

Role of Tribal Women in Conservation of Biodiversity And Traditional Knowledge in India

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Abstract—Tribal women in India play a pivotal yet often under-recognized role in the conservation of biodiversity and the preservation of traditional knowledge systems. As primary gatherers, cultivators, and custodians of indigenous practices, they contribute significantly to sustainable resource management, seed preservation, and ecological balance. This paper critically examines the role of tribal women as knowledge holders and biodiversity conservators within the framework of India's legal and policy regimes. It explores how traditional practices, passed through generations of women, contribute to conservation while ensuring livelihood security.

The study analyses key international instruments such as the Convention on Biological Diversity and the Nagoya Protocol, alongside domestic legislation including the Biological Diversity Act, 2002, to evaluate the extent of legal recognition accorded to tribal women. It highlights the gaps in Access and Benefit Sharing (ABS) mechanisms, where women's contributions remain largely invisible and inadequately compensated. The paper also engages with instances of biopiracy and the marginalization of women's knowledge within formal intellectual property systems.

Through a critical and gender-sensitive lens, the research argues that existing frameworks fail to sufficiently acknowledge tribal women as rights holders rather than mere stakeholders. It calls for a more inclusive, gender-responsive legal approach that integrates women's voices in biodiversity governance and ensures equitable benefit-sharing mechanisms. The paper concludes by proposing reforms aimed at strengthening community rights, promoting documentation of traditional knowledge, and recognizing the central role of tribal women in achieving sustainable development and biodiversity conservation in India.

Index Terms—Tribal Women, Biodiversity, Conservation, Traditional Knowledge, Gender Justice,

Intellectual Property Rights, Environmental Governance.

I. INTRODUCTION

The conservation of biodiversity and the protection of traditional knowledge have gained significant prominence in contemporary environmental and legal discourse, particularly in the Global South. India, recognized as a megadiverse country, possesses a rich repository of biological resources sustained by indigenous and tribal communities whose cultural and economic practices are closely intertwined with nature. Within these communities, tribal women play an indispensable yet insufficiently acknowledged role in conserving biodiversity and maintaining traditional knowledge systems. Their continuous interaction with natural resources situates them as primary agents of sustainable environmental management.

Traditional knowledge, as articulated under Article 8(j) of the Convention on Biological Diversity¹, encompasses the knowledge, innovations, and practices developed by indigenous and local communities through long-standing engagement with their ecological surroundings. In India, tribal women are actively involved in activities such as seed conservation, use of medicinal plants, water resource management, and sustainable agricultural practices. These contributions not only support ecological balance but also enhance community resilience and food security. Ecofeminist scholars, notably Vandana Shiva, have highlighted the intrinsic link between women and nature, emphasizing that women's

experiential knowledge plays a crucial role in sustaining biodiversity¹.

Notwithstanding their vital contributions, tribal women remain largely invisible within formal legal and policy frameworks governing biodiversity and intellectual property rights. The Biological Diversity Act, 2002², enacted in furtherance of India's commitments under the Convention on Biological Diversity³, incorporates mechanisms such as Access and Benefit Sharing (ABS) and decentralized governance through Biodiversity Management Committees. However, the implementation of these mechanisms often fails to adequately recognize or reward the contributions of women. Similarly, while the Nagoya Protocol advances the principle of equitable benefit sharing, it lacks explicit provisions addressing gender-specific concerns.

Moreover, tensions between biodiversity conservation and intellectual property regimes, particularly under Article 27 of the TRIPS Agreement⁴, raise critical questions regarding the protection of traditional knowledge. Incidents of biopiracy, including the turmeric⁵ and neem⁶ patent controversies, demonstrate how indigenous knowledge systems—frequently preserved and transmitted by women—have been appropriated without proper recognition or compensation. This highlights the inadequacy of existing legal frameworks in safeguarding community knowledge and ensuring justice.

Against this backdrop, the present study seeks to critically examine the role of tribal women in biodiversity conservation and the preservation of traditional knowledge in India. It evaluates the effectiveness of international and domestic legal regimes, identifies structural and gender-based gaps, and argues for a more inclusive, gender-responsive approach that recognizes tribal women as key rights holders in biodiversity governance.

II. CONCEPTUAL FRAMEWORK: INTERLINKAGES BETWEEN BIODIVERSITY, TRADITIONAL KNOWLEDGE, AND ECOFEMINISM

A comprehensive understanding of the role of tribal women in biodiversity conservation necessitates an integrated conceptual framework that brings together the notions of biodiversity, traditional knowledge (TK), and ecofeminism. These concepts are deeply interconnected and must be examined not in isolation but as part of a broader socio-ecological and legal discourse that shapes conservation practices in indigenous contexts.

Biodiversity, as defined under Article 2 of the Convention on Biological Diversity, refers to the variability among living organisms from all ecosystems, including diversity within species, between species, and of ecosystems⁶. It forms the foundation of ecological sustainability and human survival by supporting essential ecosystem services such as food production, climate regulation, and medicinal resources. In a country like India, biodiversity is not merely a natural asset but also a cultural and economic resource, particularly for tribal communities whose subsistence and identity are closely tied to their surrounding environment. Their practices of conservation are often community-driven, decentralized, and based on long-standing ecological understanding.

Closely linked to biodiversity is the concept of traditional knowledge, which encompasses the cumulative body of knowledge, innovations, and practices developed by indigenous and local communities through continuous interaction with nature⁷. This knowledge is characteristically collective, dynamic, and transmitted orally across generations. Unlike formal scientific knowledge systems, traditional knowledge is embedded within

¹ Vandana Shiva, *Staying Alive: Women, Ecology and Development* (Zed Books, 1988).

² Biological Diversity Act, No. 18 of 2002, India.

³ Convention on Biological Diversity, 1992, Art. 8(j).

⁴ Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), 1994, Art. 27.

⁵ *Council of Scientific & Industrial Research v.*

Union of India
(Turmeric Patent Case).

⁶ *W.R. Grace & Co. v.*
Neem Patent Case
(EPO, 2000)

⁶ Convention on Biological Diversity, 1992, Art. 2.

⁷ Convention on Biological Diversity, 1992, Art. 8(j).

cultural practices, belief systems, and everyday livelihood activities. In tribal societies, women play a pivotal role in sustaining and transmitting this knowledge. Their responsibilities in areas such as seed selection, preservation of indigenous crop varieties, identification and use of medicinal plants, water conservation, and sustainable harvesting techniques demonstrate their centrality in maintaining ecological balance⁸. Such contributions are crucial not only for biodiversity conservation but also for ensuring food security and resilience against environmental changes. The theoretical perspective of ecofeminism provides a critical lens through which the relationship between women and biodiversity can be understood. Ecofeminism argues that the exploitation of nature and the subordination of women are interconnected outcomes of patriarchal and capitalist systems that prioritize domination and control⁹. This framework challenges conventional approaches to environmental governance by emphasizing care, sustainability, and interdependence. Scholars such as Vandana Shiva have argued that women, particularly in rural and tribal communities, possess a distinct ecological sensibility rooted in their lived experiences and daily engagement with natural resources¹⁰. This positions them not merely as participants but as key knowledge holders and agents of conservation.

However, despite their significant contributions, the knowledge and practices of tribal women remain systematically undervalued within dominant legal and policy frameworks. This marginalization can be understood as a form of epistemic injustice, wherein certain forms of knowledge—particularly those that are informal, oral, and community-based—are excluded from formal recognition and protection¹¹. Legal regimes governing biodiversity and intellectual property often prioritize codified, individualistic, and market-oriented knowledge systems, thereby overlooking the collective and gendered dimensions of traditional knowledge.

Furthermore, the disconnect between grassroots conservation practices and formal governance

structures exacerbates the invisibility of women's contributions. While policies may acknowledge community participation in principle, they frequently fail to account for intracommunity power dynamics, including gender inequalities. As a result, women's voices are often excluded from decision-making processes related to resource management and benefit sharing.

In light of these considerations, this conceptual framework underscores the need to reconceptualize biodiversity conservation as not only an environmental concern but also a sociolegal and gendered issue. Recognizing the interdependence of biodiversity, traditional knowledge, and ecofeminism is essential for developing inclusive legal frameworks that address structural inequalities and empower tribal women. Such an approach would facilitate a shift from viewing women as passive beneficiaries to acknowledging them as active rights holders and central actors in sustainable biodiversity governance.

III. INTERNATIONAL LEGAL FRAMEWORK GOVERNING BIODIVERSITY AND TRADITIONAL KNOWLEDGE

The governance of biodiversity and traditional knowledge at the international level has evolved through a set of legal instruments aimed at reconciling environmental conservation with economic development and intellectual property protection. While these frameworks mark significant progress in acknowledging the value of biological resources and indigenous knowledge systems, they remain fraught with conceptual and structural limitations—particularly when assessed from a gender-sensitive perspective. A critical analysis of the Convention on Biological Diversity (CBD), the Nagoya Protocol, and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) reveals both advancements and persistent gaps in recognizing the contributions of tribal women.

⁸ Anil K. Gupta, "Grassroots Innovations and Traditional Knowledge," 36 *World Development* 1487 (2008).

⁹ Maria Mies & Vandana Shiva, *Ecofeminism* (Zed Books, 1993).

¹⁰ Vandana Shiva, *Staying Alive: Women, Ecology and Development* (Zed Books, 1988).

¹¹ Madhav Gadgil & Ramachandra Guha, *This Fissured Land: An Ecological History of India* (Oxford University Press, 1992).

The Convention on Biological Diversity (1992) represents a foundational instrument in international environmental law, establishing three core objectives: the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic resources¹². Notably, Article 8(j) of the Convention underscores the importance of respecting and preserving the knowledge, innovations, and practices of indigenous and local communities¹⁴. This provision marked a paradigm shift by formally acknowledging the role of traditional knowledge in biodiversity conservation. However, the language of the CBD remains largely community-centric and does not explicitly account for intra-community differences, including gender disparities. As a result, the distinct contributions of tribal women—who are often primary custodians of ecological knowledge—are rendered invisible within the broader category of “local communities.”

The Nagoya Protocol (2010), adopted as a supplementary agreement to the CBD, seeks to operationalize the principle of Access and Benefit Sharing (ABS) through legally binding obligations¹³. It introduces mechanisms such as prior informed consent (PIC) and mutually agreed terms (MAT) to regulate access to genetic resources and associated traditional knowledge. While the Protocol strengthens the legal framework for equitable benefit sharing, its provisions remain largely gender-neutral. Although it emphasizes community participation, it does not mandate the inclusion of women in decision-making processes or ensure their direct access to benefits. In contexts where patriarchal norms influence governance structures, this omission leads to the marginalization of women despite their substantive contributions to knowledge systems¹⁴.

In contrast, the TRIPS Agreement (1994), operating within the framework of the World Trade Organization, adopts a market-oriented approach that

prioritizes the protection of intellectual property rights through patent regimes¹⁵. Article 27 of TRIPS permits the patenting of inventions in all fields of technology, including certain biological materials, subject to specified exceptions. This approach is fundamentally at odds with the collective, intergenerational, and noncommercial nature of traditional knowledge. By privileging individual ownership and formal innovation, TRIPS fails to accommodate the communal knowledge systems prevalent among indigenous communities. This structural incompatibility has facilitated instances of misappropriation, commonly referred to as biopiracy. Illustrative cases such as the turmeric and neem patent disputes demonstrate the inadequacies of existing intellectual property regimes in safeguarding traditional knowledge¹⁶. In both instances, patents were granted for uses of biological resources that were already well-established within Indian traditional practices. These controversies exposed the absence of mechanisms to recognize prior art rooted in oral and community-based knowledge systems. Importantly, such knowledge is often preserved, practiced, and transmitted by women, yet their role remains unacknowledged within formal legal frameworks and dispute resolution processes.

The divergence between the objectives of the CBD and TRIPS further exacerbates these challenges. While the CBD emphasizes conservation, community rights, and equitable benefit sharing, TRIPS advances a regime centered on privatization and commercialization of knowledge¹⁷. This normative conflict has generated ongoing debates at international forums regarding the need for harmonization and the development of sui generis systems for the protection of traditional knowledge. However, these discussions have largely overlooked the gendered dimensions of knowledge production and ownership.

¹² Convention on Biological Diversity, 1992, Art. 1 & 3 ¹⁴ Convention on Biological Diversity, 1992, Art. 8(j).

¹³ Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits, 2010.

¹⁴ Elisa Morgera, *The Nagoya Protocol in Perspective* (Brill, 2015).

¹⁵ Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), 1994, Art. 27

¹⁶ *Council of Scientific & Industrial Research v. Union of India* (Turmeric Patent Case), 1997; *W.R. Grace & Co. v. Neem Patent Case* (EPO, 2000).

¹⁷ Graham Dutfield, *Intellectual Property, Biogenetic Resources and Traditional Knowledge* (Earthscan, 2004).

In essence, although international legal instruments have contributed to the recognition of biodiversity and traditional knowledge, they fall short in addressing the complex socio-cultural and gendered realities underlying these concepts. The absence of explicit gender-responsive provisions, coupled with the structural tension between environmental and intellectual property regimes, perpetuates the marginalization of tribal women. A more integrated and inclusive international framework is therefore necessary—one that not only bridges the gap between conservation and commercialization but also ensures the meaningful recognition and participation of women as key stakeholders and rights holders in biodiversity governance.

IV. INDIAN LEGAL FRAMEWORK GOVERNING BIODIVERSITY AND TRADITIONAL KNOWLEDGE

India has developed a comprehensive legal and institutional framework to regulate biodiversity conservation and the protection of traditional knowledge, primarily in response to its obligations under the Convention on Biological Diversity. The cornerstone of this framework is the Biological Diversity Act, 2002, which seeks to promote conservation, sustainable use of biological resources, and equitable sharing of benefits arising from their utilization¹⁸. While the Act represents a significant legislative step, its effectiveness in recognizing and safeguarding the contributions of tribal women remains subject to critical scrutiny.

The Biological Diversity Act, 2002 establishes a three-tier institutional structure comprising the National Biodiversity Authority (NBA), State Biodiversity Boards (SBBs), and Biodiversity Management Committees (BMCs) at the local level¹⁹. These bodies are entrusted with the regulation of access to biological resources and associated

traditional knowledge, as well as the implementation of Access and Benefit Sharing (ABS) mechanisms. Notably, BMCs are designed to function as grassroots institutions responsible for documenting local biodiversity and associated knowledge through People's Biodiversity Registers (PBRs). In principle, this decentralized approach provides an opportunity for inclusive participation, including that of tribal women who are primary knowledge holders²⁰.

However, in practice, the functioning of these institutions reveals significant gaps. The participation of women in Biodiversity Management Committees is often limited or symbolic, with decision-making processes largely dominated by male members²¹. This undermines the objective of equitable governance and results in the exclusion of women's voices in matters directly affecting their knowledge systems and livelihoods. Furthermore, the process of documenting traditional knowledge through PBRs frequently fails to adequately capture gender specific knowledge, particularly that related to medicinal plants, food systems, and seed preservation.

The Access and Benefit Sharing (ABS) mechanism, a central feature of the Act, is intended to ensure that communities receive fair compensation for the use of their biological resources and knowledge²². While ABS agreements have been implemented in several instances, the distribution of benefits within communities often lacks transparency and equity. In many cases, tribal women—despite being key contributors—do not receive direct or proportionate benefits. This reflects deeper structural inequalities within community governance as well as the absence of gender-sensitive implementation guidelines²³.

In addition to the Biological Diversity Act, other legal frameworks indirectly impact the protection of traditional knowledge and the role of tribal women. The Protection of Plant Varieties and Farmers' Rights Act, 2001 recognizes farmers as cultivators, conservers, and breeders of plant varieties, thereby

¹⁸ Biological Diversity Act, No. 18 of 2002, Preamble.

¹⁹ Id., S S 8, 22, 41.

²⁰ Ministry of Environment, Forest and Climate Change, *Guidelines for Operationalization of Biodiversity Management Committees* (2013).

²¹ Bina Agarwal, "Gender and Green Governance," 46 *World Development* 46 (2010).

²² Biological Diversity Act, 2002, § 21 (Access and Benefit Sharing).

²³ Kabir Bavikatte & Daniel F. Robinson, "Towards a People's History of ABS," 7 *Law, Environment and Development Journal* (2011).

acknowledging the contribution of traditional agricultural practices²⁴. However, similar to biodiversity laws, the Act does not explicitly address the gendered dimensions of such contributions. Likewise, the Forest Rights Act, 2006 provides for community rights over forest resources, including the right to protect and manage forests²⁵. While this legislation has the potential to empower tribal women, its implementation has been uneven, and women's participation in forest governance remains limited. Judicial developments in India have also contributed to the discourse on biodiversity conservation and community rights. In *Divya Pharmacy v. Union of India* (2018), the Uttarakhand High Court upheld the applicability of ABS provisions to Indian companies, reinforcing the principle that commercial utilization of biological resources must involve benefit sharing with local communities²⁶. However, even in such progressive rulings, the specific recognition of women's contributions remains absent, reflecting a broader gap in legal discourse.

A critical issue within the Indian framework is the lack of a *sui generis* system specifically designed to protect traditional knowledge in its collective and evolving form²⁷. Existing intellectual property laws, including patent and plant variety protections, are ill-suited to address the communal ownership and oral transmission of knowledge systems maintained by tribal women. Although initiatives such as the Traditional Knowledge Digital Library (TKDL) have been introduced to prevent biopiracy, they primarily focus on defensive protection and do not ensure benefit sharing or recognition for knowledge holders²⁸.

In conclusion, while India's legal framework on biodiversity is relatively advanced in comparison to many jurisdictions, its implementation reveals significant shortcomings, particularly in addressing gender disparities. The absence of explicit gender-sensitive provisions, coupled with structural

inequalities in governance and benefit-sharing mechanisms, results in the continued marginalization of tribal women. To achieve meaningful conservation outcomes, it is imperative to reform existing laws and policies to ensure inclusive participation, equitable benefit distribution, and formal recognition of women as central actors in biodiversity governance.

V. BIOPIRACY AND JUDICIAL RESPONSES: A GENDERED CRITIQUE OF LANDMARK CASES

The contestation over biodiversity and traditional knowledge has most prominently unfolded through disputes commonly characterized as biopiracy—where biological resources and associated indigenous knowledge are appropriated without authorization or equitable compensation. Although judicial and administrative interventions have, in several instances, succeeded in revoking improperly granted patents, the broader legal discourse remains narrowly focused on issues of novelty and prior art. This has resulted in a limited engagement with deeper questions of ownership, equity, and, crucially, the gendered nature of knowledge systems. A reexamination of landmark cases such as turmeric, neem, and basmati reveals both the defensive strengths and structural inadequacies of existing legal regimes, particularly in recognizing the role of tribal women.

The turmeric patent dispute stands as a seminal example in the global fight against biopiracy. In *Council of Scientific & Industrial Research v. Union of India* (1997), the United States Patent and Trademark Office granted a patent for the wound-healing properties of turmeric—a use long embedded in Indian traditional practices²⁹. The patent was subsequently revoked after evidence of prior art was presented, including ancient texts and documented practices. While the case is frequently celebrated as a milestone in the recognition of traditional knowledge,

²⁴ Protection of Plant Varieties and Farmers' Rights Act, 2001, S 39.

²⁵ Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

²⁶ *Divya Pharmacy v. Union of India*, W.P. (M/S) No. 343 of 2017 (Uttarakhand High Court, 2018).

²⁷ Carlos M. Correa, *Protection and Promotion of Traditional Knowledge* (UNCTAD, 2003).

²⁸ Traditional Knowledge Digital Library (TKDL), Government of India.

²⁹ *Council of Scientific & Industrial Research v. Union of India* (Turmeric Patent Case), USPTO, 1997.

it simultaneously exposes a critical limitation: the knowledge relied upon in the challenge was historically preserved and practiced within domestic and community settings, often by women, yet the legal process neither acknowledged nor compensated these primary custodians³⁰. This reflects a broader tendency within intellectual property regimes to validate knowledge only when it is formally documented.

A similar pattern is evident in the neem patent controversy, wherein a European patent granted to W.R. Grace & Co. for a neem-based fungicidal formulation was successfully challenged and revoked in 2000³¹. The challenge demonstrated that the pesticidal properties of neem had been widely known and utilized in India for generations. However, despite the recognition of prior use, the legal proceedings remained silent on the identity of knowledge holders. In rural and tribal contexts, women have traditionally been responsible for collecting, processing, and applying neem-based solutions for agricultural and medicinal purposes. Their exclusion from both recognition and benefit-sharing outcomes highlights the gender-blind nature of existing legal mechanisms³².

The basmati rice dispute further underscores the vulnerability of traditional agricultural knowledge within the global intellectual property framework. In *RiceTec Inc. v. Union of India*, patents were granted for certain rice lines and cultivation methods associated with basmati varieties³³. Although India successfully contested several claims, the case revealed the ease with which traditional agricultural innovations can be recharacterized as novel inventions under patent law. Importantly, women farmers have historically played a central role in seed selection, preservation, and cultivation practices that sustain such varieties. Yet, as in previous cases, their

contributions remained unarticulated within the legal narrative³⁴.

Collectively, these cases demonstrate that the prevailing legal approach to biopiracy is predominantly defensive—focused on preventing the wrongful privatization of traditional knowledge rather than affirmatively recognizing and rewarding its holders. The reliance on the concept of prior art, while effective in invalidating illegitimate patents, does not translate into proprietary or participatory rights for indigenous communities. This limitation is particularly pronounced for tribal women, whose knowledge systems are often oral, experiential, and embedded in everyday practices, making them less visible within formal evidentiary frameworks³⁵.

Moreover, the institutional processes through which such disputes are addressed tend to be state centric or driven by external actors such as research institutions and non-governmental organizations. The absence of direct participation by indigenous communities, and especially women, reinforces existing hierarchies in knowledge governance. Even where legal victories are achieved, they rarely result in tangible socio-economic benefits for the communities concerned, thereby perpetuating cycles of marginalization³⁶.

In response to recurring instances of biopiracy, India has developed mechanisms such as the Traditional Knowledge Digital Library (TKDL), which seeks to document and codify traditional knowledge in a format accessible to patent examiners worldwide³⁷. While this initiative has proven effective in preventing the grant of erroneous patents, it remains limited to defensive protection. It does not address questions of benefit sharing, nor does it adequately capture the gendered dimensions of knowledge production and transmission.

From a broader perspective, these cases highlight the inadequacy of existing intellectual property

³⁰ Vandana Shiva, *Biopiracy: The Plunder of Nature and Knowledge* (South End Press, 1997).

³¹ *W.R. Grace & Co. v. Neem Patent Case*, European Patent Office, 2000.

³² Daniel F. Robinson, *Confronting Biopiracy: Challenges, Cases and International Debates* (Earthscan, 2010).

³³ *RiceTec Inc. v. Union of India* (Basmati Rice Case), USPTO, 1997.

³⁴ Bina Agarwal, "Gender and Agricultural Knowledge Systems," *Economic & Political Weekly* (1992).

³⁵ Carlos M. Correa, *Traditional Knowledge and Intellectual Property*.

³⁶ Carlos M. Correa, *Traditional Knowledge and Intellectual Property*.

³⁷ Traditional Knowledge Digital Library (TKDL), Government of India.

frameworks in accommodating the collective, intergenerational, and gendered nature of traditional knowledge. They underscore the need for a more holistic legal approach that moves beyond the narrow confines of patent law to incorporate principles of equity, community rights, and gender justice. Recognizing tribal women as central actors in the creation and preservation of traditional knowledge is essential not only for addressing historical injustices but also for ensuring the sustainability of biodiversity conservation efforts.

VI. CHALLENGES AND RECOMMENDATIONS: TOWARDS A GENDER-RESPONSIVE BIODIVERSITY GOVERNANCE FRAMEWORK

Despite the existence of comprehensive international and domestic legal frameworks, the effective protection of biodiversity and traditional knowledge in India continues to face significant structural, legal, and socio-cultural challenges. These challenges are particularly acute in the context of tribal women, whose contributions remain inadequately recognized and insufficiently protected. A critical examination of these issues reveals the need for a more inclusive and gender-responsive approach to biodiversity governance.

One of the foremost challenges lies in the systemic invisibility of women within legal and policy frameworks. Although instruments such as the Convention on Biological Diversity and the Biological Diversity Act, 2002 acknowledge the role of local communities, they largely treat communities as homogeneous entities, thereby overlooking internal gender dynamics³⁸. This results in the marginalization of women's knowledge, which is often informal, experience-based, and transmitted orally. The absence of gender-disaggregated data and documentation further exacerbates this invisibility, making it difficult to recognize women as distinct contributors and beneficiaries.

Another significant issue is the inequitable implementation of Access and Benefit Sharing (ABS) mechanisms. While ABS frameworks are designed to ensure fair compensation for the use of biological resources and associated knowledge, their practical implementation often reflects existing power hierarchies within communities³⁹. Benefits are frequently distributed at the community level without clear mechanisms to ensure that women receive an equitable share. In many cases, decision-making authority rests with male-dominated institutions, limiting women's access to both financial and non-monetary benefits.

The limitations of existing intellectual property regimes also pose a major challenge. Conventional IPR systems, particularly patent law, are ill-equipped to protect traditional knowledge due to their emphasis on individual ownership, novelty, and formal documentation⁴⁰. Tribal women's knowledge systems, which are collective, intergenerational, and largely undocumented, do not fit within these parameters. As a result, such knowledge remains vulnerable to misappropriation and exploitation, with limited avenues for legal redress.

Additionally, there exists a disconnect between grassroots practices and formal governance structures. While tribal women actively engage in biodiversity conservation through sustainable practices, their participation in formal institutions such as Biodiversity Management Committees and forest governance bodies remains limited⁴¹. Socio-cultural barriers, lack of awareness, and institutional biases contribute to their exclusion from decision-making processes, thereby weakening the effectiveness of conservation policies.

In light of these challenges, there is a pressing need to adopt comprehensive and gender responsive reforms. First, legal frameworks should explicitly recognize women as distinct stakeholders and rights holders within biodiversity governance. This can be achieved by incorporating gender-specific provisions in laws such as the Biological Diversity Act, 2002, and ensuring mandatory representation of women in

³⁸ Convention on Biological Diversity, 1992; Biological Diversity Act, 2002.

³⁹ Nagoya Protocol, 2010; Biological Diversity Act, 2002, S 21.

⁴⁰ Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), 1994, Art. 27.

⁴¹ Bina Agarwal, "Gender and Green Governance," 46 *World Development* 46 (2010).

Biodiversity Management Committees and other decision-making bodies⁴².

Second, the implementation of ABS mechanisms must be restructured to ensure equitable and transparent distribution of benefits. This includes the development of gender-sensitive guidelines, direct benefit-sharing arrangements for women, and monitoring mechanisms to prevent elite capture within communities⁴³. Capacity-building initiatives should also be introduced to enhance women's awareness of their rights and their ability to participate effectively in governance processes.

Third, there is a need to develop a sui generis system for the protection of traditional knowledge that reflects its collective and evolving nature. Such a system should move beyond defensive protection and provide for positive rights, including recognition, attribution, and compensation for knowledge holders⁴⁴. Importantly, this framework must incorporate gender considerations to ensure that women's contributions are adequately documented and protected.

Fourth, efforts should be made to strengthen documentation and preservation of traditional knowledge through participatory approaches. Initiatives such as People's Biodiversity Registers should actively involve women in the documentation process and capture gender-specific knowledge domains. At the same time, safeguards must be put in place to prevent misuse or unauthorized commercialization of documented knowledge⁴⁷.

Finally, a broader shift in policy and discourse is required to reconceptualize biodiversity conservation as a gendered issue. Integrating principles of ecofeminism into environmental governance can help recognize the interdependence between women and nature and promote more sustainable and equitable practices⁴⁵. This would involve not only legal reforms

but also changes in institutional attitudes and societal perceptions.

In conclusion, addressing the challenges associated with biodiversity conservation and traditional knowledge protection requires a multidimensional approach that places tribal women at its center. By adopting gender-responsive legal frameworks, ensuring equitable benefit sharing, and recognizing women as key knowledge holders, it is possible to create a more just and effective system of biodiversity governance. Such an approach is essential not only for protecting traditional knowledge but also for achieving long-term environmental sustainability and social equity.

VII. CONCLUSION

The discourse on biodiversity conservation and the protection of traditional knowledge in India remains incomplete without a sustained engagement with the role of tribal women, who function as primary custodians of ecological practices and indigenous knowledge systems. Their everyday interactions with natural resources—ranging from seed conservation to medicinal plant usage—reflect a sophisticated understanding of sustainable living that has evolved over generations. This embedded knowledge is not merely cultural in nature but constitutes a critical component of ecological governance and environmental sustainability.

The analysis undertaken in this study reveals that, notwithstanding the presence of comprehensive international instruments such as the Convention on Biological Diversity and the Nagoya Protocol, as well as domestic legislation like the Biological Diversity Act, 2002, the contributions of tribal women continue to be insufficiently recognized⁴⁶. The prevailing legal

⁴² Ministry of Environment, Forest and Climate Change, *Biodiversity Rules & BMC Guidelines* (2013).

⁴³ Kabir Bavikatte & Daniel F. Robinson, "Towards a People's History of ABS," *LEAD Journal* (2011).

⁴⁴ Carlos M. Correa, *Protection of Traditional Knowledge* (UNCTAD, 2003)

⁴⁷ National

Biodiversity Authority, *Guidelines for People's Biodiversity Registers*.

⁴⁵ Maria Mies & Vandana Shiva, *Ecofeminism* (Zed Books, 1993).

⁴⁶ Convention on Biological Diversity, 1992; Nagoya Protocol, 2010; Biological Diversity Act, 2002.

frameworks adopt a largely gender-neutral approach, which obscures intra-community inequalities and fails to account for the differentiated roles played by women in knowledge production and conservation practices⁴⁷. Consequently, women remain underrepresented in decision-making processes and are often excluded from the benefits arising from the utilization of biological resources.

Furthermore, the examination of intellectual property regimes, particularly under the TRIPS framework, underscores a fundamental incompatibility between formal legal structures and the collective, intergenerational nature of traditional knowledge⁴⁸. Landmark biopiracy cases demonstrate that while existing mechanisms may succeed in invalidating unjust patents, they do not adequately address questions of ownership, recognition, or equitable compensation for knowledge holders. This limitation disproportionately affects tribal women, whose contributions are frequently undocumented and undervalued within formal legal systems⁴⁹.

The study also highlights that the challenges faced by tribal women are not merely legal but are deeply rooted in socio-cultural and institutional structures. Issues such as limited participation in governance bodies, lack of awareness regarding legal rights, and entrenched gender hierarchies continue to hinder their effective inclusion in biodiversity governance⁵⁰. As a result, the implementation of otherwise progressive legal frameworks remains uneven and often fails to achieve its intended objectives.

In order to address these structural gaps, there is an urgent need to adopt a more inclusive and gender-responsive approach to biodiversity law and policy. This includes the explicit recognition of women as rights holders, the incorporation of gender-sensitive provisions within Access and Benefit Sharing mechanisms, and the development of sui generis systems tailored to the protection of traditional knowledge⁵¹. Additionally, participatory governance

models that actively involve women in decision-making processes must be strengthened to ensure that conservation efforts are both equitable and effective. Ultimately, the integration of gender perspectives into biodiversity governance is not simply a normative imperative but a practical necessity. As scholars have argued, sustainable environmental management is intrinsically linked to the recognition of diverse knowledge systems and the equitable distribution of resources⁵². A legal framework that acknowledges and empowers tribal women will not only enhance the protection of traditional knowledge but also contribute to more resilient and sustainable ecological systems. The path forward, therefore, lies in bridging the gap between law and lived realities by placing tribal women at the center of biodiversity conservation strategies.

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⁴⁷ Bina Agarwal, "Gender and Green Governance," 46 *World Development* 46 (2010).

⁴⁸ Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), 1994, Art. 27.

⁴⁹ Vandana Shiva, *Biopiracy: The Plunder of Nature and Knowledge* (1997); Carlos M. Correa, *Traditional Knowledge and Intellectual Property* (2001).

⁵⁰ Nitya Rao, "Gender and Natural Resource Management," *Economic & Political Weekly* (2012).

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