

Legal Pathways for Gender-Inclusive Circular Enterprises: Forest Rights and the Protection of Traditional Ecological Knowledge in North-East India¹

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ABSTRACT

Forest-based livelihoods in Northeast India follow circular practices grounded in Traditional Ecological Knowledge (TEK) held by tribal women, who use selective harvesting, rotational gathering and low-waste processing to maintain ecological balance. However, TEK remains invisible in Indian law. Patent law excludes it, the Biodiversity Act documents species but not decision rules, and the GI Act recognises products without recognising women's knowledge. Forest rights law grants access but not knowledge-based rights. Customary institutions further limit women's participation in governance. Recent amendments to the Forest (Conservation) Act weaken Gram Sabhas and reduce community control, affecting TEK-based enterprises. This chapter argues for recognising TEK as collective knowledge, integrating gender-sensitive procedures across forest and IP systems, and aligning FRA with livelihood schemes to support sustainable, women-led circular systems.

Keywords: Traditional Ecological Knowledge, Circular Economy, Forest Rights, Intellectual Property, Gender.

INTRODUCTION

Sustainable development discussions, today, examine the role of local knowledge in ecological stability and community livelihoods (Berkes, 2012). In this context, many communities rely on practices that support regeneration of resources and limit waste. These practices form Traditional Ecological Knowledge (hereinafter TEK). TEK is collective, oral and based on long term experience (Berkes, 2012). Ecologically, it supports soil health, plant diversity and reliable access to forest produce (Swiderska, 2016).

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In this context, Northeast India presents a clear example of TEK-based forest use. Especially, women in Khasi, Jaintia and Garo communities manage plant selection, seasonal extraction, drying, curing and processing of forest products (Tiwari and Singh, 2015). They learn these practices within households and community groups (Tiwari and Singh, 2015). Their knowledge supports small enterprises that depend on non-timber forest products (Tiwari and Singh, 2015). Also, their practices often align with circular economy principles that focus on regeneration, reuse and low waste.

Despite this role, Indian law does not recognise TEK as a legal interest. The Patent Act excludes traditional knowledge from patentability. The Biological Diversity Act collects knowledge through People's Biodiversity Registers but does not secure strong rights for its holders. The Forest Rights Act recognises community access rights but not knowledge-based rights. Even customary institutions in Meghalaya and parts of Assam place women outside formal decision roles (Agarwal, 2001; NESRC, 2017). These factors limit the visibility of women's TEK in forest governance. They also restrict the growth of circular enterprises that depend on ecological rules.

Moreover, policy documents that promote circular economy goals do not link their strategies with TEK. They focus on industrial sectors and waste management. They do not reflect the ecological planning present in TEK-based systems. This produces a gap between national policy and community practice. It also creates risks for women who work in forest-based enterprises. They face unstable access to forests, weak recognition of their knowledge and limited participation in governance (Nongbri, 2003; Shangpliang, 2012; TERI, 2020).

In this backdrop, this chapter examines these issues through doctrinal analysis. For this, it studies the Forest Rights Act, the Biological Diversity Act, the Patent Act and the Geographical Indications Act. Also, it reviews judicial decisions that affect forest governance. Moreover, it analyses governance structures in Assam and Meghalaya. By doing this, the chapter seeks to identify points where the law does not match ecological practice. It also seeks to study the gender-based exclusions that emerge across forest and IP processes. Moreover, it examines the impact of these exclusions on sustainable production.

Overall, the chapter aims to provide a clear understanding of how TEK, gender and law interact in forest-based livelihoods. It seeks to identify practical reforms that support TEK based circular systems and strengthen women's rights. It situates these reforms within broader sustainability goals linked to biodiversity conservation, gender equality and responsible production. The chapter contributes to research on law and sustainability by showing how knowledge systems shape ecological outcomes and by identifying legal gaps that influence these outcomes.

2. CONCEPTUAL FRAMEWORK

The present research is grounded in four interrelated concepts i.e., circular economy principles, traditional ecological knowledge (TEK), gender and sustainability jurisprudence and legal pluralism. They emanate a combined lens for understanding the intersectionality of ecological regeneration, community knowledge and fragmented legal recognition while situating tribal women's forest-based livelihoods from Assam and Meghalaya. The first concept i.e., circular economy aids in chalking out the type of production systems which are at stake. The second one i.e., TEK maps the epistemic and cultural aspects of such systems. Gender and Sustainability jurisprudence provides a normative angle to assess how law situates women into ecological labour. Legal pluralism aids in exploring the causes behind the customary and statutory regimes being pulled in multiple directions in the Northeast India.

Circular Economy Principles: Reuse, Regeneration, Low-waste Production

The concept has been defined in terms of 3R i.e., 'reduce, reuse, recycle' (Kirchherr, Reike, & Hekkert, 2017). However, the now its definitions has moved beyond just 3R towards a systemic transition in relation to the resource flow process vide economy. Kirchherr et al. has demonstrated that the circular economy is commonly defined as something decreasing resource input and waste (Kirchherr et al., 2017). However, they also pointed out that it needs re-designing of production and consumption systems for segregating growth from limited resource usage (Kirchherr et al., 2017). Recent works stressed upon regenerative systems whereby slow, close and narrow material loops vide reuse, repair, remanufacture and recycling (Geissdoerfer, Savaget, Bocken, & Hultink, 2017; Schröder et al., 2020). This, in turn, reduces emissions and leakages. The research by Ellen MacArthur Foundation accordingly, emphasised that a circular economy ensures products and materials within circulation (Ellen MacArthur Foundation, 2019). This, in turn, rejuvenates nature instead of treating ecosystems as extractive aspect. Such an abstract concept could be seen already rooted in the everyday practices in context of the forest-based enterprises. It could be noted in practices like selective harvesting of non-timber forest products, seasonal rules rotational gathering and processing techniques that are low-energy and low-waste emanating. In terms of Northeast India, certain empirical studies have demonstrated that the rules are crafted by local institutions which seeks to maintain soil fertility, forest cover and water systems while ensuring livelihoods (Geissdoerfer et al., 2017). In terms of the circular economy, such practices project an informal form of circularity. Such circularity entails practices like reusing and recycling of materials within local ecosystems, minimisation of waste through careful usage of biomass and regeneration is based out of the customary norms regarding the harvest practices.

The present research situates circular economy as a normative benchmark. It seeks to explore a system whereby a legal framework is considered enabling when it fosters such regenerative, low-waste enterprises by ensuring access to forest, recognising community-based innovations and permitting value-addition and market access without undermining ecological limits. Where laws fragment resource rights, commodify knowledge without consent, or force women's enterprises into linear, extractive models, they are read as *incoherent* with circular economy principles.

Traditional Ecological Knowledge (TEK): Collective, Oral, Ecological Knowledge

Traditional Ecological Knowledge (TEK) is commonly described as a large, collectively held and culturally developed body of knowledge, practices, and beliefs (Berkes, Colding, & Folke, 2000). They evolve over time and are passed down to younger generations through cultural means about the relationship between humans and their environment. It is not an individual "invention," rather a collective and highly relational body of knowledge (Berkes, 2012; Karlsson, 2011). The transmission of TEK is typically oral and non-verbal through stories, rituals, work songs, division of labor, and apprentice-like learning (Gadgil, Berkes, & Folke, 1993). In Northeastern India, TEK provides the foundation for community-based natural resources management, including agro-forestry systems and sacred forest conservation which provide livelihoods and biodiversity conservation together (Tynsong & Tiwari, 2010). Women from indigenous tribes are frequently among the most important holders of this type of knowledge. They can identify edible and medicinal plants and tell when to harvest plants. They understand soil-water-forest interactions, and they conserve seed and plant diversity. Research on women in the area has found that because their traditional knowledge allows them to be constantly in touch with their local ecosystem, they have become marginalized from formal decision making by policies and programs (Tynsong & Tiwari, 2010).

In this work, TEK is examined in terms of ecological and cultural commons. Such commons is to be studied as a shared, intergenerational knowledge system that aids in circular practices in forest-based livelihoods. It entails three effects for the analysis.

Epistemic form

TEK can't be categorized as an individual's 'patentable' invention because it is oral, contextual and collective.

Embeddedness in Livelihood

The way TEK has been embedded within people's livelihoods means that the way TEK is expressed cannot be separated from how people carry out their work and social relations.

Vulnerability to Misappropriation

Many of the ways that TEK is passed down through generations have traditionally been by women. They undertake this unpaid work by collecting, processing and passing on knowledge. Some vulnerabilities exist for these communities if they document or digitize their TEK for use in biodiversity or intellectual property frameworks. It ranges from being vulnerable to having their TEK used by others without any level of control over the use or without any type of equitable sharing of the benefits.

Therefore, TEK is not just seen as “input” to a new generation of eco-enterprises. It is instead considered a primary legal subject. Something that needs protection, regulation and equitable distribution among tribal communities, with tribal women recognized as key guardians and decision-makers of TEK.

Gender and Sustainability Jurisprudence: Feminist Legal Theory, Ecofeminism, indigenous Agency

Feminist legal theory foregrounds its premise upon the aspect that law is not neutral to gender and that it can be used to reinforce patriarchy. Although legal structures and mechanisms may be equal, many laws and institutions are developed using patriarchal systems and processes. In India, Ratna Kapur and other feminist scholars have demonstrated how gender equality jurisprudence has brought about some gains, however, these legal advancements often vacillate between providing protection and equality (Kapur, 2018; MacKinnon, 1989). They do not address the root causes of the social subordination of women (Kapur, 2018; MacKinnon, 1989). Therefore, feminist jurisprudence asks: Which people’s experiences are recognized within legal reasoning? Who’s labor and knowledge are invisible? Building upon feminist critiques of law, ecofeminists challenge such way by interlinking the subjugation of women with the subjugation of nature. For example, Vandana Shiva states that reductionist and patriarchal models of science and development devalue women’s labor and ecological cycles and argue for a “feminine principle” of development based on diversity, subsistence and nonviolence (Shiva, 1988). In ecofeminist debates in India, it is argued that women’s daily labor in collecting firewood, water, fodder, etc. provides environmental stewardship (Agarwal, 1992). However, laws and policies treating these women as marginalized and not as key actors in their own right (Agarwal, 1992). Contemporary scholarships have identified the presence of elements of ecofeminism in India’s environmental law and policy (Singh & van Houtum, 2002; Agarwal, 2010). However, jurisprudence still does not center women’s ecological labor and decision-making. The study of gender and sustainability jurisprudence occurs at three different levels:

Doctrinal Critique

Examining if statutes such as the ‘Forest Rights Act’ (FRA) or ‘the Biodiversity Act’ conceptualize “community”, “beneficiary”, or “rights holder” in ways that acknowledge women’s labor and contributions and how women are included in the implementation process.

Material Focus

Highlighting tribal women’s forest-based labor and eco-enterprises as examples where gendered power, environmental regulation and market forces intersect.

Indigenous Agency

Viewing tribal women as agents and not only as vulnerable subjects that engage in negotiations, interpretations and resistance against the State and customary norms.

The literature demonstrates that in India and throughout the Global South there are numerous studies on women-led cooperatives, self help groups and community initiatives that utilize indigenous knowledge to achieve climate and livelihood resilience, while also facing structural barriers in regards to land, resources and political rights (Singh & van Houtum, 2002; Agarwal, 2010; UNDP, 2016). Through this theoretical framework, intellectual property law and forest governance will be analyzed using a gendered lens. When GI registrations include men as representatives, when Gram Sabhas or forest committees exclude women’s voices, and when benefits-sharing agreements include men’s names as the primary recipients, it demonstrates the aspects of gendered invisibility. In contrast, women are actively involved in sustaining TEK-based circular enterprises.

Legal Pluralism: Customary *vs.* Statutory Law in Tribal Contexts

Legal pluralism is defined as the co-existence of multiple legal frameworks in the same space consisting of customary, religious, community-based, and state. Legal centralism, the view that the state’s legal framework is the sole framework governing society, has been critiqued by John Griffiths (Griffiths, 1986). He argues that state law is just one of many normative frameworks, and that people live their lives according to many overlapping, often conflicting, semi-autonomous social fields (Griffiths, 1986). Northeast India is an exemplary case of legal pluralism. There are constitutional provisions, autonomous district councils and judicial decisions that recognize customary laws of all the different tribes in addition to central and state statutory law (Cairns & Das, 2019). Customary law governs access to forests and land use rights, inheritance and dispute resolution. Simultaneously, the national laws, such as the ‘Forest Rights Act, the Biodiversity Act, the Geographical Indications Act and the Patent Act’, provide the framework for rights relating to forests, biological resources and traditional knowledge. However, from a gender perspective, legal pluralism is a double-edged aspect. Customary law and institutions can reflect ecologically

responsible practices and community-centered values that align with TEK and circular economy practices. However, research has shown that customary law and institutions in Northeast India are generally male-dominated and that women may be excluded from decision-making regarding land and forests, even in matrilineal societies, like the Khasi (Karlsson, 2008; Nellithanam, 2020). In this chapter, legal pluralism is employed as a map to help identify:

- i. Normative intersections between customary rules for forest use and TEK transmission and resource sharing, and statutory rules for forest rights, biodiversity access and IP protection.
- ii. Jurisdictional gaps and overlaps: for example, community rights recognized in the FRA and mediated by local bodies that do not include women, or GI and patent procedures. They ignore customary norms of collective ownership.
- iii. Power imbalances in whose norms will prevail amidst conflict situations: state bureaucracies, male village elders, IP offices, or women's collectives and cooperatives.

The application of this lens allows the research to consider not only what the statutes stipulate, but also how they are interpreted (and/or ignored) in tribal contexts in which customary law enjoys significant social legitimacy.

FOREST RIGHTS AND TEK IN NORTHEAST INDIA

The relationship of forest rights, traditional ecological knowledge (TEK) and gendered livelihoods in northeast India is all influenced by an intersectional relationship between statutory law, customary institutions and judicial interpretations. Although the region has strong community-based forest governance structures, much of the legal framework (particularly the 'Forest Rights Act, 2006') is centered around access to resources rather than recognizing TEK as a separate, legally protectable interest. This chapter will examine the doctrinal structure of the FRA. It highlights examples from the Khasi, Jaintia and Garo communities through case studies. Also, it analyzes governing institutions and evaluates how courts have interpreted forest rights in ways that impact TEK, in indirect yet significant manner.

Case Studies: Khasi, Jaintia, Garo Women's Forest-based Livelihoods

Research conducted in Meghalaya and Assam demonstrates how Khasi, Jaintia and Garo women are at the center of maintaining their livelihoods through forest-based TEK intensive practices. For example, in the Khasi and Jaintia regions, women were traditionally responsible for gathering broom grass, lac, wild fruit and medicinal herbs as well as making woven items such as baskets. Rekha M. Shangpliang's research concerning the Khasi women and forest law found that although women in matrilineal society can inherit land,

they are limited in their ability to make decisions regarding forest use due to patriarchal clan council and village dorbars' decision-making processes (Shangpliang, 2012). Women in the Jaintia Hills also used oral histories to demonstrate that they maintained knowledge of edible plants, seed varieties and natural dye plants, which assisted the community in adapting to environmental stressors (climate change, etc.), market changes, and other types of change (Tiwari & Singh, 2015; Swiderska, 2016). Similarly, studies of Garo women in agroforestry and bamboo-based business ventures demonstrated similar findings. Garo women's knowledge of multiple species crop rotation, composting, regenerating bamboo and bamboo craft generated circular production systems with little to no environmental waste (Tynsong & Tiwari, 2010; Talukdar et al., 2021).

Through anthropological research by Karlsson, followed by additional analysis of women's TEK in these societies by S. Mukherjee and Sruthi, demonstrates that women's TEK in these societies are not supplementary to women's livelihoods (Karlsson, 2011; Mukherjee & Sruthi, 2020). Rather, it represents women's central role in managing ecological resources (Shangpliang, 2012; Shiva, 1988; Singh et al., 2010). The women as "seed keepers," holders of herbal knowledge and main processors of forest biomass represent a circular economy model of regeneration, reuse and low-waste production (Agarwal, 2001; Borah, 2021; Pushpangadan, 2010; National Biodiversity Authority, 2021). However, women's TEK are largely unaccounted for within formal forest management documentation, benefit sharing agreements and Intellectual Property regimes (Pushpangadan, 2010; National Biodiversity Authority, 2021).

Governance structures: Gram Sabhas, Forest Management Committees, Gendered Exclusions

Gram Sabhas are central to the governance of forests in accordance with the FRA. They are allowed to start claims for rights, to verify rights to lands and to govern the use of forest areas (Government of India, 2006). The guidelines that apply to Gram Sabha meetings include a requirement that one-third of the membership of Gram Sabha should comprise of women (Ministry of Tribal Affairs, 2018). This gives the potential for the traditional ecological knowledge (TEK) held by women to influence the development of community forest plans and the making of decisions in the context of those plans.

However, the governance of forests in Northeast India is far more complicated than the legal framework would suggest. It is shaped by legal pluralism. In addition to the role of Gram Sabhas there are other custom-based bodies (for example, Dorbar Shnong – the Khasi village assembly, Raid councils, clan-based institutions and Autonomous District Councils) that have their own authority over the forests (Cairns & Das, 2019; Karlsson, 2008). There are also various types of Forest Management Committees (FMCs), Joint Forest Management (JFM) bodies and departmental structures (line departments) that all operate in a form of overlap.

The above governance structure emanated dual effects:

TEK is Invisible in the Formal Decision-making Processes

The fact that women have ecological knowledge does not mean that this knowledge will be translated into representation on Gram Sabha issues, claim verification processes or management decisions.

Fragmentation Exists between Customary and Statutory Systems

When customary bodies are predominant in forest governance, the formal procedures of the FRA may be ignored, set aside, or selectively implemented. Therefore, it leads to inconsistency in the recognition of TEK (Griffiths, 1986; Merry, 1988).

Therefore, while the FRA aims to democratize forest governance, the exclusion of women based upon customary norms, limits the degree to which the TEK of women is used to develop legally recognized forest management strategies (Agarwal, 2001; Bose, 2019).

Judicial Pronouncements Interpreting FRA and their Implications for TEK

While, as outlined above, the FRA does not specifically protect (TEK), the way that the law is interpreted by courts and other legal actors has the potential to indirectly protect it. One example is the Niyamgiri judgment i.e., *Orissa Mining Corporation Ltd. v. Ministry of Environment & Forests & Others*, (2013) 6 SCC 476. In this case, the Supreme Court ruled that Gram Sabhas have the right to decide if proposed mines are harmful to the traditional cultural, spiritual, or community rights of the Dongria Kondh people. Implicitly, the Court recognized that forest rights include the relationship between the people who live in those forests and the ecosystems in which they live. This relationship has been passed down from generation to generation. While the Court did not use the term “ecological knowledge,” the Court made it very clear that the knowledge and cosmology that are unique to each community are also legally-protectable interests under the FRA. On the other hand, the *Wildlife First & Others v. Ministry of Environment & Forest & Climate Change & Others*, W.P. (C) 109/2008 case clearly shows how the FRA is being used to pit community rights against conservation. The February 2019 eviction order (which was later stayed) signalled the judicial willingness to prioritize a protectionist approach to conservation over community rights. This type of conservationism is based on the same logic as *T.N. Godavarman Thirumulpad v. Union of India & Others*, (1997) 2 SCC 267. It sees the forest as a place to be restricted and controlled by bureaucrats, often at the expense of the knowledge-based ways in which communities live and practice their culture. When combined with *Lafarge Umiam Mining Pvt. Ltd. v. Union of India & Others*, (2011) 7 SCC 338, which allowed limestone mining in Meghalaya as long as environmental assessments were completed and customary decision-making processes were followed, the regional

implications of this become even clearer. In the Lafarge Umiam Mining case, although the Supreme Court acknowledged the existence and importance of Khasi customary institutions, the Court ultimately gave priority to the assessment of environmental impacts by bureaucrats over the ecological knowledge of the community. As a result, a hierarchy of environmental knowledge exists in Indian environmental law and policy, with state-certified science-based environmental knowledge considered to be more valuable and deserving of legal protection than the more context-specific and ecologically adaptive knowledge of the community. Additionally, Centre for Environmental Law, WWF-India v. Union of India & Others, (2013) 8 SCC 234, reinforced the idea of strong conservation in protected areas. They further supported more exclusionary conservation policies that would undermine community-led TEK-based stewardship of forest resources.

Overall, it could be observed from these judgments that Courts recognize the cultural, spiritual, and territorial aspects of forest rights. However, they rarely articulate TEK as a separate legal category. Instead, they consistently favor scientific forestry and bureaucratized procedures over the community-based knowledge systems.

Therefore, while the Niyamgiri ruling has tremendous transformative potential for recognizing TEK in the context of Gram Sabhas, subsequent and parallel conservation jurisprudence has effectively diminished that potential.

Northeast India is a region where opportunities to promote forest rights and traditional ecological knowledge (TEK) exist. However, they are also fraught with tension. On one hand, the Forest Rights Act (FRA) affords communities an expansive set of rights in relation to forest resources. On the other hand, it doctrinally under-theorizes TEK. Indeed, the Khasi, Jaintia, and Garo women manage local ecosystem services through their knowledge-based forest livelihoods. Yet, these same women are marginalized within governance systems that include customary male authorities as well as bureaucratic institutions.

Moreover, while the judiciary has created an interpretative space for TEK through decisions such as Niyamgiri, competing conservationist juridical perspectives have constrained this interpretive space.

Hence, to create gender inclusive circular enterprises that draw upon TEK, legal frameworks will need to transition from merely focusing on the distribution of resources and instead provide explicit recognition of rights based upon knowledge. Furthermore, the representation of women at every level of governance will be essential in creating equitable decision-making processes. In addition, strengthening Gram Sabha authority in the context of the Northeast and achieving harmony between statutory and customary law will help ensure that the rights and interests of tribal women are represented in the forest rights architecture in India. It would allow the forest rights architecture to meaningfully reflect the ecological and economic wisdom currently being practiced by tribal women in India.

CIRCULAR ECONOMY, LEGAL INCOHERENCE AND POLICY FRAGMENTATION IN NORTHEAST INDIA

Traditional Ecological Knowledge in Northeast India aligns with circular economy goals. Circular economy principles focus on resource regeneration, low waste and continuous use of materials (Kirchherr et al., 2017; Geissdoerfer et al., 2017). Tribal women in Assam and Meghalaya follow these principles through established harvesting cycles and careful forest use (Tiwari & Singh, 2015; Tynsong & Tiwari, 2010). Their knowledge ensures that plant populations recover. Their selection of mature plants protects younger growth. Their rotation of harvest zones reduces pressure on specific patches. Their use of byproducts supports compost, animal feed or local crafts. Their choices show a structured approach to resource efficiency (Berkes, 2012).

Their knowledge is not a marginal practice. It forms a coherent system for maintaining ecological health. Studies on forest-based livelihoods in Meghalaya show that women use plant indicators to judge soil fertility and moisture levels (Shangpliang, 2012). They decide when to begin or stop collection (Roy, 2015). They observe changes in seed size, leaf colour and insect activity (Berkes, Colding & Folke, 2000). Their judgments reduce the risk of over extraction (Agarwal, 2001). This approach serves the same purpose as formal resource assessment methods. It ensures a stable supply over time.

Despite this alignment, formal circular economy policy in India focuses on industrial sectors. Policy papers from NITI Aayog refer to plastics, metals, construction waste and municipal systems (NITI Aayog, 2021). They do not link circularity with TEK (UNDP India, 2022). They do not mention forest based systems (United Nations, 2015). This absence creates a conceptual gap. TEK based circular systems exist but do not enter planning documents. This gap influences resource governance in Northeast India.

Legal Incoherence Across Sectors

Circular economy frameworks describe resource loops. These loops do not function without governance systems that support them. In Northeast India, forest laws, IP laws and livelihood schemes influence different components of circular systems. These laws operate separately and such separation creates incoherence.

The Forest Rights Act supports community control over resources. It does not protect TEK. IP laws protect formal innovation. They do not recognise TEK. Biodiversity law documents knowledge. It does not integrate circular principles. Livelihood schemes promote enterprise growth. They do not incorporate ecological decision rules. Circular economy policy focuses on industrial waste. It does not include forest-based cycles. These frameworks do not connect.

A circular system requires alignment between rights, knowledge and economic activity. However, the present legal structure does not provide this alignment. Women rely on customary norms to maintain ecological balance and customary norms lack legal weight in statutory procedures. This weakens circular systems grounded in TEK.

Policy Fragmentation and Scheme Limitations

Van Dhan Vikas Kendras aim to support tribal value addition (TRIFED, 2023). They promote processing of minor forest produce (Ministry of Tribal Affairs, 2018). They provide machinery, training and marketing support (Bose, 2019). These centres assume consistent supply of raw material. Supply depends on forest access and ecological conditions (Cairns & Das, 2019). Many communities have unresolved rights under the Forest Rights Act (TERI, 2020). Also, forest departments control access in many regions. This creates uncertainty. Van Dhan plans do not integrate TEK-based rules for sustainable harvest. Training modules focus on processing and marketing. They do not include ecological knowledge.

Moreover, National Rural Livelihood Mission works with self-help groups (Ministry of Rural Development, 2022). The mission trains women in enterprise development (Ministry of Rural Development, 2022). It focuses on credit, accounting and product packaging (Upadhyay, 2019). It does not train women in documenting TEK or asserting ecological rights. NRLM integrates women into markets (Roy, 2015). However, it does not support their role as ecological managers.

These schemes function without coordination with forest governance institutions. No mechanism links Van Dhan centres with Gram Sabha-level forest planning. No guidelines link NRLM groups with Community Forest Resource management. Hence, TEK-based rules do not enter scheme design. This results in production targets that conflict with ecological rhythms.

Gender Sensitive Implementation Gaps

Gender inclusion appears in several policies. FRA mentions women in Gram Sabhas. NRLM focuses on women's groups. GI law does not specify gender participation but allows collective action. These inclusions remain limited in practice.

Traditional institutions in Meghalaya maintain male leadership (Nongbri, 2003; NESRC, 2017). Women who try to participate in forest-related decisions face cultural barriers (Upadhyay, 2019). Their names may appear in committee lists (Ministry of Tribal Affairs, 2018). However, their influence remains limited. Gram Sabhas in many Sixth Schedule areas do not include women as active participants (Cairns & Das, 2019). Even though FRA requires their presence, the customary practices often override this requirement.

In Assam, village committees vary in their inclusion of women. Forest department staff often meet male leaders during inspections (Roy, 2015). Women describe their knowledge informally (Agarwal, 2001). However, this knowledge does not enter official records (TERI, 2020). Biodiversity Management Committees also show low participation of women (National Biodiversity Authority, 2021). PBRs record species lists but do not capture the decision rules women follow (National Biodiversity Authority, 2021). This weakens the representation of TEK.

Policy documents on circular economy do not include gender-based analysis (NITI Aayog, 2021). They do not examine the role of women in forest-based circular systems (UNDP India, 2022). They do not reference TEK. This absence leads to policies that replicate existing gender gaps.

Overall, circular economy goals in Northeast India require alignment between TEK, forest governance and livelihood support. Current frameworks operate separately. TEK aligns with circular principles. Law does not recognise TEK. Livelihood schemes do not integrate ecological knowledge. Gender bias in governance limits women's influence. Institutional fragmentation restricts coordination. These gaps weaken the potential of TEK-based enterprises and the sustainability of forest-based economies.

PROPOSED REFORMS, PATHWAYS AND CONCLUDING REMARKS

Overall, there is strong potential to build a legal and policy framework that supports Traditional Ecological Knowledge and women who practise it. To this end, communities in Assam and Meghalaya hold stable ecological systems. Women maintain these systems through careful decisions that support regeneration and reduce waste. Law and policy can strengthen these systems by recognising their place in forest governance and circular economy planning.

Gender Inclusive Intellectual Property Pathways

Intellectual property frameworks can include women in producer roles and decision processes. GI law can create requirements for gender balanced producer groups. For this, applications should identify the knowledge sources that shape the reputation of the product. Also, authorised user lists should include women who carry out ecological and craft-based work. Moreover, IP offices can prepare guidance materials that explain how oral knowledge can be submitted through recorded statements. This can support communities that do not rely on written documentation.

A TEK Register can provide a formal method for communities to record their ecological practices. Such entries should originate through village meetings where women participate

directly. Each entry can describe the practice, the conditions for use and the ecological limits linked to the practice. This approach aligns IP frameworks with community-based authorship.

FRA Amendments and TEK Recognition

The Forest Rights Act can incorporate language that recognises TEK as part of community forest rights. FRA rules can require Gram Sabhas to document TEK while preparing Community Forest Resource plans. These plans can record harvest cycles, soil and plant indicators and regeneration rules. Women should occupy half the seats in CFR committees. Hence, their participation can improve the accuracy of management plans.

FRA amendments can add a clause that requires administrators to consult documented TEK before approving forest diversion. This can strengthen community claims and support ecological safeguards. CFR monitoring groups can use TEK-based indicators to evaluate forest health during routine checks.

Institutional Support and Capacity Strengthening

Agencies that manage biodiversity, livelihoods and forest governance should include TEK modules in staff training. Officers should learn how communities monitor plant growth and regeneration. This knowledge will support better administrative decisions. Also, documentation teams should include local women who practice TEK. This can ensure accuracy in biodiversity registers and management plans.

Digital tools can record oral explanations through audio or video files. This removes the need for complex written documents. District-level TEK cells can help communities prepare records for forest governance, benefit sharing and GI registration. These cells should have women supervisors to support gender inclusion.

Moreover, livelihood missions can support TEK-based enterprises by aligning production schedules with ecological cycles. Training sessions should include information on regeneration limits. This will help women maintain sustainable production. Market support programs can promote TEK-based products with clear recognition of the ecological practices behind them.

Sui Generis TEK Law

A dedicated TEK law can provide the strongest form of recognition. The law can define TEK as knowledge arising from collective experience. It can assign rights to communities and specify that women participate in all decision-making steps. The law can include a consent requirement for any research or commercial use of TEK. Benefit sharing should reach women producers and not only male-led bodies. A TEK Authority can support

these processes. The Authority can include biodiversity specialists, gender experts and community representatives. It can coordinate with IP offices, forest departments and livelihood missions. This can reduce administrative overlap and improve recognition.

Integration of Forest Rights and Livelihood Schemes

Livelihood schemes should align with forest governance. Van Dhan centres can use CFR management plans to decide product selection and extraction levels. NRLM groups can work with village forest committees before starting enterprises. This can reduce conflicts between production goals and ecological limits.

Also, scheme guidelines can include environmental safeguards based on TEK. Officers can encourage enterprises that rely on careful harvesting rather than rapid extraction. TRIFED and NRLM staff can use TEK frameworks when designing cluster level plans. This can improve the stability of supply chains and protect regeneration cycles.

CONCLUDING REMARKS

Legal and policy reforms can improve the position of women who hold TEK. Current frameworks exclude or overlook their knowledge. IP law remains centred on individual invention. Forest law recognises access but not ecological expertise. Biodiversity law documents knowledge without giving strong rights. Livelihood schemes promote production without ecological safeguards. These problems reduce the ability of communities to maintain sustainable forest-based economies.

Reforms that bring TEK into formal law can strengthen circular economy goals. Amendments to FRA can support knowledge-based governance. Gender inclusive GI processes can recognise women's work. Institutional support can help communities document and protect TEK. A dedicated TEK law can create a coherent system for rights, consent and benefit sharing. Integration across ministries can reduce policy fragmentation.

This chapter contributes to debates on gender, law and ecology. It shows that sustainable forest management depends on recognising TEK. It identifies the structural reasons for gender exclusion in IP and forest governance. It offers legal pathways that combine community rights, ecological knowledge and livelihood support.

Future research can examine how TEK-based governance changes forest outcomes when women lead CFR planning. It can analyse the effect of GI reforms on women producers. It can review the performance of TEK Registers in protecting community knowledge. It can also evaluate how integrated livelihood schemes influence ecological stability in forest-based economies. This research can guide long-term policy development and support community resilience in Northeast India.

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