
TRADITIONAL KNOWLEDGE: LEGAL PROTECTION AND EMERGING CHALLENGES

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ABSTRACT

Traditional Knowledge ("TK") is the accumulated wisdom of indigenous and local communities relating to medicine, agriculture, biodiversity conservation, and cultural practice which sits uneasily within a global intellectual property architecture that was conceived for individual, novel, and time-bound innovation. Traditional Knowledge is, by contrast, typically collective in origin, orally transmitted across generations, and continuously evolving rather than fixed at a discrete point of creation. These characteristics place it in fundamental tension with the foundational premises of patent, copyright, and trademark doctrine, each of which presupposes an identifiable author or inventor, a discernible act of novel creation, and a finite term of protection. This structural mismatch has, over the past three decades, generated a distinct and increasingly urgent field of doctrinal inquiry and international policy negotiation.

This paper undertakes a doctrinal examination of the legal foundations of Traditional Knowledge protection and traces the evolution of the governing international regime. It begins with the Convention on Biological Diversity (1992), which first recognised state sovereignty over genetic resources and the role of community knowledge in their conservation, and proceeds through the Nagoya Protocol (2010), which operationalised access-and-benefit-sharing obligations, to the 2024 WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge, which introduces a mandatory disclosure requirement for patent applicants relying on genetic resources or associated Traditional Knowledge. The paper then turns to India's domestic legal framework, analysing the Biological Diversity Act, 2002, the relevant disclosure and prior-use provisions of the Patents Act, 1970, and the Traditional Knowledge Digital Library as a defensive documentation strategy against biopiracy.

The paper identifies and critically examines four principal gray areas that continue to trouble scholars, regulators, and practitioners: the underlying conceptual mismatch between Traditional Knowledge and conventional IPR doctrine the documentation-versus-disclosure paradox inherent in defensive

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databases such as the TKDL and unresolved questions of community ownership, representation, and equitable benefit-sharing; and the comparatively narrow substantive scope of the newly concluded WIPO Treaty. The paper concludes by proposing the contours of a coherent sui generis regime responsive to the collective, dynamic, and customary character of Traditional Knowledge.

Keywords: Traditional Knowledge, Intellectual Property Rights, Traditional Knowledge, Convention on Biological Diversity (CBD), Nagoya Protocol, Biological Diversity Act, 2002 and Sui Generis Protection.

I. Introduction

Traditional Knowledge constitutes one of humanity's oldest and most valuable knowledge systems, representing the cumulative wisdom, innovations, skills, and practices developed by indigenous peoples and local communities through centuries of observation, experimentation, and interaction with their natural and cultural environments.³ Unlike modern scientific knowledge, which is generally documented, institutionalised, and attributed to identifiable individuals or organisations, traditional knowledge is predominantly collective in nature, transmitted from generation to generation through oral traditions, customary practices, cultural rituals, and lived experience. It is dynamic rather than static, continuously adapting to changing environmental, social, and economic conditions while remaining deeply rooted in the customs, values, and cultural identity of the communities that preserve it. Consequently, traditional knowledge is increasingly recognised not merely as a repository of historical information but as a living intellectual resource that continues to contribute to sustainable development, biodiversity conservation, healthcare, agriculture, climate resilience, and cultural continuity.

The World Intellectual Property Organization (WIPO) defines Traditional Knowledge as "knowledge, know-how, skills and practices that are developed, sustained and passed on from generation to generation within a community, often forming part of its cultural or spiritual identity." ⁴This definition reflects the distinctive characteristics of traditional knowledge, namely its collective ownership, intergenerational transmission, close association with indigenous and local communities, and inseparable relationship with cultural identity and

³ Chakrabarty, Suman, and Kamrul Hossain. "Recognizing indigenous traditional knowledge with medicinal value within a legal framework: an overview of the issues and challenges with special focus on India." *Man India* 104 (2024): 41-60.

⁴ Ghosh, Shubha. "Globalization, patents, and traditional knowledge." *Columbia Journal of Asian Law* 17, no. 1 (2003).

natural resources. However, no universally accepted or legally binding definition of Traditional Knowledge exists under international law. Various international instruments, including the Convention on Biological Diversity (CBD), the Nagoya Protocol, and the recently adopted 2024 WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge, employ different formulations depending upon their respective regulatory objectives.⁵The absence of a harmonised definition has contributed significantly to inconsistencies in legal protection across jurisdictions and remains one of the central challenges in the development of an effective international framework for the protection of traditional knowledge.

Traditional knowledge manifests across an exceptionally wide spectrum of fields encompassing medicine, agriculture, biodiversity conservation, environmental management, architecture, food preservation, handicrafts, fisheries, pastoral practices, textiles, folklore, and cultural traditions. In the field of healthcare, traditional medicinal systems such as Ayurveda, Siddha, Unani, Sowa-Rigpa, and numerous indigenous tribal healing practices preserve extensive knowledge regarding medicinal plants, natural formulations, and therapeutic techniques. In agriculture, farming communities have developed indigenous methods of seed preservation, crop rotation, water conservation, pest management, and climate-adaptive cultivation that have sustained food security for centuries. Traditional ecological knowledge has enabled communities to manage forests, wetlands, grazing lands, and water bodies sustainably while maintaining ecological balance and conserving biodiversity.⁶Similarly, artistic traditions including handloom weaving, textile designs, tribal art, music, dance, oral folklore, architecture, handicrafts, and ritual practices embody the cultural heritage and collective identity of indigenous peoples and local communities. These diverse manifestations demonstrate that traditional knowledge extends far beyond technical or scientific information and encompasses an integrated system of cultural, environmental, spiritual, and social practices.

India occupies a particularly significant position within the global discourse on traditional knowledge owing to its extraordinary biological and cultural diversity. Recognised as one of

⁵ Bhukta, Anindya. *Legal Protection for Traditional Knowledge: Towards a New Law for Indigenous Intellectual Property*. Emerald Group Publishing, 2020.

⁶ Escobar, Arturo, Carlos Frederico Marés de Souza Filho, João Arriscado Nunes, João Paulo Borges Coelho, Laymert Garcia dos Santos, Lino João de Oliveira Neves, Luis Carlos Arenas et al. *Another knowledge is possible: Beyond northern epistemologies*. Verso Books, 2020.

the world's mega-biodiverse countries, India possesses nearly eight per cent of the world's recorded biodiversity despite occupying only about 2.4 per cent of the Earth's land area. It is home to thousands of medicinal plant species, diverse agro-climatic zones, numerous indigenous communities, and hundreds of tribal groups, each possessing distinct systems of traditional knowledge developed over centuries. Much of this knowledge remains undocumented and is preserved through oral traditions, customary practices, and community institutions. The collective nature of ownership distinguishes Indian traditional knowledge from conventional intellectual property, as the knowledge is generally held by communities rather than individual inventors and is regarded as a shared cultural inheritance rather than a commercial asset. Consequently, the protection of traditional knowledge in India involves not only issues of intellectual property law but also concerns relating to biodiversity conservation, indigenous rights, cultural preservation, environmental governance, and social justice.

The increasing commercial value of biological resources and traditional knowledge has transformed the legal protection of Traditional Knowledge into a matter of considerable national and international importance. Scientific advancements in biotechnology, pharmaceuticals, agriculture, cosmetics, nutraceuticals, and genetic engineering have created unprecedented opportunities for commercial utilisation of biological resources and the traditional knowledge associated with them. While such utilisation can generate innovation and economic growth, it has also exposed indigenous and local communities to the risk of exploitation. Traditional medicinal formulations, agricultural practices, and biological resources that have been collectively developed over generations have frequently been commercialised by external entities without obtaining the prior informed consent of the knowledge holders or providing any form of compensation.⁷ This phenomenon, commonly described as biopiracy, refers to the unauthorised appropriation of biological resources and associated traditional knowledge through patents or other intellectual property rights, often without acknowledging the contribution of indigenous communities or sharing the resulting economic benefits.

Several internationally recognised disputes have highlighted the vulnerability of traditional knowledge to biopiracy. The grant of patents concerning the medicinal properties of turmeric, the fungicidal properties of the neem tree, and the aromatic qualities of basmati rice

⁷ Gururagavendran, Bharath. "Locating novel protections for the Traditional Knowledge of Indigenous communities in customary international law." *UCLA Journal of International Law and Foreign Affairs* 27, no. 1 (2023): 101-154.

demonstrated how existing patent systems could permit exclusive rights over knowledge that had long existed within traditional communities.⁸ Although these patents were ultimately challenged and, in some cases, revoked, the disputes exposed significant deficiencies in conventional intellectual property regimes and underscored the need for legal mechanisms capable of recognising and protecting collectively held traditional knowledge. These controversies also prompted important institutional responses in India, including the establishment of the Traditional Knowledge Digital Library (TKDL) and the strengthening of legislative measures relating to biodiversity conservation and access and benefit-sharing.

The legal challenge surrounding traditional knowledge arises from the structural incompatibility between the characteristics of Traditional Knowledge and the foundational principles of conventional intellectual property law. Existing intellectual property regimes including patent, copyright, trademark, and industrial design law were developed primarily to protect innovations created by identifiable individuals or legal entities. Such systems generally require originality, novelty, inventiveness, fixation, identifiable authorship, and protection for a limited duration. Traditional knowledge, however, is collectively created, evolves incrementally over generations, is often transmitted orally rather than through written documentation, and is intended to remain in continuous community use rather than becoming the exclusive property of any individual⁹. Consequently, many forms of traditional knowledge fail to satisfy the eligibility requirements for protection under conventional intellectual property law, despite possessing significant economic, scientific, cultural, and environmental value. At the same time, the absence of legal protection renders such knowledge susceptible to misappropriation by third parties who may obtain exclusive intellectual property rights over innovations derived substantially from community knowledge.

This tension has given rise to an enduring debate regarding the appropriate legal mechanism for protecting traditional knowledge. While some scholars advocate adapting existing intellectual property laws to accommodate the unique characteristics of Traditional Knowledge, others argue for the development of a distinct *sui generis* legal regime that recognises collective ownership, customary law, perpetual protection, prior informed consent, and equitable benefit-sharing. International negotiations within the World Intellectual Property Organization (WIPO)

⁸ Oguamanam, Chidi. *International law and indigenous knowledge: Intellectual property, plant biodiversity, and traditional medicine*. University of Toronto Press, 2006.

⁹ Fan, Rebecca C. "Governing Indigenous Knowledge? A Study of International Law, Policy, and Human Rights." PhD diss., University of Essex, 2015.

particularly through the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC), have sought to develop international legal standards addressing these concerns. Similarly, the Convention on Biological Diversity (CBD) and the Nagoya Protocol have introduced obligations concerning access to genetic resources and fair and equitable sharing of benefits arising from their utilisation.¹⁰ Nevertheless, considerable uncertainty continues to exist regarding issues such as ownership of traditional knowledge, protection of orally transmitted knowledge, recognition of customary laws, cross-border traditional knowledge, digital sequence information, community rights, and the relationship between biodiversity law and intellectual property law.

Within the Indian context, the legal framework governing traditional knowledge is similarly fragmented. Rather than being protected through a single comprehensive statute, traditional knowledge is addressed through a combination of the Patents Act, 1970, the Biological Diversity Act, 2002 (as amended in 2023), the Protection of Plant Varieties and Farmers' Rights Act, 2001, the Geographical Indications of Goods (Registration and Protection) Act, 1999, the Forest Rights Act, 2006, and administrative initiatives such as the Traditional Knowledge Digital Library (TKDL) and the People's Biodiversity Registers (PBRs).¹¹ Although these measures collectively provide significant protection against biopiracy and promote conservation and benefit-sharing, they also create overlapping jurisdictions, inconsistent standards, and regulatory gaps that continue to generate uncertainty regarding the effective protection and enforcement of community rights.

Against this background, the present paper examines the legal protection of traditional knowledge from both international and Indian perspectives while critically analysing the unresolved doctrinal and regulatory challenges that continue to impede an effective protection regime. It seeks to evaluate whether the existing legal framework adequately balances the objectives of biodiversity conservation, innovation, intellectual property protection, indigenous rights, and equitable benefit-sharing. Particular emphasis is placed upon identifying the persistent "gray areas" within the present legal framework, including the absence of a universally accepted definition of traditional knowledge, the limitations of conventional intellectual property law, fragmented domestic legislation, difficulties in recognising

¹⁰ Correa, Carlos M. "Traditional knowledge and intellectual property." *Geneva: The Quaker United Nations Office (QUNO)* 17 (2001).

¹¹ Oguamanam, Chidi. "Protecting indigenous knowledge in international law: solidarity beyond the nation-state." *Law Text Culture* 8 (2004): 191-230.

community ownership, challenges associated with digital sequence information, and the evolving international debate concerning disclosure requirements and benefit-sharing.

II. Conceptual Framework: Defining Traditional Knowledge

There is no universally accepted or legally binding definition of Traditional Knowledge under international law. Instead, various international organisations, treaties, and national legal systems employ working definitions that are tailored to their respective regulatory objectives. The absence of a single, uniform definition reflects the diversity of traditional knowledge systems across cultures and jurisdictions and has contributed to significant legal fragmentation in the international protection of traditional knowledge.¹² Different legal instruments focus on different aspects of traditional knowledge depending upon whether their objective is biodiversity conservation, intellectual property protection, cultural heritage preservation, or equitable benefit-sharing.

The World Intellectual Property Organization (WIPO) defines Traditional Knowledge as "knowledge, know-how, skills and practices that are developed, sustained and passed on from generation to generation within a community, often forming part of its cultural or spiritual identity."¹³ This definition emphasises that traditional knowledge is collectively created and preserved over generations rather than being the product of a single identifiable inventor or author. It recognises that traditional knowledge is dynamic, continuously evolving through adaptation and practical experience while remaining rooted in the customs, traditions, and lifestyles of indigenous peoples and local communities.

From a legal perspective, traditional knowledge encompasses a broad range of subject matter, including medicinal knowledge, agricultural practices, ecological management techniques, biodiversity conservation methods, handicrafts, food processing techniques, and traditional technologies. Unlike conventional intellectual property, which is generally characterised by novelty, individual authorship, limited duration, and exclusive ownership, traditional knowledge is typically collectively owned, transmitted orally or through customary practices, and preserved over generations without formal documentation.¹⁴ These characteristics make it

¹² Gaitenidis, Nikolaos. "Indigenous Peoples, Cultural Heritage, and Traditional Knowledge: Untying the Gordian Knot of Human Rights and Intellectual Property in International Law." *International Journal on Minority and Group Rights* 1, no. aop (2025): 1-45.

¹³ Tobin, Brendan. *Indigenous peoples, customary law and human rights-why living law matters*. Routledge, 2014.

¹⁴ Coombe, Rosemary J. "Intellectual property, human rights & sovereignty: New dilemmas in international law

difficult to protect traditional knowledge under conventional intellectual property regimes such as patent, copyright, or trademark law, thereby necessitating specialised legal mechanisms.

The absence of a universally binding treaty definition has practical legal consequences. International instruments such as the Convention on Biological Diversity (CBD), the Nagoya Protocol, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), and the 2024 WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge each employ different formulations depending upon their specific regulatory objectives. Similarly, national legislations vary considerably in defining the scope of traditional knowledge and identifying its rightful holders. This lack of uniformity creates uncertainty regarding ownership, access rights, prior informed consent, benefit-sharing obligations, and enforcement across jurisdictions.¹⁵ Consequently, determining whether a particular body of knowledge qualifies as protected traditional knowledge often depends upon the legal framework applicable in the relevant country or under the applicable international instrument.

From a legal standpoint, it is important to distinguish Traditional Knowledge from several related but distinct concepts that frequently arise in international negotiations concerning biodiversity, intellectual property, and indigenous rights. Although these concepts often overlap, they are governed by different legal principles and regulatory frameworks.

The first related concept is Genetic Resources (GRs). Genetic resources refer to the biological material itself, such as plants, seeds, animals, microorganisms, or other biological material containing functional units of heredity that possess actual or potential value. The definition is contained in Article 2 of the Convention on Biological Diversity (CBD). Genetic resources constitute tangible biological materials, whereas traditional knowledge relates to the intangible knowledge, innovations, and practices associated with the use or management of those resources.¹⁶ Legally, this distinction is significant because access to genetic resources is governed primarily by Access and Benefit-Sharing (ABS) mechanisms under the Convention on Biological Diversity (CBD) and the Nagoya Protocol, whereas the protection of the

posed by the recognition of indigenous knowledge and the conservation of biodiversity." *Indiana Journal of Global Legal Studies* 6, no. 1 (1998): 59-115.

¹⁵ Nijar, Gurdial Singh. "Traditional knowledge systems, international law and national challenges: marginalization or emancipation?." *European Journal of International Law* 24, no. 4 (2013): 1205-1221.

¹⁶ Anderson, Jane E. "Law, knowledge, culture: the production of Indigenous knowledge in intellectual property law." In *Law, Knowledge, Culture*. Edward Elgar Publishing, 2009.

associated knowledge raises additional issues concerning intellectual property rights, customary law, community ownership, and benefit-sharing.

A second and more specific concept is Associated Traditional Knowledge (ATK). It refers to traditional knowledge that is directly associated with the utilisation of a particular genetic resource.¹⁷ It generally consists of knowledge regarding the medicinal, agricultural, nutritional, ecological, or commercial uses of biological resources and is therefore central to patent law and biodiversity regulation. For instance, knowledge possessed by an indigenous community regarding the medicinal properties of the neem tree or turmeric constitutes associated traditional knowledge because it directly relates to the utilisation of a genetic resource. Associated Traditional Knowledge has become particularly important in international patent law following numerous cases of biopiracy, where inventions based on traditional knowledge were patented without acknowledging or compensating the communities from which the knowledge originated. Consequently, modern legal instruments increasingly require patent applicants to disclose the origin or source of genetic resources and associated traditional knowledge used in their inventions, thereby promoting transparency and facilitating compliance with benefit-sharing obligations.

Another distinct but related concept is Traditional Cultural Expressions (TCEs), also known as Expressions of Folklore. Traditional cultural expressions include artistic, literary, musical, dramatic, architectural, ceremonial, and cultural manifestations that embody the cultural identity of indigenous peoples and local communities.¹⁸ Examples include traditional music, dances, folklore, paintings, handicrafts, textile designs, symbols, rituals, oral narratives, and ceremonial performances. Unlike traditional knowledge, which primarily concerns functional or technical knowledge capable of practical application, traditional cultural expressions are primarily expressions of a community's cultural heritage and identity. Although traditional knowledge and Traditional Cultural Expressions frequently overlap for example, traditional medicinal rituals may involve both medicinal knowledge and ceremonial practices they remain legally distinct subject matters. Recognising this distinction, the World Intellectual Property Organization (WIPO) has historically negotiated separate international legal instruments concerning the protection of Traditional Knowledge and Traditional Cultural Expressions

¹⁷ Xia, Nan. "Intellectual property protection for traditional medical knowledge in China's context: a round peg in a square hole?" *Medical Law Review* 31, no. 3 (2023): 358-390.

¹⁸ Kingsbury, Benedict. "'Indigenous peoples' in international law: a constructivist approach to the Asian controversy." *American Journal of International Law* 92, no. 3 (1998): 414-457.

through different negotiating tracks within the Intergovernmental Committee (IGC). The distinction is important because the legal rights, methods of protection, exceptions, enforcement mechanisms, and policy objectives applicable to Traditional Cultural Expressions may differ substantially from those governing traditional knowledge.

Therefore, while genetic resources, associated traditional knowledge, and traditional cultural expressions are closely interconnected, each represents a distinct legal concept governed by different domestic and international legal frameworks¹⁹. A clear understanding of these distinctions is essential for designing effective intellectual property laws, biodiversity regulations, access and benefit-sharing mechanisms, and community rights protections that adequately safeguard the interests of indigenous peoples and local communities.

Traditional knowledge is typically: (i) collectively held rather than individually authored; (ii) transmitted orally or through practice rather than in fixed documentary form; (iii) cumulative and dynamic, evolving across generations rather than fixed at a single point of "invention"; and (iv) holistic, often inseparable from spiritual, cultural, and ecological context. Each of these characteristics' places TK in tension with the individualistic, novelty-based, and fixed-term logic of patent, copyright, and even most sui generis IP regimes.

Traditional Knowledge serves several important legal, social, cultural, and environmental objectives. One of its primary objectives is the prevention of biopiracy, which refers to the unauthorised commercial exploitation or patenting of biological resources and associated traditional knowledge without the consent of the communities that developed and preserved such knowledge. Many indigenous and local communities have, over generations, developed valuable knowledge relating to medicinal plants, agricultural practices, biodiversity conservation, and natural resource management. Protecting TK helps prevent the grant of patents over knowledge that is not genuinely novel because it already exists within a community's traditional practices. This ensures that existing traditional knowledge cannot be monopolised through intellectual property rights by individuals or corporations who merely document or commercialise it without making an inventive contribution.

Another significant objective of protecting Traditional knowledge is the conservation of biodiversity. Indigenous peoples and local communities have historically acted as custodians

¹⁹ Battiste, Marie. "Reconciling Indigenous knowledge in education: Promises, possibilities, and imperatives." *Dissident knowledge in higher education* 7, no. 5 (2018): 123-148.

of forests, medicinal plants, wildlife, water resources, and other ecosystems. Their traditional practices often promote the sustainable use of natural resources and maintain ecological balance. By recognising and protecting traditional knowledge, governments and international organisations encourage the continuation of these environmentally sustainable practices. This contributes to the conservation of biological diversity, supports climate resilience, and aligns with the objectives of international instruments such as the Convention on Biological Diversity (CBD), which recognises the crucial role of indigenous communities in conserving biodiversity.

Finally, the protection of Traditional Knowledge plays a vital role in cultural preservation. Traditional knowledge is not merely a collection of technical information; it forms an integral part of the cultural identity, customs, beliefs, languages, rituals, and heritage of indigenous and local communities. Preserving Traditional knowledge safeguards these cultural traditions from erosion caused by modernisation, globalisation, and the loss of intergenerational transmission. It also prevents the misappropriation, distortion, or decontextualised commercial use of culturally significant knowledge, symbols, and practices without the consent of the communities concerned. By protecting Traditional knowledge societies recognise and respect the cultural rights, dignity, and identity of indigenous peoples while ensuring that their knowledge systems continue to be valued and transmitted to future generations.

III. International Legal Framework

1. Convention on Biological Diversity, 1992 (CBD)

The CBD, with 194 parties, provides for the respect, preservation, and maintenance of the knowledge, innovations, and practices of indigenous and local communities embodying traditional lifestyles relevant to the conservation and sustainable use of biological diversity, and calls for the equitable sharing of benefits arising from the use of such knowledge.²⁰ Article 8(j) in particular reaffirms the sovereign right of States over their biological resources and forms the normative foundation for national access-and-benefit-sharing (ABS) legislation such as India's Biological Diversity Act, 2002.

²⁰Convention on Biological Diversity, 1992, art. 8(j); see Intepat IP, Protecting Traditional Knowledge in India, <https://www.intepat.com/blog/traditional-knowledge-india>.

2. Nagoya Protocol, 2010

The Nagoya Protocol operationalises the CBD's access and benefit sharing objective by establishing procedural obligations on Prior Informed Consent (PIC) and Mutually Agreed Terms (MAT) for access to genetic resources and associated TK, and by requiring parties to take measures to ensure that benefits arising from utilisation are shared fairly with the communities holding the knowledge.

3. TRIPS Agreement, 1994

The TRIPS Agreement is largely silent on TK as such. Article 27.3(b), which permits members to exclude plants and animals other than micro-organisms from patentability, has been the principal textual hook for the long-running "TRIPS–CBD disconnect" debate on whether patent applicants should be required to disclose the origin of genetic resources and associated Traditional Knowledge used in an invention.²¹ This debate, driven substantially by India and other biodiversity-rich developing countries, fed directly into the WIPO negotiations described below.

4. WIPO Intergovernmental Committee (IGC) and the 2024 Treaty

After roughly two decades of negotiation, WIPO member States adopted the WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge at a Diplomatic Conference held in Geneva from 13–24 May 2024.²² This is the first WIPO treaty to address the interface between IP, genetic resources, and TK, and the first to contain provisions specifically for indigenous peoples and local communities. Its central obligation, under Article 3, requires patent applicants to disclose the country of origin or source of genetic resources, and the indigenous peoples or local communities who provided the associated TK, where the claimed invention is based on such resources or knowledge.²³ The Treaty enters into force upon ratification by fifteen contracting parties, negotiations on the broader TK and Traditional Cultural Expressions tracks continue under the IGC.²⁴

²¹ Posey, Darrell Addison. "Safeguarding traditional resource rights of indigenous peoples." *Ethnoecology: Situated Knowledge/Located Lives*. The University of Arizona Press, USA (1999): 217-229.

²²WIPO, Diplomatic Conference on Genetic Resources and Associated Traditional Knowledge, <https://www.wipo.int/diplomatic-conferences/en/genetic-resources/>; WilmerHale, WIPO Adopts Treaty on Intellectual Property Genetic Resources and Associated Traditional Knowledge (Aug. 2024).

²³USPTO, WIPO Treaty on Intellectual Property, Genetic Resources, and Associated Traditional Knowledge,

²⁴WIPO, WIPO Treaty on IP, GR and Associated TK,

Commentators have described the instrument as a "symbolic and modest" first step: it creates a procedural disclosure obligation but does not itself create substantive rights in TK, define ownership, or prescribe benefit-sharing outcomes leaving those questions to domestic access-and-benefit-sharing law.

IV. The Indian Legal Framework

1. The Biological Diversity Act, 2002

It was enacted to give effect to India's obligations under the CBD, the Biological Diversity Act, 2002 regulates access to biological resources and associated TK through a three-tier institutional structure which is the National Biodiversity Authority (NBA) at the Centre, State Biodiversity Boards (SBBs), and local Biodiversity Management Committees (BMCs).²⁵ Foreign entities must obtain prior approval from the NBA before accessing Indian biological resources or associated knowledge for research, commercial use, or IPR applications, and the Act mandates equitable benefit-sharing with the concerned community, implemented in more granular form through the Biological Diversity Rules, 2004 and the Guidelines on Access to Biological Resources and Associated Knowledge and Benefit Sharing Regulations, 2014.

2. The Patents Act, 1970

Indian patent law contains two provisions of direct relevance. Section 3(p), inserted by the Patents (Amendment) Act, 2002, excludes from patentability any invention which, in effect, is traditional knowledge or is an aggregation or duplication of the known properties of a traditionally known component.²⁶ Section 10(4)(d) separately requires an applicant to disclose the source and geographical origin of biological material used in an invention, and section 25 permits opposition to a patent on the ground of non-disclosure or wrongful disclosure of such source. Because the general novelty and inventive-step requirements would in any event bar most TK-based claims, section 3(p) is regarded by several commentators as substantively declaratory its principal value lies in giving patent examiners an explicit, traditional knowledge specific ground for rejection.

²⁵Biological Diversity Act, 2002, ss. 3, 6, 21; Chambers and Partners, Safeguarding Traditional Knowledge Under Indian Patent Law

²⁶Patents Act, 1970, s. 3(p); PMC, Protecting Traditional Knowledge Related to Biological Resources,

3. The Traditional Knowledge Digital Library (TKDL)

Established in 2001 as a joint initiative of the Council of Scientific and Industrial Research (CSIR) and the Ministry of AYUSH, the Traditional Knowledge Digital Library is a defensive documentation tool that converts India's classical texts on Ayurveda, Unani, Siddha, and Yoga into a searchable, multilingual prior-art database, classified through the purpose-built Traditional Knowledge Resource Classification (TKRC), a subdivision of the International Patent Classification system.²⁷ It is accessible to patent offices including the USPTO, EPO, and the patent offices of Japan, the UK, Canada, Germany, Australia, Chile, and India under non-disclosure access agreements limiting use to search and examination purposes.²⁸ The TKDL has been credited with contributing to the withdrawal, rejection, or amendment of several hundred patent applications worldwide that sought to claim Indian traditional knowledge as novel invention.

4. Other Relevant Statutes Protecting Traditional Knowledge in India

Although India does not have a standalone sui generis legislation exclusively governing the protection of Traditional Knowledge (TK), several sector-specific statutes collectively contribute to its protection by recognising community rights, conserving biological resources, safeguarding traditional agricultural practices, and preserving cultural heritage.²⁹ Among the most significant of these are the Protection of Plant Varieties and Farmers' Rights Act, 2001, the Geographical Indications of Goods (Registration and Protection) Act, 1999, and the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (Forest Rights Act). These statutes complement the Patents Act, 1970, and the Biological Diversity Act by addressing different dimensions of traditional knowledge within their respective regulatory frameworks.

The Protection of Plant Varieties and Farmers' Rights Act, 2001 (PPVFR Act) represents one of India's most progressive legislative measures in recognising the contribution of farmers and traditional communities to agricultural innovation and biodiversity conservation. Enacted to comply with India's obligations under the WTO Agreement on Trade-Related Aspects of

²⁷Intepat IP, *supra*; HG.org, *supra*.

²⁸Intepat IP, Protecting Traditional Knowledge in India, <https://www.intepat.com/blog/traditional-knowledge-india>.

²⁹TKDL Annual Report 2023, cited in Chambers and Partners, *supra*; Puthrans, Combating Biopiracy: How India's TKDL Protects Traditional Knowledge (Jan. 2025).

Intellectual Property Rights (TRIPS), the Act adopts a balanced approach by protecting the rights of plant breeders while simultaneously recognising the longstanding contributions of farmers in conserving, improving, and developing plant genetic resources. Unlike conventional plant variety protection regimes, the Protection of Plant Varieties and Farmers' Rights Act expressly recognises Farmers' Rights, permitting farmers to save, use, sow, resow, exchange, share, and even sell farm produce, including seed of protected varieties, subject to the limitation that they may not sell branded seed.

The Geographical Indications of Goods (Registration and Protection) Act, 1999 also contributes significantly to the protection of traditional knowledge by safeguarding products whose unique qualities, reputation, or characteristics are intrinsically linked to a specific geographical region and the traditional methods employed in their production.³⁰ A Geographical Indication (GI) identifies goods as originating from a particular territory where a given quality, reputation, or other characteristic of the goods is essentially attributable to their geographical origin. Many GI-protected products embody generations of traditional knowledge, craftsmanship, and community-based production techniques. Prominent examples include Darjeeling Tea, Basmati Rice, Kanchipuram Silk, Banarasi Sarees, Mysore Sandalwood Products, and numerous traditional handicrafts and agricultural products. By preventing unauthorised use of registered geographical indications, the Act protects not only the commercial reputation of these products but also the traditional production methods and cultural heritage associated with them. Although the GI Act does not directly confer ownership rights over traditional knowledge itself, it provides indirect protection by preserving community-based knowledge systems that contribute to the distinctive identity and quality of region-specific goods. It thereby supports rural livelihoods, encourages the continuation of traditional production practices, and promotes the preservation of India's rich cultural and artisanal heritage.

Another important legislation contributing to the preservation of traditional knowledge is the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, commonly known as the Forest Rights Act (FRA). The Act seeks to correct the historical injustice suffered by forest-dwelling Scheduled Tribes and other traditional forest communities by recognising their legal rights over forest land, minor forest produce, water bodies, grazing

³⁰ Gururagavendran, Bharath. "Locating novel protections for the Traditional Knowledge of Indigenous communities in customary international law." *UCLA Journal of International Law and Foreign Affairs* 27, no. 1 (2023): 101-154.

areas, and community forest resources. Although the Forest Rights Act is primarily a social justice and environmental legislation, it has significant implications for the protection of traditional knowledge. Indigenous and forest-dependent communities possess extensive ecological knowledge regarding medicinal plants, biodiversity conservation, wildlife management, sustainable harvesting techniques, and ecosystem preservation. By recognising community rights over forest resources and empowering local communities to protect, regenerate, conserve, and manage community forests, the Act indirectly safeguards the traditional ecological knowledge that has evolved through generations of close interaction with forest ecosystems. Furthermore, the recognition of community forest resource rights enables indigenous communities to continue practising their customary methods of resource management, thereby ensuring the continued transmission and preservation of traditional knowledge linked to forests and biodiversity.

Collectively, these statutes demonstrate that India's approach to protecting traditional knowledge extends beyond conventional intellectual property law. Instead of relying upon a single legislative instrument, the Indian legal framework adopts a multidisciplinary approach that integrates biodiversity conservation, agricultural rights, community participation, cultural heritage preservation, and environmental governance. While each statute addresses a distinct aspect of traditional knowledge, together they create a complementary legal framework that acknowledges the collective contributions of indigenous peoples, farmers, artisans, and forest-dwelling communities to the preservation and sustainable utilisation of India's traditional knowledge systems.

V. Landmark Biopiracy Disputes

A small number of disputes did more than any statute to shape India's Traditional Knowledge strategy, and are worth recounting because the gray areas discussed in Part VI trace directly back to the limits these cases exposed.

A. The Turmeric Patent (1995)³¹

A US patent granted in 1995 for the use of turmeric powder in wound healing was successfully challenged by Council of Scientific and Industrial Research (CSIR) before the US Patent and

³¹ G., Hariharan. (2002). Basmati, Turmeric and Neem-Patenting and Related Issues-Case Studies. *Law Rev. Gov't LC*, 2, 185.

Trademark Office on the ground that the use was traditional Indian knowledge, evidenced through ancient Sanskrit texts and a 1953 paper published in the Journal of the Indian Medical Association making it one of the earliest and most cited instances of a TK-based patent revocation, and a direct catalyst for the creation of the TKDL.

B. The Neem Patent (1994–2000)³²

A European Patent Office patent covering a method of controlling fungal infection in plants using neem oil was revoked in 2000 following opposition on the ground that the fungicidal properties of neem had been known and used in India for centuries, illustrating the evidentiary difficulty of proving prior use of orally transmitted, undocumented knowledge before a foreign patent office.

C. The Basmati Rice Dispute (1997)³³

A US patent granted to RiceTec Inc. over certain rice lines and grains, described using the term "Basmati," triggered concern in India over the misappropriation of a geographically and culturally specific agricultural product; the episode contributed significantly to the eventual enactment of the Geographical Indications Act, 1999 as a complementary protective mechanism distinct from patent law.

D. The Kani Tribe – Jeevani Case³⁴

In contrast to the disputes above, the arrangement between the Kani tribal community of Kerala, the Tropical Botanic Garden and Research Institute (TBGRI), and a pharmaceutical licensee over the anti-fatigue drug "Jeevani". It developed from a plant whose properties were disclosed by Kani informants which is frequently cited as an early, if imperfect, benefit-sharing model, under which a share of licence fees and royalties was directed to a community trust fund.

³² Singh, O., Khanam, Z., & Ahmad, J. (2011). Neem (*Azadirachta indica*) in Context of Intellectual Property Rights (IPR). *Recent Research in Science and Technology*, 3(6).

³³ Mukherjee, U. (2008). A study of the basmati case (India-US basmati rice dispute): the geographical indication perspective. *Available at SSRN 1143209*.

³⁴ Prasad, S., & Vikram, K. (2025). Legal Gaps in Patenting Practices paving the way for Exploitation of Indigenous Medicinal Knowledge: Lessons from the Kani Tribe and the Commercialization of the Jeevani Herb. *Journal on Development of Intellectual Property and Research*, 1(1), 2-14.

VI. Gray Areas and Unresolved Legal Issues

The foregoing framework, though extensive, leaves a substantial number of doctrinal and practical questions unsettled. These grey areas are not peripheral; rather, they go to the conceptual coherence of traditional knowledge protection as a distinct field of law. Despite significant legislative developments at the national and international levels, important conceptual, institutional, and enforcement challenges continue to hinder the effective protection of Traditional Knowledge.

The first and most fundamental challenge is the structural mismatch between traditional knowledge and conventional intellectual property rights (IPR). Patent, copyright, and design law are built around concepts such as individual or corporate authorship, a fixed moment of creation, novelty or originality, and a limited term of protection after which the work enters the public domain. Traditional knowledge, by contrast, is collectively held, incrementally developed over generations, lacks a single identifiable author or moment of invention, and is intended for perpetual community use. Consequently, attempting to fit traditional knowledge within existing IPR frameworks often proves unsuccessful.³⁵ Either the knowledge fails to satisfy requirements such as novelty, originality, or fixation, or the application of conventional IPR principles distorts the collective and customary nature of traditional knowledge by requiring formal registration and identification of a single rights-holder. This foundational incompatibility gives rise to many of the other unresolved issues in traditional knowledge protection.

A second major concern relates to the documentation of traditional knowledge. India's Traditional Knowledge Digital Library (TKDL) is expressly designed as a defensive mechanism that documents traditional knowledge so that patent examiners can recognise it as prior art and reject wrongful patent claims. While this strategy has been effective in preventing biopiracy, it also creates an unintended consequence. By converting oral and community-held knowledge into a searchable database, the TKDL makes such knowledge more readily accessible to third parties for legitimate commercial exploitation without requiring prior informed consent or benefit-sharing.³⁶ Publication as prior art merely prevents patent

³⁵ AM, H. M. (2019). Emerging trends in the generation, transmission and protection of Traditional Knowledge. *Indigenous Policy Journal*, 30(1), 1-15.

³⁶ Coombe, R. J. (1998). Intellectual Property, Human Rights & (and) Sovereignty: New Dilemmas in International Law Posed by Recognition of Indigenous Knowledge and the Conservation of Biodiversity. *Ind. J. Global Legal Stud.*, 6, 59.

monopolisation. It does not confer affirmative proprietary rights or licensing powers upon the source communities. Thus, documentation serves an important defensive purpose, it does not by itself ensure compensation or legal control for traditional knowledge holders.

Another unresolved issue concerns the identification of the appropriate rights-holder. Traditional knowledge is often shared across communities, regions, and even national borders, and may have evolved through collective contributions or parallel development by multiple groups. Determining which community is entitled to grant consent or receive benefit-sharing payments therefore presents considerable legal and practical difficulties. India's Biological Diversity Act seeks to address this issue by channelling benefit-sharing through the National Biodiversity Authority (NBA) and the State Biodiversity Boards (SBBs), rather than directly to individuals or communities. However, disputes frequently arise regarding which village, community, or family should be recognised as the legitimate beneficiary and existing legislation provides only limited guidance for resolving such conflicts.

The absence of a binding international *sui generis* regime for traditional knowledge further complicates protection efforts. Although negotiations have continued for more than two decades within the World Intellectual Property Organization's Intergovernmental Committee (WIPO IGC), no comprehensive international instrument currently establishes substantive proprietary rights over Traditional Knowledge. The 2024 WIPO Treaty is limited to introducing a procedural disclosure requirement in patent applications involving genetic resources and associated traditional knowledge. It neither provides a universally accepted definition of traditional knowledge nor determines ownership rights or mandates a uniform system of benefit-sharing. Instead, these substantive issues remain subject to national legislation, resulting in a fragmented international framework characterised by widely differing access and benefit-sharing (ABS) regimes.

Another significant challenge arises from the fragmentation of India's legal framework governing traditional knowledge. Traditional knowledge related rights are dispersed across multiple statutes, including the Biological Diversity Act, the Forest Rights Act, the Patents Act, the Protection of Plant Varieties and Farmers' Rights Act, and the Geographical Indications Act. These laws are administered by different ministries and regulatory authorities with limited coordination, creating jurisdictional overlap and uncertainty.³⁷ For example, tensions may arise

³⁷ Dutfield, G. (2017). TK unlimited: The emerging but incoherent international law of traditional knowledge

between the rights of forest-dwelling communities recognised under the Forest Rights Act and access regulation under the Biological Diversity Act. Such fragmentation may also leave certain forms of traditional knowledge insufficiently protected because no single statutory regime comprehensively addresses their use.

Rapid technological developments have also created new legal uncertainties. Advances in genomic sequencing have enabled researchers and commercial entities to utilise Digital Sequence Information (DSI) derived from genetic resources without requiring physical access to the biological material itself. Existing access and benefit-sharing frameworks were drafted before such technologies became widespread and do not clearly address whether the use of TK-linked DSI should trigger disclosure obligations or benefit-sharing requirements.³⁸ Consequently, the legal status of Digital Sequencing Information remains an unsettled issue that continues to be debated within both the Convention on Biological Diversity (CBD) and WIPO processes.

Finally, the effectiveness of the 2024 WIPO Treaty may be limited by its flexible implementation framework. Although the Treaty requires disclosure of the origin of genetic resources and associated traditional knowledge in certain patent applications, it grants contracting parties' considerable discretion regarding implementation and enforcement. It does not prescribe uniform consequences for non-compliance, leaving States free to determine whether failures to disclose should result in patent invalidation, administrative penalties, criminal sanctions, or other remedies. This flexibility is likely to produce divergent national approaches, thereby perpetuating the fragmentation that already characterises the global access and benefit-sharing regime rather than creating a harmonised international system.

VII. Recommendations

A comprehensive and effective framework for the protection of Traditional Knowledge (TK) in India requires legal, institutional, and policy reforms that go beyond the existing defensive mechanisms. While initiatives such as the Traditional Knowledge Digital Library (TKDL), the Biological Diversity Act, 2002 (now the Biological Diversity Act, 2023), and patent law exclusions have played an important role in preventing biopiracy, they are insufficient to ensure

protection. *The Journal of World Intellectual Property*, 20(5-6), 144-159.

³⁸ Aubry, S. (2019). The future of digital sequence information for plant genetic resources for food and agriculture. *Frontiers in plant science*, 10, 1046.

that indigenous and local communities enjoy meaningful control over their knowledge and receive equitable benefits from its commercial utilisation.³⁹ Accordingly, several reforms can strengthen India's Traditional Knowledge protection regime.

First, there is a need to strengthen Biodiversity Management Committees (BMCs) at the panchayat and municipal levels. Under the Biological Diversity Act, BMCs are entrusted with documenting local biodiversity, preparing People's Biodiversity Registers (PBRs), and facilitating conservation efforts. However, many BMCs remain underfunded, understaffed, and lack adequate technical expertise.⁴⁰ Dedicated financial resources, regular capacity-building programmes, and trained personnel should be provided to enable these committees to perform their statutory functions effectively. Strengthening BMCs would ensure that decisions relating to Prior Informed Consent (PIC) and Access and Benefit Sharing (ABS) are taken at the level closest to the communities whose traditional knowledge and biological resources are being accessed. This decentralised approach would promote greater community participation, improve transparency, and ensure that the interests of indigenous and local communities are adequately represented before commercial access is granted.

Secondly, India should expand the documentation model of the Traditional Knowledge Digital Library (TKDL) to include oral and tribal knowledge through participatory, community-led registers. Although the TKDL has successfully documented codified systems such as Ayurveda, Siddha, Unani, and Yoga, a significant portion of India's traditional knowledge continues to exist only in oral traditions maintained by tribal and indigenous communities.⁴¹ Such knowledge remains vulnerable to misappropriation because it is often undocumented and difficult to establish as prior art. Building upon the existing People's Biodiversity Register (PBR) framework, community led documentation initiatives should be encouraged in which local communities actively determine what knowledge should be recorded, how it should be used, and who may access it. Importantly, these registers must include strong safeguards relating to prior informed consent, confidentiality, restricted access where necessary, and

³⁹ Trivedi, V., & Trivedi, N. (2026). Digital Sequence Information and Traditional Medicinal Knowledge: Bridging the Regulatory Gap in the Age of Dematerialisation. *Journal of Intellectual Property Rights (JIPIR)*, 31(4), 591-598.

⁴⁰ Ghrtilahre, S., Kumari, N., Datta, D., Kumar, A., Sahay, G., & Bhatore, A. (2026). Protecting India's biodiversity: The role of the biological diversity Act 2002: A review. *Bhartiya Krishi Anusandhan Patrika*, 40(1), 23-29.

⁴¹ Sharma, G., & Pradhan, B. K. (2024). Exploring Traditional Knowledge: Bio-Prospecting and Biopiracy in India and Southeast Asian Mega-Diversity Nations. In *Biodiversity and Business: Bio Prospecting and Benefit Sharing* (pp. 447-483). Cham: Springer Nature Switzerland

community ownership. Documentation should never become a means through which outsiders freely exploit traditional knowledge without the permission of its rightful custodians or without providing fair compensation.

Thirdly, India should enact a comprehensive sui generis legislation specifically designed for the protection of Traditional Knowledge. The present legal framework primarily provides defensive protection through Section 3(p) of the Patents Act, 1970, which excludes from patentability inventions that are essentially traditional knowledge or mere aggregations of known properties. While this prevents the wrongful grant of patents, it does not create positive or enforceable ownership rights in favour of traditional knowledge holders. A dedicated sui generis law should recognise indigenous and local communities as the legitimate custodians of their traditional knowledge and provide legally enforceable community rights over its use. Such legislation should clearly define ownership, establish procedures for obtaining prior informed consent, prescribe transparent benefit-sharing mechanisms, provide civil and criminal remedies for unauthorised use, and establish specialised authorities for dispute resolution. This would move India from a system based primarily on preventing misappropriation to one that actively empowers traditional knowledge holders.

At the international level, India should continue to advocate within the World Intellectual Property Organization (WIPO) Intergovernmental Committee (IGC) for the development of a comprehensive international legal instrument covering both Traditional Knowledge and Traditional Cultural Expressions (TCEs).⁴² Although the 2024 WIPO Treaty on Intellectual Property, Genetic Resources and Associated Traditional Knowledge introduced mandatory disclosure requirements regarding the source of genetic resources and associated traditional knowledge in patent applications, it does not comprehensively regulate ownership rights or benefit-sharing obligations. India should therefore support negotiations aimed at adopting a broader international framework that clearly defines community rights, establishes uniform standards for prior informed consent, and creates binding obligations for equitable benefit-sharing. Such an instrument would provide greater legal certainty across jurisdictions and improve international cooperation in preventing biopiracy.

Another important reform is the harmonisation of India's biodiversity-related legislations,

⁴² Trivedi, V., & Trivedi, N. (2026). Digital Sequence Information and Traditional Medicinal Knowledge: Bridging the Regulatory Gap in the Age of Dematerialisation. *Journal of Intellectual Property Rights (JIPR)*, 31(4), 591-598.

particularly the Biological Diversity Act, the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (Forest Rights Act), and the Protection of Plant Varieties and Farmers' Rights Act, 2001. These statutes often operate independently despite addressing interconnected issues relating to biodiversity, community rights, genetic resources, and traditional knowledge. Overlapping jurisdictions and inconsistent implementation may create regulatory gaps, uncertainty, and opportunities for forum shopping by commercial entities seeking to avoid stricter regulatory requirements. Effective inter-ministerial coordination, uniform policy guidelines, integrated institutional mechanisms, and information-sharing among relevant authorities would help eliminate inconsistencies and ensure a coherent legal framework governing access to biological resources and traditional knowledge.

Finally, India should clarify the legal status of Digital Sequence Information (DSI) under its Access and Benefit Sharing (ABS) framework.⁴³ Advances in biotechnology increasingly allow researchers and commercial enterprises to utilise digital genetic information without physically accessing biological material from the country of origin. Existing ABS regulations were primarily designed to regulate access to tangible biological resources and do not adequately address the commercial use of genetic sequence data. As international negotiations under the Convention on Biological Diversity (CBD) and the Nagoya Protocol continue to evolve regarding DSI, India should proactively amend its domestic regulatory framework to specify whether the utilisation of digital genetic information derived from Indian biological resources will trigger benefit-sharing obligations. Such clarification is essential to prevent regulatory loopholes and ensure that rapid developments in genomics and biotechnology do not undermine the objectives of biodiversity conservation, equitable benefit-sharing, and the protection of traditional knowledge.

VIII. Conclusion

I Would like to conclude that Traditional Knowledge represents one of the most complex and evolving frontiers of contemporary intellectual property and biodiversity law. It occupies a unique legal space that challenges the foundational assumptions of conventional intellectual property regimes. Unlike patents, copyrights, or industrial designs, which are premised upon

⁴³ Klünker, I., & Richter, H. (2022). Digital sequence information between benefit-sharing and open data. *Journal of Law and the Biosciences*, 9(2), lsac035.

individual authorship, novelty, inventiveness, and time-limited exclusivity, traditional knowledge is collectively created, intergenerationally transmitted, culturally embedded, and intended to remain a shared community resource.⁴⁴ Attempting to protect such knowledge solely through traditional intellectual property doctrines has therefore exposed significant conceptual and practical limitations. The legal challenge is not merely one of extending existing rights to a new subject matter but of designing a framework capable of recognising fundamentally different forms of knowledge production, ownership, and stewardship.

India has emerged as one of the leading jurisdictions in addressing this challenge. Through the establishment of the Traditional Knowledge Digital Library (TKDL), the exclusion of traditional knowledge from patentability under Section 3(p) of the Patents Act, 1970, and the Access and Benefit-Sharing (ABS) framework under the Biological Diversity Act, India has developed an innovative defensive protection model that has significantly curtailed the wrongful grant of patents over well-documented traditional medicinal knowledge.⁴⁵ The successful challenges to the turmeric, neem, and other biopiracy-related patents demonstrate the effectiveness of this approach in preserving the public domain and preventing the monopolisation of pre-existing community knowledge. India's experience has also influenced international policy discussions and has served as a model for several countries seeking to combat biopiracy. However, defensive protection alone cannot provide a complete legal solution. Preventing the grant of an illegitimate patent is fundamentally different from recognising and enforcing the positive rights of traditional knowledge holders. The existing legal framework continues to leave several critical questions unanswered. The ownership of undocumented and orally transmitted traditional knowledge remains uncertain. Indigenous and local communities often lack clearly enforceable legal rights over the knowledge they have collectively nurtured for generations. The fragmentation of domestic legislation, overlapping institutional jurisdictions, and varying international standards further complicate effective protection and enforcement.

The unresolved issues identified throughout this research including the absence of a universally accepted definition of traditional knowledge, uncertainty regarding collective ownership,

⁴⁴ Rajani, K., Ranjan, T., Kumar, R. R., Patil, G., Kumar, M., Kumar, J., & Kumar, M. (2018). Traditional knowledge and its promotion through providing legal rights. In *The role of intellectual property rights in agriculture and allied sciences* (pp. 151-180). Apple Academic Press.

⁴⁵ Sinjela, M., & Ramcharan, R. (2005). Protecting traditional knowledge and traditional medicines of indigenous peoples through intellectual property rights: issues, challenges and strategies. *International Journal on Minority and Group Rights*, 12(1), 1-24.

inadequate recognition of customary laws, protection of undocumented and cross-border traditional knowledge, regulation of digital sequence information, and the lack of harmonisation between biodiversity law and intellectual property law demonstrate that the present legal framework remains incomplete.⁴⁶ These are not merely technical legislative gaps but fundamental questions concerning the relationship between intellectual property, indigenous rights, biodiversity conservation, distributive justice, and cultural heritage. Their resolution requires legal frameworks that move beyond defensive protection and instead affirm traditional knowledge as a legitimate form of intellectual creation deserving of positive legal recognition and effective enforcement.

Ultimately, the future of traditional knowledge protection will depend upon the willingness of national governments and the international community to rethink the conventional boundaries of intellectual property law. The objective should not simply be to prevent the misappropriation of traditional knowledge but to establish a legal order that respects the dignity, autonomy, and collective rights of the communities that have preserved this knowledge over centuries. Such a framework must ensure prior informed consent, guarantee fair and equitable benefit-sharing, recognise customary governance systems, and balance innovation with the protection of cultural and biological heritage. Traditional knowledge should therefore no longer be viewed merely as a repository of ancient practices or as prior art preventing the grant of patents. It is a living intellectual tradition, an indispensable component of humanity's cultural and ecological heritage, and a continuing source of scientific, medicinal, agricultural, and environmental innovation.⁴⁷ The evolution of its legal protection will ultimately serve as a measure of whether intellectual property law is capable of adapting to knowledge systems that are collective rather than individual, perpetual rather than time-bound, and rooted in community stewardship rather than commercial exclusivity. In that sense, the debate over traditional knowledge is not simply about protecting the past, it is about redefining the future of intellectual property law in a manner that is more inclusive, equitable, and responsive to the realities of a culturally and biologically diverse world.

⁴⁶ McManis, C., & Terán, Y. (2011). Trends and scenarios in the legal protection of traditional knowledge. *Intellectual property and human development: current trends and future scenarios*, 139-174.

⁴⁷ Ouma, M. (2017). Traditional knowledge: the challenges facing international lawmakers. *WIPO Mag.*, 12.