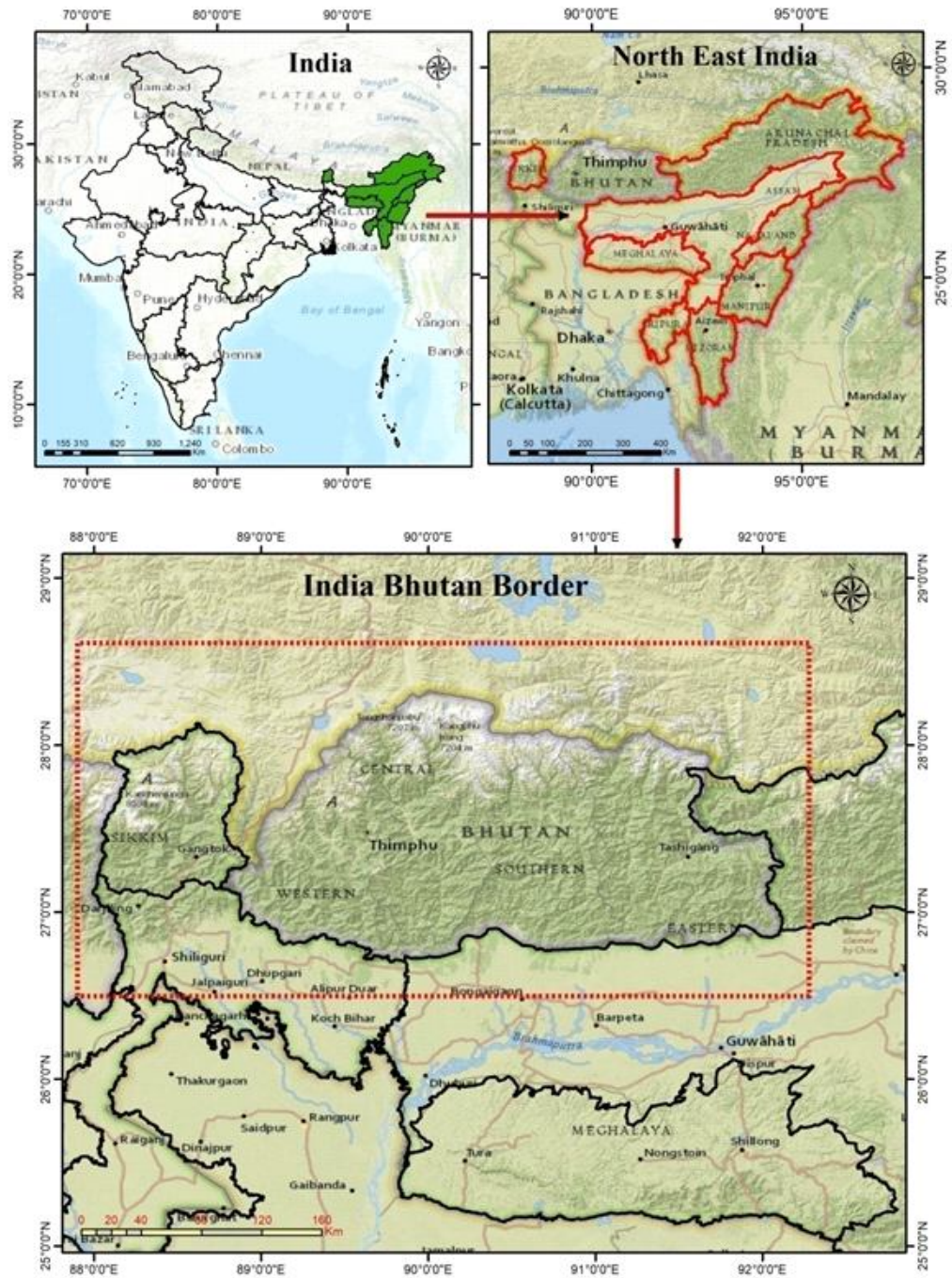
The history of border making has been dynamic and complex and it has impinged on life in Northeast India in many subtle ways. Various stages of colonial incorporation produced fluctuating borders and contested borderlands. These were accompanied by shifting categorizations of various groups of

inhabitants (from ‘settled’, to ‘primitive’, to ‘savage’ and ‘most primitive’) and these in turn produced gradations in their cultural capital and in variations in administrative absorption (Excluded Territories, Partially Excluded Territories, Inner Lines, *etc.*). The Partition of British India added a new layer of contested border making in Northeast India. Such contestations concerned the exclusion of the Chittagong Hill Tracts (which went to Pakistan), the disputed inclusion of Manipur and bids for independent nationhood in Nagaland and Mizoram^{4,12,17}. The post-colonial state tried to fix these conundrums of border making but also inherited intractable border disputes with China (in Arunachal Pradesh), Pakistan and Bangladesh. These international disagreements turned Northeast India into a ‘sensitive’ region and a national security concern. Partition created the region we now call ‘Northeast India’. Its new international borders disrupted long established connections, both physical and man-made, and created new scales of association. The result was a configuration of contrary developments of homogenization and divergence within the region, making regional generalizations hazardous¹⁶.

Since independence, the borderland of Northeast India has been almost entirely surrounded by international borders and, at the same time, a web of internal boundaries between Indian states and lower administrative units criss-crosses it¹³. While these borders appear as mere lines on a map, they are best understood as sites that are continually shaped, altered, undermined and re-inscribed by numerous social actors. Some of these are, of course, local borderlanders people who happen to live in the vicinity of borders—but many

other actors also impinge directly or indirectly on border-related processes, for example, state agents, (inter) national businessmen, labour migrants and refugees. The multilateral associations and dissociations, both local and transnational, which exist today need to be explored in much greater detail to grasp how this enormous borderland is impacting by the environmental and climate risk. Such exploration can be fruitful only if we contextualise with current issues. The colonial and post-colonial states administering Northeast India differ in many respects from each other but their shared preoccupation with, and problems of, control, categorization and planned improvement act on the region in very similar ways¹⁸.

Global climate change is fundamentally altering the world as we know it. As this recognition increasingly permeates social and political discourse, our understanding of what this will mean also increases as scientists continue to delineate with ever greater clarity the impact of a warming climate on the natural world around us¹. Here climate change is the new challenging phenomena in borderland areas. Borderland is easily vulnerable to climate and environmental risk. Northeast borderland, for example, is considered to be at high risk because of extreme environmental fragility and poverty¹⁰ due to differential amounts of wealth, political authoritarianism, economic development, and geographic location⁹ mean that the consequences of climate change will impact borderland in multiple and complex ways.



Map Source: By Authors

Climate and Environmental risk at Borderlands:

Climate and environmental risk in the borderland of northeast India is less explored. In the borderland, mainly Bhutan is the country which is mostly impacted by changing climate and environmental risk. Because most of the northern tributaries of the Brahmaputra originate from Bhutan and Arunachal Pradesh bordering China. Rivers from Bhutan belong to Baksa, Udalguri, Chirang and Kokrajhar districts in the entrance point in Indo-Bhutan border in the state of Assam, India. There has been evidence of less flow of water in most of the Trans Boundary Rivers like— Daranga, Sunkosh, Manas, Champabati, Aai and Dhanshiri originating in sub-Himalayan Bhutan due to climate change.

Most of the rivers flowing from Bhutan have become dry and seasonal after they entered plains either in Bhutan or India. Small Himalayan rivers like Gaurang, Beki, Namlang, Daranga, Pagladia, Motonga, Nona, Borla, Nonoi, Puthimari and Borolia-originating in Bhutan and flowing to Assam—had large volume of water even in winter are now running dry. Water flowing from Bhutan's Himalayas sustains the lives and livelihoods of millions of people residing in plains of Assam and West Bengal. More than 80 per cent of people in the region live near rivers to have water accessibility. Some 70 per cent of the region's population is food-energy deficient, a proportion almost as high as that in desert region¹. Some of the environmental and climatic risk has been discussed in below.

Water :

The Himalayan or sub-Himalayan rivers flowing through Bhutan, Arunachal Pradesh and Assam join with the Brahmaputra.

These tributaries of Brahmaputra for most of their length drain the steep slope of the Himalayan foothills to the south where rainfall is heavy and irregular due to climate change. The irregular rainfall affecting the flows as well as geomorphological activities attributes climate change with increasing atmospheric temperature¹¹.

Entrances of every river in Indo-Bhutan border site became full of sediment, mostly sand, boulders, pebbles and shingles. Deposited sediment along the rivers contains less alluvial or organic components. The massive extraction of boulders, stones and sand have increased the sediment load in downstream of concerned rivers resulting in shifting of river water and rise of riverbeds.

The major portion of heavily silt laden flood waters carried to the flood plains in Bhutan-Assam border and ultimately to the Brahmaputra not only aggravates flood congestion, but also adds to silt charge of the river. However, Floods not only carried heavy runoff, particularly where slopes were inundated, but also very large volume of detritus, the result of excessive soil erosion, to risen land surface in the plains by bank spill.

Geographical :

Bhabar formation comprises of the alluvial sediments at the Indo-Bhutan belt covering the central and southern part. The behavior of ground water in the piedmont sediments is naturally different from with less alluvial components. The material is a heterogeneous admixture of boulders, pebbles, cobbles with the interstices filled by sand and silt. But these materials are increasing abruptly

by flash floods in the districts of Udalguri, Baksa, Barpeta, Chirang, Bongaigaon and Kokrajhar have been changed due to changing climate².

In Indo-Bhutan border of Assam and West Bengal, dramatic reduction in the slope of the rivers have resulted in unloading of huge sediments in the valley downstream that accumulates during the passage through the hilly terrains which are highly susceptible to erosion. Repeated flash-floods during this period made the entire riverine system in Bhutan-Himalayas severely disturbed with repeated sedimentation. The characteristics of floods in Assam and North Bengal have changed over the period and current understanding of flash flood remains at the levels of general concepts. Flash floods and aftermaths are generally not investigated as a separate class of events but are rather reported as a part of the overall seasonal floods situation¹.

As Bhutan has become richer, and invested more in dam building and infrastructure this development has led to further erosion. The sediment resulting from these activities – mostly sand, boulders, pebbles and shingles – now chokes the Transboundary Rivers. This type of sediment contains less organic nutrients, which negatively impacts agriculture in these borderland. Sand deposits used to extend from 5 to 10 kilometres in to the southern plains as the rivers entered the state of Assam. Now, according to local people, this area has stretched to at least 20 kilometres downstream¹. Sand and boulder depositions along small Himalayan rivers are increasing in the last 20 years in Indo-Bhutan border areas.

Moreover, the floods now carry massive sand deposits as the sharp hills have been eroded by the waters. It is suspected many mining and development activities like dam building may also be responsible for sand and stone deposition in the river beds. Further, it led changed in the Indo-Bhutan belt.

Flash floods :

Flash flood becomes a very common form of natural disaster in these borderlands. It increased habitat inundation, crop land destruction, mortality rate of both human and live-stocks. Sand and boulders have been deposited extensively in floodplains in Assam by Pagladia, Manas, Beki, Motonga, Puthimari (Lokhaitora), Borolia and Dhansiri. It is believed that apart from GLOF, cloudburst and LSDOF (Landslide dam outburst flood) in Bhutan Himalayan foothills are causes of flash flood and massive sand deposition in Assam. But the problems and causes have not been established yet scientifically. It is suspected many mining and development activities like dam building are also responsible for sand and stone deposition in the river beds.

Glacial Lake Overflow Floods (GLOFs), cloud bursts and Landslide Dam Outburst Flood (LSDOFs) have all resulted in flash floods. While flash floods are significantly different from normal floods in terms of cause, propagation, intensity, impacts, predictability and management they are generally not investigated as a separate class of events but are rather reported as a part of the overall seasonal floods situation. This means that these new activities are neither reported on, nor managed, in a manner that would best suit them.

Flash floods that become frequent in the last 15-20 years are responsible for this transformation. Every year flash floods erode the river bank in different direction and the river bed became shallow and wide with full of sand. Flash floods transformed vast stretches into deserts within the last two decades¹¹.

The rivers originating in the lesser Himalayas used to have wide river beds in plains of Assam with low flow depths. During the rainy season most of them flow torrentially and meander widely. Being rain fed, these rivers used to carry thin volume of water even in winter. But these features have been vulnerable to climate risk. Climate change and local deforestation affects these rivers severely. Apart from atmospheric temperature rising in the Hindu-Kush Himalayas as a whole, intense seasonal precipitation in Bhutan Himalayan foothills triggers a variety of natural hazards. Due to high intensity rainfall events in Bhutan Himalayas are often localized phenomenon and have intense implications. These intense rainfall events, sometimes called cloudburst, can occur in remote areas as a result of topographic variation. Of course it has a relation with atmospheric temperature rising as well as climate change².

Trans-Himalaya plays a major role in controlling the weather and climatic conditions. The progressive accumulation of greenhouse gases in atmosphere is causing uncertainties in climatic changes and severe impacts on the existing ecosystem. Dying rivers, desertification along their smashed banks are characterized by complex interplay of climatic and geo morphological process, availability of limited natural resources and economic conditions leading to enhance the resource degradation

and the associated environmental consequences. The researchers acknowledged these extended degraded areas are adversely affecting the indigenous ecology and species. Desertification of crop land, low agricultural productivity and uncertainty in agricultural production forced people to find out other livelihood and habitat. Lack of basic facilities in villages and better prospects in cities are other reasons for migrating.

It is true that mortality rate from flash floods is much higher than from other water-induced disasters, but deposition of moraine, sand and stone create big environmental problems in the borderlands. The desertification leading to alienation from livelihood has created crisis such as pressure on forest land and growing of illicit trade and business. Labour migration has become a key issue in the present day globalised world, and it is a major livelihood strategy for many people in the region. The fragile bedrock, steep slopes and high rate of surface erosion attributes to devastating flood, erosion and desertification. The deposition of sand, stone, boulder and silt in Bhutan-Himalayan rivers flowing through Assam create a new type of desertification and most of the rivers are dry near Bhutan-India border as the rivers entering into the floodplains of India. It is estimated at least 1.5 lakh hectare of cropland have been effected by Bhutan Himalayan rivers.

Effects on people's livelihood :

In Indo-Bhutan borderland having large population, limited land resources, and growing water stress-face a common challenge of how to grow more food with the same or less land, less water, and increased

water prices. Rice, the staple foods in the region, requires huge amounts of both water and energy. No scientific study has been done about the decreasing amount and duration of water in small Indo-Bhutan trans-boundary rivers. It is believed that continuing of the same will further aggravate the situation alienating more people from their habitat and livelihood. A combination of building activity in Bhutan, and changes in rainfall patterns are now making major changes to the land, having knock-on effects that few can fully foresee¹⁰. Unfortunately because the effects are felt most by the poor, but most of the study and the policy community have paid little attention.

Forests in the borderland primarily impacted by climate change, leading to the extreme vulnerability of the Himalayan biodiversity hotspots. Most of the people dependent on forests for their food and livelihood needs is quite high in the borderland. This is leading to a deterioration of land due to jhum cultivation, encroachment and deforestation, making this borderland unfit for future use in livelihoods.

The borderland sees higher agricultural vulnerability in the north, which keeps on declining towards the south. Since agricultural vulnerability is a function of crop production and input, the higher vulnerability may be lower input levels. The high relative variability of rainfall, floods, and droughts leads to lower agricultural yield and food insecurity. There is rising evidence that climate change is endangering tea plantations in Assam and leading to decreased tea yields in the borderland.

The borderland region is highly vulnerable to vector-borne diseases, which are

a major public health concern. Increased flash flood in the borderland have led to the spread of Japanese Encephalitis, malaria, dengue and lymphatic filariasis (Iqbal & Ali, 2021). Among these diseases, malaria and Japanese Encephalitis are predominant and spread to Assam, Arunachal Pradesh and Mizoram borderlands.

At the same time rice, the staple food in the borderland, requires huge amounts of both water and energy to grow. For many peoples collecting drinking water is and difficult task. Women are the worst affected by climate change and bear the brunt of it. Generally, women walk half a kilometre or more to fetch water. Climate change also causes malnourishment and food insecurity amongst the people. It is generally seen that women of lower socio-economic background have higher rates of anemia (Iqbal & Ali, 2021). On the other hand, with loss of livelihood, many young people have turned to the business of sand mining and stone crushing both legally and illegally.

The above discussion is that borderlands are vulnerable to environmental and climate change risk. The paper has been provided much attention towards the climate change phenomena in the northeast borderlands. Desertification is one of the serious problems in Himalayan foothill areas. The fragile landscapes of the region are highly susceptible to natural hazards, leading to ongoing concern about current and future climate change impacts in the region. Climate change concerns in the Himalayas are multifaceted encompassing flood, droughts, landslides, human health, biodiversity, endangered species, agriculture, livelihood and food security.

The changing climatological, ecological, social, and political landscape are impacting in these borderlands. While climate induced stresses will impact all regions, communities, and nations, the choices and strategies of accommodation, adaption, and amelioration will no doubt vary tremendously as localized conditions and needs, and cultural, religious, economic, and political values and practices shape local, regional, and national responses.

In the way forward, the subsequent management and integrity could help to mitigate the adverse effects of development activities, environmental risk and climate change. Development activities like dam building in Bhutan affecting river system must be controlled. Forest as well as trees will check and reduce of the flow of stone, sand and silt from hills to plains. Deforestation and encroachment must be stopped and a forestation programme must be implemented in adjoining areas of hills and plains in the borderlands.

The TraMCA is indeed a good initiative conservation-wise, although it could do more to go for environmental climate concern, and in making it more participatory through the inclusion of local communities. The transboundary water sharing between India and Bhutan through a century-old irrigation system called the *jamfwi* (in Bodo). The transboundary resource sharing and biodiversity conservation initiatives, which are more likely to succeed on this particular borderland due to the Indo-Bhutan Friendship Treaty of 1949, which was updated in 2007. This called for the expansion of economic relations and co-operation in the fields of culture, education, science, and technology. Although biodiversity and environment

are vital components, that could be added to this treaty. Therefore, there is an urgent need of concerned authority and policy makers of both Bhutan and India along with other borderlands such as India and Bangladesh, India and Myanmar have to recognize these potentialities.

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