A Comparative Study of Development, Identity, and Ecological Precarity in the Nilgiris and Sundarbans

Undergraduate Honors Thesis in Geography

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Abstract

This paper examines how forest-dependent communities experience ecological precarity and engage with development interventions in two ecologically sensitive regions of India: The Nilgiri Biosphere Reserve (NBR) in Tamil Nadu and the Sundarbans Biosphere Reserve (SBR) in West Bengal. Interviews were mediated by Keystone Foundation in the Nilgiris and Tagore Society for Rural Development (TSRD) in the Sundarbans. Research analysis is guided by one core research question: "How do forest-dependent communities in the NBR and SBR experience ecological precarity through their livelihoods, and how do they perceive and engage with development interventions intended to address these conditions?" Alongside the core research questions are sub-questions to examine how socio-political identity, spatial autonomy, and power dynamics shape these experiences.

Findings suggest that development interventions have provided only partial relief without altering the governance structures that produce precarity. In the NBR, Keystone Foundation's Forest Rights Act advocacy has improved the Irula communities' economic autonomy and strengthened their claims to tribal lands. In the SBR, participants described the decline of TSRD, and the structural inapplicability of the Forest Rights Act has left communities without meaningful legislative or institutional recourse. Across both sites, colonial forest governance logic continues to reproduce precarity for the communities most dependent on forest resources, whilst also shaping intersectional experiences of living in these biospheres.

Table of Contents

Chapter 1: Introduction

1.1 Background

1.1.1 Ecological Precarity Across Forest Landscapes

This research examines two ecologically precarious forest areas in India: The Nilgiri Biosphere Reserve (NBR) in Tamil Nadu and the Sundarbans Biosphere Reserve (SBR) in West Bengal. Ecological Precarity is an "intertwined set of discourses of fragility, vulnerability, power relations across species and imminent extinction". The ecological stability of both regions is defined by the politics of the state and the power dynamics it exerts over the region and its people. This research examines how historical and contemporary development interventions and forest governance shape forest spaces and the livelihoods of forest-dependent communities in the NBR and SBR, and how socio-political and social identities structure unequal access to resources, development interventions, and livelihood pathways across the two regions. This research does not aim to comprehensively evaluate the effectiveness of development interventions; instead, it focuses on how they are experienced and perceived. Drawing on interviews with individuals involved with development institutions and with recipients, this study assesses past and ongoing projects through recipients' perceptions. This leads to one core research question and three sub-questions:

"How do forest-dependent communities in the NBR and SBR experience ecological precarity through their livelihoods, and how do they perceive and engage with development interventions intended to address these conditions?"

"In what ways do social identities affect access to, and participation in, development institutions and their interventions?"

"How do wildlife zoning, forest boundaries, and contemporary forest governance structures affect the spatial autonomy of forest-dependent communities in the NBR and SBR, and how does it differ by region?"

"How do state agencies, NGOs, and corporate actors shape the implementation and outcomes of development interventions across the two regions?"

1.1.2 The Nilgiri Biosphere Reserve and the Sundarbans Biosphere Reserve

The Nilgiris is a high-elevation plateau spanning across Tamil Nadu, Kerala, and Karnataka, part of the Western Ghats mountain range. The Western Ghats are considered a biodiversity hotspot, recognized by UNESCO as one of the world's eight 'hottest hotspots' (Sakkamuthu et al., 2024). According to the International Union for Conservation of Nature and UNESCO, the NBR is currently classified as a 'threatened ecosystem' due to anthropogenic impacts on the region's ecological stability.

The Sundarbans is the largest mangrove forest ecosystem in the world, spanning West Bengal, India, and Southwestern Bangladesh. The Sundarbans mangroves account for one-third of the global population of mangrove species (Ghosh et al., 2015). It is part of the Bengal delta, connected to major estuarine rivers, including the Ganges River and its distributaries, which flow southward to the Sundarbans (Ghosh et al., 2015). The Sundarbans is a critical ecosystem, not

just for those who live on its fringes but for the entire West Bengal region, as it acts as a shield against frequent biannual cyclones and tsunamis (Ghosh et al., 2015). Aside from protection from natural hazards, the region's ecology also relies heavily on the health of the mangroves. From sediment retention to nutrient flow and distribution to the protection of coral reefs and a wide range of fish species, it is extremely ecologically significant (Ghosh et al., 2015). The Sundarbans is also well known for the presence of the Royal Bengal Tiger, attracting tourists to the region (Ghosh et al., 2015). With its ecological significance also comes its economic significance, as it provides livelihood opportunities for those living on its fringes.

Under the biosphere reserve classification, forest spaces are organized into core, buffer, and block/transition zones. The biosphere reserve zoning regulates who may access forest resources and under what conditions. According to UNESCO (n.d), the purpose of the biosphere reserve is for "testing interdisciplinary approaches to understanding and managing changes and interactions between social and ecological systems, including conflict prevention and management of biodiversity." Though the biosphere reserve classification for both sites began in the 80s, the NBR received its official recognition in 1986, and the SBR only in 2001. The core zone is strictly protected for the conservation of ecosystems, species, and genetic diversity, with minimal or no human interference permitted. The buffer zone is where limited human activity is allowed, including research, education, and sustainable resource-use practices compatible with the conservation goals. The outermost transition zone (also referred to as the development, block, cooperation, or manipulation zone depending on the locality) supports more intensive human activity, including settlements, agriculture, and economic development.

Based on my preliminary visits to the SBR and the NBR, the biosphere reserve classification is only apparent among individuals in the SBR, whilst in the NBR, the

classifications are not widely mentioned. The limited reference to biosphere reserve boundaries among the Irula suggests that forest spaces are not experienced through formal governance classifications, but through lived relationships with land. On the contrary, formerly or current forest-dependent individuals in the SBR view the forest space primarily through formal governance classifications, reflecting a more mediated tie to forest land. Although the biosphere reserve serves a similar purpose across both sites, its outcomes are experienced differently. This classification is not only a simple ecological initiative but also a political one. Core zones are typically restricted from human activity without a permit, while buffer and transition zones allow for varying degrees of use, creating a hierarchy of access across space. As a result, biosphere reserve zoning directly shapes livelihood opportunities, spatial autonomy, and the ways forest-dependent and forest-dwelling communities interact with the environment.

1.1.3 Socio-Political Identities of India

According to the 2011 Indian Census, there are more than 10 million members of the Scheduled Tribes community living in rural and urban areas of India, and the community is growing at a rate of 23.7%. Scheduled tribe population accounts for 8.6% of the total Indian population; however, they constitute 25% of India's poorest population (World Bank, 2011). In Tamil Nadu, the total population of all Scheduled Tribe members is 794,697, most of whom live in rural areas (Census of India, 2011).

In the NBR, the primary tribal group of focus for this research is the Irula tribal community, which is a part of the Particularly Vulnerable Tribal Groups (PVTGs), a sub-classification of the Scheduled Tribe. Scheduled tribes are officially recognized tribal groups, while PVTG are scheduled tribes with the following characteristics according to the UNDP

(2023): “(1) Preservation of pre-agricultural practices, (2) Hunting and gathering practices, (3) Decreasing or stagnant population growth, and (4) relatively low levels of literacy in contrast to other tribal groups.” Within the Nilgiris district of Tamil Nadu, there are 9,480 Irula members, accounting for 22% of the district's Scheduled Tribe population (Census of India, 2011).

The Irula tribe traditionally has engaged in hunting and gathering, animal husbandry, agriculture, and other forest-related activities (K R & Kasi, 2025). The Irula have traditionally been forest-dwellers; however, development interventions and shifts in forest governance have led Irula community members to out-migrate from forest spaces in search of alternative livelihoods, which are typically limited to casual labor (K R & Kasi, 2025; Prakash, 2025). Due to historical modes of forest management, many who still reside in the Nilgiris often work on tea plantations, among other forms of casual labor found in the urban centers near the biosphere (K R & Kasi, 2025). Traditional ways of life are impeded by the accumulated effects of colonial forestry, globalization, and the liberalization of the Indian economy in 1991 (Sen, 2024). Despite landmark legislation such as the Forest Rights Act of 2006 (FRA), livelihood precarity still plagues the Irulas and other tribes residing in the NBR. The Irula’s classification as forest-dwellers and as a PVTG directly shapes their ability to access legal rights under the FRA. While these classifications position the Irula as eligible for support, their continued reliance on institutional actors to exercise these rights shows that access is mediated through governance structures. This highlights how socio-political and social identities are not only descriptive but also actively shape access to land, resources, and development interventions.

The SBR also has tribal communities; however, they are not indigenous to the Sundarbans. In 1765, Claud Russel began the land reclamation process of the Sundarbans and wanted to turn the forest into productive land for revenue generation (Bera, 2025). This would

lead to a large-scale migration of tribal communities into the Sundarbans (Hembrom et al., 2024). During the peak of colonial exploration, the Sundarbans would become commodified for its timber (Hembrom et al., 2024). The mass felling of timber in the Sundarbans would then require a large labor force; thus, a large-scale migration would follow. Tribal communities in the Chota Nagpur Plateau in West Bengal, such as the Oraons, Mundas, and Santhals, were forcibly relocated to the Sundarbans to build embankments and convert forestland into rice fields (Hembrom et al., 2024; Bera, 2025). After settling, tribal communities would begin to assimilate into the dominant Bengali communities and eventually become socio-economically and politically marginalized (Bera, 2025).

According to the Indian Census (2011), 47% of the Sundarbans population consisted of marginalized groups such as scheduled tribes, as well as scheduled castes. Additionally, 40% of households are living under the poverty line (Census of India, 2011). The identities of communities in the Sundarbans have historically been shaped by colonial labor practices and a generational process of marginalization. Their classification as non-tribal forest-dependent rather than forest-dwelling has significant implications for access to legal rights. Identity is not simply a social category, but also a governance mechanism that determines access to resources, spatial autonomy, and development interventions.

The ecology of the Sundarbans has been tipped away from equilibrium by excessive deforestation and by the construction of embankments during the colonial period, which has shifted the region's balance indefinitely (Sen, 2024). The Forest Department's approach still employs a dualistic view of forest spaces and people, meaning that humans are often seen as separate from the ‘untamed’ forest. This logic is a continuation of colonial logic. The dualistic ontological perception of the forest has greatly impacted the spatial autonomy of the people

through demarcations aimed at biodiversity and wildlife protection (Gupta, 2024). Under dualistic logic, the fortress conservation model becomes the most widely used. Thus, traditional access to resources has been completely halted or severely restricted. This struggle for spatial autonomy can be fought through the FRA, however, not without issues. The FRA is highly bureaucratic in its processes.

Identity plays a key role in shaping how forest-dependent and forest-dweller communities experience forest governance and development interventions, and these governance structures and interventions, in turn, also shape the identities of the communities themselves. In the context of this research, the two study populations, the Irula Tribe and Gosaba block inhabitants, are recognized as forest-dependent or forest-dweller. The Irulas are forest-dwellers, and the Gosaba Block inhabitants are forest-dependent. Forest-dwellers are not necessarily limited to only tribal people, and forest-dependent people are not limited to non-tribal people. This label is not a self-categorized label but rather, appointed and determined by the state. Thus, the terms forest-dweller and forest-dependent are socio-politically produced. Furthermore, tribal status, caste, religion, gender, and age all play a role in how much agency one has in many aspects of life as a forest-dependent person.

The Indian caste system has existed for over 3,000 years and has inadvertently set up a generationally oppressive socio-political system that is predicated on one's hereditary identity (Goghari, 2023). At the top of the caste hierarchy are the Brahmins, the priestly class, and at the bottom are the Dalits, also referred to as the "untouchable ones" (Goghari, 2023). Those who fall under the lower caste categories, such as the Dalits, are considered "impure" and thus are subjected to fill occupations that are considered ritualistically impure within the Hindu context, such as working with dead bodies, processing cowhide, or removing human waste (Goghari,

2023). Though tribal communities are often seen as separate from the larger Indian socio-political structure, they remain subject to caste identities and are typically placed at the lower end of the hierarchy (Ramdas & Trivedi, 2025). Their integration into the larger Indian society would transform their community's cultural traditions indefinitely.

Based on my preliminary visit to the NBR, the effects of integration were particularly evident in the labor they engaged in, as well as in other cultural tendencies, such as the placement of bathrooms and food choices among the youth. The labor that the Irula community engaged in within the NBR was largely oriented toward generating revenue for external actors, particularly through employment on tea plantations or in waste management. Waste management is an occupation typically assigned to lower-caste individuals, as it is considered their obligation to work in 'impure' occupations. Integration into the Indian society essentially pushed the Irula community into casual labor as they lost access to traditional resources. Aside from identities that stem from the socio-political structure of India, social identities such as age and gender also become a defining factor on how one experiences systemic discrimination.

This research is guided by a Feminist Political Ecology framework to better understand how ecological precarity and development are experienced unevenly across different social groups. While Political Ecology analyzes the role of state power and capitalist processes in shaping environmental change, it does not fully account for how these processes are experienced differently across identities. Feminist Political Ecology is therefore necessary, as it shows that ecological precarity is not experienced equally but shaped by existing power relations at multiple scales.

1.2 Theoretical and Conceptual Framework

To contextualize the current state of both the Nilgiris Biosphere and the Sundarbans Biosphere, we must observe through the lens of Feminist Political Ecology (FPE). According to Elmhirst (2015), FPE "emphasizes politics and power at different scales, but goes further in highlighting gendered power relations, and in making an explicit commitment towards tackling gender disadvantage and inequality. FPE directs attention towards gendered processes within the politics of environmental degradation and conservation, the neoliberalization of nature and ongoing rounds of accumulation, enclosure and dispossession associated with each of these."

Feminist Political Ecology emerged out of the field of Political Ecology in the 1990s as an extension of Political Ecology. At the base of both FPE and the Political Ecology framework is an examination of the role of capitalist markets and state forces in the processes of local dispossession and environmental disruption, rather than viewing environmental degradation as isolated from the broader political structure (Roberts, 2020). The framework of Political Ecology recognizes the dominance of the historical Malthusian approach to understanding environmental degradation and food insecurity, and counters its quantitative analysis of material conditions, which treats environmental problems as isolated from broader political processes. The Political Ecology framework has been associated with interdisciplinary studies of environmental change and livelihood in the context of resource extraction and development interventions (Roberts, 2020). Essentially, as Roberts (2020) states, Political Ecology is an attempt to understand "the relationship between environmental degradation and social marginalization, the causes of environmental conflicts over changing patterns of access to and control of resources, and the fundamental connections between place identity, and social movements." Though identity is mentioned by Roberts (2020), it is not treated as a crucial aspect to explore deeply.

Political Ecology, first coined by Eric Wolf in 1972 in the context of neoliberalism, broadly examines how power relations shape environmental change and resource access through Cultural Ecology, Marxist Political Economy, and Development Studies. However, the theoretical framework does not explicitly consider social identities as part of its analysis (Roberts, 2020; Elmhirst, 2015). The first generation of Political Ecology was heavily influenced by the Marxist principles of Frank's 'Dependency Theory' and Wallerstein's 'World-Systems Theory' (Roberts, 2015; Frank, 1989; Wallerstein, 1974). Both Frank's and Wallerstein's contributions argued that underdevelopment does not represent an evolutionary process towards consumer capitalism, but rather an inherent contradiction in the modern capitalist world system (Roberts, 2015).

In this analysis, underdeveloped countries, or the global south, are crucial to maintaining global capitalism, as they provide developed countries with cheap raw materials, markets for manufactured goods, and cheap labor (Frank, 1989; Wallerstein, 1974). Therefore, underdevelopment is not simply a natural state within an evolutionary scale but rather produced by the world economy as the 'underdeveloped' countries are kept dependent on 'developed countries' through their reliance on foreign capital and external markets (Roberts, 2015). The reliance on foreign capital only intensified under a global push for a neoliberal capitalist economy.

Piers Blaikie and Harold Brookfield (1987) published *Land Degradation and Society,* which linked the marginalization of agricultural workers and hunter-gatherers to the state's enclosure of common resources to generate revenue through market production (Roberts, 2015). Blaikie and Brookfield's (1987) work and prior literature proposed that Political Ecology methodologies should employ a multi-scalar analysis by beginning with the study of local-level

dynamics and their relationship to the land before connecting these dynamics to larger societal and political structures (Roberts, 2015).

However, in the 1990s, the field of Political Ecology was critiqued for its tendency to view capitalism as an unchecked, monolithic structure (Roberts, 2015). As Tsing (2005) states, the global market is subject to resistance and facilitation from local actors who have their own values and agendas. Anthropologist Donald Moore (1993) would argue that Political Ecology scholars need to move beyond early Political Ecology, as it relied on an uncomplicated opposition between local land users and states and corporations. Moore (1993, 2005) argues that local resource users and the state are characterized by complex divisions in which individuals do not share the same goals and values (Roberts, 2015). With this push for change, Moore would then inspire the post-structuralist phase of Political Ecology in the 1990s (Roberts, 2015). In this phase, political analysis moved beyond Dependency Theory and World-Systems Theory, whilst also incorporating more subjective experiences of environmental and economic change (Roberts, 2015). Additionally, studies on gender, race, environmental justice, and social movements, as well as post-structuralism and discourse theory, would begin to theoretically influence the field of Political Ecology and would eventually lead to the emergence of Feminist Political Ecology in 1996.

Rocheleau et al. (1996) established FPE, which extends as a framework that positions gender as a "critical variable" shaping access to and control over natural resources, while also intersecting with class, caste, ethnicity, and other forms of social difference (Elmhirst, 2015). Additionally, FPE deepens Political Ecology's engagement by highlighting how environmental change, development interventions, and resource governance are inherently gendered processes (Elmhirst, 2015). Without analyzing identities as a key factor in shaping access to resources, an

equal field is assumed among individuals, and thus experiences of marginalization are more or less the same across genders, ages, ethnicities, or castes (Elmhirst, 2015). FPE essentially challenges Political Ecology's tendency to treat communities and households as homogenous. Therefore, Political Ecology is insufficient for this research, and FPE must be employed to incorporate identities as a key factor. This research contributes to the field of Feminist Political Ecology by applying its insights to the comparative analysis of the Nilgiris and Sundarbans Biosphere Reserves.

The concept of intersectionality is crucial to the analysis in this research, as socio-political identities are central to perceptions and experiences of development and to the forest spaces themselves. Identities are constantly shaped by the political structure that evolves throughout the different eras of forest regimes. Both the Nilgiris and the Sundarbans have undergone resource exploitation by different state and non-state entities. Neoliberal perceptions of conservation have transformed the livelihoods of both forest-dependent and dweller communities living within or around the fringes of these spaces. Politicizing conservation is essential for understanding how ecological precarity and livelihood security are produced across multiple scales and shaped by the broader power structures embedded in development regimes. Additionally, to understand how state perceptions of forest spaces ultimately determine how conservation is enacted, and decide who is involved as a stakeholder. The 'development' of forest spaces is deeply ingrained with political power structures that ultimately determine the state of livelihoods.

Additionally, Ecological Precarity is a key concept that also merges politics and power dynamics with the non-human aspects of the environment. According to Nayar (2019), Ecological Precarity is the "intertwined set of discourses of fragility, vulnerability, power

relations across species and imminent extinction". A key point in this definition is the "power relations across species," as it moves away from an anthropocentric approach to the environment. Most importantly, it acknowledges that the entire ecological system is also dependent on human power dynamics and the politics that accompany them. Without the consideration of the non-human, the experiences of those dependent on the forest become reduced. A non-dualistic approach to understanding the SBR and the NBR is crucial. Ecological Precarity, as a concept, is appropriate for this research, as both the SBR and NBR fall under this category.

Lastly, relational comparison will also be employed in the data analysis. Relational comparison is a way of comparing places not as isolated cases but as part of wider webs of relations (Hart, 2018). Rather than presenting two forest areas as separate cases and asking how they differ or resemble each other, relational comparison asks how they are mutually shaped by shared social, ecological, and political-economic processes, such as conservation regimes or state policies (Hart, 2018). Though the SBR and the NBR differ in their own ways, they are still historically and politically linked.

This research builds on FPE by applying its focus on power and identity to a comparative analysis of the NBR and the SBR. Rather than treating communities, their access to forest resources, and development interventions as uniform, this research shows that these processes are shaped by differences in socio-political and social identities. In doing so, it extends the field of FPE by demonstrating how state classifications, such as "forest-dweller" and "forest-dependent," or social identities such as gender and age, actively structure unequal access to rights, resources, and development. This is important, as it shows that ecological precarity is not

only produced through large-scale political processes, but also through the ways in which identities are defined and recognized within governance systems.

1.3 Preliminary Field Visits and NGO Background

Prior to this research, two preliminary visits were conducted in the peripheries of the NBR and SBR, mediated by two NGOs. In the NBR, the Keystone Foundation had introduced NGO-affiliated individuals and the Irula community, who are actively involved with the Foundation in Kotagiri. In the SBR, the Tagore Society for Rural Development (TSRD) had also introduced NGO-affiliated individuals and a few non-affiliated individuals living in Gosaba Block. Preliminary visit to the NBR began on June 27th, 2025, to July 6th, 2025, as part of a study abroad program "Topics in Human and Environment/Society Geography: Development Social Wellbeing". The preliminary visit to the SBR took place from December 28th, 2025, to December 31st, 2025. The initial visit to the SBR was primarily due to the limited access to the key sites in the NBR. Activities during the preliminary visits included site observation, informal conversations, and visits to development project locations facilitated by partner NGOs. These experiences help contextualize the research and the interpretation of later interview data.

Keystone Foundation is a non-profit NGO situated in the NBR, working closely with the Irula tribal community. Keystone Foundation was established in 1993, and by 1999, its headquarters would be located in Kotagiri in the Nilgiris. Currently, Keystone consists of over 150 members and operates in Coimbatore, Wayanad, Sathyamangalam, and Pillur.

Their mission is to "enhance the quality of life and the environment" (Keystone Foundation, n.d.). Ongoing Keystone Foundation development programs include biodiversity conservation, community wellbeing, climate change, water and sanitation, networks and

alliances, and people and nature collectives (Keystone Foundation, n.d.). According to Keystone Foundation's website, "each program works to achieve a mix of several of the United Nations Sustainable Development Goals... All programs are approached in an intersectional manner, with cross-sectoral activities mindfully planned to meet goals…" Keystone Foundation employs participatory methodologies in its engagement with the Irula community to democratize development decision-making as much as possible (Keystone Foundation, n.d.).

Based on the preliminary site visit in the NBR, Irula community members discussed their experiences accessing traditional forest resources and their interactions with the Keystone Foundation. "Handholding" was a term that was often used by Keystone Foundation members to describe the process of legally claiming tribal land title rights for the Irula community. From the language of Keystone Foundation members, it is apparent that the Irula community relies on Keystone to exercise their tribal rights and have them legally recognized by the forest department. Despite Keystone Foundation's presence in the community since the 90s, the Irula community still struggles to make their livelihoods more sustainable. Keystone Foundation's focus remains more active in the legal space than in infrastructure or short-term relief.

Furthermore, the Irula community engaged in casual labor on tea plantations that cover a large part of the Kotagiri hills (see Figure 1). Most tea plantation owners are not native to the region. This transformation of forest landscapes into plantations illustrates how ecological precarity is not only environmental but structurally produced through neoliberal land-use changes that reshape both livelihoods and local identities.

Figure 1: Tea plantations covering the hills of Kotagiri, Nilgiris. Photograph taken during preliminary field visit. The image shows the extensive presence of plantation landscapes surrounding local settlements.

TSRD is a civil society organization in West Bengal and Jharkhand, established in 1969. TSRD's stated missions include fostering self-reliant rural communities through participatory development, balancing modern resources with traditional knowledge, addressing structural poverty through awareness building, and prioritizing women's empowerment (Tagore Society for Rural Development, n.d.). The Gosaba Block of the Sundarbans has historically been a key site of TSRD's development work, particularly through the Rangabelia Comprehensive Rural Development Project. The Rangabelia Project was initiated in the late 1960s, beginning as an intervention focused on food insecurity and agricultural vulnerability among rural households

(Tagore Society for Rural Development, n.d.). Formalized in 1975, the project expanded to include health services, education, irrigation, sanitation, and environmental initiatives. TSRD's programming in the Sundarbans has emphasized livelihood diversification, soil and water management, animal resource development, and mangrove regeneration, and operates across multiple blocks, including Basanti, Canning-I, and Kultali (Tagore Society for Rural Development, n.d.).

Preliminary observations in the Gosaba Block of the SBR suggested a noticeable decline in the organization's presence relative to its historically documented role in the region. Individuals working in administrative roles have noted that the decline of TSRD began with the founder's passing in the early 2000s. The reduced presence of TSRD, a historically central NGO in the Gosaba Block, highlights the fragility of non-state development infrastructures, where long-term continuity is not guaranteed. On the other hand, the state development interventions are not significantly transformative. Based on observations, the infrastructure in the Gosaba Block, particularly in Rangabelia village, shows visible damage from cyclones and flooding.

Figure 2: Defunct hospital in Rangabelia village, Gosaba Block, Sundarbans. Photograph taken during preliminary field visit. The image shows an inoperable healthcare facility within the region.

As shown in Figure 2, key infrastructure, such as healthcare facilities, remains defunct in parts of the Sundarbans, providing context for understanding the uneven availability of institutional support in the region. An informal conversation with a local man and a professor from Kolkata noted that the hospital has been defunct since a major flood during Cyclone Aila in May 2009. Though the building infrastructure remains, all equipment is gone, and healthcare workers in the community are very limited. According to the professor, healthcare workers

simply are not responding to the demand as the region does not provide a secure life. Additionally, healthcare workers who come from urban areas simply do not have cultural ties to the landscape and therefore do not understand the nuanced cultural perceptions of healthcare in the region. The professor states that the region needs "sons of the soil" as they truly understand what it means to live in the Sundarbans. "Son of the soil" is a term used to refer to an individual or oneself as being proud and deeply connected to the soil of the Sundarbans. On multiple occasions, male participants stated that they remain in the Sundarbans despite ongoing precarity because they identify themselves as "sons of the soil."

Access to the Islands of the Sundarbans also presents a huge barrier for the flow of resources into and out of the Sundarbans. To reach the Gosaba Block, a boat must be taken within a specific time window due to fluctuations in water levels (see Figure 3). These are physical constraints that shape access to services, markets, and development interventions in the region. Important services, such as emergency services, are limited due to the difficult landscape.

In the absence of consistent institutional support, development becomes less accessible, thus reinforcing or exacerbating existing vulnerabilities among forest-dependent communities in the SBR. This directly relates to the central research question, as my preliminary visit to the SBR made it evident that development is uneven and dependent on institutional presence and governance structures.

Figure 3: Gadkhali ferry pier across from Gosaba Block, Sundarbans. Photograph taken during preliminary field visit. The image shows the primary mode of transport connecting island communities.

While NGOs play a visible role in mediating development interventions, they do not replace governance structures; rather, they operate within them and are constrained by state policies and legal frameworks.

Photographs included in this study were taken during preliminary field visits and are used for contextual and illustrative purposes only. These images do not form part of the formal data

collection and do not include identifiable individuals. Additionally, preliminary visits are not treated as formal data collection but serve to contextualize findings and insights.

1.4 Thesis Structure

This thesis is organized into five chapters. Chapter 1 establishes the central problem of ecological precarity in the SBR and NBR and highlights the significance of forest dependency for understanding ecological precarity and development interventions. The main research question and three sub-questions guiding the study are introduced, providing the necessary background on the NBR and SBR. The chapter also presents the theoretical and conceptual frameworks, which include Feminist Political Ecology, intersectionality, and relational comparison.

Chapter 2, Literature Review, examines existing scholarship on colonial and post-colonial forest governance in India, highlighting how historical policies have shaped post-colonial conservation logics. This chapter examines state-community relations through colonial forestry and the various legislation related to forests. The chapter also examines the rise of developmental regimes under neoliberalism, involving non-state actors such as NGOs, donors, and corporate actors, and includes multiple scholarly perspectives on wildlife zoning and fortress conservation as mechanisms for assuming territorial control. Together, the literature review provides a foundation for understanding how ecological precarity is produced and addressed across scales and eras of forest governance regimes.

Chapter 3, Methodology, outlines the qualitative research design and comparative strategy used to analyze the NBR and SBR relationally rather than as isolated cases. This chapter outlines the use of relational comparison as a method aligned with Feminist Political Ecology,

enabling analysis of the Nilgiris and Sundarbans as interconnected rather than isolated cases. This chapter details the study sites, sampling methods, and data collection strategies. Lastly, the chapter ends with a discussion of the researcher's positionality, relational comparison, and limitations encountered during fieldwork.

Chapter 4, Results, presents the empirical findings from both field sites. The chapter begins with an examination of ecological precarity and livelihood practices, followed by an analysis of development interventions and their perceived effectiveness from the recipients and affiliated members of developmental institutions. This is followed by an exploration of the differences through livelihood pathways, gendered experiences, age dynamics, migratory labor patterns, and spatial autonomy. The chapter then discusses the Forest Rights Act, its limitations in the Sundarbans, and the challenges faced by Irula communities in exercising their Forest Rights. The findings are presented through a Feminist Political Ecology lens, emphasizing how ecological precarity and development interventions are experienced unevenly across different social groups.

Chapter 5, Discussion and Conclusion, uses findings across both regions by returning to the Feminist Political Ecology framework to interpret findings and highlight the broader implications for governance, development interventions, and ecological precarity. It highlights how identity, governance structures, wildlife zoning, and development regimes intersect to produce experiences of precarity and access to forest resources. The chapter concludes by reflecting on the broader implications for forest policy in India.

Chapter 2: Literature Review

2.1 Colonial Forest Governance

To understand the current framework of forest governance in both the NBR and SBR, one must understand India's colonial history and the state's perception of the forest. Through the lens of political ecology, forest spaces are not simply ecological landscapes but also areas that are actively defined politically. Forest spaces do not exist outside of existing power dynamics. Forest spaces and its boundaries are dynamic and everchanging, even before British colonial involvement with the Mughal empire clearing forest land for defense and cultivation (Guha, 1989). It is with British involvement in forestry that drastic exploitation of forest spaces becomes most apparent.

After the Battle of Buxar in 1764 between the East India Company and the Mughal Bengal, the East India Company's focus was then on cash crop production and the expansion of cultivation which had accelerated the exploitation of forests in Northeastern India (Sen, 2024). During British colonial rule, forest spaces were systematically territorialized and exploited for its resources to generate revenue. According to Guha (1984), British administrators in the early 1800s saw the forest spaces as an impediment to agricultural expansion. As British maritime power expanded, the British state began being heavily involved in forestry starting with teak forests in Malabar in 1806 as teak was durable for ship building (Guha, 1989). During this period of industrialization, the British also needed to extract timber resources for railway constructions which eventually led to the establishment of the Forest Department in 1864 (Rangarajan, 1994). One of the most prominent policies that were enacted was the Indian Forest Act of 1878 (IFA of 1878). The colonial legislation officially established a state monopoly control over forest spaces

(Rangarajan, 1994). As a result of the IFA of 1878, impacts were not merely ecological but also social and political.

In the Indian Sundarbans, livelihoods that relied on forest resources were drastically altered as legislation banned shifting cultivation, nationalized timber and non-timber forest products (NTFP), imposed fees on grazing, and restricted autonomy throughout forest spaces (Sen, 2024). For centuries, the Sundarbans have been a resource frontier. In 1757, the British East India Company established its headquarters in Kolkata, at the edge of the forest. Following the establishment of the British East India headquarters, General Clod Russel initiated a plan in 1771 to divide the forest land and lease it to landlords to extract timber (Ghosh et al., 2015). As a result of this plan, poor farming communities and tribal populations migrated to the Sundarbans to clear the forest and develop the land by building embankments (Sen, 2024). During the 18th century, the mangrove forest extended as far as Kolkata. By 1873, the northern boundary of the forest had receded by 10-20 kilometers (Ghosh et al., 2015). From 1873 to 1968, the mangrove coverage had decreased by half (Ghosh et al., 2015).

As for the Nilgiris, British officials first entered in 1819 as the Madras government began to expand the reach of its administrative power (Cederlöf, 2005). Under the Madras government, tribal communities such as the Todas were unable to exercise their land rights under the principle of ‘For the good of the nation’ (Cederlöf, 2005). Following the increasing administrative influence, land-grabbing would occur on a large scale by the 1830s (Cederlöf, 2005). According to Cederlöf, the process of colonial intervention in the Nilgiris was not an abrupt colonial takeover but rather involved negotiations between indigenous communities and entrepreneurs, depending on the extent of the Madras government’s legal influence. As European migration to the region increased, so did the demand for firewood, leading to large-scale felling of timber

(Joshi et al., 2018). The deforestation eventually led the Madras government to enact legislation prohibiting woodcutting without permission and banning brick manufacturing, which consumed firewood (Joshi et al., 2018). By 1857, the forest department had set guidelines that would completely restrict woodcutting to conserve timber and preserve the forest's appearance (Joshi et al., 2018). Despite these regulations, firewood remained in high demand, and the colonial government addressed this demand by allotting plots of land to contractors (Joshi et al., 2018). There is still continuity in the principle of 'For the good of the nation', as the well-being of the local indigenous population was excluded while the state's exploitation of resources was encouraged.

2.2 Post-Colonial Forest Governance

Despite India's independence from British rule, forest governance still marginalizes communities. Post-independence reforms did not address state-driven ecological precarity but rather followed the footsteps of colonial modes of forest governance (Sen, 2024). Even within the post-colonial context, the deprivation of tribal rights and the lack of land recognition worsened as unsurveyed lands within privately owned community land were transferred directly to the Forest Department and declared as reserved or protected forests (Bose, 2010). Revenue remained a top priority, as raw materials were extracted in large quantities (Sen, 2024).

In the 1980s, the Forest Conservation Act (FCA) was enacted, and its effects on forest communities were completely detrimental. Overnight, the FCA classified forest-dweller and other forest-dependent communities as encroachers (Gupta, 2024). The FCA essentially centralized authority over the forest in the hands of the Union government and the Forest

Department, thereby removing local communities from any decision-making positions (Gupta, 2024). The FCA claimed to prevent biodiversity loss and protect "inviolate" forest spaces; however, the logic of the legislation still employs a dualistic perception of forest spaces: conservation requires forests to be isolated from human presence (Gupta, 2024). Gupta (2024) states that the "FCA dealt a death blow to the forest and land rights of traditional forest dwellers, and forest-dependent communities, mostly from the scheduled tribes and castes." The amendments to the FCA mentioned by Gupta (2024) included an amendment from 1996 and one in 2021. The 1996 amendment expanded the definition of forests to include any areas labeled as "forests" in government records, as well as landscapes that fell under the dictionary meaning of the term or were identified as forests by an expert committee appointed by the Supreme Court (Gupta, 2024).

During the early 1980s, a global reform for 'decentralization' began to pick up and changed state-local relationships (Datta, 2021). Decentralization was a push to empower local people to participate in decision-making processes of local development interventions, which largely included natural resource management, signifying the transfer of power from the state to local communities (Datta, 2021). The rise of decentralization came with the establishment of institutions such as the Joint Forest Management (JFM), which promoted cooperation between state and local communities within forest conservation frameworks (Bhattacharya et al., 2010). Early results of the JFM initiative showed increases in biodiversity, NTFP availability, faunal diversity, and local employment (Bhattacharya et al., 2010).

However, Sundar (2000) argues that the JFM initiative is not radically a new model but still mirrors colonial logic. A key point that Sundar (2000) makes regarding gendered exclusion is that the exclusion of women is not a result of JFM rules but rather a continuation of old village

politics that were never addressed. Thus, under the rules of JFM, local elite men were granted further power to exclude women from forest spaces (Sundar, 2000). While JFM was introduced as a decentralized approach to forest governance, it does not fundamentally alter the underlying power structures that govern access to forest resources. Though local communities are included in forest management practices, participation does not equate to ownership or legally recognized rights. Decision-making authority largely remains with the Forest Department, and community involvement is often limited to implementation rather than control (Damodaran & Engel, 2003; Deb, 2020; Sundar, 2000). As a result, JFM continues to reflect earlier forms of forest governance that prioritize state authority.

Alongside the establishment of the JFM, the National Forest Policy (NFP) of 1988 marked a significant shift toward aligning policies with the decentralization movement. Section 2.2 of the NFP states, "The principal aim of Forest Policy must be to ensure environmental stability and maintenance of ecological balance, including atmospheric equilibrium, which are vital for the sustenance of all life forms, human, animal, and plant. The derivation of direct economic benefit must be subordinated to this principal aim." On the other hand, within a few years of the NFP of 1988, economic liberalization was enacted in 1991 and led to a shift away from decentralization goals (Benabou & Harms, 2021). This neoliberal shift meant that the Indian government began prioritizing the privatization of key production sectors, leading to land clearing to expand these industries (Benabou & Harms, 2021). While the NFP of 1988 was still in effect, it was poorly enforced, and the ecological degradation of forest spaces continued (Benabou & Harms, 2021).

During the period of economic liberalization, environmental crises emerged as a key focus in international policy (Benabou & Harms, 2021). The relationship of the people

dependent on the forest eventually was not only limited to state entities such as the forest department but also a multitude of actors, such as NGOs, international donors such as the World Bank or the UNDP, the Indian Supreme Court, and domestic and foreign private actors (Benabou & Harms, 2021). However, the Forest Department's top-down authority over most of India's forest space remained (Benabou & Harms, 2021; Sundar, 2000). In essence, neoliberal reform did not decentralize forest bureaucracies but merely reorganized interactions between the Forest Department and emerging actors, while marginalized forest-dependent communities remain unable to exercise their rights to the forest.

Lastly, the current landmark legislation enacted was the Forest Rights Act of 2006 (FRA). According to the Ministry of Tribal Affairs, the FRA "recognizes the rights of the forest-dwelling tribal communities and other traditional forest dwellers to forest resources, on which these communities were dependent for a variety of needs, including livelihood, habitation, and other socio-cultural needs." This legislation directly addressed the historical injustices faced by tribal communities and forest-dwellers, as well as the ongoing precarity they experience in their environment and livelihood opportunities. According to Bose (2010), there three main reasons why the FRA are vital: (1) Tribal lands are taken by private corporations in the name of public interest such as 'development' and 'industrialization', (2) Community lands and resources that are owned by the government are handed to private corporations directly, (3) Special Economic Zones are encroaching forest spaces that cover tribal and forest-dweller land. In result, tribal people and forest-dwellers become displaced and often migrate as precarious workers.

While JFM promotes participation, it does not provide communities with legally recognized rights to land and forest resources. In contrast, the FRA shifts toward a rights-based framework by recognizing the claims of forest-dwelling populations and attempting to address

historical injustices (Satpathy, 2017). Even when participatory approaches are used, governance structures continue to determine who has control, reinforcing uneven access and livelihood outcomes (Macura et al., 2011).

Some proponents of the FRA fail to consider the realities of tribal life in the contemporary context (Bose, 2010). The belief that tribal people hold all the knowledge needed to nurture nature and are protectors of the forest falls short of recognizing that they have their own aspirations for themselves and their communities beyond the forest spaces they inhabit; this belief is reminiscent of the 'noble savage' which romanticizes indigenous communities while limiting their personal experiences and perceptions with development. This assumption reduces tribal communities to their socio-political identities and ignores their engagement with changing economic and social conditions. It overlooks many who seek livelihood opportunities, education, and forms of development that extend beyond traditional forest-based practices. As Bose (2010) comments on the FRA, "Pro-poor institutional reform may well resemble scaffolding, of which the FRA is a plank."

2.3 Post-Colonial Developmental Regimes

As mentioned, post-colonial regimes often reproduce colonial logic with exceptions to decentralized approaches. Most notably, the dualistic perception of nature has been widely employed both historically and in contemporary contexts. Forest spaces continue to be defined and regulated by regimes that determine who may access forests and their resources (Gupta, 2024). Post-colonial developmental regimes in India largely retain the dualistic fortress-conservation model. The fortress conservation model essentially demarcates wildlife or biodiversity zones that must be kept "inviolate" (Rai et al., 2018). The Wildlife (Protection) Act

1972, and later policies converted many colonial reserved forests into national parks, sanctuaries, and tiger reserves whilst banning or heavily restricting grazing, swidden agriculture, fuelwood collection, NTFP harvest, and other customary uses of forest resources (Rai et al., 2018). Since the 2000s, the creation of protected habitats and tiger reserves has reinforced the fortress conservation model and legitimized the state's power to declare and enforce restricted zones (Rai et al., 2018).

This dualistic approach to forest spaces would then be intensified under the neoliberal state. Tiger reserves and other protected areas would be promoted as sites of global biodiversity value, while the same legislations are used to displace forest dwellers in the name of conservation and "green" development (Rai et al., 2018). Within tiger reserves such as Biligiri Rangaswamy Temple, the classification of space as tiger habitat has led to increased surveillance and patrolling by the Forest Department (Rai et al., 2018). Furthermore, the enforcement of rules regarding access to tiger reserve areas has essentially criminalized shifting cultivation, hunting, burning, and even the collection of NTFPs (Rai et al., 2018). Rai et al. (2018) call this "in situ displacement", meaning that while people remain in the site, they also lose effective control over their land and their livelihood practices. These protected areas are not isolated from the neoliberal market, as state and non-state actors often generate revenue from wildlife tourism, prompting the forest department to implement stricter measures to protect against anthropogenic environmental degradation (Rai et al., 2018).

The contemporary state of development of forest spaces and related communities includes the state and a plethora of non-state actors since India's economic liberalization. From forest departments and courts to NGOs, conservation networks, tourism operators, and carbon forestry projects, all of whom participate in redefining forests as protected habitats (Sen, 2024).

For example, corporate involvement in development schemes through Corporate Social Responsibility (CSR) initiatives has also been prevalent in the neoliberal context. CSR became legally mandatory in India under the Companies Act, 2013 (Dixit, 2023). According to the Companies Act, "Companies with an annual turnover of 151 million USD or more, or a net worth of 75 million USD or more, or a net profit of 0.7 million USD or more, must comply with the Act (Baroth & Mathur, 2019). Additionally, the act requires companies to spend at least 2% of their average net profit over the previous three years on CSR initiatives (Baroth & Mathur, 2019). In Sheehy's (2015) work, she explores the various definitions of CSR and sums CSR as "a type of international private law and can be defined as a socio-political movement which generates private self-regulatory initiatives, incorporating public and private international law norms seeking to ameliorate and mitigate the social harms of and to promote public good by industrial organizations."

Chapter 3: Methodology

3.1 Study Sites

3.1.1 Nilgiri Biosphere Reserve

The NBR spans parts of Tamil Nadu, Kerala, and Karnataka and is located within the Western Ghats mountain range in southern India (see Figure 6). Designated as a UNESCO Biosphere Reserve in 1986, the NBR contains forested landscapes characterized by high biodiversity and long-standing human settlement. Like the SBR, the NBR is organized into core and buffer zones. While the zoning framework is similar in principle across biosphere reserves, the everyday relevance of these zones is articulated differently in the NBR than in the SBR, based on preliminary field engagement.

In the Nilgiris, research focused on members of the Irula tribal community, residing in villages within the forest fringes of the biosphere. Data were collected through a group interview conducted via Zoom with Irula community members. Due to foreign access restrictions to the field site, the interview was conducted remotely rather than in person. The NBR contains two zones: core and buffer. Figure 6 presents an archival map of the Nilgiri Biosphere Reserve, used due to the lack of publicly available GIS boundary data.

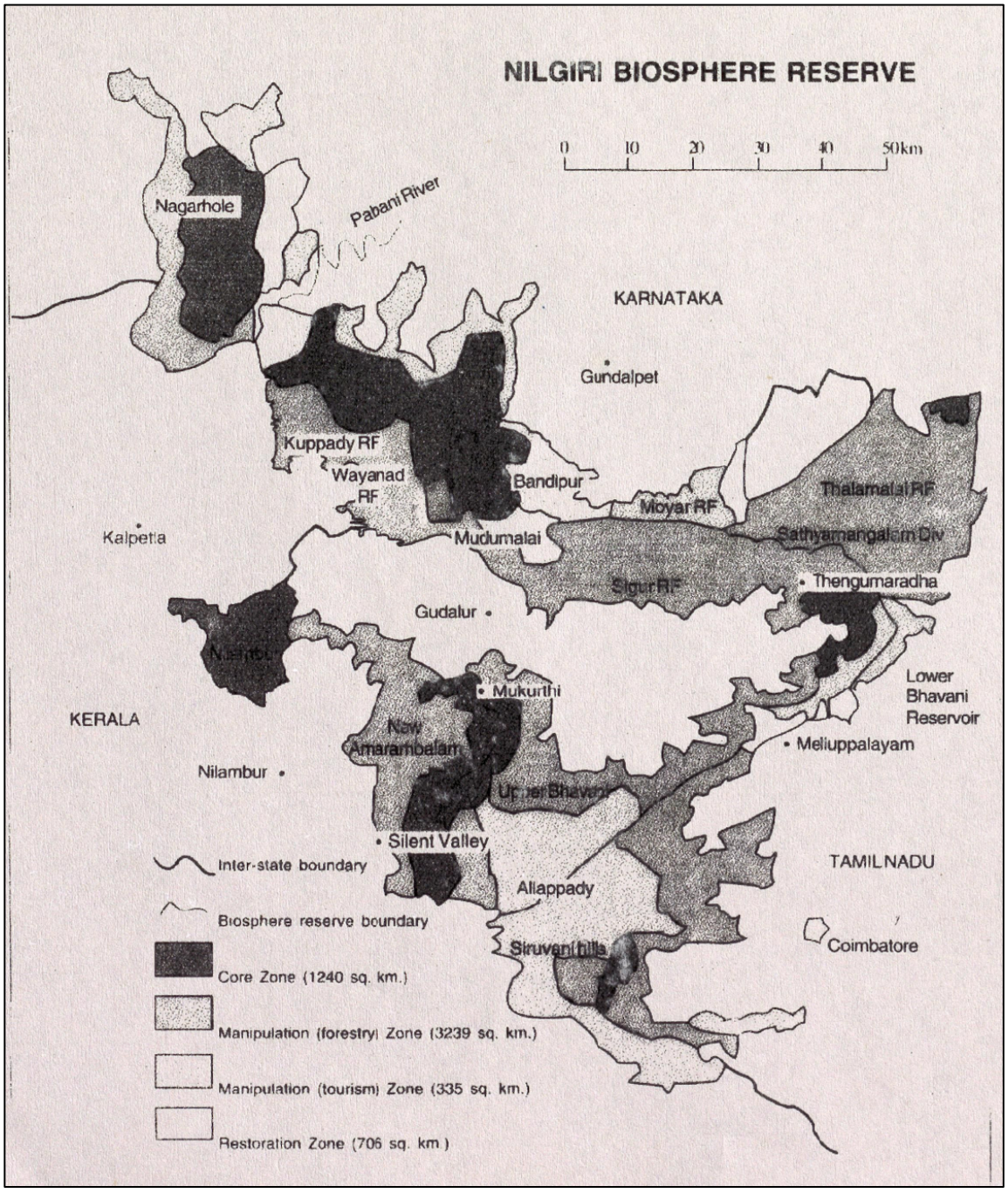

Figure 6: Archival Map of the Nigiri Biosphere Reserve.

Note. From "Border and land zones map of Nilgiri Biosphere Reserve," R. Prabhakar Papers, Archives at NCBS, undated. https://collections.archives.ncbs.res.in/items/8fa0e6e7-ca92-436f-9a8c-46ab4bb0e39e

3.1.2 Sundarbans Biosphere Reserve

The SBR lies within the South 24 Parganas and 24 North Parganas districts of West Bengal. Parganas refers to the administrative revenue unit established during the Mughal Empire and later consolidated by the British. The South 24 Parganas district contains the largest inhabited islands in the fringes of the SBR. The SBR contains three zones: core, buffer, and block/transition, with the periphery permitting limited human activity and access to the core strictly prohibited without a permit.

The research site is in the north-eastern part of the SBR, within the Gosaba Community Development Block (see Figure 7). This area consists of islands separated by rivers, many of which are inhabited, and is part of the Sundarbans Biosphere Reserve. According to Sen (2024), Gosaba Block is like a lifeline for people living in remote islands. Goods such as clothes, medicine, gas, and furniture flow through Gosaba into remote islands (Sen, 2024). Furthermore, Gosaba Block contains tourist accommodations and services, such as boat rides to tourist-permitted areas of the SBR.

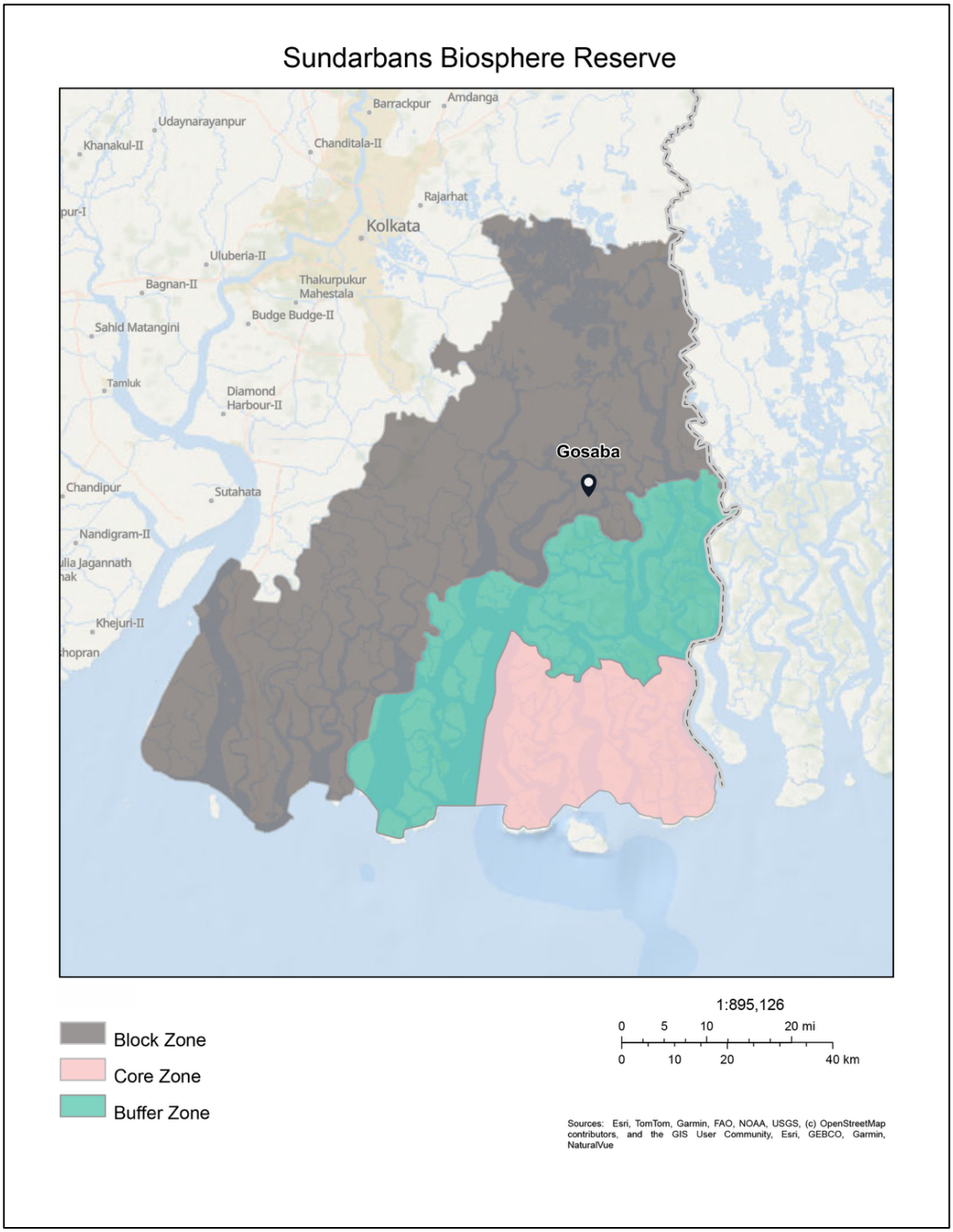

Figure 7: Map of the Sundarbans Biosphere Reserve.

Note. Adapted from Sundarbans regions (WFL1) (2022), ArcGIS Online (https://ucboulder.maps.arcgis.com/home/item.html?id=c09a7a7271c2417b8f01438a7fe711a4).

3.2 Research Design

This research employed a qualitative research design to explore how forest-dependent communities experienced ecological precarity and development interventions in the NBR and the SBR. However, due to site access limitations, all interview data were collected remotely via Zoom. A qualitative approach was necessary to capture lived experiences and perceptions of development interventions, which cannot be adequately represented through quantitative data alone. In designing this research, I also consider my positionality as a foreign student researcher.

The research relied on three semi-structured interviews and one focus group conducted with participants in the SBR, and one group interview conducted with members of the Irula community in the NBR. All interactions were facilitated and mediated by the Keystone Foundation in the Nilgiris and the Tagore Society for Rural Development (TSRD) in the Sundarbans. Semi-structured interviews enabled in-depth exploration of core themes, including experiences with development interventions and interactions with the climate and environment. Participants in semi-structured interviews were asked to participate for approximately one hour, though the duration was flexible depending on participants' availability. Interviews in both study sites were conducted with a trusted translator whom participants were familiar with and comfortable with.

Group interviews were conducted to gather a wide range of perspectives, given limited interactions with the community. Additionally, to observe collective perspectives and to observe how community members discussed livelihood practices and environmental challenges. Group interviews allow participants to feel more voluntary in their participation; thus, there is decreased pressure on individuals to answer.

All digitally collected data was stored in encrypted folders. All participants were de-identified to protect their privacy and uphold confidentiality.

3.3 Sampling Methods

Participants in this research were selected through purposive sampling facilitated by Keystone Foundation and Tagore Society for Rural Development (TSRD).

In the Nilgiris case study, the interview with the Irula community was organized through local collaborators familiar with the community. The discussion took place in a group interview format, in which community members voluntarily responded to questions about their livelihoods and experiences with development interventions. Participation in the discussion was voluntary and open-ended, rather than directed questions.

In the Sundarbans case study, participants were identified through TSRD; thus, most participants were affiliated with TSRD apart from two participants. Individuals representing different types of dependency on the forest, occupations, and social positions were chosen to gain insight into diverse perspectives on livelihoods and development initiatives. In one case, a semi-structured interview employed a snowball sampling method due to changes in participant availability.

3.4 Data Collection

3.4.1 Nilgiri Biosphere Reserve

Data from the Nilgiris were collected through a Zoom-based group interview with 13 members of the Irula community. Six of the participants were women, and 7 were men. The age

demographic of the group varied greatly from youth community members to elders who held community leadership roles. All participants are familiar with and actively engaged with Keystone Foundations and its developmental interventions. The interview was conducted with the assistance of a translator of Irula heritage who was familiar with the participants. This interview was mediated through Keystone Foundation.

Because the researcher does not speak Tamil, translation was necessary for communication between the researcher and participants. During the interview, a young male Irula community member assisted with translation. The interview focused on several key topics, including:

- **Primary livelihoods and alternative livelihoods**
    - Gendered labor
    - Income
- **Agricultural practices and crop cultivation**
    - Whether traditional crops are still being planted
    - Changes in crop choices over time
- **Forest access**
    - Access to NTFPs
    - Access to traditional forest resources
    - Access to water bodies
- **Climate variability and environmental change**
    - Perceived changes in seasonal patterns
    - Access to government programs and subsidies
- **The role of Keystone Foundation and other NGOs in development interventions**

- **Personal aspirations with regard to community development**

3.4.2 Sundarbans Biosphere Reserve

Data from the Sundarbans were collected through three semi-structured interviews and one focus group discussion, all conducted via Zoom and facilitated by Tagore Society for Rural Development (TSRD). Participants were located within the Gosaba Block of the SBR. TSRD was responsible for selecting participants, based on a set of criteria, from individuals who were or are currently forest-dependent for this study, which will provide contextual information about past and ongoing development projects in the Gosaba Block.

Three semi-structured interviews were conducted via Zoom with individuals representing varied livelihood positions and degrees of forest dependency. Participants included individuals affiliated with TSRD and one community member actively engaged in forest-dependent livelihoods.

A focus group discussion was conducted via Zoom with four elder community members, two women and two men, all of whom are affiliated with TSRD. The purpose of the discussion was to gather perspectives on climatic, environmental, and social changes in the region. Elders were asked to reflect on changes they had observed in local livelihoods (not limited to forest-dependent livelihoods), development initiatives, and environmental conditions over time. Furthermore, the discussion also aimed to gather perspectives on gendered pathways to livelihoods. The focus group allowed participants to discuss their experiences of changes in livelihoods, climate patterns, river systems, and development activities in the Sundarbans.

3.5 Limitations

As a foreign researcher, I required local government approval to access field sites in the NBR, which was not granted. All data collection across both study sites was therefore conducted via Zoom. Due to all data being digitally collected, there is a lack of empirical data on the field site that may provide this research with field observations, informal interviews or the conduct of numerous participatory methodologies that may further add to this research.

Second, language barriers hindered effective communication and interpretation. The researcher does not speak Tamil or Bengali. As a result, all interviews relied on trusted translators. Live translation was effective, though some minor details may have been lost in translation. Furthermore, because all participant selection was conducted through Keystone Foundation or Tagore Society for Rural Development (TSRD), this may introduce selection bias into the findings.

Third, the availability of forest-dependent participants in the Sundarbans was very limited. Many male community members were engaged in seasonal migratory labor, thereby restricting access for individuals who may be reliant on forest resources.

Chapter 4: Results

4.1 Nilgiri Biosphere Reserve (NBR)

4.1.1 Livelihoods, Gendered Labor and Environmental Change

Both forest-dweller and forest-dependent communities are shaped by governance structures, though in distinct ways across regions. The group interview with Irula community members revealed that all participants' livelihoods are constantly shaped by forest access, seasonal agricultural cycles, and gendered labor. The main livelihood of all participants is farming, both on their own land and on land not owned by the Irula community. Most households own between two and four acres of land, which was acquired through the FRA. The crops grown include bananas, millets, cashews, rice, jasmine, cotton, pepper, and coffee. Participants commented on the shift away from traditional crops such as millets toward cash crops, despite the risks of climate variability that may affect their growth. Traditional seed use is declining as a result, with farmers instead purchasing cash-crop seeds from markets. This is also due to forest land classification, which excludes some of the Irula community members from government agricultural subsidies for fertilizers and seeds. Participants noted that some subsidies have recently begun reaching the community, but awareness and access remain limited. Participants noted that farming alone does not provide sufficient income for most households, and that alternative livelihood activities are necessary to make ends meet.

Significant environmental changes have also been a key point raised by the group participants. The most reported changes were declining water availability in local streams and water bodies, irregular rainfall patterns, and increasingly frequent drought conditions.

Participants noted that seasonal rainfall patterns have shifted in ways that affect both crop production and daily access to water. When streams dried up, participants reported lacking a proper water irrigation system in the village and being forced to seek daily-wage work elsewhere. Additionally, because the forest department's land covers water bodies, participants' access to alternative sources is limited. All these patterns have strained their agricultural work and thus forced men and women onto different paths to pursue more livelihood opportunities.

The women commented that their alternative livelihood included an ecotourism program that operates on Saturdays and Sundays. This ecotourism program, as participants from the NBR have mentioned, includes community members performing traditional dances and music for visiting tourists. Each session lasts approximately one hour, and participants receive 200 rupees (approximately $2.15 USD) per day. Additionally, women also engage in forest product collection and agricultural labor, earning approximately 300 rupees (approximately $3.22 USD) per day as agricultural laborers. Men also reported engaging in agricultural labor on their own land and wage labor on other people's land, at a rate of 600 rupees (approximately $6.45 USD) per day. During periods of drought or erratic seasonal rain, men would take on construction work in nearby urban areas, including at a nearby dam construction project, earning between 700 and 750 rupees (approximately $7.52 and $8.05 USD) per day. Women engaged in construction labor earn approximately 400 rupees (approximately $4.30 USD) per day. Wages across all labor categories are consistently lower for women than for men. Women in the community also handle household chores, including caring for their children whilst working.

Wildlife crop damage is also a major factor in agricultural practice, as participants are noticing an increase in wildlife interactions over time. A few participants noted that elephants often eat their crops, and there is currently no effective method to protect their farmland. One

participant commented on the need for infrastructural development to reduce wildlife interactions.

4.1.2 Development Interventions and Power Dynamics

Keystone Foundation was described by participants as the primary development actor in their locality, with activities spanning from farming training, health programs, and guidance on FRA land title claims. One of the most significant outcomes of Keystone's work, as described by participants, was the shift in control over NTFP collection and their access to the market to sell these products. Previously, contractors and the Forest Department controlled collection, and community members received only daily wages. Following community rights recognition with Keystone's support, the community now collects and sells forest produce without middlemen and now has access to all revenue from their labor. Participants framed this as a meaningful improvement in their economic autonomy, though they also noted that further infrastructure is still needed, particularly procurement centers and machinery to increase the market value of the NTFPs they collect.

Participants noted that Keystone Foundation is primarily most effective in Community Forest Rights advocacy and building awareness. Keystone’s approach to development is participatory, allowing the community to take on leadership roles. However, it is noted that throughout the interview, there appears to be a ‘handholding’ problem with the community, particularly regarding the exercise of their FRA. The Irula community is almost completely dependent on Keystone Foundation’s presence to advocate for the community’s forest rights.

4.2 Sundarbans Biosphere Reserve (SBR)

4.2.1 Ecological Precarity, Livelihoods, and Migration

Similar patterns of ecological precarity are observed in the Sundarbans, though shaped by different institutional and environmental conditions. Elder participants in the focus group described the Sundarbans as a region that has been under constant ecological stress for as long as they can remember, with the effects felt most acutely by those whose livelihoods depend on forest and river systems. All participants have had livelihoods that relied on the rivers and the forest; however, they have all shifted their labor towards farming. All participants agreed that the level of ecological stress has increased dramatically in the past decade. For example, river salinity was identified as an increasing problem, which was attributed to the rising frequency of cyclones that push seawater inland and into river systems. One participant commented that the salinity is physically unbearable. She describes a particular fish that bites on their ankles during river-related activities as being a common experience throughout their life. However, it is only recently that these small wounds have begun to burn and itch due to the salinity levels in the river system, making fishing difficult.

Participants noted that two cyclones occur annually, and that each event accumulates the degradation of agricultural land and freshwater availability. Additionally, participants commented that during the rainy season, flooding brings polluted water into village freshwater reservoirs, making access to clean drinking water difficult. In some cases, participants described the need to obtain drinkable water from other islands or to purify pond water with alum, a process one participant associated with recurring illness.

One semi-structured interview participant, a man in his late fifties with a variety of livelihoods tied to the forest and river systems of the SBR, described riverbank erosion as the biggest factor in affecting his fishing livelihood. He then comments that the rate of riverbank erosion is increasing due to rising tourism in the SBR. The participant also described the dangers of entering core areas of the SBR, noting that tigers are most dangerous during fishing and crab collection, as fish and crabs accumulate near the bank during low tide. This has led the Forest Department to impose strict access controls on core areas, which he described as both a safety measure and a significant restriction on access to livelihoods. Aside from tigers, the participant has also dealt with thieves targeting those who collect forest resources, such as honey. Though these experiences were uncommon for the participant, they seemed more worried about negative encounters with the forest department.

To access the core areas for resources, a permit for entry is required, and permits are very limited in number. The participant does not have this permit and risks being encountered by the forest department. Without this permit, his spatial autonomy becomes extremely limited, thereby impacting various pathways toward a livelihood. Another key point that this participant has made is the debt that local fishermen are in. Though the participant did not describe the loaning scheme, it appears to the participant that most, if not all, those dependent on the forest are drowning in accumulating debt with no easy way out.

All focus group participants describe how young men in the community are mostly absent due to seasonal migration for wage labor, mainly in cities, leaving women to handle households, agricultural work, alternative livelihoods, and participation in local development programs simultaneously. The male and fewer female youth typically travel to Kerala, Chennai, Bangalore, and Tamil Nadu for construction work, tailoring, or housekeeping. Youth

unemployment was described across all interviews as a normalized condition in the SBR. After seasonally migrating for labor, the youth typically engage in agriculture on their family's land. Focus group participants also noted that automation in agriculture is beginning to compete with the migratory labor market, creating uncertainty about whether agricultural migration will be a sustainable option.

For those who remain in the Gosaba Block, Tagore Society for Rural Development (TSRD) and affiliated CSR programs provide some livelihood opportunities, though participants described these as secondary alternatives. A focus group and a semi-structured interview with one of the elders from the focus group revealed that women usually participate in handloom and saree weaving workshops organized by TSRD. Women with children would bring them to work as they still hold responsibility over the household without the men home. Saree production takes approximately five working days per piece, yielding a commission of 200 rupees (approximately $2.15 USD) per saree. Towel production yields 58 rupees (approximately $0.62 USD) per piece; typically, the women produce one towel per day. Participants reported working 10-15 hours per day; despite the long hours and limited revenue, this labor is considered supplementary rather than their primary livelihood. In the case of participants in the SBR, there are little to no indications of a 'primary' livelihood, but rather multiple pathways to living a sufficient life. A 'primary' livelihood seems to be something the elders in the focus group speak of in the past tense. However, for the participants working under TSRD, it seems that their position in the organization is the primary occupation.

The local mangrove nursery was described as one of the more significant conservation livelihood initiatives in the area, supported by TATA Group as part of their CSR obligations and employing approximately 100 women. Workers collect seeds and pack them into soil-filled

packets, earning one rupee per packet, while nursery workers earn between 400 and 500 rupees (approximately $4.30 and $5.37 USD) daily for six hours of work. Though none of the participants have engaged in conservation livelihoods, one of the women in the focus group mentioned that the nursery is worked entirely by women, whilst the leadership and administration are held by men.

4.2.2 Development Interventions and Power Dynamics

In the case of the SBR, Gosaba block, the Forest Department was described by participants in the focus group and in all semi-structured interviews as having the most authority in the area, with its regulations determining which livelihoods are possible and under what conditions. On the other hand, TSRD was described as the primary NGO operating in the region, currently active in 9 of the 14 administrative blocks. It is important to note that the focus group participants have described a decline in TSRD's effectiveness since the founder's death in the early 2000s. The period of the founder's leadership was consistently referred to across interviews as a golden age of development in the region, a sentiment that participants noted is also reflected in locally produced music commemorating that era. The golden age of TSRD and the present were described as incredibly different, with TSRD applying fewer projects, engaging less with the community, and having a generally decreased organizational presence. This decline has left a gap in development support that neither government programs nor CSR initiatives will fulfill.

One semi-structured interview participant, a young man in his early twenties working in the tourism sector, provided an account of the relationship between the Forest Department and local elites. He described core area permits, which cost one lakh rupees (~1000 dollars), as inaccessible to ordinary community members and noted that they are frequently obtained through

informal, corrupt channels rather than through a legitimate process. This power dynamic among local politicians and forest-dependent peoples concentrates access to the core area among those with social connections to navigate the permit system, leaving forest-dependent community members with access only to buffer and periphery zones.

This same participant, alongside the fisherman and all focus group participants, also described the social consequences of tourism growth in the area. Rising rates of alcohol and substance abuse among youth were attributed directly to the increased tourism, as alcohol is becoming more easily available to the inhabitants of the Gosaba block. Mobile gaming addiction was also described as increasing among the youth. These patterns are seen as consequences of a neoliberal form of development, as the community lacks development interventions that address local livelihoods.

The inapplicability of the FRA to the SBR was also raised by participants from the focus group interviews. Unlike the NBR, where the Irula community can exercise community forest rights under the FRA, the residents of the Gosaba Block are classified as forest-dependent rather than forest-dwelling, meaning the FRA does not extend legislative protection to those living in the SBR.

Chapter 5: Discussion and Conclusion

5.1 Discussion: Relational Comparison

5.1.1 Ecological Precarity and Spatial Autonomy

Access to forest resources, development interventions, and livelihood opportunities is unevenly distributed and shaped by legal status, identity, and institutional access. This supports the FPE's framework, which claims that environmental outcomes are produced through power relations rather than experienced uniformly across communities. The ecological conditions reported by participants in the NBR and SBR differ significantly but share a common structure: both sites are actively produced by the intersection of environmental change and governance regimes that restrict community access to traditional resources. In the NBR, ecological precarity is experienced primarily through drought, irregular rainfall, declining water availability, loss of traditional resources, and wildlife encounters on agricultural land. In the SBR, ecological precarity is experienced through increased cyclone frequency, rising river salinity, riverbank erosion, flooding, irregular seasonal rainfall, and persistent contamination of freshwater sources. Additionally, the declining size and diversity of fish species were described by multiple participants across both the focus group and semi-structured interviews. Ultimately, the degradation of river and forest ecosystems is affecting the availability and access to resources that communities in the SBR depend on.

In both the SBR and the NBR, such ecological pressures are embedded in governance frameworks that limit communities' capacity to adapt and pursue sustainable livelihoods. For most participants in the SBR and the NBR, ecological precarity is experienced at the peripheries

of the forest rather than within it. Through the forest department and state legislations, the dualistic vision of human-nature relations remains. State-led responses to ecological precarity essentially derail the livelihoods of local forest-dependent and forest-dweller communities.

Unfortunately, according to Datta (2018), the forest department is more concerned with territorial jurisdiction than with sustainable forest management. Additionally, forest department conservation interventions perform worse compared to NGOs and other eco-development committees in the SBR (Datta, 2018). Based on SBR and the NBR interviews, participant reports on development interventions correlate well with Sen's (2024) findings in the SBR, "Conservation policies in the Sundarbans align with a large-scale effort of 'economizing governance', integrating environmental conservation parameters with the financial sphere." In both sites, state-led interventions largely focus on the community's ability to generate revenue rather than on the political aspects of forest-dependent and forest-dweller livelihoods.

Furthermore, development interventions from the forest department that participants from the SBR have mentioned seem to respond only to humanitarian crises rather than provide a continuous support system to uplift communities. Under these circumstances, marginalized forest communities then become reliant on non-state actors as a support system. However, all interview participants, except for one, were affiliated with Keystone Foundation and Tagore Society for Rural Development (TSRD). Therefore, there may be deeper and less biased insights into the current state of development and the various state and non-state actors involved.

Spatial autonomy, the ability of forest-dependent and forest-dweller communities to access and move through the forest spaces on which their livelihoods depend, is heavily constrained in both the NBR and SBR. In both sites, spatial autonomy is actively shaped by the Forest Department's authority over forest boundaries and the process through which tribal land is

recognized. The FRA has successfully provided some communities with community land entitlements that formalize access to the forest; however, it is clear from the NBR group interview that the forest department makes it difficult for the community to claim community forest rights.

Due to these circumstances, Keystone Foundation must handhold the Irula community with title claims, as they have greater capacity to advocate for community forest rights. In the SBR, access to core areas requires permits, which participants described as practically inaccessible to most community members and is frequently obtained through corrupt means by those with elite connections. On both sites, the Forest Department defines spatial access, whilst the legal tools available to communities to contest the Forest Department differ significantly. As mentioned in the results, in the NBR, the FRA provides a legislative pathway, but it is ineffective without the help of Keystone Foundation. In the SBR, however, there is no equivalent pathway that exists for forest-dependent non-dwellers. Thus, leaving spatial autonomy to be defined by the Forest Department. Here, we can examine how one's socio-political identity becomes a defining factor in shaping spatial autonomy.

5.1.2 Gendered Livelihoods and Youth Participation

Across both study sites, there is a consistent pattern in which women are positioned as the primary participants in conservation and development livelihood programs, while men pursue livelihoods unrelated to development or conservation schemes. In the NBR, women participate in ecotourism performances and NTFP collection and engage in agricultural labor, earning consistently less than men across all labor categories. Men engage in higher-paying agricultural

and construction labor and are more mobile in their search for seasonal work outside the village. In the SBR, women participate in development and conservation livelihood programs, including the mangrove nursery and handloom workshops, while men migrate seasonally for construction and other labor. Conservation programs are administered by men despite being carried out entirely by women. In both sites, development programs engage women as participants but do not meaningfully address the underlying power structures that shape gendered access to resources, income, and decision-making. Additionally, the number of labor activities women engage in exceeds that of men, as they take on household labor while men are working. outside the village. Household labor seems rather invisible and not recognized as a significant, physically and mentally demanding activity. It seems to be seen more as a woman's unquestioned duty instead.

Youth engagement in development differs greatly between the two study sites. In the NBR, participants described youth as active in development interventions by the Keystone Foundation, noting that some of its programs directly empower them. In the SBR, youth participation in local development interventions was described as significantly minimal. Youth migration to urban labor markets is described by the SBR participants as crucial, as there is no sustainable life to be made in the SBR. With a low youth population in the Gosaba block, the elderly take on manual labor. However, as with the NBR, the youth must eventually return to help their families with agricultural land. Ecological precarity is experienced through gendered divisions of labor, in which men are more likely to engage in seasonal migration, while women take on increased responsibilities within the local economy. This aligns with FPE's focus on how gender structures everyday experiences of environmental and economic change.

In the case of the SBR, local development programs do not meaningfully incorporate youth as a central focus to community empowerment. Unlike the SBR, the Irula community in the NBR has few but active development programs led by Irula youth, funded by the Keystone Foundation.

5.1.3 Development, Legislation, and Community Empowerment

The FRA is the most significant piece of legislation aimed at decentralizing forest governance; however, its application and effectiveness differ between the two regions. In the NBR, Keystone Foundation has actively supported Irula communities in claiming individual and community forest rights, with meaningful outcomes such as ensuring NTFP revenue fully benefits the community by removing middlemen from mediating market access.

NBR participants described this as a significant development in their capacity to exercise spatial and economic autonomy, though gaps in access to government schemes remain. In the SBR, the FRA is structurally inapplicable, as stressed by participants in the elders' focus group. As mentioned, the distinction between forest-dwellers and forest-dependent people in the legislation means that forest-dependent individuals in the Gosaba Block cannot exercise FRA rights, leaving them without a legal mechanism. Access to forest resources is mediated through socially and politically constructed identities rather than environmental conditions alone. The distinction between forest-dweller and forest-dependent populations shows how state classifications structure unequal access.

In both sites, gender, age, tribal status, and social position all shape access to development programs and resources. In the NBR, participants described the process of

exercising FRA rights as something the community cannot successfully claim without Keystone Foundation actively guiding them through title claims. Even where a legislative pathway exists, the ability to advocate for and claim land rights requires an external institution, Keystone Foundation, on which the Irula community depends. In the SBR, access to resources is mediated through informal power structures. Access to the core is determined not by need or dependency but by one's social and financial capital.

Gender dynamics in the SBR are also significant: male youth are seasonally absent, and women take on household labor in addition to agriculture and other types of casual labor. Yet this household labor remains in the backdrop within both development programming and governance frameworks. In both cases, the communities most dependent on the forest are not positioned to access the entitlements that legislation should provide, limited by its language and its bureaucratic structure. Post-colonial development and conservation logics continue to reproduce precarity for marginalized communities regardless of the decentralizing and participatory legislative frameworks.

5.2 Conclusion

In conclusion, across both sites, the findings point to a consistent pattern: ecological precarity is not merely an environmental change but is actively created and maintained by governance structures rooted in colonial forest management and continues to operate through the same dualistic logic today. By applying a Feminist Political Ecology framework, this research demonstrates that development interventions and access to resources are mediated not only by governance systems, but also by identity, producing uneven outcomes across forest spaces and communities.

Development interventions, whether from NGOs, the state, or CSR programs, have provided relief but have not altered the conditions that generate precarity, ecologically and socially. Development interventions that have been most effective, such as Keystone Foundation's FRA advocacy work, are those that have engaged with the political aspects of precarity. However, development interventions are still unable to address the various intersectional experiences of forest spaces: women absorb the labor while the men are pushed outward (predominantly youth in the SBR), and the communities most dependent on the forest remain the least protected by the frameworks that were designed for them in the first place.

What the relational comparison reveals is that the NBR and SBR are not simply two isolated cases of ecological precarity. They are two reflections of the same broader structure, shaped by shared histories of colonial forestry, post-colonial governance, and neoliberal conservation. Understanding this shared structure is essential. Further research employing relational comparisons across various Indian forests may provide us with deeper insights into how identity and politics are deeply intertwined and a defining factor in people's ability to create a sustainable life.

Development interventions in the SBR and NBR remain shaped by underlying governance structures that determine access to resources and livelihood opportunities. The comparison between the Nilgiris and the Sundarbans shows that ecological precarity is not experienced uniformly but is structured by institutional access and socio-political and social identities. While participatory approaches such as JFM introduce local involvement, they do not fundamentally alter control over forest resources. The FRA represents a shift toward decentralization, though its implementation remains uneven due to its bureaucratic processes.

The findings and insights gained from this research suggests the need for a more holistic approach to development interventions in forest-dependent regions. An approach must move beyond short-term solutions and instead address forest governance, livelihoods, and social identities. Rather than relying solely on NGOs or policy initiatives, development must be grounded in long-term institutional. The current forest governance system allows for institutional bureaucracies to curb recipients from receiving adequate development interventions. Sustainable change cannot be made with mere legislations that does not recognize the state's authority as a key factor in shaping how development interventions are enacted and received. Furthermore, granting access rights to forest land does not completely solve livelihood problems, although it may be transformative. Ecological precarity must also be considered on top of title rights as forest resources are strained by environmental stresses. Access to forest land whilst the environment no longer supports the survival native species would still produce precarity.

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