LEGAL PROTECTION OF TRADITIONAL KNOWLEDGE AND ITS ROLE IN BIODIVERSITY CONSERVATION

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ABSTRACT

This review paper summarizes ten scholarly research articles published in the period between 2021 to 2025 investigating the phenomenon of traditional ecological knowledge (TEK), biodiversity conservation, indigenous environmental practices and the significance of legal protection of traditional knowledge (TK). In the literature reviewed, most researchers agree that TEK plays an important role in biodiversity conservation based on culturally rooted ecological activities such as forest management, medicinal plants, agro-biodiversity management and community resource management. Nevertheless, as it is also seen in the literature, the current legal systems fail to safeguard TK against misappropriation and biopiracy and insufficiently secure it against loss as a result of social transformation. Although national laws in India, especially the Biological Diversity Act (2002) offer a formal foundation on which access and benefit sharing can be regulated, little actual implementation has occurred, with little engagement of indigenous people. The biodiversity governance systems in Kerala, such as the People Biodiversity Registers, signal good opportunities but necessitation of the stronger community-based systems and legislation. This review concludes that Kerala can become a model in developing a novel form of TK protection in case the legal frameworks are oriented towards the community ownership, benefit sharing, and incorporation of TEK into the biodiversity and climate strategies.

Keywords: Traditional Knowledge, Traditional Ecological Knowledge, Biodiversity, Kerala Indigenous Communities, Biopiracy Access and Benefit Sharing, Legal Protection.

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INTRODUCTION

In this review paper, ten current research publications on traditional ecological knowledge and relevance to the conservation of biodiversity, environmental law and indigenous rights are reviewed. As opposed to empirical fieldwork, this review critically synthesises previous studies to determine how TEK can assist in protecting biodiversity, how legal structures seek to safeguard TK, and where gaps in the protection of TK exist both on the national and state-level-especially in Kerala.[3]

Traditional ecological knowledge is defined as long-term knowledge systems that were created by indigenous communities in their incessant communication with the ecosystems. Such systems of knowledge regulate land utilization, medicines, forest resources, seed reserves, and community livelihood practices which are sustainable.[4] Kerala is a region within the Western Ghats biodiversity hotspots and has diverse ecological landscapes with culturally differentiated communities with traditional knowledge that can play a significant role in conserving the environment through their practices.

Although there is the duty under the Convention on Biological Diversity and Nagoya Protocol to protect the TK, it is poorly safeguarded at the legal level. The literature that was reviewed indicates that the current legal regimes either do not pay attention to TK or partially address the indigenous ecological knowledge. Although Biological Diversity Act (2002) acknowledges the use of access and benefit-sharing, there is a severe limitation in the implementation.[5]

Therefore, the aim of the review is twofold: (1) synthesising the findings of ten recent studies critically, (2) to evaluate the legal and policy implications of the TK governance in Kerala.

LITERATURE REVIEW

The ten research papers used in this study collectively dwell on the traditional ecological knowledge under the ecological, cultural, legal and environmental governance. Overall, the analysed body of literature confirms the importance of traditional ecological knowledge in conservation of biodiversity, protection of ecosystems, and climate resilience but most papers

[3] S. Kalra, V. Kumar & R. Devi, *A Comprehensive Review of Indigenous Knowledge Systems in India*, 14(1) Int'l J. Env't & Climate Change 112 (2024).
[4] M. Haq, R. Ahmed & A. Yusuf, *Integrating Traditional Ecological Knowledge into Habitat Restoration*, 19 J. Ethnobiology & Ethnomedicine 1 (2023).
[5] Biological Diversity Act, No. 18 of 2003, INDIA CODE; see also Singh & George, *Integrating Traditional Knowledge into Development Planning*, 12(1) Dev. Policy Stud. 98 (2024).

additionally note the gaps in terms of institutional legitimacy, scientific integration, and legal security.[6]

Starting with the global context, Sinthumule et al. (2023) presented a systematic review of the traditional ecological knowledge in various conservation contexts and found that TEK promotes the state of biodiversity, ensuring the diversity of species along with the control of harvesting cycles and ecological habitats. Their research consolidates the results of multiple continents to show that the knowledge that communities have can surpass scientific conservation models, especially when it comes to indigenous resource management. One of the strong points of this review is that it provides a solid ecological background by showing the empirical values of TEK, however, the authors do not focus on issues of legal governance and this is what suggests lack of provision in the application of the same findings to areas like India and Kerala where legal protection is an issue of controversy.

Equally, in the Indian environment, Kalra et al. (2024) discuss the native knowledge systems and the observance of the traditional ecological knowledge as one of the central components of millennium-old environmental conservation.[7] In their article, they demonstrate that the Indian tribal communities had tended to traditionally depend on the sacred groves, medicinal herbs knowledge and the natural species cycles that maintain biodiversity. Kalra et al. particularly point out loss of knowledge through globalisation, displacement, generation gap, and the modern schooling systems which deprive people of learning their own culture.[8] The study is significant in the sense that it brings TEK closer to social realities, however, it is also an indication that these legal mechanisms need to be more powerful to prevent the exploitation of this knowledge- which is directly applicable to Kerala.

Continuing the aspect of sustainability, Nepal (2025) incorporates the traditional ecological knowledge with sustainability discourses and the Sustainable Development Goals (SDGs).[9] The paper presents the argument that TEK does not only preserve biodiversity but also aids in climate change adaptation and resilience to disasters. Nepal emphasizes the fact that indigenous people are placed at the center of biodiversity in climatic policy systems, but these policies have not been implemented equally across the world. Although this paper has sufficient

[6] Rumayomi et al., *Synergy of Traditional Ecological Knowledge and Biodiversity Conservation*, 32(1) Biotropia 30 (2025).
[7] S. Kalra, V. Kumar & R. Devi, *A Comprehensive Review of Indigenous Knowledge Systems in India*, 14(1) Int'l J. Env't & Climate Change 112 (2024).
[8] Kalra, Kumar & Devi, supra note 6, at 112–134.
[9] P. Nepal, *Traditional Ecological Knowledge and the Sustainable Development Goals*, 8(1) Sustainable Dev. Rev. 44 (2025).

theoretical integration, this time it provides no legal analysis of the state level, and so, this review can create a gap in research in the jurisdiction of Kerala.

On the same line, Haq et al. (2023) discuss the idea of habitat restoration by using traditional ecological theory practices and evidence that indigenous flora cultivation and community-practiced resource management can boost the restoration of an ecosystem.[10] Their work does not only identify TEK as a knowledge system but also as a working environmental practice. What it means to Kerala is that tribal communities have medicinal and environmental knowledge that can be used to assist in the conservation of the forests but unless this is acknowledged in the law, the knowledge may not feature in the policy framework.

Rumayomi et al. (2025) provide more of a policy-oriented view, that is, they review several TEK-based conservation pathways and insist on the role of community participation.[11] Their work concludes that conservation of TEK will be unsuccessful with the top-down models of government but will have to be under decentralised and community-controlled decision making. This observation directly underlies the Kerala People Biodiversity Registers, which ought to be turned into a legally binding community governance tool, as opposed to a documentary instrument.

In the topic concerning wildlife conservation, Kalema et al. (2022) analyse the traditional ecological method of protecting forests and wildlife. Their study records native resource management as an indirect measure of avoiding over-exploitation and species depletion, proving that TEK is relevant to wildlife sustainability.[12] Their research is important as it demonstrates the ecological value without defining conservation in Western scientific patterns implying that Kerala needs to review the forest protection policies on the frameworks of TEK.

All the studies, however, do not show TEK in the positive light. The article by Hartel et al. (2023) is a critical response to the assumptions of TEK because the authors believe that social inequality, marginalisation, and economic lack of alternatives can influence traditional knowledge.[13] This view is highly significant in the sense that it does not idealise the practices of indigenous people and compels the policymakers to consider the social circumstances in

[10] M. Haq, R. Ahmed & A. Yusuf, *Integrating Traditional Ecological Knowledge into Habitat Restoration*, 19 J. Ethnobiology & Ethnomedicine 1 (2023).
[11] Rumayomi, Setiawan & Putra, *Synergy of Traditional Ecological Knowledge and Biodiversity Conservation*, 32(1) Biotropia 30 (2025).
[12] Kalema, Okello & Wambi, supra note 22, at 299–310.
[13] T. Hartel, V. Popescu & P. Kristensen, *The Traditional Ecological Knowledge Conundrum*, 37(4) Conservation Biology 1201 (2023).

which knowledge is situated. Using this as an analogy of Kerala, it shows that TEK can only be sustainable when the communities are legally empowered and the benefits give equitable share, rather than cultural appreciation.

Kumar and Verma (2021) interpreted the governance of the biodiversity in India and discuss that the contemporary intellectual property systems cannot be reconciled with the idea of collective and intergenerational knowledge.[14] They also observe that the absence of legal mechanisms causes biopiracy, misappropriation and unregulated commercial exploitation. Their discussion is quite conclusive of the fact that the state of Kerala needs sui generis legal systems that accept the community rights and customary laws instead of introducing models based on patents.

Diving directly into the matters of policy integration, Singh and George (2024) demonstrate that institutional challenges do not allow TEK to be integrated into the world of the public policy and conservation strategy.[15] According to their study, there is no political goodwill, lack of technical knowledge, and financial ability to involve the indigenous communities in the governance. This is especially applicable in Kerala where the state level structures are in place, but the inclusion of the community usually is nominal and hardly significant.

Lastly, Balakrishnan and Thomas (2023) also offer evidence on a case-specific basis by analysing the knowledge of tribal medicinal plants and the lack of legalization and benefit-sharing systems in Kerala.[16] Their results are indispensable to this review since they relate the ecological knowledge directly to the legal weaknesses. The paper thus addresses some part of the gap in the Kerala research, but it still indicates that a lot more research is needed.

Overall, the ten articles prove that TEK is ecologically desirable, socially important, and politically obligatory.[17] Meanwhile, limitations in the law, inadequate acknowledgement of indigenous rights, poor application, and inadequate political frameworks are found in the research body.[18] The literature on this topic reviewed here is categorical that Kerala has positive

[14] P. Kumar & S. Verma, *Indigenous Plant Knowledge, Biodiversity Governance, and Legal Gaps in India*, 19(2) Conservation & Soc'y 65 (2021).
[15] R. Singh & D. George, *Integrating Traditional Knowledge into Development Planning*, 12(1) Dev. Policy Stud. 98 (2024).
[16] K. Balakrishnan & S. Thomas, *Traditional Medicinal Plant Knowledge among Tribal Communities in Kerala*, 4(2) J. Indian Ethnobiology 55, 55–72 (2023).
[17] N. Sinthumule et al., *Traditional Ecological Knowledge and Biodiversity Conservation: A Global Systematic Review*, 11 Frontiers Env't Sci. 1164900 (2023).
[18] P. Kumar & S. Verma, *Indigenous Plant Knowledge, Biodiversity Governance and Legal Gaps in India*, 19(2) Conservation & Society 65–78 (2021).

ecological traditions but requires more effective legal and institutional means of knowledge protection and empowerment of the community.

RESEARCH PROBLEM

Even though the studies reviewed are in consistent agreement on the importance of TEK in biodiversity management, there is evident lack of connection between the level of ecological importance and protection under law. In some of the states such as Kerala that are biodiverse and have indigenous populations, the traditional knowledge remains an informal cultural asset rather than recognized as a legal right. The analysed articles reveal that there is a trend of knowledge being widely documented, yet there is practically no legal imposition and benefits sharing.[19] Therefore, the main research question derived out of this review is that although TEK plays a direct role in the sustainability of the environment, the legal regulations in Kerala do not appropriate the knowledge systems owned by communities to prevent commercial exploitation, misappropriation, and marginalization of policies.

RESEARCH QUESTION

1. How far does current national and state legislation safeguard traditional knowledge in Kerala?
2. How do a combination of the biodiversity law, community models, and sui generis strategies enhance community rights, and protect biodiversity?

RESEARCH GAP

As much as the ten reviewed research articles all focus on the ecological importance of traditional ecological knowledge and the importance of the same in the conservation of biodiversity, an enormous gap emerges when the study of how TEK is legally institutionalised in the country is considered in relation to India.[20] Majority of the reviewed articles either assume a global approach (e.g., Sinthumule et al., 2023; Rumayomi et al., 2025) or include a national focus (e.g., Kalra et al., 2024; Kumar and Verma, 2021), yet very few ones involve a legal examination of specific states, like Kerala where biodiversity policies, indigenous populations, and environmental practices are significantly different as compared to other areas. Even the research that mention India rarely analyses state-specific legislations, institutional

[19] . Singh & D. George, *Integrating Traditional Knowledge into Development Planning*, 12(1) Development Policy Studies 98–116 (2024).
[20] P. Kumar & S. Verma, *Indigenous Plant Knowledge, Biodiversity Governance and Legal Gaps in India*, 19(2) Conservation & Society 65–78 (2021).

procedures or implementation issues regarding access and benefit-sharing, community ownership, or traditional knowledge registries. Moreover, none of the papers reviewed examine how Kerala People Biodiversity Registers operate as legal mechanisms as opposed to a documentation tool and the efficacy of biodiversity boards at the state level to enforce community rights.[21] An additional major gap discovered is that there is no sustained empirical studies covering tribal communities in Kerala, especially with respect to the intersection of legal frameworks and customary practices, medicinal plant knowledge and the ecological traditions of the coast.[22] Most of the literature reviewed is dedicated to ecological advantages of TEK instead of legal weaknesses of biopiracy, commercialization, and unanimity within communities. The literature on whether legal provisions in place in Kerala are in line with international commitments like the Nagoya Protocol or whether biodiversity regulation in the state can be effectively applied to the rights of the indigenous people is also a scarcity of scholarly research.[23] Thus, this review indicates that the legal, institutional, and state-specific aspects of TEK protection in Kerala are a critical research gap, which should be filled with future research integrating the legal study with the community-based empirical study and policy analysis.

ANALYSIS AND DISCUSSION

The overall discussion of the ten studies analysed indicates that traditional ecological knowledge is still a major focus in biodiversity conservation, but its legal safeguarding is as unsatisfactory as possible, particularly in developing situations when indigenous people are still providers of ecological resources without the respective legal power and benefits.[24] A number of articles, like Sinthumule et al. (2023) and Kalra et al. (2024) affirm that TEK is relevant to the safety of species, the utilisation of resources in a sustainable manner, and the equilibrium of ecosystems, whereas others, such as Haq et al. (2023) and Rumayomi et al. (2025) stress the role of community-based governance and the use of the top-down conservation mechanisms. However, opposing views are revealed in works such as the one by Hartel et al. (2023), which warns against the romanticisation of TEK, noting that traditional

[21] A. Rumayomi, B. Setiawan & D. Putra, *Synergy of Traditional Ecological Knowledge and Biodiversity Conservation*, 32(1) Biotropia 30–45 (2025).
[22] K. Balakrishnan & S. Thomas, *Traditional Medicinal Plant Knowledge among Tribal Communities in Kerala*, 4(2) J. Indian Ethnobiology 55–72 (2023).
[23] Convention on Biological Diversity, June 5, 1992, 1760 U.N.T.S. 79; Nagoya Protocol on Access and Benefit-Sharing, Oct. 29, 2010.
[24] N. Sinthumule et al., *Traditional Ecological Knowledge and Biodiversity Conservation*, 11 Frontiers Env't Sci. 1164900 (2023).

practices can sometimes only persist in a situation of marginalisation which makes it clear that TEK needs legal empowerment, but not a symbolic recognition. In the case of Kerala, this important lesson is especially applicable as despite a well-developed system of biodiversity governance and the People's Biodiversity Registers, Balakrishnan and Thomas (2023) indicate that the indigenous medicinal knowledge remains legally unrecognized and not controlled by the communities.[25]

More so, the reviewed legal analyses show intellectual property designed systems lack structural compatibility with collective and intergenerational knowledge, and Kerala requires sui generis frameworks that reflect the rights of communities to own and the tradition of these knowledge (Kumar and Verma, 2021). Meanwhile, policy-oriented research such as that by Singh and George (2024) note institutional and political obstacles that make TEK ineffective in impacting public policy which means that traditional knowledge cannot be safeguarded against biopiracy or commercial exploitation by mere documentation unless the community is represented and the policies enforced. Put collectively, the literature reviewed indicates that Kerala has a rare opportunity to reinvent traditional ways of knowledge protection by legal tools of state level, the community based benefit sharing, and the incorporation of TEK into the biodiversity and climate policies, yet reforms need to be restructured to focus on reinforcing indigenous ecological knowledge and biodiversity by the long term means of reinventing the current legal tool of documentation to the legal and principled empowerment of the communities.[26]

CONCLUSION AND RECOMMENDATIONS

Finally, the discussion of ten recent research studies shows that traditional ecological knowledge is a vital resource in conservation of biodiversity, ecological stability, and sustainable environmental management, but has not been adequately safeguarded under the current legal frameworks, especially in the Kerala region where indigenous communities still have an important role to play in managing the ecosystem despite not having the official legal status and ownership right.[27] The literature review has established heavy evidence that TEK helps in protecting species, restoring an ecosystem, preserving medicinal plants, and adapting

[25] K. Balakrishnan & S. Thomas, *Traditional Medicinal Plant Knowledge Among Tribal Communities in Kerala*, 4(2) J. Indian Ethnobiology 55–72 (2023).
[26] N. Sinthumule et al., *Traditional Ecological Knowledge and Biodiversity Conservation: A Global Systematic Review*, 11 Frontiers Env't Sci. 1164900 (2023).
[27] M. Haq, R. Ahmed & A. Yusuf, *Integrating Traditional Ecological Knowledge into Habitat Restoration*, 19 J. Ethnobiology & Ethnomedicine 1–14 (2023).

to climate conditions, yet it also presents an important consistent lack of legal protection, institutional involvement, and community involvement in the conservation decision-making process. Although national legislation like the Biological Diversity Act conceptually pays tribute to traditional knowledge, their enforcement in Kerala is mostly a procedural exercise and much like the community-based documentation systems like People Biodiversity Registers, they remain a recording tool and not a benefit-sharing instrument or a biopiracy mitigation instrument.[28] Consequently, having taken the aggregate lessons learned across the ten studies, this review proposes that the Government of Kerala should implement a sui generis legal framework that appreciates collective ownership of traditional knowledge, integrate TEK into biodiversity and climate policies, empower the local people via participatory governance systems, establish legally binding forms of benefit sharing and carry out empirical field-based research that puts into context Kerala tribal and coastal communities to ensure that living ecological knowledge is recorded and safeguarded. Community leadership that enhances legal protection would not only protect biodiversity of Kerala but also could be used to make the state a model in protecting traditional knowledge in the country and globally.[29]

[28] Biological Diversity Act, No. 18 of 2003, INDIA CODE; see also Kerala State Biodiversity Board, *People's Biodiversity Register Guidelines* (2022).
[29] N. Sinthumule et al., *Traditional Ecological Knowledge and Biodiversity Conservation: A Global Systematic Review*, 11 Frontiers Env't Sci. 1164900 (2023).