보**HIMALAYAN** A Naturenomics[™] Publication

THE FUTURE OF THE THIRD POLE & HIMSAGAR

(Eastern Himalaya)





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he village of Karthick Chapori lies on a river island in the middle of the Brahmaputra. Every year, as the monsoon season reaches its zenith, the village is inundated by floods that erode its banks and silt the land. These floods are a natural part of this landscape and historically have served to replenish the fertile soils of the lands that line the Brahamputra river valley. Changes in the landscape, such as increasing urbanisation and upstream deforestation and the loss of wetland habitats, have amplified the negative impacts of these annual floods and made them more devastating. Now, there is another more serious challenge on the horizon: the climate crisis.

In 2024, the village of Karthick Chapori experienced the most violent floods in the villagers' memory – and on record in the past fifteen years (records only extend till 2010 in this area). The flood deposited up to 3 feet of silt on the banks of the island. Within a span of 33 hours, floodwaters entered the village and took the villagers by surprise, leaving them little to no time to

evacuate or make other arrangements. The year before, the village lost a significant area of land to erosion, with several families outright losing their farmland to the river and homes that had once been built safely 1-2 kilometers inland, suddenly found themselves little more than 200 metres from the shoreline.

This story is not an unusual one in Assam. The state has been losing at least INR 200 crore per year on flood damages – with that figure rising as high as INR 10,000 cr in 2022. Over 40,000 hectares of agricultural land were damaged in this year's floods. Millions have been displaced from homes over the years and floods have long resulted in a disruption to the education of children in this area. The result of this is an unfolding, ongoing tragedy with a very human dimension.

It is also a story about the intersecting ecological and climate crisis happening right now in the Third Pole – and its consequences for the lives of billions across the Asian continent.

2024: The year of ecological collapse?

In 2023, preliminary research indicates that the world's terrestrial ecosystems emitted more carbon than they absorbed. Wildfires, drought, heat related tree deaths, unusual insect and pest outbreaks all contributed to terrestrial carbon sinks emitting more carbon than they sequestered. The currents circulating waters in the Atlantic Ocean are weakening due to both rising temperatures and increased ice melt, with consequences for our global temperatures, rainfall patterns and natural carbon absorption systems. The Living Planet Index released in 2024 indicates a sharp decline in average species population since the 1970s - while covering only a fraction of the world's wildlife.

These signs point towards a swiftly approaching tipping point. Some scientists believe the Amazon Rainforest, long plagued by increasing wildfires, logging and agribusiness clearances, has already crossed a tipping point towards collapse. If terrestrial ecosystems fail to sequester carbon over the next few years, we are very likely to be looking at a world in the middle of ecological collapse.

The picture is no more rosier in the Third Pole - a vast geography spanning the entire Hindu-Khush Himalayan region and the Tibetan Plateau. While this region is critical to alobal climate patterns, including the regulation of the South Asian monsoon that feeds our farms, it is warming three times faster than the rest of the world. This has led to increased glacial melt and shrinking permafrost, with serious downstream consequences for the landscape: violent and unpredictable annual floods, glacial lake outburst. loss of wetlands, desertification. the transformation of ecosystems - and all its consequences for the livelihoods and economy of the Himalavan region, but especially the Eastern Himalaya in India, Nepal, Bhutan and Bangladesh.

The power of valuation, biodiversity and people

The scale of this existential threat demands immediate action. Of key importance is valuation, which has two levers: the cost of inaction (i.e. risk) and the invisible value of ecosystems services. The Third Pole is expected to see both a rise in rainfall as well as a rise in evaporation: leading to net water scarcity. As these effects accelerate, ecosystem protection and restoration in a region like the Third Pole, with a highly naturedependent and affected economy, becomes a critical means of mitigating economic loss: e.g. forest restoration upstream reducing flood damage downstream, protecting agricultural productivity and yields by moving towards climate-resilient forms of agriculture.

Across the region, communities are taking on the challenge of protecting their ecosystems and exploring new climate-resilient livelihoods. A growing movement for community-driven conservation in the North East states of India is expanding to reduce logging and eliminate unsustainable hunting practices in rich and biodiverse forests. In the village of Karthick Chapori, where our team has been working since 2022, the villagers have come together to restore forest landscapes in their area both as a means of reducing erosion in the long-term and in providing habitats for wildlife away from the village to reduce human-animal conflict. Indigenous people are increasingly seeking to protect not only ecosystems, but traditional seeds and crops, recognising their resilience to a wider range of extreme weather events from floods to drought. In 2023, the state of Assam introduced its first areen budget, seeking to scale investment cross-sectorally in greening the state economy, with 10% of total spending going directly towards green investments, primarily in renewables.

These pockets of resistance to the onslaught of climate and ecological crisis are cause for hope. But they also demonstrate the urgent need for systematic policy interventions to transform the regional approach to our natural ecosystems as non-productive and lacking in value. This is where valuation of natural capital has a role to play in enabling a better sense of the cost of both destruction and inaction, that allows for informed decision-making. Sir Partha Dasgupta's Economics of Biodiversity makes this very case, in terms of encouraging investments to "regenerate" the "supply" of natural ecosystems that propel our economy.

There is also a greater need for international cooperation in addressing transboundary issues affecting this region. Collaborative agreements between countries sharing these fragile ecosystems are crucial for sustainable management of shared resources, especially water bodies originating from these mountains. Moreover, raising global awareness about the significance of this region in climate regulation and biodiversity conservation is vital.

This 12th edition of the Eastern Himalayan Naturenomics[™] Forum and edition of *The Himalayan* delves into these issues, examining questions of biodiversity loss, conservation and land management within the Third Pole and its future – and the much broader regional needs for energy transition, policy reform and technological adoption to enable an approach to climate resilience that integrate both people, biodiversity and ecosystems.

The future of the Eastern Himalayan region is intimately intertwined with the health of the Third Pole. In the absence of action, we have a future of extreme crisis - social, economic, and security - within the next few decades. The imperative, therefore, is to face the hard facts that face us: and work to ramp up action for our remaining ecosystems, to invest in adaptation and mitigation mechanisms and to institutionalise the tangible economic value of these ecosystems in our budgetary processes and analyses. Building a shared future for the Eastern Himalaya hinges on securing its natural capital - its majestic mountains, pristine forests, and lifesustaining rivers. Only through collective action and a commitment to ecological preservation can the Third Pole adapt and thrive in the face of an escalating climate and ecological crisis.

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Community Conservation in Eastern Himalaya – select case studies

– Dr. Anwaruddin Choudhury Author, Ornithologist, Mammologist, Artist and Photographer, Assam

he Eastern Himalaya (EH) comprises parts of the states of Arunachal Pradesh, Assam, Sikkim and the northern districts of West Bengal in India, and Bhutan and extreme eastern Nepal. The area is part of a global biodiversity hotspot.

Physiographically, the EH stretches up to the Siang River of eastern Arunachal Pradesh. However, for conservation, the Mishmi Hills and other hilly tracts of north-east India are also included in the greater concept of EH. There are several protected areas declared by the respective governments; however, the local communities are also coming forward to preserve their heritage once they have realised the importance of conservation. Quite a few such initiatives have been going on in the region of which a few noteworthy are being narrated here. I had the opportunity to work with all of them.

Bugun community initiative

It was in 1996 that I first visited Eaglenest Wildlife sanctuary in western Arunachal Pradesh. The area had fascinated me and soon I started visiting frequently documenting its mammals and birds. In the process I came to know Mr. Indi Glow, a leading citizen of Tenga valley belonging to Bugun tribe through Mr Manish Palit, then Divisional Forest Officer. I wrote a few articles on wildlife including one on the birds of Eaglenest in Forktail journal of UK. Soon tourists, especially birdwatchers started visiting the area. A new species of bird, Bugun Liocichla was described from the area by Ramana Athreya. Mr. Glow organised the local youth of his community to preserve the area outside the sanctuary but belongs to community and mooted the idea of setting up of 'Singchung Village Bugun Community Reserve'. It is a 17 square kilometre biodiversity rich area adjacent to Eaglenest Sanctuary and was created in 2017. They won the India Biodiversity Award 2018 in the "Conservation of wildlife species" category conferred by the National Biodiversity Authority (NBA) and featured in the tableau of Arunachal Pradesh during the Republic Day parade at New Delhi in 2024.

Khonoma community initiative

In Nagaland, there was a case of an area at Ghosu village of Zunheboto distrct where the headman has declared it as a 'bird sanctuary' in 1990s. I visited the area in 1996. But it is the 'Khonoma Nature Conservation and Tragopan Sanctuary' or KNCTS that has attracted lot of attention. Located in the Barail range, the area is home to rare Blyth's Tragopan and is protecting a part of scenic Dzukou valley. I had been to Dzukou twice being accompanied by late Thomas Kent Rengma, a conservationist and tourism Director. One of the key architects of KNCTS was late Tsile Sakhrie of Khonoma village. His house became our stopover at Khonoma. As part of my motto to encourage them, I invited a delegation headed by late Sakhrie to visit Manas National Park of Assam and interact with the local NGOs involved in conservation. After their meet, we had an interactive session at my official residence as Deputy Commissioner of Baksa where bulk of the park is located.

KNCTS is about 18 kilometres west of Kohima, the capital of Nagaland. The total area of the reserve is around 25 square kilometres and was created in 1998. The sanctuary is home to several threatened mammal, including the clouded leopard, Asiatic black bear, stump-tailed macaque and hoolock gibbon, as well as over 250 bird species.

Manas community initiative

Assam's famous Manas National Park is located along the foot of the EH. It is also a World Heritage Site. The area was in turmoil between 1989 and early years of the present century. In 2003, under a peace accord among others four new districts were created and I was asked to take charge of one, i.e., Baksa district where a major part of Manas is located. One day the Superintendent of Police Mr G. Duari informed me that the youth including members of All Bodo Students Union and some poachers are trying to form a conservation group so that the national park can get some protection as most of the species has declined greatly owing to breakdown of law and order and subsequent poaching. Very soon, sometime in 2004 we landed at Kamardwisa near Koklabari and had consultations with the group. We ensured our full support and the group came to be known as MMES (Manas Maozigendri Ecotourism Society). This group not only supplemented the efforts of the Forest department in anti-poaching, they also started professional eco-tourism which have benefitted many village families. Chandrakanta Basumatary, Mahendra Basumatary, Rustom Basumatary among many others were involved in the process.

While things started to improve in the park area, the eastern buffer of Manas Tiger Reserve continued to face devastation. I picked up Bijoy Choudhury, an energetic young man with deep interest on conservation. He showed his leadership quality on some occasions. He formed a group and named it 'Manas Souci Khungur Eco-tourism Society'. Within a span of a year the local communities stared supporting the conservation and the areas around Chowki became a major tourist hub. Then Bijoy Choudhury shifted his attention towards west at Bhutankhuti, this time for habitat restoration to reduce human-elephant conflict. Within years a barren scrubland became an excellent tree forest with no significant poaching. The ex-poachers of both these groups laid down their arms to me as the then District Magistrate of Baksa.

Jaintia Hills community initiative

Across Meghalaya, there are several sacred groves. Unfortunately, many are being degraded both physically as well as aesthetically. Mrs Heisakaru Lato, a dynamic forest official initiated documentation of wildlife in the sacred groves which are otherwise not aetting much attention. Camera traps captured presence of several small mammals while there were birds including the endemic Tawny-breasted Wren Babbler and the rare bat Wroughton's freetailed bat in a cave of one of the sacred groves. She and her team held consultation meetings with the community leaders. Her efforts has resulted in declaration of at least 17 such sacred groves as Community Reserves under the Wild Life (Protection) Act between 2013 and 2021.

Third Pole Vis-à-Vis Hindu Kush Himalaya A Global Natural Asset

- Dr. Eklabya Sharma Ashoka Trust for Research in Ecology and the Environment (ATREE), India

he Third Pole, a global natural asset, encompasses the Hindu Kush Himalaya and Tien Shan mountains together forming the largest area of permanent ice cover outside the North and South Poles. Apart from the two poles the Third Pole region has the most frozen water and is also known as the 'Water Tower of Asia'. Rivers originating from this region forms the lifelines for more than 2 billion people in Asia. Like the Amazon forest is known as lungs of the planet, the Third Pole can be called the "Pulse of the Planet" as this region feels the first signs of climate change in this world. The Third Pole hasn't received enough global attention and investments. Urgent actions are needed to address complex crises of climate induced disasters and impacts on lives, livelihoods, water and biodiversity in the Third Pole region.

In a 2007 report, Inter-governmental Panel for Climate Change (IPCC) has identified this region as white spot meaning data gap region. Recently, two major scientific assessments of the region were published, namely, (a) The Hindu Kush Himalaya Assessment: Mountains, Climate Change,

Sustainability and People¹ and (b) A Scientific Assessment of The Third Pole Environment². Other two equally important early assessments in filling the data gaps in this region were (a) Climate Change Vulnerability of the Mountain Ecosystems in the Eastern Himalaya³ and (b) Climate Change in the Hindu-Kush Himalaya: A State of Current Knowledge⁴.

In the perspective of this magazine "The Himalayan" the focus of this article will be on the Hindu Kush Himalaya (HKH) and the Eastern Himalaya within the Third Pole region. The HKH is shared by eight countries namely, Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan. Ten major rivers originate from the HKH region and houses four global biodiversity hotspots. The region provides ecosystem services (such as water, food, energy etc.) that directly sustain the livelihoods of 240 million people in the mountains and hills, and 1.9 billion people living in the river basins.

The HKH region is characterized by rugged terrain with a harsh environment, and an extremely varied climate along the mountain chain extending 3500 km from Afghanistan to Myanmar. The HKH includes the Karakoram and Pamir ranges, as well as the Tibetan Plateau. These climatic and environmental conditions create challenges, but also a wide range of opportunities for livelihood options. The HKH region plays an important role in global atmospheric circulation, biodiversity, and the hydrological cycle, in addition to the unparalleled beauty of its landscape and provision of other ecosystem amenities. The uniqueness of the HKH is amply demonstrated by the fact that the world's tallest ten mountains are all located in the region. The HKH region is also home to many diverse ethnic communities speaking about 1000 different living languages and dialects, with enormous socioeconomic and cultural diversity. These communities practice a variety of traditional livelihoods, including diverse farming approaches, which have optimally used agricultural land and reaped harvests sustainably despite harsh environment.

The HKH is a hotspot of climate change, where temperature amplification by elevation-dependent warming is evident. Even a 1.5 °C global temperature rise by 2100 is too hot for the HKH. At current emission trends, temperatures are expected to increase above 2.5 °C by 2100. Two thirds of the region's glaciers will melt by 2100 under current emission trends, with one third melting with an increase of 1.5 °C. Precipitation has become uncertain and water security is at high risk.

The cryosphere - snow, ice, and permafrost is an important part of the water supply in the mountains and downstream of the HKH. Glaciers have thinned, retreated, and lost

¹ Wester P, Mishra A, Mukherji A, Shrestha AB (eds.) (2019) *The Hindu Kush Himalaya Assessment – Mountains, Climate Change, Sustainability and People.* Springer International Publishing, Switzerland

² United Nations Environment Programme (2022) A Scientific Assessment of the Third Pole Environment. UNEP, Nairobi, Kenya

³ Tse-ring K, Sharma E, Chettri N, Shrestha A (2010) Climate change vulnerability of mountain ecosystems in the Eastern Himalaya - Climate change impact and vulnerability in the Eastern Himalaya : Synthesis report. ICIMOD, Kathmandu, Nepal

⁴ Singh SP, Bassignana-Khadka I, Karky BS, Sharma E (2011) *Climate change in the Hindu Kush-Himalaya : The state of current knowledge*. ICIMOD, Kathmandu, Nepal

mass since the 1970s. Trends of increased mass loss are projected to continue in most regions, with possibly large consequences for the timing and magnitude of glacier melt runoff and glacier lake expansion. Glacier volumes are projected to decline by up to 90% through the 21st century in response to decreased snowfall, increased snowline elevations, and longer melt seasons. The HKH provides vital services such as water for food (especially irrigation), water for energy (hydropower), and water for ecosystems and societies (riparian habitats, environmental flows, and rich and diverse cultural values).

Ecosystems of the HKH are diverse with one of the highest diversity of flora and fauna providing varied services to one fourth of humanity. With four out of 36 global biodiversity hotspots, the HKH is a cradle for 45,000+ species of plants and 7000+ species of animals. The Eastern Himalaya as part of the HKH is very rich in biodiversity and known for high endemism. The three global biodiversity hotspots meet in the Eastern Himalaya where many species evolved to form a nature treasure, and this region is still not fully explored. Global and regional drivers of change on biodiversity and ecosystem loss are prevalent and increasing in the HKH. These drivers include land use and land cover change, pollution, climate change, invasive species, solid waste, habitat degradation, and overexploitation of resources, among others, impacting biodiversity, ecosystem services, and human wellbeing. Threats to biodiversity and ecosystems have accelerated due to increased developmental activities in the past four decades. Road construction. mining, infrastructure and urbanisation have raised much of the environmental concerns. particularly the loss of valuable habitats. natural resources, degradation of key ecosystems and disruption of ecosystem services, and fragmentation of landscapes.

More than one billion people in the HKH are at risk of exposure to increasing frequency and intensity of disasters. Rising trends appear in the number of disasters reported, the numbers of people killed and affected, and the size of economic losses. This is due to various drivers including climatic change and environmental degradation. Cascading events resulting from a multi-hazard environment have upstream-downstream linkages, often with transboundary impacts. The HKH is especially prone to floods, flash floods, avalanches, and landslides, but also to droughts and earthquakes. The number of GLOFs in the region are increasing.

Transformative socio-ecological change towards economic and environmental prosperity in the HKH demands evidencebased actions to maintain biodiversity for enhanced ecosystem services, to reduce disaster risk, to mitigate and adapt to climate change, to protect cryosphere and manage water, to restore multi-functional landscapes, to safeguard social and traditional systems, to community participation in conservation and development planning and to enhance diversified livelihoods of local people are central to ensuring resilience and sustainability in the region, as well as collaboration among government and nongovernment actors.

Community ownership of the project can be enhanced through deep listening to the community, creating a wellbeing baseline as discussed above, participatory planning and capacity building with this wellbeing baseline in mind, and monitoring and evaluating the project with wellbeing as a critical success measure and indicator of unforeseen community impacts.

Managing Climate Vulnerability in the Eastern Himalaya and Third Pole

– Karishma Ahmed Balipara Foundation



he Himalayan Region with its abundant natural resources and diverse ecosystems houses the Third Pole, a complex network of mountain glaciers and snowfields storing frozen water at a volume second to only the Arctic and Antarctic polar caps. But looming climate threats and events like rising temperatures and glacial melting has made the region severely susceptible to the climate crisis, with far-reaching consequences for both the environment and local communities. Research has predicted that the region will experience major changes by 2050 and beyond – unless urgent climate action is taken at a global and local level to change the trajectory.

Current emissions and temperature trends present a concerning outlook for the region. Several studies have suggested that the Himalayan region is warming faster than the global average and if current emission trends continue, the region could see temperature increases of 1.5 to 2 degrees Celsius by 2050, with potential rises of up to 4 degrees Celsius by 2100. This warming

will not only accelerate glacial melt but in turn will also affect water security for over a billion people who rely on river systems fed by these glaciers¹.

Despite all the efforts to bring down global emissions, the region may still continue to face the impacts of global warming. The Hindu Kush Himalaya Assessment on climate change in the Himalaya by ICIMOD, has suggested that even if temperature is arrested within the 1.5° C target, the Hindu Kush Himalaya (HKH) region will likely continue to warm by at least 0.3° C higher. and in the northwest Himalaya and Karakoram at least 0.7° C higher². These trends are concerning as they could trigger a wide range of negative biophysical and socioeconomic events including increasing glacial melting, biodiversity loss, and unpredictable water supplies impacting life in the region.

Effects on Ecosystems and Communities

This region, the Third Pole, is often referred to as the 'Water Tower of Asia,' and supplies vital water resources to billions across Asia. However, the accelerated melting and retreat of glaciers, combined with shifting precipitation patterns, are jeopardizing water security and disrupting ecosystems. The reduction in glacial meltwater during dry seasons will exacerbate water scarcity, affecting both agriculture and drinking water supplies. Erratic monsoons, now continuing over a longer period with intense showers, are already causing floods and exacerbating soil erosion in hill states. many endemic species, is also at risk due to changing climates and habitat loss. In turn, the loss of biodiversity is further accelerating the loss of ecosystems services such as soil nutrient cycling. Desertification now affects over 12% of the land area in India's Eastern Himalaya. The risks are even more pronounced on nature-dependent climatesensitive activities like agriculture, livestock rearing, and tourism. In a highly rural economy like that of this region, A varying and unpredictable climate threatens livelihoods, food security, and public health, particularly among marginalized groups who lack the resources to adapt.

In October 2023, Sikkim witnessed a glacial lake outburst flood (GLOF) which wreaked havoc along the Teesta river, bringing into focus the magnifying risk of climate changeinduced GLOF across the Indian Himalayan Region. Such climate induced hazards are often cascading in nature thus making their prediction really difficult. As the impacts of climate change intensify in the Himalayan region, it is therefore imperative to adopt comprehensive and coordinated policy measures informing both adaptation and mitigation efforts. Not acting promptly on these challenges could lead to irreversible damage to both the environment and the communities that depend on it.

Strategies to reduce the region's climate vulnerabilities

From a mitigation lens, reducing the demand for fossil fuels and rapidly transitioning to renewable energy sources globally can help

The region's unique biodiversity, including

¹ ENVIS Bulletin Himalayan Ecology, Vol. 31. (2023). EIACP Centre on Himalayan Ecology, G.B. Pant National Institute of Himalayan Environment.

² Krishnan, R. et al. (2019). Unravelling Climate Change in the Hindu Kush Himalaya: Rapid Warming in the Mountains and Increasing Extremes. In: Wester, P., Mishra, A., Mukherji, A., Shrestha, A. (eds) The Hindu Kush Himalaya Assessment.

slow down global warming and its effects on the Himalaya . Leveraging hydropower, solar, and wind, alongside promoting energyefficient technologies such as end to end electrification of grids and better building insulation, can significantly lower emissions. Promoting electrified public transportation, coupled with policy measures like subsidies for clean energy, can accelerate the shift away from fossil fuels. These combined efforts could help reduce the region's carbon footprint while building resilience against climate impacts.

In the region, at the ground level, concerted efforts are also needed towards monitoring and forecasting of extreme events which could be done through increased budgetary provisions for better monitoring, forecasting and stronger early warning systems for floods, landslides and glacial lake bursts. More policies and schemes are needed to provide insurance and effective remuneration to communities in high climate-risk areas for the rising, recurrent costs of extreme weather events. Better planning is needed to map climate-risk prone zones and areas and plan for appropriate development and infrastructure installation.

On the adaptation front, promoting sustainable agricultural and land-use practices in the Himalayan region can help protect the environment and secure the livelihoods of local communities. Naturebased solutions linked to the conservation of forests and wetlands can go a long way in building natural climate resilience to floods, droughts and desertification. Additionally, improving watershed management can help mitigate water security issues. Government can develop and implement strategies promoting climate resilient infrastructure by modifying building by-laws, mandating environmental impact assessments etc. It is also important to acknowledge the necessity



of climate finance to aid the mitigation and adaptation efforts in the region.

In addition to policy measures, on-the-ground actions are necessary to mitigate ongoing climate impacts starting with communitybased disaster risk management programs aimed at enhancing their capacities and response to climate risks. Raising awareness about climate change and its impacts can strengthen community resilience. Educational programs should promote sustainable practices and encourage local populations to reduce their carbon footprint and enhance their adaptive capacity.

Pursuing a comprehensive strategy for the Third Pole

The Third Pole and the wider Eastern Himalayan region are facing escalating threats from climate change, with projections indicating profound impacts on both ecosystems and local communities by midcentury and beyond. To mitigate these challenges and prevent irreversible damage. it is crucial to adopt a comprehensive strategy that combines strong policy measures with immediate. on-the-ground actions. By focusing on sustainability and resilience, stakeholders-including governments, communities, and international partners-can work together to protect this vital region. Ensuring the longterm well-being of its ecosystems and the millions of people who depend on them requires urgent and coordinated efforts to address the mounting risks posed by climate change.



Loss of biodiversity in the Eastern Himalayan Region – Dr. Manashi Goswami Assam University, Silchar

he Eastern Himalayan Region known for its unique and diverse floral and faunal biodiversity forms a part of the Himalayan Biodiversity Hotspot. Monsoon showers, low-lying floodplains of Brahmaputra, the steep mountains and rain-shadow effect in the northern slopes of the Himalaya contributes to exceptionally diverse faunal and floral diversity in the Eastern Himalaya. According to a study, the Eastern Himalaya harbors about 450 species of avifauna that are not found in the western Himalaya.

Species diversity, species richness and distribution patterns of biodiversity in the Eastern Himalayan forests are regulated by altitude and environmental factors (Saikia et al., 2017).

Biodiversity loss, associated with permanent ecological changes in the ecosystem, can lead to a breakdown in the functioning of the ecosystem. 2.3% of the land surface of the Earth is represented by the Biodiversity Hotspots of the world. Reports suggest that these biodiversity hotspots have been losing 86% of their habitats due to climate change and anthropogenic

activities. According to Living Planet Report 2022, we have experienced an average 69% loss in the abundance of mammal, bird. reptile, fish and amphibian species since 1970. According to data cited by WWF, over 75% of the original Himalayan habitat has been degraded. Steep decline of biodiversity of the Himalava is due to human development, pollution, overexploitation of resources and climate change (ICIMOD report). WWF report stated that fuelwood and fodder collection, land conversion, overgrazing have also impacted natural habitat of Eastern Himalaya, causing habitat alteration and species loss. These widespread landcover cover change within the Third Pole region also has pushed the fragile ecosystem of the region towards degradation.

Extensive grazing by livestock causes the removal of the understory of the forests thus damaging the composition of natural ecosystem. Deforestation for want of fuelwood and timber, shifting cultivation and conversion of land for plantation led to massive forest loss in the region. One of the repercussions of deforestation is soil erosion. The northeastern states are more vulnerable to soil erosion due to higher rainfall. Changes in topography, vegetation, rainfall and canopy cover aid in soil erosion.

Climate change and habitat loss are the emerging factors for biodiversity loss. A study reported that 36% of protected areas in Eastern Himalaya is highly vulnerable to climate change. Climate changes in the past 50 years shows an increase of temperature by 1.3 degree Celsius, decrease in summer monsoon rainfall and increase in extreme weather conditions. The 'Third Pole' which is the source of nine largest rivers in Asia, providing food and other ecosystem services to more than 1.5 billion people, is highly vulnerable to environmental changes.

Climate change and biodiversity loss have been recognised a related crisis. Biodiversity loss can be one of the major drivers of productivity loss within ecosystem. Thus, while climate change can affect biodiversity. biodiversity loss can also affect climate change by altering carbon sequestration and storage (Weiskopf et al., 2024). According to a recent study, biodiversity loss reduces global terrestrial carbon storage because an ecosystem's carbon sequestration potential is greatly linked to its biological diversity. Greater loss is projected under intense climate change and land-use scenario. wherein higher levels of climate change leads to greater biodiversity loss, which in turn leads to greater carbon emissions. A recent analysis found that mitigation activities that maintain tree diversity could avoid 9-36 per cent loss of productivity across biomes.

Climate change has been relatively greater in the Himalaya than in the Indian plateaus and plains (Krishnan et al., 2020). The high elevation sites have seen the greatest climate change over a fifty-year period. Climate vulnerability increases with elevation and the species at high elevation are at high risk of being extinct.

India's State of the Forest Report 2021 reported an overall loss of 1,072 sq km of forest cover in the Himalayan states. A study by National University of Singapore estimated that by 2100, only 10 per cent of the Indian Himalayan land area would be covered by dense forests, and in the Eastern Himalaya the dense forest cover would decrease from 7.2 per cent in 2000 to 38.7 per cent in 2100.

The Eastern Himalaya is dominated by

agrarian economies and forest-based livelihood, which imposes considerable pressure on land resources. Thus, climate change and economic development significantly impact the Eastern Himalayan ecosystem.

Loss of biodiversity not only has a cascading effect on ecosystem and ecosystem services but also impacts the ecosystem resilience to disturbances. Diverse ecosystem is more resilient to climate change and loss of biodiversity reduces ecosystem stability, increasing the risk of ecosystem collapse. Loss of biodiversity and reduction of ecosystem resilience to climate change leads to loss of genetic diversity. According to studies, genetic diversity is lost due to climate change, habitat fragmentation and population reduction. Genetic diversity allows the species to adapt to environmental changes and large genetic diversity positively affects ecosystem resilience and function. Thus, loss of genetic diversity threatens the adaptive potential and long-term survival of a species.

Impact of biodiversity loss on communities

Biodiversity matters because it not only has a vast effect on the productivity and stability of the ecosystem but also provides myriad developmental benefits to the communities. Biodiversity loss not only undermines the ability of the ecosystem to function effectively and efficiently, but also have a direct impact on the socio-economic condition of the communities who are directly dependent on ecosystem.

Effect on health and hunger

A recent study from Assam reported that local communities use 78.7% of the wild bioresources as food, 11.5% for timber and

5.7% as firewood. A wide variety of wild bioresources are used by different rural communities of Northeast India which has medicinal properties as well as local market value. Wild bioresources are an integral part of food security and subsistence of these communities and an essential part of rural household economy.

Health is directly related to food production. Loss of crop diversity and climate-resilient crops would increase our reliance on agrochemical thus exposing us to health damaging pollutants. The health of 60 per cent of world's population who depend on plant-based traditional medicine is compromised due to lack of availability of wild-collected medicinal plants. Decline in diversity of fish impact nutrition security as they are source of protein and micro-nutrient for the communities.

Food security

The UNFCCC-COP27 recognized safeguarding food security and ending hunger a fundamental priority. Biodiversity loss pose a serious threat to global food security, sustainable development and poverty eradication. Loss of genetic diversity reduces crop yield. Loss of soil biodiversity makes soil less resilient undermining its ability to support wild and cultivated varieties of crops.

Food security

A study in the journal Nature identified biodiversity loss as the biggest reason for emergence of infectious disease. Link between biodiversity loss and infectious have always been a matter of discussion and concern. A study reported that COVID-19 pandemic, believed to have been spread by bats, also have link to biodiversity loss.

Livelihood security

India's forest biodiversity supports the livelihood of about 275 million people who are dependent on forest resources. Ecotourism contributes significantly to livelihood of local communities. In addition, biodiversity supports many industries like agriculture, fishery and forestry. Loss of biodiversity has an adverse effect on the people dependent on these industries for livelihood sustenance. Biodiversity loss can disrupt the availability of these resources, leading to loss of income and increased vulnerability to economic shock.

Biodiversity loss therefore have a negative socio-economic consequence by disproportionately affecting marginalized communities that are reliant on natural resources, thereby increasing poverty and inequality in the society.

Impact on traditional healers

With the loss of biodiversity, traditional medicines used by traditional healers are also lost, most of them are lost even before they could be discovered and recorded. This has reduced the availability of medicinal plants of therapeutic plant varieties and missing out on potentially useful compounds. This limits the traditional healers of potential treatments of many diseases, especially to lower socio-economic background and vulnerable groups.

Northeast India is a home to more than 200 angiosperm family of ethnobotanical use and the communities of Northeast India rely on indigenous traditional knowledge for treatment of ailments. Out of 3895 plant species found in Assam, 7.34% are wild edible of ethno-medicinal properties. Northeast India is a repository of medicinal plants and use of ethno-medicine is still prevalent among rural communities and the tribal communities of the region.

Loss of cultural values

India's biodiversity is interwind with its cultural and traditional significance, particularly for indigenous communities. Many species hold cultural and religious significance, the scared groves that have helped conserve biodiversity for centuries. Loss of biodiversity can result in loss of cultural heritage and loss of traditional knowledge.

Loss of traditional knowledge

In addition, traditional knowledge and traditional agricultural practices are also at risk due to biodiversity loss and climate change. The loss of traditional seed biodiversity due to climate change are contributing to decline in food security and agricultural resilience. Climate change causes heat stress that reduces the vigor of seeds, and the increasing temperature causes seed dormancy and reduce germination rates.

The increasing reliance on cultivated varieties of crop due to industrial agriculture is posing a threat to traditional seed diversity. Loss of traditional seed varieties lead to the loss of valuable traits like resistance to pest and drought, and also the traditional knowledge and culture associated with them.

Increased vulnerability to natural disasters

Diverse ecosystem protects human communities from natural disasters like flood, landslides and storms. As such loss of biodiversity reduce the ability of ecosystem to buffer these events, thereby increasing the vulnerability of communities to natural disasters.

Reduced resilience to climate change

Biodiversity is crucial for ecosystem resilience to climate change. As loss of biodiversity reduce the capacity of ecosystems to adapt to changing climate conditions, it exacerbates the impact of climate change on human societies.

Way forward

A most recent report by Food and Agriculture Organization of the United Nations stated that biodiversity and ecosystem resilience of natural forests of Asia-Pacific region are declining. To address the challenge of biodiversity loss and climate change, forest restoration and ecosystem resilience should be encouraged. The ultimate goal of the 2030 biodiversity target under the Kunming-Montreal Agreement is to ensure protection of at least 30 per cent of areas of degraded terrestrial, inland water, and marine and coastal ecosystem, achieve food security, nutrition and livelihood for local communities. As biodiversity loss and climate change are predicted to worsen in the coming years, policy efforts should be directed towards strengthening conservation efforts. Active participation of the stakeholders, especially the forest-edge communities who are dependent on forest resources for their livelihood, will be crucial for long-term conservation efforts (Benett et al., 2019). As both forests and local communities are interdependent, conservation activities should be planned to preserve biodiversity without jeopardizing the needs of local communities. Therefore, to safeguard the Eastern Himalayan ecosystem, systematic mapping of the priority conservation sites and their longterm viability for conservation, and projected impact of climate change and anthropogenic pressures would be imperative.





Northeast India's Fight for Climate Justice

Rituraj Phukan
Indigenous People's Climate Justice Forum



hen it comes to climate change, the Northeast of India must rank among the earlyimpacted regions of the world; we have lived through decades of floods, erosion, loss of livelihoods, conflicts, loss of biodiversity and displaced migrants. In the past, not many would associate these as manifestations of anthropogenic warming of the planet, but our understanding of the climate crisis has evolved. We are now aware of the vulnerabilities of the region with worse projections for the future.

In late September, Assam, Meghalaya, Manipur, Mizoram, Tripura, Nagaland, and Arunachal Pradesh experienced an unusual heatwave with temperatures touching 40 degrees Celsius and some places reporting anomalies of up to 10 degrees above normal for the time of the year. Compounded by extremely humid conditions, many places in Assam reported "heat-dome" like conditions with temperatures that felt like 50 degrees Celsius.

Earlier in May, another prolonged heatwave had killed scores of people. Schools were shut down due to excessive heat, with some places recording temperatures 8 degrees above normal. The heat wave was felt across India with Assam being among several states registering new temperature records.

Interspersed between the heatwaves, devastating floods inundated most parts of Assam with over a hundred persons reported dead. More than 1.2 million people were affected across 23 districts of the Brahmaputra valley. Rampant erosion by the swollen rivers caused extensive damage to properties, crop fields, farms and livestock, impoverishing the affected populace.

The floods inevitably bring along a plethora of health and sanitation challenges, disease outbreak and food scarcity, adding to the woe of the people. There were several instances of wild animals straying into human habitation often resulting in human and animal casualties. Visuals of tigers and elephants in conflict with people have flooded social and mainstream media in recent months. My understanding is that any conversation about climate justice should inevitably include Assam and the Northeast of India, as the development aspirations of our people have for long been undermined by the interlinked crises of climate change and biodiversity loss. There are enough studies to support these claims.

Last year, the "Gross Domestic Climate Risk" published by the Cross Dependency Initiative ranked nine Indian states including Assam among the top 50 regions globally at risk of damage to the built environment due to climate change hazards by 2050. Assam was ranked 28th in the list with a projected increase of over 330% in climate risk by 2050 in comparison to the year 1990.

Assam has consistently appeared on the top of states listed as most affected or vulnerable to climate change in India; the state was listed among the 8 most vulnerable states by the 'Climate Vulnerability Assessment for Adaptation Planning in India Using a Common Framework.' The national climate vulnerability assessment report from the Department of Science and Technology





placed 60 percent of districts in Assam under the highly vulnerable category. Another study by the Council on Energy, Environment and Water found that six of India's eight most flood-prone districts during the last decade are located in Assam.

Even in 2018, Assam was found to be most vulnerable by the "Climate Vulnerability Assessment for the Indian Himalayan Region Using a Common Framework" prepared by the Indian Institute of Technology Guwahati, Indian Institute of Technology Mandi and the Indian Institute of Science Bangalore. Based on these findings, Assam and Mizoram were named as the most vulnerable to climate change by the Indian delegation at the 24th UN Climate Change Conference (COP24).

Changes in precipitation have manifested in widespread seasonal water scarcity, especially in urban areas. The lack of winter rains in the past few years has seen warmer temperatures during the winter months, and water stressed populations. The scarce winter rainfall also impacted crop and vegetable production in the state jeopardizing the food security, health and wellbeing of the people.

Another 2018 study created a data-based index of 'hydro-political' issues in areas with a history of transboundary water resources, where conflicts are likely to be exacerbated by climate change and population growth. The Ganges- Brahmaputra basin was among the five global hotspots where 'water wars' are likely to happen in the future.

The Hindu Kush Himalaya Assessment Report of 2019 had corroborated the projections of the 2014 Intergovernmental Panel on Climate Change report regarding glacial loss in the Himalaya, besides providing fresh insights into impacts in the Eastern Himalayan region. The forecasted loss of over a third of glaciers in the Eastern Himalaya by 2100 even if warming is contained to 1.5 C degrees is compounded by the fact that average temperatures across the Hindu Kush Himalaya have already increased by 1.3 degrees Celsius. About 40 percent of the glaciers in the Tibetan plateau could disappear by 2050 with implications on the overall water, energy, and food security of the entire northeast region including Assam.

The prevailing worldview is that the global biodiversity and climate crises are interlinked, and the role of indigenous people in conservation of the remaining natural places on earth are now acknowledged. A recent study shows that indigenous communities are at higher risk of hardship from impacts like flooding because of pre-existing socioeconomic vulnerabilities.

The indigenous people and local communities of northeast India are unwitting victims of the climate crisis. Despite insignificant contribution to the accumulation of greenhouse gases, our people are among the first to face the direct impacts of warming and have the least resources to adapt to the consequences. At the same time, these communities have the knowledge and values oriented towards nature that have helped cope with weather anomalies for centuries, and steward over 80% of the planet's remaining biodiversity.

The heightened helplessness of the people in the region mirrors the plight of other frontline communities around the world. One is compelled to guestion whether the continued loss of lives and properties, and projections of worsening consequences for our future generations evoke any feelings of empathy and solidarity among world leaders. The Eastern Himalava are blessed with natural largesse, and in Northeast India, we have an abundance of indigenous traditions and knowledge systems that could contribute to resilience and capacity enhancement, making the region indispensable to the evolution of global climate justice jurisprudence.



THE HIMALAYAN 19

Envisioning the Future of the Third Pole and the Eastern Himalaya

Michael Dawson
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 Ruella Rahman Khound Independent Filmmaker, Assam

n 2023, the Supreme Court of India ruled mandating the right of the people of India against the adverse effects of climate change. This right was interpreted as intertwined with the fundamental rights to life and equality enshrined in the Indian Constitution. This decision builds upon previous judgments that recognised the right to a clean environment. The Court's emphasis on the link between climate change and human rights highlighted the urgency of integrating climate mitigation and adaptation strategies across policy frameworks.

However, a closer look at the ruling reveals the unintended consequences today, in which development for climate resilience is now pitted against the environment itself. The Supreme court ruling in April on the right to a healthy environment and to be free from the consequences of climate change is part of a case in which environmentalists petitioned the court to shift all overhead transmission lines for solar plants underground where they affected the habitats of the critically endangered Great Indian Bustard. In response, the Centre's Ministry of New and

Renewable Energy argued that such a move would drastically increase the cost of delivering solar energy and make it commercially unviable.

This emerging tension is one of critical importance in the Third Pole - and specifically within the Eastern Himalaya. As countries in the region push for clean energy, its rivers increasingly come under the threat of huge hydropower electric projects and dams, which threaten both critical wildlife and their habitats as well as the livelihoods of indigenous communities dependent on both the region's rivers and terrestrial ecosystems. The push for solar power puts both critical habitats and communities at risk, whether those are desert ecosystems and pastoral landscapes in Ladakh or grasslands in elephant corridors in Assam. The cost of destroying these ecosystems and habitats and livelihoods remain unaccounted for when making policy decisions. The result is the further undermining of our natural ecosystems – and our natural resilience to climate change.

The loss of biodiversity in the Third Pole – and its implications

The World Bank estimates that climate change could push over 100 million people within the particularly vulnerable South Asian countries into poverty by 2030 - without climate-smart interventions. The region has already lost over 20% of its forest cover, with some countries like Nepal having just 40% forest cover per capita, significantly below the recommended minimum of 50% ICIMOD research indicates that the Third Pole has lost between 70-80% of its original habitat and that by the turn of the century, this is going to reach nearly 90%. A quarter of endemic species are projected to be lost in the Indian Himalayan region by 2100. Rising temperatures are contributing to the transformation and loss of grassland, meadow, wetlands and permafrost





ecosystems. A report by the International Centre for Integrated Mountain Development (ICIMOD) warns that with a business-asusual approach to climate change, at least one-third of the Hindu Kush Himalayan glaciers could disappear by 2100. This translates to a significant decrease in freshwater availability, which will severely jeopardise food security and the livelihood of millions.

This inevitably has a cascading effect. The growing problem in the Eastern Himalaya the diminishing forest cover - exacerbates the issue. Between 2019 and 2021, India's Eastern Himalaya lost over 100,000 hectares of forests. Forests act like sponges, storing water and regulating its release. With less forest cover and emerging desertification of large tracts of land, the meltwater runs off quickly, leading to floods during the peak melts and water scarcity during dry seasons. This disrupts agricultural cycles, alters land use patterns that have previously been followed for centuries and increases the risk of desertification, further impacting agricultural productivity that is fraught with seasonal fluctuations and the incomes of the people.

The human cost mirrors the ecological devastation. The future of the Eastern Himalaya and its people is intricately linked, and both face a precarious future if the ecological costs of climate change continue to rise. Yet, amidst these daunting challenges lies an opportunity for building resilience and ecological restoration. By collaboratively focusing on restoring degraded lands, reforestation initiatives, and improved water management practices, the vast geographic region of the Third Pole within which reside the Eastern Himalaya can adapt and mitigate the worst effects of climate change.

Mitigation Strategies

Striking a balance between promoting climate-friendly industries, creating jobs and biodiversity concerns requires better and more advanced tools for green budgeting than the current investment paradigm. International recognition is growing for the critical role that biodiversity plays in managing the climate crisis, reflected in official agreements signed at both COP26 and COP28. Globally, the tide is turning towards valuing nature: valuation tells us not only what we lose, but what we stand to gain if we invest effectively in nature. The current GDP-centric model overlooks the vital contribution of nature. India's Eastern Himalaya, with its rich biodiversity, is a prime example with over 60% of the workforce relying on agriculture, directly dependent on healthy ecosystems.

For biodiversity rich regions like the Third Pole which boast a wealth of biodiversity from the rainforests to wetlands, valuing these ecosystems using methodologies like market valuation and cultural significance can generate significant revenue streams. These funds can then be channeled back into green initiatives, creating a self-sustaining model which ensures both environmental and climate resilience that benefits communities across the board. To effectively steward these natural assets, creating ecological budgets and integrating them into financial accounts at both the state and national level is critical. Integrating environmental factors into the fiscal structure of an economy, especially the annual national budget, will allow the government to track natural capital expenditure-and invest for its regeneration.

Given the loss of critical resilience-building ecosystems such as wetlands and upstream forests, greater attention needs to be paid to the management of these ecosystems. Forestry programs that promote sustainable logging practices, community-managed forest models, and financial incentives for forest conservation, while developing measures that tackle the growing deforestation and illegal trade, can contribute significantly. Reforestation efforts, particularly focusing on native indigenous



tree species, play a crucial role in carbon capture, reducing soil erosion, and regulating local climate patterns. Restoring and protecting wetlands of the Eastern Himalaya can significantly reduce flood risks in downstream areas. A stronger focus needs to be placed on managing ecosystems as watersheds - recognizing the role. for example, that forests upstream in Arunachal Pradesh play in regulating the flow of rivers in parts of Assam. Restoring of degraded land that encompasses practices like soil and water conservation techniques, promoting sustainable grazing, reducing overexploitation and regulating extractive industrial expansion are measures not only improve land fertility for agriculture but can also enhance groundwater reserves within the region.

Promoting climate-smart agriculture that uses water efficiently, improves soil health, and utilises drought-resistant crop varieties can significantly boost resilience. These initiatives not only support ecosystem health and water security but also provide livelihood opportunities through sustainable timber harvesting, ecotourism, and benefits from non-timber forest products, such as medicinal herbs. The Asian Development Bank estimates that South Asia needs to invest over \$30 billion annually in its water and sanitation sector by 2030 to meet growing demand. Investing in water storage infrastructure can help store excess water during peak melt and distribute it efficiently during dry seasons.

Collaborative efforts between transboundary governments, local communities that share resources across borders, research institutions, and NGOs are crucial for achieving this vision. Above all, its rural and indigenous communities, on the frontlines of both an ecological and climate crisis, need to be centred: with their experiences, challenges and knowledge guiding policy development in tandem with science for the future of the Eastern Himalaya.

Without the Third Pole, there is no Eastern Himalaya. While there is hope for the region, we must also confront the existential facts of our time and act. Only with targeted action and a willingness to face the reality of the challenges facing us, can we build a hopeful future – for people and biodiversity together.

