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Climate Change and Biodiversity Loss: A Challenge for Livelihood and Sustainability among Tribal Communities

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Abstract

The issue of climate change and the degradation in biodiversity have ceased to be a far off environmental concern but a part of everyday strain on the lives of those who are in the most immediate contact with the environment. The paper discusses the impacts of these two crises on the lives and sustainability of tribal peoples in general with specific focus on forest-reliant Adivasi people in India as compared to the larger global context. It combines recent evidence of the global evaluation about the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services, the Living Planet Report of the World Wide Fund on Nature, the temperature record verified by the World Meteorological Organization, the effects estimation of the Intergovernmental panel on climate change, and reads that information alongside census and forestry data about tribal populations. The main point is that the tribal communities are in a problematic dual position.

Keywords: climate change; biodiversity loss; tribal communities; Adivasi; forest livelihoods; sustainability; traditional ecological knowledge; India.

1 Introduction

The current century has taken on a new environmental status two dragged along emergencies. The initial one is climate change. In 2024 the global average temperature was found to be more than 1.5 degrees Celsius higher than during the years between 1850 to 1900 (approximately 1.55 degrees Celsius with a limited margin of error) becoming the warmest in the instrumental record and the first full calendar year where the global average temperature topped 1.5 degrees Celsius above that of the years 1850 to 1900 (World Meteorological Organization [WMO], 2025). The next decade (2015-24) is numbered in the top ten of the hottest every year has ever recorded and the European climate service measured the 2024 anomaly as nearly 1.6 degrees Celsius on its scale (Copernicus Climate Change Service, 2025). An individual warm year would not violate in itself the long term objective of the Paris Agreement which is a multi-decade control but the trend of movement cannot be rejected.

The second is the loss of biological diversity which is an emergency. The international intergovernmental assessment of the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services determined that approximately one million animal and plant species risk extinction in the future, most of them in a few decades, and the average rate of environments disappearing is now tens/hundreds of times an average of the last ten million years (IPBES, 2019). In a second reading of the identical decline, the Living Planet Report cemented the news of an average reduction of 73 per cent in size in monitored vertebrate

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populations between 1970 and 2020, freshwater populations by 85 per cent and populations in the Asia and Pacific region by 60 per cent (World Wide Fund for Nature [WWF], 2024). These do not tell two different tales. Warming is varying the ranges, changing the timing of the species and disappearance of forests, wetlands and their surrounding cover is eliminating some of the systems that were earlier retaining carbon and buffering the local weather. In the interdependent manner, one crisis breeds another.

To the majority of the urban population these processes are perceived as news, heat a bit longer or a season unexpectedly early or late. In the case of communities where their livelihood is interwoven in a specific forest or river, they are also registered as a direct threat to the livelihood. Of the 900-plus countries, across the globe an estimated 476 million Indigenous people inhabit some 90 countries, being nearly 5 per cent of the human population (World Economic Forum [WEF], 2023). Approximately, 1.6 billion individuals rely on forests to sustain themselves through at least some of their means (Food and Agriculture Organization of the United Nations [FAO] & United Nations Environment Programme [UNEP], 2020). The Scheduled Tribe population in India according to the last census was 104.28 million approximately 8.6 per cent of the Indian populace, in 705 separate communities, in thirty states and union territories (Census of India, 2011). About 275 million rural Indians out of which a portion are tribal people depend on forests to earn money, fuel and food (Ministry of Environment, Forest and Climate Change [MoEFCC], 2021).

This essay pre) defines an easy yet uncomfortable argument. Tribal communities have made the least efforts to drive climate change and the loss of biodiversity, as their land and water use practices are generally low in emissions and with low ecological footprint, but one of the first, and some of the worst affected. They are vulnerable since their resources are not financial but natural, they are sensitive since a bad harvest or bad collection season leaves them with little more to rely upon and their adaptability ability is normally compromised by the insecurity to the rights to the same forests they rely on. But these very communities possess an in-depth ecological explicit and experimented knowledge, and they are able to govern the lands that are overall in a better environmental condition than those under other types of power (IPBES, 2019).

It is well worth defining proportion, at the very first stage. It is not to place the two on a par of morality to juxtapose to the production of an industrial economy the small foot-print of a tribal district. Quite on the contrary. Homes that smoulder some fuelwood and scavenging households that scavenge the forest have virtually no share in the build up of the greenhouse gases, but the warming effect that this build up creates falls on them, like a tonneal weight. The burden of the problem created to a great extent in the prosperous industrial economies falls more on the shoulders of the physical geography of the global South, and even within the global South; it is the tribal and forest dwelling poor, who bear the brunt of the physical expression of the problem.

The analysis is carried out in eight processes. Section 2 discusses the existing scholarship and outlines the gap in the research. Section 3 brings together the evidence worldwide and in India that grounds the analysis. In section 4, the conceptual framework and the method are presented. In section 5 the pathways followed by climate change and loss of biodiversity to tribal livelihoods are tracked. Part 6 progresses to sustainability, traditional knowledge and adaptation and the tension between conservation regulations and customary rights. Section 7 links together the threads into a conclusion and Section 8 provides conclusions and further work directions.

2 Literature Review

2.1 Climate change, biodiversity, and the people in between

There is now much literature on the transformations in the living world occurring in the face of a warming climate. The increase in temperature shifts the vital limits of their ability to survive, brings flowering and reproduction out of their usual pattern and increases the percentage of drought, flood and fire. This evidence was collected by the Intergovernmental Panel on Climate Change in its impacts assessment and simply put the loss of biodiversity and the alteration of climate are taking place together and each reinforcing each other, with the context of unsustainable land and resource use (IPCC, 2022). The lack of the human medium through which the more technical of this writing refers, is not insignificance itself; what is needed here is the human ground where the aspect of ecological change transforms to be a livelihood issue to specific individuals.

2.2 Tribal and forest dependent communities as a special case

The intimate relationship between the tribal societies and the forests has been long captured in the second body of work which is based on forestry, development studies and anthropology. Investigations of central and eastern India indicate that forests to such households serve both as food source, sources of fuel, fodder, building material and even as medicine and in addition as the safety net that sustains the families in the lean months and even during shocks (see the discussion in FAO and UNEP, 2020). Other forest products like honey, resin, bamboo, tendu leaf and a broad array of medicinal plants constitute a significant portion of the cash income in tribal districts and this product is a major part of the revenues that forests generate in states like Madhya Pradesh and Odisha (MoEFCC, 2021). Through this literature, it is evident that to the tribe communities, the health status of the ecosystem around them does not contribute to their economy as an isolated aspect among other contributing factors. It is the back-bone of the very economy, that is why they are so directly hit by the ecological degradation.

The reliance is not even, and the superior researches are cautious of the issue. A few of the tribal divisions are settled cultivators, others have a mixed identity between agriculture and gathering of forest products, with only a few being largely hunters and collectors, meaning that the exposure of each division has a slightly more or less distinct appearance. The one thing that they have in common is a small financial cushion. Once a forest good goes under there is hardly ever a bank account or an insured commodity to draw on, so the family makes do either by consuming less or borrowing expensively or by an excursionist in pursuit of wage labor. The investigation into food security in the tribal areas of Central and Eastern India reveals that the proportion of households already in the lean season is already experiencing hunger since the contribution of an altering climate is not yet considered (FAO & UNEP, 2020).

2.3 Traditional ecological knowledge and the shift in framing

The third strand is related to the knowledge in these communities. The notion of the traditional ecological knowledge as the set of knowledge, a practice, and faith regarding the connections between living entities and their surroundings that are transmitted and modified down the line has redefined tribal peoples as a lethargic occupants into the savvy administrators of intricate systems (Berkes, 2012). The sacred groves that have been preserved by tradition, through a process of rotating crops and cultivating with mixed methods, with strict regulation of when and how much harvest to retrieve, can now be interpreted as operating

conservation systems, as opposed to quaint survivance. This re-based has been taken to the pinnacle of climate science. High confidence in the conclusion made in the Sixth Assessment Report was that Indigenous knowledge and local knowledge can offer valuable insights to act on climate risk, and it shifted its view on Indigenous peoples as a tool primarily to address the weaknesses of vulnerable communities to a perspective on Indigenous peoples as actors and partners to address adaptation (IPCC, 2022). The report also contextualized the problem within the framework of climate justice, its distributive, procedural, and recognition aspects, which transforms it into a question of charity and makes it a right.

2.4 The research gap

With this backdrop one can say with a certain degree of accuracy that the gap is. The climate and biodiversity literatures generate strong global numbers and hardly ever track down the number to the household stage of forest dependent tribal groups. The development and anthropological literatures elucidate the household level with a great level of detail and tend to attribute climate change as a backdrop instead of a driver. And as the worth of traditional knowledge is becoming much more generally accepted in principle, the conflict in practice between that principle and the conservation and development policies which continue to render tribal communities stateless is explored. It is time, however, to have an account that is both able to frame the global evidence and the local reality within one frame, to read climate change and biodiversity loss as being in one part not 2 parts, and to place tribal knowledge and tribal rights at the heart of the question of sustainability rather than in the margins. The following paper tries to give such an account, through the prism of India, and its huge and forest tied tribal population, keeping the comparison on the global scale in perspective.

3 Global and Indian Background

Since the successive argument is alternating between the planet and the home, it is best to place the quantities of interest next to each other and then interpret them. The Table 1 summarizes the headline indicators of climate change and loss of biodiversity globally. The numbers are contributed by the bodies whose business is to tabulate them, and are to be interpreted not as absolute numbers, but as such as are as well as possible calculated, because of the imprecision involved in measuring the entire Earth, they are always approximate. The temperature value is a real record, which is the first calendar year above the 1.5-degree mark (WMO, 2025). The figure on species is based on how most experts consider the proportion of groups being assessed to be at risk (IPBES, 2019). Instead of quantifying the number of animals lost, the figure of wildlife follows the average increase or decrease in the population size, and the line is easy to cross, but it is very significant (WWF, 2024).

Table 1. Global indicators of climate change and biodiversity loss.

Indicator	Recent estimate	Source
Global mean temperature, 2024	About 1.55 degrees Celsius above the 1850 to 1900 level; the first calendar year above 1.5 degrees and the warmest on record	WMO (2025); Copernicus (2025)
Species at risk	About one million animal and plant species threatened with extinction, many within decades	IPBES (2019)
Rate of extinction	Tens to hundreds of times the average rate of the past ten million years	IPBES (2019)
Wildlife populations, 1970	Average decline of 73 per cent in monitored vertebrate populations; a decline of	WWF (2024)

Indicator	Recent estimate	Source
to 2020	60 per cent in the Asia and Pacific region	
Freshwater populations	Average decline of 85 per cent, the steepest of any realm	WWF (2024)
Forest dependent people, world	About 1.6 billion people rely on forests for part of their livelihood	FAO and UNEP (2020)
Forest lost since 1990	About 420 million hectares converted to other uses	FAO and UNEP (2020)
Indigenous peoples	About 476 million people across 90 countries, close to 5 per cent of the world population	WEF (2023)
Indigenous lands	Around 22 per cent of the global land surface, overlapping areas of high biological diversity	UN DESA (2009)

Source. The data in this table has been taken from WMO (2025), Copernicus (2025), IPBES (2019), WWF (2024), FAO and UNEP (2020), WEF (2023), and UN DESA (2009).

One of the characters in this sphere is worthy of an admonishment. The statement that approximately 80 per cent of the remaining biodiversity of Planet Earth is on the territories of Indigenous peoples, has been reiterated in a report released by the United Nations and the World Bank. The scholarship of recent years even challenges the empirical foundations of that very number, following it back to a misunderstanding of a previous study of ecological regions, as opposed to biodiversity per se (Mongabay, 2024). The cautious stance is that Indigenous and tribal lands have proven to be crucial to the living world, and are frequently in a better state than those run by states or companies, without resorting to one disputed figure. This article adheres to such a precautionary stance.

The Indian picture provides the figures around the world with a human face. The table 2 profiles the dependent communities on tribal and forest in India. The population of Scheduled Tribe is large both in real terms, is extremely diverse, is predominantly rural, and is strongly forest bound, and is at the bottom of the country in terms of such indicators like literacy. The two tables read appear to display the fundamental issue. These are the community communities indicated in Table 2 which are most vulnerable to the pressures summarised in Table 1, and are the ones most lacking in financial buffers to these pressures.

Table 2. Profile of tribal and forest dependent communities in India.

Dimension	**Figure**	**Source**
Scheduled Tribe population	104.28 million, about 8.6 per cent of the national population (2011)	Census of India (2011)
Distinct tribal groups	705 notified Scheduled Tribes across thirty states and union territories	Census of India (2011)
Rural residence	About 94 million, close to nine in ten, live in rural areas	UNDP (2024)
Forest residence	More than half of tribal people live in or near forested areas	UNDP (2024)
Forest dependence, all groups	About 275 million rural people, near 27 per cent of the population, depend on forests for subsistence and income	MoEFCC (2021)
Fuelwood dependence	About 70 per cent of the rural population relies on fuelwood for domestic energy	FAO and UNEP (2020)
Primary sector work	More than 80 per cent of Scheduled Tribe workers are engaged in agriculture and allied activities	Census of India (2011)

Dimension	Figure	Source
Literacy	Scheduled Tribe literacy at 63.1 per cent, below the national rate of 72.8 per cent	Census of India (2011)

Source. The data in this table has been taken from the Census of India (2011), UNDP (2024), MoEFCC (2021), and FAO and UNEP (2020).

4 Conceptual Framework and Methodology

4.1 Conceptual framework

The five ideas overlap in analysis which are summarised in Table 3. Firstly is the sustainable livelihoods approach where the security of a household is considered to be based on a portfolio of natural, social, human, physical and financial assets. To the tribal communities the natural resource is king of the portfolio, hence the reason why a forest shock or seasonal calendar shock is easily converted into a shock with respect to income and food. The second concept is the uniqueness, typical to the field of vulnerability research, of a difference between a hazard and a harm it inflicts. Harm is contingent on exposure to it and being vulnerable to it and the ability to adjust. This difference is why the paper has brought about the main argument, which is that the communities may experience great losses due to a crisis that they contributed little in order to cause it.

The third one is that of traditional ecological knowledge which places in-depth knowledge of the environments by the tribal people as a working aspect of adaptation as opposed to folklore (Berkes, 2012). The fourth is climate justice, in the sense of three parts adopted by the Sixth Assessment Report, that is the allocation of burdens, fairness of the processes through which decisions are made and the acknowledgment of various cultures and knowledge (IPCC, 2022). The fifth is the political ecology of conservation which maintains that policies of conservation of the areas under protection and the right to access resources are never neutral, but are shaped by power and by history, thus introducing the conflict between conservation policy and customary rights into the limelight. Collectively these concepts enable the paper to proceed out of global numbers to lived consequences without losing one or another.

Table 3. Conceptual framework and its function in the study.

Lens or framework	Core idea	Function in this study
Sustainable livelihoods approach	Livelihood security is based on portfolio of natural, social, human, physical and financial assets	Posits Forest and biodiversity assets as the natural capital which is most vulnerable to environmental stress.
Vulnerability and exposure	Damage caused by a hazard is a matter of exposure, sensitivity and adaptive capacity	and not the contribution by tribal communities to the drivers.
Traditional ecological knowledge	Knowledge, practice and belief of relationships with the environment, established and transmitted across generations	positions the tribal knowledge as an adaptation resource, and no longer as folklore.
Climate justice	The distributive, procedural, recognition aspects of who takes the burdens, who takes the decision-making are the key to a just response.	Reads tenure and participation as central to any fair response

Lens or framework	Core idea	Function in this study
Political ecology of conservation	Policies regarding area protection and resource exploitation are determined by power and the past	Brings conservation policy vs customary rights into the limelight.

4.2 Methodology

This paper is a qualitative and synthetic study. New field data is not reported. It rather gathers quantitative data of authoritative world and country sources of data, i.e., the reviews of IPBES, the WWF, the WMO, the IPCC, and the FAO, and interprets it in the context of the collection of above-presented framework. There are three moves to the method. The former is to create the magnitude of climate change and loss of biodiversity based on the primary measurements. The second one is to create demographic and economic profile of tribal, forest dependent communities based on census and forestry information. The third one is to bridge the two by following the definite channels through which ecological change trickles down to livelihoods, based on the impacts literature and on the framework. The outcome is provided in the form of an analytically transferable account but not a statistically representative survey. The limitation of this is primarily due to that decision. Since it is based on aggregate data and secondary research, it fails to reflect the subtle difference between one tribal group and another and the numbers it adopts have the aforementioned uncertainties. These boundaries directly lead to the field based work which is identified in the conclusion.

5 How Climate Change and Biodiversity Loss Reach Tribal Livelihoods

The connection between an average in the world and a house budget passes through a number of tangible route. They are laid out in table 4 and the following discussion elicits those that are most important. The common denominator is that all of these routes strike against a natural resource that the tribal households rely on and that tribal households will be able to buy a resource that can replace the obtained natural resource.

Table 4. Pathways from climate change and biodiversity loss to tribal livelihoods and sustainability.

Livelihood or sustainability dimension	Pressure from climate change and biodiversity loss	Consequence for tribal communities
Food from farms and forests	Erratic rainfall, longer dry spells, and shifting flowering and fruiting seasons	Lower and less predictable yields of grain, tubers, and gathered food, and rising food insecurity
Gathered forest produce	Decline of wild species, forest degradation, and the spread of invasive plants	Falling supply of honey, resin, bamboo, tendu leaf, and medicinal plants that provide cash income
Water and health	Drying springs, warmer streams, and changing ranges of disease	Longer journeys for water, loss of fish, and fresh exposure to illness

Livelihood or sustainability dimension	Pressure from climate change and biodiversity loss	Consequence for tribal communities
		carried by insects
Cultural and spiritual life	Loss of sacred groves, sacred species, and reliable seasonal markers	Weakening of ritual calendars and of the knowledge tied to particular species and places
Land and mobility	Displacement by disaster, and by conservation or development projects	Distress migration into informal labour, loss of tenure security, and decay of collective institutions
Adaptive capacity	The combined stress of ecological change and weak recognition of rights	Reduced ability to fall back on customary coping strategies when shocks arrive

5.1 Food, gathered produce, and income

The initial and the nearest channel is the food and income. Tribal farming is much more rain fed, and as such is exposed to increasing irregularity of the monsoon. Late or reduced duration and intensity of the rains result in narrowing the window of sowing and making the yield less predictable. The wood, into which a poor year of farming plunges, is strained about at the same time. Warming and degradation change flowering and fruiting in a community, so plants that the community is dependent on might fail to fruit at the right time predicted by the calendar and labour required to collect them. Most of the produce sold by a tribal household on a cash basis (honey, resin, bamboo, tendu leaf, medicinal plants, etc.) rely on a healthy and diverse forest, and the systematic global species reduction observed on the global scale manifests locally in scrawnier collection and reduced income (WWF, 2024). Bad season does not get evened out over time because these households possess limited financial reserves and are experienced at once, in the sense of less food to eat and increasing debt.

The goods involved are concrete as a result of the specific goods. The flower of the mahua tree is picked, consumed, and marketed all over much of central India and the plant is predictive of the time of year, as well as its sensitivity to heat, during weeks before the monsoon. A large seasonal cash economy is supported by the leaf of the tendu on which country cigarettes are rolled, and its quality and quantity is determined by the well-being of the dry forest surrounding it. The same applies to sal seed, bamboo, a long list of medicinal roots and barks. They are all wild goods whose abundance is controlled by the ecological conditions, which are beyond the control of the collector. The less predictable those conditions become, the less predictable becomes the income they will bring, as well as the calendar of the collection that previously structured the working year starts to lose its predictability (WWF, 2024).

5.2 Water, health, and the loss of the everyday commons

There is a second pathway that passes through water and health. Most of the tribal villages rely on springs, small streams, and shallow wells which react rather well to rainfall and temperature variations. The daily chores of water-carrying, which grow more and more burdensome, particularly when springs weaken and streams grow warmer, now have to bear, with a burden that is largely borne by women and girls, and

freshwater fish, a valuable, yet disappearing, source of protein, an echo of 85 per cent average reduction in freshwater populations reported globally (WWF, 2024). The increase in temperature also shifts the carry range of diseases carried by insects to previously disease-free areas and times to provide an economic shock to the health shock. The IPCC reported that to Indigenous peoples, where such changes interfere with social relationships and knowledge networks in which food and care are exchanged, the damage extends further than material into the community life of the community (IPCC, 2022).

5.3 Culture, displacement, and the double bind

The third direction is the cultural and territorial direction and is the easiest to ignore. To most tribal peoples, many groves, hills, streams and species are sacred and the calendar of the ritual is the natural world cues of the seasons. Once such signs are no longer reliable and such species are in the doldrums it is not just an income that is being lost but a sense of time and place. Mobilization hardens all the other strains. Both the disasters, which increase as secrets become more hot, and the projects, such as conservation projects are driving tribal communities out of their usual areas. The consequence is that there is usually migration of the distress into the insecure informal labour within towns where the ecological knowledge that granted these societies their competence is of no value. This is the twofold bind of the centre of the paper. It often happens that the same people who would be most likely to be human stewards of biodiversity are the ones who are most likely to be displaced.

The magnitude of displacement can not be underestimated. Indian tribal areas have carried with them a huge proportion of land occupied by dams, mines and infrastructure over the years and with the acceleration of frequency of flood and drought and forest fire, there is more of a climatic driver of movement to the previously existing economic driver. And even as a family is uprooted, a house and a field is not all. It is part of a web of relationships to special trees, streams and shrines, and of finely local knowledge, which only really makes sense in one place. That is not the kind of thing that goes off to a resettlement colony or even to a city slum, which is why displacement so frequently makes good forest managers unemployed city workers.

6. Sustainability, Traditional Knowledge, and Adaptation

In the case that the section before is a list of pressures, this section reaches to resources that the tribal communities contribute to the issue, the policy context that supports or impedes them. The beginning point is that sustainability is not a foreign concept to these communities where it is a new external objective to be imported. It is already inherent in many of the traditional practices. The sacred groves reserve areas of forests against any extraction and, therefore, retain areas of high diversity. Rotational cultivation and long fallow, which may be criticised in earlier times can preserve the soil and habitat on moderately populated populations. Community regulation of a common resource applies to rules regarding the season, and the amount of harvest that are enforced by the community authority, rather than the state. But interpreted in terms of traditional ecological knowledge, these are not barriers to development but is experimental system of life within ecological constraints (Berkes, 2012).

Climate science has made some strides towards this opinion. The Sixth Assessment Report had the conclusion with great certainty that Indigenous and local knowledge will be able to enhance adaptation, and they considered identifying that knowledge as a justice issue and not a goodwill issue (IPCC, 2022). Whether policy is The science--the question is whether the science comes first or, to put it differently, whether policy is

preceded by the science. Here mix is done on the record. On the one hand, India has put in place law that acknowledges the forest rights of the tribal and other traditional forest dwelling communities such as the right to hold and use forest land and the ability to use and manage community forest resources, under the legislation of 2006 (Government of India, 2007). Moving to the other end of the road, the old model of conservation, which implements protective barriers around lands, and pushes the local communities nearby out of the zone, has not always vanished and the minor difference between rights on paper and rights in practice is still broad. The political ecology perspective is apt in the sense that it does not accept this divide as an incident. Freedom of who will access a forest, and who has to exit a forest are decisions regarding authority.

I would like to dwell upon the law of 2006, as it represents a real change of principle. Not only the rights of a family to use that forest land that it has long farmed but also the rights of a community to use, manage as well as protect a collective forest resource are recognised (Government of India, 2007). Where societies have established these rights to the community and are organised to realise them, there are promising indications that local management would keep degradation at bay and may even lead to forest restoration as it is the local population who benefit directly through having a healthy forest which is guided by the local population in deciding how it is used. The challenge is that recognition has been disproportionately low and generally slow and community rights have been significantly behind the claims of individuals. The law is a promise that will be fulfilled but fulfilled only partially and that is precisely where the conflict over the sustainability of the tribal level much of the effective struggle is happening.

There are two additional points which should be highlighted. The former deals with women. Women are the ones who harvest most of the forest produce, fetch the water and who have much of the practical knowledge about what plants are curing, which ones are safe to eat and at what time of the year they are in season in the majority of tribal economies. The drying of springs and thinning of forests increases their working day and the amount of purchase in their knowledge, and therefore the burden of ecological change lies disproportionately not only within the household but also among households. Any effort to adapt that does not pay attention to this will fail to capture not only the burden (people) that must bear most but also to capture much of the knowledge on which adaptation must rely. The second reason is that recognition without resources, does not do much. The aspect of secure rights is most important when they are complemented with support on the institutions, the tools and finances that enable a community to act on them.

The tribal communities, in turn, have three requirements that are related to sustainability. The former is secure tenure, as individuals will invest in a long-term management of the land which they are sure they will receive. The second is a real involvement, such that conservation and climate programmes are made with a community, as opposed to being imposed on community, which is the procedural aspect of climate justice (IPCC, 2022). The third is the active use of traditional knowledge and the scientific knowledge not to decorate them but to be a real contribution in the way forests and watershed are handled. With the convergence of these three, it is evident that the evidence of Indigenous managed lands being typically in better ecological health might simply indicate that the result may be positive to both people and biodiversity (IPBES, 2019). In their absence even detailed funded programmes are bound to fail in that they go against the tide of the communities that are supposed to be drawn by them.

7. Discussion

When the evidence is read as a whole, three findings come out. The first is the lack of responsibility and harm fit. The places in Table 2 have added virtually nothing to the emissions and the industrial land use change in Table 1, but are located in the middle of the exposed view to the changes therein. It is not an incidental element of fairness but the essence of analysis, since it is the reason that a purely technical reaction, which only involves the emissions and the areas covered will not reach the people who are the most in need of support.

The second observation is that climate change and the loss of biodiversity cannot be differentiated in the lives of these communities. One of the problems is experienced in the same table, in the same, reduced meal, a warming season and a thinning forest. The problem with policy that is focused on climate and biodiversity in separate departments and separate budgets do not reflect the reality of how the crisis comes. The lines in Table 4 are intersected by the normal line of administration and an efficient response would have to also intersect.

The third discovery is related to knowledge and rights. Most of the relevant knowledge needed to adapt and much of the strongest practices to be used in conservation are found in those communities which are most exposed. The question is however whether that potential is fulfilled more or less hinges on new science as opposed to old questions of tenure, participation and recognition. This puts the issue in a new perspective. The barricade to sustainability in tribal locales is not usually a lack of ecological comprehension but usually a lack of secure rights and true collaboration. Once they are provided, the interests of the community and those of the living world are likely to pull along each other, and not to conflict.

A bigger lesson to the way the twin crises are governed can be seen here. The global discourse has generally viewed climate change and biodiversity loss as the domain of scientists, diplomats, and money and has communities entering the conversation later (or not at all).

8. Conclusion and Directions for Future Research

The Indian statistics speak of a highly vast rural, forest bound tribal populace that is thinly buffered against with the shocks (Census of India, 2011; MoEFCC, 2021). When placed next to each other, they reflect on communities that have made minimal or not contributed in creating the crisis, took a great deal of the energy, but possess knowledge and practices that are going to be required by any serious action taken. Their tenure, their knowledge and their right to participate in the decision making that determines their forests cannot be disintegrated as far as sustainability of these communities is concerned.

There is a number of lines that lead to further development. Close field based research, which quantifies, community by community, the turn and fall of species with their declining management of income, food, water and health, is the most crucial and that the cumulative trajectories which are massed in this direction can be checked and honed against lived experience. Instead of making assumptions, a second line would appraise the extent to which the acknowledgement of forest rights under the law has been converted into ground-based secure tenure and improved ecological performance. One would report on particular activities of traditional ecological knowledge and research, collaborating justly with communities where they exist, how they can be coupled with scientific monitoring to reinforce adaptability. A fourth would push outwards the Indian case, and compare forest reliant tribal communities in India and Indigenous and local communities

elsewhere, whereby what is common in these and what is distinct in these can be distinguished. The principle which directs in each of these directions is the same. Practices of treating tribal communities as a problem that has to be dealt with should be abandoned and they should be treated as partners whose experience and rights are the key to the sustainable future of people as well as the living world.

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