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A Primer to Traditional Knowledge Protection in India: The Road Ahead

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Abstract
As India moves ahead in the twenty-first century to be a global player, it must take a balanced and inclusive approach. Marginalized and vulnerable tribal communities make approximately 10% of the massive population, playing a dynamic role in this regard. Their ancestral knowledge can be explored to inculcate the ethos in multiple disciplines. This would most certainly bring the much-needed balance in achieving the United Nations Sustainable Development Goals. Where the world is fast losing its natural resources, promoting traditional knowledge (TK) could become an initiative for its reconstruction in post-COVID 19 scenarios. Apart from reinstating the rights of these indigenous communities, this step would also facilitate the economic benefit of the country through the incorporation of TK in the realm of Intellectual Property. This would be a masterstroke for India to lead the Global South. This would also bring in a balance with the Global North, where significant developments have already taken place, in this regard. TK per se should not necessarily be protectable unless based on scientific evidence.

Keywords Traditional knowledge · Climate change · Nagoya protocol · TK and IPR · Biopiracy · TKDL and NIF · Tiered or diffused concept

Introduction

In this study, we will deliberate about indigenous peoples (of India) and their natural conservation practices through the lens of Intellectual Property Rights (IPR). The paper is divided into seven parts. The first, describes in brief, the role indigenous

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peoples have played in the conservation of natural resources and ecosystem services amidst the crisis. The complexity and misconceptions involved in TK and the difficulties in bringing it under IPR has been dealt with in the second. The third and fourth part unravels the challenges of biopiracy and the successful measures taken by India in protecting TK. The fifth and sixth part discusses the existing laws and proposes a policy that may be adopted by India in formulating the relevant policy and law concerning benefit sharing that could help India to be a leader in the Global South. The seventh part concludes the paper with a prelude to the beneficiaries of this strategic endeavour.

The methodology adopted in this paper incorporates drawing of conclusion using cross-country analysis for solutions to address the challenges brought forth by this complicated position.

The paper is based on primary and secondary sources in this genre of study.

Crisis in India's Natural Resources: The gift of Neo-Colonialism

It is estimated that over 75% of global biological resources are found in the Global South and in traditional or ancestral habitats utilized by Indigenous Peoples and Local Communities (IPLC). See, for example, Oguamanam (2013).[1] According to a recent study,[2] it was found that the world has lost over 90% of large fish species.[3] The primary reason identified behind this was its consistent demand leading to uninterrupted predatory fishing, irrespective of breeding seasons.[4] Lack of ecological ethics in the realm of the new world order of economic dominance by the Global North has played a significant role in this and similar others.

India has been blessed with fertile grounds, but modern scientific interventions like High Yielding Varieties (HYVs) and Genetically Modified Organisms (GMOs) have resulted in an imbalance in environmental sustainability. Studies have shown the adverse impact of the Green Revolution on the farmers and their farming lands.[5] Mono-cropping patterns have resulted in increased salinity of soils decreasing its fertility.[6] Such agricultural practices have attracted exponential use of pesticides by the farmers, and consequentially there has been deterioration. Punjab, which was the

[1] Oguamanam (2013: 3).

[2] Neubauer (2013: 347–349).

[3] Free (2019: 979).

[4] Burgess (2013:15943–15948).

[5] In this regard Hsaio (2015) observed that "Despite their agricultural, economic, and safety, pesticides can also have negative impacts on our health. Many conventional pesticides are synthetic materials that kill or inactivate the pest directly. These chemical pesticides include compounds such as organophosphates, carbamates, pyrethroids, and sulfonylureas. Short-term exposure to a large amount of certain pesticides can result in poisoning. Exposure to large amounts of pesticides is usually more likely for people such as farmers who may frequently touch and/or breathe in pesticides. The effects of long-term exposure to small amounts of these pesticides are unclear, but studies have linked them to a variety of chronic health conditions such as diabetes, cancer, and neurological defects"; Also see, Reinhardt (1999: 149–149).

[6] Yang (2020: 8).

nucleus of the Green Revolution, now is a nucleus of agricultural distress. *Kisan* is the true nation-builders, but due to lopsided agrarian practices, they are being burdened with increasing debts and out-of-pocket expenditures on health, sinking them deeper into the vicious circle of poverty and vulnerability.[7] There have been thousands of recorded and unrecorded suicide deaths of farmers in India during the last two decades,[8] especially after introducing and implementing World Trade Organisation (WTO) and Trade Related Aspects of Intellectual Property Rights (TRIPS) in India.[9]"According to the National Crime Record Bureau's report, in the 20 years from 1996 to 2016, more than 30 lakh (0.3 million) farmers have committed suicide all over India. A good part of this is due to the impact of WTO and Free Trade Agreements (FTAs). Regional Comprehensive Economic Partnership (RCEP) would be yet another monster that would eat our farmers."[10] Phase wise reintroduction of indigenous agricultural practices to arrest agrarian distress to both the farmer and the land, is the key for India's progress in the next few decades.[11] The ecological ethics and ethos are the critical parameters to sustainability inherent in TK, and it is elusive in modern scientific education. Mono-crops needs to be phased out along with GMOs. To give the readers a brief idea of the stark difference between the two sets of agricultural practices, reference to Table 1 is given below.

Navdanya,[12] an Indian based NGO, (like some others, e.g., Vrihi) has actively advocated for the cause of traditional knowledge in agricultural practices.[13] It believes in the philosophy of living soil, living seed and living earth, which has enabled partnered small farmers with sustainable agricultural practices. Traditional food production systems offer a possible solution for food security and sovereignty.[14] Mono-crop cultivation has forced the farmers to buy genetically modified seeds[15] at the cost of innumerable indigenous varieties. This consequently destroyed the TK of production of such varieties as well as their unique ways of conservation.[16] Odhiambo states that,

> Indigenous knowledge can reveal missing ecological keys, which may help scientists develop alternative agricultural technologies less dependent on non-renewable resources (e.g. fossil energy) and environmentally damaging inputs (e.g. chemical pesticides) than conventional technologies.[17]

[7] Nagaraj (2014: 79).
[8] Ibid.
[9] Kennedy and King (2014: 1–9).
[10] Biju (2019).
[11] Perroni (2017).
[12] Founded by world-renowned scientist and environmentalist Dr Vandana Shiva, Navdanya is based in Uttaranchal.
[13] To know more visit https://www.navdanya.org/site.
[14] Jacques and Jacques (2012: 2970–2997).
[15] Some activists object to the terminology 'seed' to be broader enough to incorporate GMOs.
[16] Each variety is different from the other and so is their indigenous ways of conservation.
[17] Odhiambo and Kamp (1990: 3–5).

Deep Rooted Misconceptions Regarding Traditional Knowledge

Recent lifestyle trends (such as increased use of organic products like cosmetics, food etc.) and health care through the AYUSH knowledge system[18] indulges the consumers at large, in a fascination towards ancient and traditional knowledge which have been the basis and backbone of human civilization. As more information unearths in this area of environmental and ethical discourse, multiple biopiracy cases have buoyed up and exposed the nexus between TK on the one hand and modern scientific inventions on the other. The hypocrisy involved in bluntly pirating this knowledge, coupled with creating strategies to nomenclate a discovery as an invention without giving due credit (forget benefit sharing) to the people who carried such information for centuries. Parallel to this, by declaring TK as obsolete and superstitious, demystifies the truth behind such claims.[19] The fact that more than 75% of medicines used by modern science have a natural indigenous origin can no longer be ignored.[20] More so, the scientists are exploring further on ancient chemicals like aspirin etc.[21] to make new medicines. Before indulging too much on the relevance of TK, it shall be prudent to identify the significant contrasts between modern and traditional knowledge (Table 2).

TK[22] or indigenous knowledge (often used interchangeably) has been arrogated with various derogatory descriptions like primitive, backward, rural, savage, unscientific, etc.[23] The reason behind such misadventure is cultural heterogeneity coupled with European perception of superior bloodline which led to devastating torture and murder of millions of Jews in the Second World War and millions more in colonies like India where people died of hunger and famine irrespective of bumper crop production. A notion of absolute superiority has always played a dominant role in both the cases of German annihilation of Jews and modern scientific ideas over indigenous knowledge, especially during the colonial period and beyond in some jurisdictions. It is till recent decades the notion has been challenged in global platforms.[24] The knowledge that indigenous peoples have inherited and practised since time immemorial have been referred to as superstitious and based on unscientific claims.[25] Their self-identification with an isolated culture, which is territorial in nature, is intrinsic to their 'way-of-life and with the environment.[26] But being isolated puts them at a disadvantageous position with little bargaining power when it comes to their right on TK.[27] Apart from this, TK unlike, modern scientific

[18] AYUSH stands for Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy.
[19] Chambers (2000: 221–240).
[20] Sen and Chakraborty (2017: 234–244).
[21] Landau (2010).
[22] Traditional knowledge is defined in UN documents as knowledge of 'Indigenous and local communities embodying traditional lifestyles' IPLC, Article 8(j) CBD.
[23] *Supra* note 19, at 7.
[24] Ibid.
[25] Ibid.
[26] *Supra* note 14.
[27] Gernigon (2000: 33).

Table 1 Contrasts between Traditional and modern agricultural practices

Indigenous agricultural practices	Modern agricultural practices
It is an outcome of the connection between culture, land and indigenous peoples	It is an outcome of the unidirectional relation between land and output in terms of profits
We are holistically connected with nature like crops that suit the soil, water usage dependent on rain, etc	Complete disconnect from nature like crops which return the most profit (e.g. cash crops), water-intensive and capital intensive
It is completely dependent on maximizing the use of natural resources like cow dung for manure, *neem* as a pesticide, etc	Excessive use of technology in the form of modified seeds, pesticides and synthetic fertilizers

Cole and Fernando (2014: 6)

knowledge, are transmitted through traditional folklores and through imitation amongst certain clans through centuries.[28] It generally has a spiritual essence which creates a sacred consciousness to it.[29] It behaves in an integrative and holistic fashion with the view of the world as interrelated. Another interesting, distinctive feature of TK is the emotional[30] involvement which has been criticised by many modern scientists as baseless.[31] In practice, the participation by subjective parameters in certain TK has confused even the advocates of TK as a weakness.[32] However, the strength of TK lies in the long period of the human and ecological interface. Modern scientific knowledge is based on mathematical and quantitative calculations.[33] It is desirable that the two systems work in tandem to develop knowledge and education.

Innovations from Traditional Knowledge: Biopiracy

The interface "between TK and innovations in the realms of pharmaceuticals, cosmetics, agriculture, chemicals and environmental conservation, which constitute the core of the 'biopiracy' phenomenon, provide pivotal sites in which IP, specifically the patent regime, directly engages TK in contestation over the utilization of Genetic Resources (GRs) across different knowledge frameworks."[34] Notwithstanding these examples, "the interfaces between IP and TK/TCEs generally tend to be difficult to pin down. In the patent regime, 'newness' or 'novelty' of TK,[35] analogous to an invention, is a consistently problematic issue."[36] It is literally impossible to go back to the pages of the past to identify the ancestral inventor or discoverer of a particular

[28] Bruchac (2014: 3817).
[29] Juden (2003: 313–313).
[30] Li (2010: 385–414).
[31] Ibid.
[32] Sengupta (2019: 146).
[33] National Research Council (2013: 477–486).
[34] Oguamanam (2019: 1–24).
[35] Newness is the sole factor that distinguishes a TK from a knowledge that is commonplace.
[36] Mgbeoji (2001: 163–186).

Table 2 Contrasts between TK and modern knowledge system

Traditional knowledge system	Modern knowledge system
Its origin is found in folklores, ancient books, ancient paintings and the way of life of indigenous and tribal peoples	Its origin lies in the traditional knowledge systems
The essence lies in respecting nature and deducing from it. It is more holistic in nature	The essence lies in manipulating and abusing nature and its laws. It has been termed as an 'instrumentalist' view of nature (Dickson 1999: 631)
It has sociological, epistemological undertones to its studies	The undertones are highly contrasting as it is scientific, mathematical and mechanical in nature

Ezeanya-Esiobu (2019: 115)

clan or tribe, of a specific practice. "In the area of copyrights, fixation and publication, especially of TCEs, are perennial hurdles."[37] As the majority of such expressions practice within communities closely knitted and carefully segregated from the outside world, it remains technically unpublished. "In respect of trademarks and designs, claims of sacredness—as a basis of exclusion of specific marks, symbols, insignias, or systems from commercial exploitation—remain a source of tension amongst stakeholders (Coombe 1998)."[38,39] In most of the cases involving such violation, the marks are allegedly pirated and used derogatorily by western countries.[40]

Case Study: Neem

Neem (*Azadirachta indica*), a very common tree species of India with medicinal value,[41] has been the subject of numerous patents. (At least 40 in the US alone and 150 worldwide) All the inventions that relate to neem virtually used public domain traditional knowledge as their basis.[42] This led to a huge uproar amongst the Indian users who refused to accept this and leading to a challenge of two patents (1) "to a European Patent Office (EPO) patent for the fungicidal effects of neem oil (Patent No. 436 257 B1) owned by W. R. Grace & Co., and (2) to the US patent for a storage-stable azadirachtin formulation (Patent No. 5124349) also owned by W. R. Grace."[43] In the year 2000, the patent described above was revoked by EPO due to the lack of novelty and invented step.[44] Patenting Neem, name of every household, had a substantial socio-economic impact. Almost all rural and semi-urban

[37] Boateng (2012: 9), Kuruk (1999: 769).
[38] Supra note 36.
[39] Supra note 34.
[40] Ibid.
[41] Souravi, K (2020: p. 489).
[42] Supra note 34.
[43] Ibid.
[44] Dutfield (2004: 53).

communities are aware of neem as having a plethora of health benefits. Indian heterogeneous communities were equivocal in opposing the patenting of neem by an American company. They feared the tyranny that looms large which the patent holder may unravel once obtained from the IP rights.[45]

Case Study: Rosy Periwinkle

Rosy Periwinkle (case) is another well-known instance where biopiracy was exposed against an American company Eli Lilly, a pharma-giant in Arizona established in 1876.[46] Rosy Periwinkle is a naturally grown plant found in abundance in Madagascar. (Fig. 1) During the 1950s, the researchers of the company heard about the medicinal value of the plant Rosy Periwinkle and collected samples from India as well as Madagascar. They isolated the samples and tested the two components, vincristine and vinblastine, as unearthed from the indigenous experts of the region. During the process of testing, they identified alkaloids which later became very effective in treating childhood leukaemia with a success rate of over 90 per cent. During the late 1950s, the company started marketing it and especially vincristine earned a substantial profit for Eli Lilly. The natives of Madagascar, who originally identified the medicinal qualities and values involved in Rosy Periwinkle, never got any share of profit gained by *Eli Lilly* because of the absence of benefit-sharing laws, both internationally and locally.[47,48,49]

Laws Protecting Traditional Knowledge

National and regional laws protect TK within a limited space, but the impact of this knowledge system is global. TK, irrespective of its local applicability (generally limited to a clan or at times only within a family in a community), TK across the globe has been found to be based on certain ethical and moral precepts.[50] This homogenous behaviour of TK renders an impact that is beyond national boundaries. Practices like prohibition to the fishing of certain species during their breeding season could be seen as a standard practice amongst all indigenous fishing communities.[51] Same could be found in protecting coral reefs by indigenous communities by application of similar techniques in different parts of the world. International customary law has been flouted in almost all jurisdictions, and the impact is quite visible

[45] Some similar experiences are referred to in the work of Will Holland (2019).
[46] Chakrabarty and Sinha (2021).
[47] Ibid.
[48] Fisher (2018: 7).
[49] It is pertinent here to state that the countries where the patents were accepted did not ratify CBD or the Nagoya Protocol.
[50] Deb (2014: 123–159).
[51] Ibid.

Fig. 1 World Map showing the sample of neem taken from India to USA and EPO (Maps of World 2020)

today.[52] Nearly ninety per cent of large fishes of the world have got extinct in the last six decades.[53] Therefore, international participation and cooperation to facilitate such laws at both, international and national level is required. Shared policy objectives would ensure protection, expansion and recognition of TK (Fig. 2).

Indigenous communities represent the social and unified ethos of our country. The sheer expansive nature of the existing TK has been inadequately represented in the prevailing laws and legislations. Some jurisdiction has succeeded in incorporating protective laws for their fading TK while some others are losing their valuable knowledge at a very fast rate due to non-protective or inadequate measures. However, a *sui generis* system to promote the TK has been proposed. This development owes greatly to the Nagoya Protocol, where India is a signatory.[54]

The major limitations that are inherent in the Indian legal system are multidimensional. Primarily, the government do not recognize the term indigenous per se, irrespective of using the word aboriginal once, in a document before the international community.[55] This position of India in the international forum reinstated that tribals survive but not as indigenous communities.[56] However, this distinction took place at a later stage as India was a party to the ILO Convention of 1957 on Indigenous and Tribal Population. India supported the document at the early stages when it only used the term Indigenous. In several Government publications, the term Adivasis and aboriginal have been used interchangeably. The current rejection of the term

[52] Ibid.
[53] Myers and Worm (2003: 280–283).
[54] Architha Narayanan (2018: 1).
[55] Chakrabarty (2018: 14).
[56] Ibid.

Fig. 2 World Map showing the sample of Rosy Periwinkle taken from Madagascar and India to Arizona, USA (Maps of World 2020)

indigenous was developed in the context of the Working Group in 1984 and later in 1992.[57] Secondly, India still follows ILO 107, which has already been replaced by ILO 169. There are innumerable issues to be depicted at this juncture. ILO 107 was discarded and was replaced with ILO 169. Thirdly, there are no positive protection parameters of these peoples towards their land and culture.[58] As a matter of fact, there are many indigenous communities in India which are not recognized under the purview of Scheduled Tribes, making the process 'more of politics than of law'. In submitting the Universal Periodic Review reports, India has suppressed the atrocities that these peoples have undergone in the hand of non-tribal peoples and the state.[59] Millions of these peoples have been ousted from their habitat, forcing them to change their way of life and contributed to the loss of traditional knowledge, their ancestral cultural expressions, language and traditional indigenous farming practices amongst others.[60] In the absence of any uniform legal framework proposed

[57] Ibid.

[58] Argument placed by the contributors, based on the previous fact; Available at: <https://www.telegraphindia.com/opinion/tribal-status-to-be-a-scheduled-tribe-and-being-tribal-are-no-longer-the-same-thing/cid/1691000> (Accessed 15th September 2020).

[59] UN HRC (2017).

[60] First-hand experience recorded by the contributor during PhD empirical studies, for more please look at Shodhganga thesis at chapter 6.(https://shodhganga.inflibnet.ac.in/handle/10603/246918).

by WIPO (like other IPRs), TK has not been protected positively in India,[61] unlike that of Malaysia[62] or Kenya.[63]

Sui generis Legislation to Combat Biopiracy: Position in India

Sui generis means something unique and exclusive to a specific jurisdiction. *Sui generis* legislation is passed with specific objectives in mind. To achieve certain protection for TK within the IPR domain, some *sui generis* legislation came into force to address the issue.

TK and its incorporation in IPR were not simple. To make this happen, two concepts evolved;

i) Amending the existing laws of IPR and making necessary changes to accommodate TK and its derivatives, and
ii) To make comprehensive legislation to promote and protect TK within IPR.

Many jurisdictions within WTO have made necessary changes in their legal system to accommodate TK within IPR. India accommodated TK both by amending existing IPR statutes and creating new ones. As a matter of practice, the onus for protection of TK/TCEs globally vests upon WIPO of WTO[64] who are responsible for TRIPS to make a strategic alteration to accommodate TK and TCE. Some of the recent legislation that came up to protect TK in India is "The Biological Diversity Act, 2002",[65] the "Protection of Plant Varieties and Farmer's Rights Act, 2001"[66] and the "Geographical Indications of Goods (Registration and Protection) Act, 1999".[67] There has been significant development in various existing IPR legislations in India like the Patent Act, Copyright Act and the Trademark Act (Table 3).

Sui generis systems per se have played the most significant role so far in protecting TK and TCEs in almost all jurisdictions. However, the actual organization that was required to be made to provide worldwide protection of TK and TCEs is that of WIPO. After the formation of WTO and the establishment of WIPO, all intellectual properties along with its derivatives have been regulated by WIPO. The absence of a specific law with regard to TK & TCEs (from WIPO) has been felt largely by countries across continents rich in tradition and culture. WIPO of late has shown interest to investigate newer avenues in framing a unified regulation to regulate TK/TCE as

[61] Acts, the Plant Varieties Act and the Biodiversity Act protects passively and not actively as required to be adapted in India.
[62] Antons (2010: 1189–1204).
[63] Justus Wanzala (2017).
[64] WIPO and WTO are two different organisations WIPO has a cultural mission and no trade aim, whereas WTO is duly trade orientated. WIPO has treaties that member states can ratify or not, WTO TRIPs is of adhesion and there is no space to non-ratification or to repel certain articles.
[65] The Biological Diversity Act, 2002.
[66] Protection of Plant Varieties and Farmer's Rights Act, 2001.
[67] *Geographical Indications of Goods (Registration and Protection) Act, 1999.*

Table 3 Indicating the various legislations pertaining to the protection of TK in existing IPR legislations

S. no	Indian legislation	Specific provision protecting TK in India
1	Patents Act 1970 (Amendments of 2002 & 2005)	Sections 3 (b), (c), (d), (f), (h), (i), (j) and (p) (But falls well short of patenting a TK)
2	Copyright Act	Section 31A, 38 and 57 But the term 'folklore' is absent. (Hence TCEs cannot be protected)
3	Geographical Indications Act 1999	Section 11, 24 and 25 (It is at its nascent stage and weak in its implementation)[a]
4	Trademarks Act 1999	Section 29 (It is challenging to get a trademark of all marks used throughout the development of TK)
5	Biodiversity Act 2002	Sec 6(1) (Very poorly implemented so far in India)

[a]Ragavan (2001: 1)

it has done with other IPRs.[68] Initially, WIPO worked upon various complex and puzzling positions, but no scientific conclusion could be made in this regard.[69,70]

Paris, as well as the Berne Convention, highlights the axiomatic principle that IP rights are typically territorial. "The extraterritorial application of this public domain would also attract the same rules that relate to the extraterritorial application of IP and similar other laws."[71]

Sui generis Strategies Developed in India to Protect TK

India witnessed significant activism to protect traditional expertise from being patented in Europe and America. The *basmati* and *neem* controversy created enormous pressure[72] leading to some simple yet significant *sui generis* protection of TK.

Traditional Knowledge Digital Library (TKDL)

With biopiracy being rampant and the cost of fighting litigation to combat such white-collar pirates running into millions of dollars, a strategy was developed by the Government of India (GOI), which took around eight years to materialize and be effective. Traditional Knowledge Digital Library or TKDL was established with the objective of incorporating a list of codified TK practices of India. This dynamic list includes more than thirty thousand medicinal formulations and is made available

[68] Fisher (2017).
[69] Ibid.
[70] ibid.
[71] Okediji (2018: 176).
[72] Public commotion leading to a political outrage forcing the government to act.

Table 4 Protection of TK by various countries (selected) *Source*: WIPO (Dutfield 2020)

Country	Digital database	Year of establishment	Remarks
China	Traditional Chinese Medicine Patents Database	2002	In case the invention relies upon the genetic resources, applicant shall disclose such sources under Article 26(5) of the Patent Law 2009
Finland	Database on TK associated with TRs	Not yet estb. But press release was given in 2016 to build one	The proposed database will be built to promote traditional Sámi knowledge and will be administered by the Finnish Sámi Parliament
Peru	Registers of Traditional Knowledge	2002	They established a National Bio piracy Prevention Commission in 2004
Philippines	TKDL on Health	2014	The University of the Philippines developed the TKDL-Health of the country's traditional practices on health and healing
South Africa	National Recordal System	2013	The system has a unique tool of giving geographical location of the TK owner as this beneficial for prior art research
Republic of Korea	Korean Traditional Knowledge Portal	2007	The database was based on traditional Korean medicine (Korean traditional literature and scholarly articles)
Venezuela	BioZulua	2002	This project brings together knowledge of about 24 ethnic groups living in Venezuelan part of the Amazonian jungle
Malaysia	Malaysian TKDL	2009	Interesting social initiative was taken to capture TK-Project Linkages, which has enabled the community to record insights from the elders told in the form of storytelling

online to provide relevant information to patent and trademark examiners in offices of respective jurisdictions, refraining from a grant. The data is made available in five UN languages, viz., French, German, English, Spanish and Japanese for convenience irrespective of the fact that data originated in languages like Sanskrit, Urdu, Persian and Hindi.

After this development, there has been a significant decline in biopiracy cases and frivolous filing of patent applications related to Indian Systems of Medicines (ISM). Amidst this positive development abroad, a significant loophole was detected. It was found that the Indian Patent Office has granted innumerable patents on ISM, turning a blind eye on TKDL.[73] After a review of such cases dating back to 2005, it revoked patents granted, violating TK. Later an agreement was signed by TKDL with IPO on similar lines of EPO and Patent offices of UK, USA, Canada, Germany, Australia etc. Consequently, there has also been a significant economic impact that was felt in the local pharma industry in India.

This popularity of TKDL, along with its success, prompted changes by WIPO. The International Patent Classification (IPC) of WIPO adopted the Traditional Knowledge Resource Classification System (TKRC), a novel classification system of TKDL. "The International Patent Classification (IPC), established by the Strasbourg Agreement 1971, provides for a hierarchical structure of independent language symbols for the classification of patents and utility models according to the different areas of technology[74] to which they pertain. A new version of the IPC enters into force each year on January 1."[75] Another significant success was the identification of 1155 biopiracy claims at various IPOs by the TKDL Team.[76] Consequently, a lot of them were legally restrained from similar malpractice. Thus, TKDL has turned out to be a very successful defensive mechanism to stop biopiracy, as they carry on their effort to improve the database of 150 books *inter alia*, on areas like Yoga, Unani, Siddha and Ayurveda.

India's successful attempt at collaborating with TKDL inspired various countries to protect their own TK (see Table 4). To quote Piaroa Elder, an indigenous community of Venezuela, "When a seed is removed from its environment, it dies halfway to its destination, and the same thing could happen to indigenous knowledge".[77]

National Innovation Foundation (NIF)

Alongside TKDL, NIF is another pioneering contribution from India to protect and promote TK.[78,79] The main objective of NIF is to encourage and assist in the

[73] *Supra* note 34 at p 50.
[74] Brooks (1994: 478).
[75] WIPO (2020).
[76] Supra note 20 at p 49.
[77] Humberto Márquez (2002).
[78] Supra note 25.
[79] The Department of Science and, GOI, later established NIF in the year 2000 for preventing biopiracy on the one hand and IPR protection of TK and Ancestral Knowledge. This ensures, consequently, retainment of the rich knowledge the land is famous for.

protection of TK. It is a team of experts which engages in facilitating the knowledge holders to protect their innovations in accordance with the existing IPR regime. They provide, *inter alia*, substantial support in conducting prior art searches, filing of patents to the people who are mostly unaware of legal intricacies that their TK may possess along with their miraculous knowledge.

The Department of Science and Technology, GOI, established NIF in the year 2000 for preventing biopiracy on the one hand and IPR protection of TK and Ancestral Knowledge on the other. This ensures, consequently, retainment of the rich knowledge the land is famous for.

Credit must be given to the relentless effort that was put into by the eminent Professor Anil Gupta of IIM, AMD and his team to formulate the Honey Comb Network, which started its journey during the 1980s. In 1993, a discussion network called Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) was framed to assist unearthing TKs from various parts of India.[80]

The following table (Table 5) identifies the significant functions of NIF, which facilitates TK.

NIF has also helped substantially in the last two decades from its establishment, protecting TK. The following list (Table. 6) is a few remarkable achievements of NIF worth cherishing.

Proposed Protection Parameters

Traditional knowledge and traditional cultural expressions are integrally related and inherent to the way of life of indigenous and tribal peoples. The doctrine of discovery[81] coupled with coercion and deception[82] caused irretrievable loss and suffering to the indigenous and tribal communities across continents. Similar instances were recorded in the US where tribes were dispossessed of their cultural, historical and religious resources giving the United States " 'the exclusive right…to extinguish' Indian title…whether it be done by treaty, by the sword, by purchase, by the exercise of complete dominion adverse to the right of occupancy, or otherwise."[83] India is also not an exception where the Europeans coerced the tribal communities to participate in the Christian mode of worship, as they did in the US.[84]

[80] Ramesh Pillai (2015).
(In the words of Professor Anil K. Gupta, Executive Vice Chairperson of India's National Innovation Foundation "*every time an old person dies a library of information is buried. Never before have we lost more traditional knowledge*." This inspired Project Linkages in Malaysia.).

[81] Irwin (1997: 35–55). Also see, Miller (2005: 1).
("The United States has imposed several restrictive laws banning the practice of certain Native American religious activities, including outlawing ceremonies such as the Ghost Dance and Sun Dance seen throughout Plains tribal cultures.")

[82] Ibid.

[83] McNeil (1997: .365).

[84] Banner (2009: 16) and Robertson (2005: 99).

Table 5 Functions of NIF with appropriate initiatives (selective) *Source:* NIF, India (Ibid)

Initiative	Function
Students' Club for Augmenting Innovations (SCAI)	"SCAI comprises of students from India's best management and technology institutes. They provide product development, mentoring and monitoring to innovators and TK holders at the grassroots."[a]
Scouting, Documentation and Database Management (SDDM)	The team actively looks for creative indigenous ideas/innovations/TK through extensive fieldwork in rural and urban areas. They search for 'oddballs' to the experimenter(s), local community and knowledge experts in the society. It is an extremely crucial step in fulfilling the mission of NIF
Grassroots Technological Innovations Acquisition Fund (GTIAF)	GTIAF, after being operationalized in 2012, crusaded the function of obtaining the "rights of technologies from innovators and providing compensation for the same. The purpose of doing so is to disseminate the knowledge at low or no cost for the larger society."[b]
In situ incubation	This function is essential as the services are provided to the innovator at his/her place. "All incubation facilities (financial, technical, mentoring, etc.) of grassroots technologies are extended to the innovator at his place to ensure the continuation of work without hindrance."[c]
Community workshops	The primary purpose of these workshops is to expedite the process of converting an idea into a prototype. NIF targets rural areas of the country at the premises of seasoned innovators to motivate other grassroots innovators and to improve their accessibility to fabrication facilities locally
Innovations' exhibition at the President House and The Festival of Innovation and Entrepreneurship (FINE)	Since 2015, NIF and Rashtrapati Bhavan are organizing this in the form of roundtables on various topics related to Innovation. In addition to this, an exhibition is organized to "showcase the creativity and ingenuity of common people."[d]
Dissemination and Social Diffusion (DSD)	"NIF team undertakes activities related to the diffusion of grassroots innovations all across the country with particular emphasis in tribal, backward and far-flung areas of the country."[e]

[a]Ibid

[b]Ibid

[c]Ibid

[d]Ibid

[e]Maps of World (2020)

This divestiture of tribal land by the government implied complete loss of control over sacred sites once possessed by the tribal and indigenous communities. Unfortunately, the government has never been respectful of these sacred places. Culturally

Table 6 Few remarkable achievements of NIF with proper nomenclature *Source:* NIF, India (Ibid)

Name	Contribution
Eco-parasite	Several practices based on TK were pooled to control the tick infestation. "Standardized composition of neem (Azadirachta indica) and monks pepper (Vitex negundo) demonstrated 100 per cent acaricide property within 48 h of treatment. Re-infestation was not noticed for 29 days post-treatment. It provided a low-cost solution for livestock keepers, which was economically viable. NIF introduced a nation-wide campaign to provide this low-cost technology to common people, and various demonstrations were organized in the states of Gujarat, Andhra Pradesh, Himachal Pradesh, Maharashtra, Tamil Nadu, Chhattisgarh, Odisha and Haryana."[a]
PPV & FR	NIF- "India helps the grassroots farmers who have developed or bred a new variety for registration variety under PPV & FR Authority 2001 so that these farmers shall be deemed to be entitled to save, use, sow, re-sow, exchange, share or sell their farm produce including seed of a variety protected under this Act. During this process, NIF-India guides and helps the farmers in the filing and registration process by collecting the data required according to DUS guideline and filing other related documents."
Farmers Field School	The purpose of Farmers Field School, organized in different states, is to propagate the TK system on "Insect-Pest Management to reduce the burden of chemicals in agriculture. The farmers are trained to use bio-resources for insect-pest management as per crops requirements."[b]
Grassroots Technological Innovations Acquisition Fund (GTIAF)	So far, "NIF has acquired rights of seventy-eight technologies of fifty-eight innovators from fourteen states at the cost of Rupees thirty-five lakh fifty thousand. NIF, through GTIAF meetings, explain the purpose of the fund, rights, duties and obligations of both NIF and the innovators. Subsequently, the innovators willing to hand over the rights of their technologies to NIF sign agreement with it."[c]
Herbal Healing Traditions	"NIF documents and shares TK practices, like herbal practices, from all over the country. These pertain to the use of plant/ plant parts for human, veterinary or agricultural use and have been classified according to the plant used. Uses of the same plant mentioned in codified literature or research papers/books are also given along with the references in all cases." (See the image below)

[a]Ibid

[b]Ibid

[c]Ibid

Modified Trees (CMTs) of the indigenous people of the United States and Canada are also threatened with the loss of possession. These CMTs are living Native American cultural artefacts which were used for navigational, medicinal, storytelling, burial and ceremonial purposes. *Ute* community is widely known for making a clock, calendar or even a compass through CMTs. In one case, they have combined two trees with a single slit in between and the only time sunlight passed through this slit was on the winter solstice. Instances of traditional knowledge pieces have been found in India as well, where few monuments use similar technology of using sunlight *inter alia* for determining time. Gavi Gangadhareshwara temple in Bengaluru,

India, is a rock-cut architecture where the sun-rays fall on the shrine only on a specific day of the year.[85]

Irrespective of the difficulty in finding the intercepting point of the knowledge systems of the various native peoples of the United States or Canada, or India, it is not very difficult to anticipate the commonality and richness of the two. One of the living examples of CMT is the living roots in Meghalaya, which demonstrates the uniqueness of India's traditional knowledge systems. Khasi community of this state twisted around the aerated roots to form them into a bridge.[86] These structures/trees hold sacred value to the community, which highlight their ingenuity and uniqueness.[87]

This loss of ethnicity and cultural rights has significantly damaged indigenous and tribal peoples' rights. Cultural practices play an ideal role to make life meaningful, useful and valuable. Indigenous cultural life enshrines intangible aspects like sanctity, sacredness with tangible things attached to them. Abuse of such elements infringes community sensitivity which acts as an impediment to the universality of cultural rights.

Consequently, assimilation at a staggering pace with a significant compromise on moral and cultural ethos followed. On certain critical junctions, ethical and legal conflicts ensued, which were eliminated with the rod of office. Cultural symbols, patterns or marks created once used for religious and sacred practices were used otherwise (e.g., commercial use or using derogatory to the purpose of such symbol or mark). Culturally modified trees, like other cultural symbols of a community, also suffered a similar fate.

The Ray of Hope

At the end of the Second World War, decolonisation and protection of human rights evolved to be the two major forces to control the state of affairs.[88] Cultural rights emerged to be an integral part of human rights which promotes the right to follow any cultural practices on the one hand and refraining from harming others on the other. It is essential to contrast universality and homogeneity. Culture is the synthesis of the productivity of any society which is threatened by cultural relativism. History unravels forced attempts of assimilation, a practice contrary to the universality of human rights, in general, and cultural rights, in particular.[89] Emphasis is required to be given to protect one's culture and cultural choices. Any use of others' cultural practice, which may have an impact, should only be permitted through free, prior and informed consent. Respect for cultural diversity under international standards is also a critical part of respecting human rights. Plural mono-culturism,[90] which promotes respecting everyone's right, must be acknowledged.

[85] Dwivedi and Saroha (2005: 310) and Vyasanakere (2008: 1632).
[86] Bareh (1985).
[87] Lewin (2012).
[88] Morsink (1993: 357).
[89] Travis (2008: 415).
[90] Šokčević (2011: 735–749).

Community sensitivity is an integral part of the universality of cultural rights.[91] Cultural sensitivity within the penumbra of community sensitivity includes an openness to know and acknowledge the diversity of cultural practices.[92] Various measures have been taken to create awareness programs, mandatory workplace ethics training, amongst others.[93]

The people who are behind the preservation and procurement of such knowledge should be acknowledged and rewarded. As a matter of fact, they are even bereft of any benefit for what they or their ancestors have done at the enrichment of a selected few. This deprivation, coupled with non-recognition of their knowledge (generally termed as superstition) and their right over such property, has led to the extinction of TK & TCEs from the planet.[94] The concept of community ownership that exists among the indigenous and tribal communities is quite different from the western notion of ownership.[95] However, a better understanding may be achieved between the two when it comes to its management, knowledge practice, communicating values and the values we hold in general through engaging with one another with the objective of creating a safe and sustainable world.[96]

In order to explore the ways and methods to identify indigenous communities, it is imperative to explore the conventional method of compensation for past exploitation, which some countries have invoked to restorative justice and the other method being access and benefit-sharing.[97] The latter has been far and few amongst jurisdictions, with the former predominating with affirmative action.

Significant development has taken place to protect the cultural rights of distinct communities. Still, violation seems to be never-ending, with regular cases of misappropriation being done *inter alia*, by leading fashion brands.

Case Study—Kente Cloth

Africa has housed some of the oldest people that the modern world is aware of. Their life and culture have survived thousands of years amidst challenges. Their cultural expression has played a significant role in the formation of what they are today. Amongst the various groups prevalent in this area, the Ewe and Ashanti of Togo and Ghana use certain clothes with specific geometric pattern and colour in West Africa. The said patterns, which is meant to be (in the dress) of the kings of the said community, were found to be worn by a growing number of African Americans in ceremonies like university convocations in the USA. Later it was found to be worn

[91] Burnette (2014).
[92] Ibid.
[93] Winkelman (2005).
[94] For instance, Mono crop cultivation requires no conservation of seeds as the farmers would buy the GMO seed annually. This has led to the extinction of hundreds of indigenous varieties of seeds. And along with that the knowledge of preservation of those indigenous seeds has also gone extinct as well.
[95] Small and Sheehan (2008 103–119).
[96] Jensen (2017: 65).
[97] Reuters (2017).

in a more casual context. This was contradictory to the permissible use of the said culture.

More and more blacks are dressing in whole or in part in African garb as an expression of their identity and racial solidarity or their adherence to the ideology of Afro centricity.[98]

A stark distinction can be noticed in a series of cases where the appropriation has been done by fashion brands, unlike that of independent individuals, as in the case of *Kente* Cloth designs discussed above. Misappropriation of an Inuit Parka design by KTZ, a UK fashion brand; *Mola* Pattern originating in *Guna* Culture of Panama attributed as Puerto Rican Culture by sports brand Nike in its "Air Force 1 Puerto Rico" model of the shoe; Louis Vuitton's *Basotho* blanket from traditional native designs of the people of *Lesotho*, to name a few.

The absence of an internationally recognised regulatory framework has badly been felt, with the rise in such cases reflecting the vacuum and the inability to protect culturally rich communities' intellectual property by existing IPRs. This emerging danger of the loss of biodiversity coupled with various facets of distinctive cultural identity cannot be avoided.

Losing cultural heritage can be mitigated with positive efforts to restore such tangible or intangible articles or artefacts. This can be made possible with strategic research coupled with the intervention of the elderly people of the community. Various culturally extinct objects can be reconstructed with museum employees' assistance having experience and expertise and activists involved in protecting traditional culture. Compensation or benefits received may also be used for the said purpose. It would also be prudent to invest in documenting the indigenous languages as well. Protecting indigenous language can be the key to the reconstruction and rehabilitation of lost TK and TCEs. Efforts are required to protect the language of various indigenous communities from extinction for sustaining these communities' cultural heritage. Loss of language contributes significantly to the loss of TK & TCEs. More and more young peoples of the clan are required to learn them from their elderly members. The majority of traditional practices have moved on from generations only through folklore and seldom by documentation. With many modern-day indigenous members living far away from their ancestral lands and their family members in such territories, it has become challenging for the art forms to be secured and safe for transmission. Information technology can certainly help in this endeavour, if used judiciously.[99]

One of the recent developments to bring equality amongst the stakeholder and certainty in the law of benefit-sharing concerning TK and TCEs, the tiered or differentiated concept, has emerged, which was articulated in the Draft IGC documents (in Article 3 prepared for the 27th Session of WIPO, 2014b; 2014c). This unique approach intends to structure a framework to delineate the various kinds of TK and TCEs, primarily based on their degrees of diffusion (Refer to Fig. 3). This, consequently, tries to identify the extent of exclusive rights that the custodians of such

[98] Austin (1994: 147).

[99] Robinson (2021: 369).

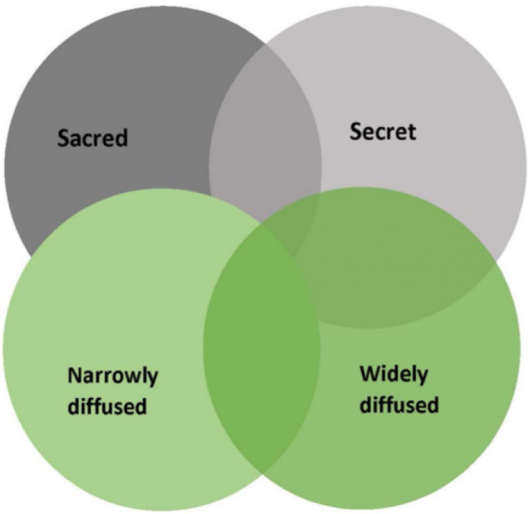

Fig. 3 The four-element of the tiered or diffused concept (Ibid.)

TK and TCEs would be entitled to receive. On the basis of this parameter, the exclusive right may lead to conferring licence on clans or communities to explore such TK. Irrespective of the fact that this approach is not collectively accepted amongst the IGC members. The major challenges being the lack of uniformity amongst the indigenous leaders, scientific clarity of the facts beyond certain period time in the past, reinstate retrospective position prior to the colonial era and impact assessment of knowledge piracy thereof. "The 'tiered and differentiated' approach has been received with mixed feelings, including scepticism and trepidation, especially in the rank of demandeur countries and even the Indigenous Caucus."[100] It is none the less a fluid concept, and it is crystallizing around the following categories: (See Fig. 3).

Secrecy and sacredness are associated with strong or exclusive rights, whereas weaker forms of rights are attached to narrowly diffused and widely diffused Traditional Knowledge and Traditional Cultural Expressions (TCEs) since they are available in the public domain.[101]

The benefit-sharing mechanism in place in India is based on traceability of origin. The benefit is shared where the tribal community can be traced. Some of the immediate benefits that India may enjoy by implementing this model are as follows:

1. A specific positive mechanism would be adopted for the first time in India to act as a standard for subsequent issues,
2. Uniformity in accessing benefit sharing amongst the stakeholders,
3. The element of clarity would be introduced effectively,
4. As identified in this article, India has shown the way to protect TK indirectly by adopting a *sui generis* system of TKDL. Similarly, it can introduce this system in

[100] Supra note 37.
[101] Ibid.

this part of the world which may act as a model to be adapted and acted upon in similar circumstances.
5. This would also avoid a multiplicity of benefit-sharing laws and regulations.
6. This would also enable the indigenous peoples to exercise their rights over their culture, communities and ancestral practices, which upholds the promises undertaken to achieve in the UNSDGs.

The primary objective of the classification mentioned above is to differentiate the weaker forms of rights for the widely available TK and TCEs. This, consequently, would attach an exclusive right (strong right) to the indigenous community, which has kept it secret and outside the public domain. Generally, the indigenous elderly refrain from disclosing TK. Once assured of protection, voluntary documentation of such practices and knowledge be expected. This incentive would encourage the younger members of the community to carry on with their ancestral knowledge as their forefathers. In other words, weaker forms of rights may be attached to widely diffused or publicly available TK and TCEs.[102] By incorporating this process, access and benefit-sharing aspects could be assessed and be acted accordingly. Once the policy is incorporated, the mechanism would assure stratified benefit sharing amongst the stakeholders. The method has been discussed and accepted to some extent in the Global North but has not been done in the Global South. Countries like Canada and Australia have, to some extent, invoked this method of benefit sharing and have got success.[103] India, by adhering to this policy, would position itself to be the trendsetter and a leader in this part of the globe. It is imperative to state that the limited TK and TCEs still left amongst the people, mostly the elderly, requires urgent protection and documentation. The young must be assured of the economic viability of their ancestral knowledge. Special measures should be taken to promote these TK and TCEs and retrospectively protect the rights of these peoples with a robust legal framework to implement benefit sharing, adhering to the principles laid down in the Nagoya Protocol, where India has been a signatory.

To address the complicated issue of bringing TK within the purview of IPR on the one hand and protecting and preserving TK and creating an adequate benefit-sharing mechanism for the indigenous communities on the other would be the key. Given the unique nature of TK, this could be done in two ways:

1. By a law framed by WIPO, or
2. By *sui generis* legislation in India, as has been in some jurisdictions

The Beneficiaries

Application of laws systematically would not only help to preserve the rich TK & TCEs of the world but would be able to benefit approximately four hundred and

[102] Ibid.
[103] Ibid.

seventy-six million Indigenous Peoples worldwide,[104] in over ninety countries which makes up over 6 per cent of the global population, and would be able to contribute to alleviating about fifteen per cent of the extreme poor.[105] The establishment of their rights would also act as an assurance for the continuance of traditional practices associated with that land which is a major untapped source of sustainable agriculture. What could follow is *ubi jus ibi remedium*, where the question of justice for forest-dwelling communities which have faced the brunt at the cost of 'development' could also be achieved. A systematic re-transfer of land to the displaced indigenous communities with the reintroduction of indigenous species would also help in sustainable development. International practices of community ownership should also be ensured in line with ILO 169 and directions laid down in Samatha v. State of Andhra Pradesh.[106] The growing movement of these peoples in the modern world has got its momentum from the judiciary itself. For instance, in the famous Australian case of Queensland[107] the Australian Supreme Court rightfully restored the entire land area back to the aboriginal peoples of Australia. The Indian counterpart to this, Samatha[108] where the Hon'ble Supreme Court of India acknowledges the right to land and natural resources of the tribal peoples in India.[109]

Conclusion

It is imperative to state that the limited TK and TCEs still left amongst the people, mostly the elderly requires urgent protection and documentation. The young must be assured of the economic viability of their ancestral knowledge. Special measures should be taken to promote these TK and TCEs and retrospectively protect the rights of these peoples with a robust legal framework to implement benefit sharing. Millions of people within the indigenous and tribal communities across the world are facing survival-related challenges, where the adult-youth populace have been geographically displaced, away from their homeland in search of survival and social inclusion. Only those, who are old and not otherwise able to move or work, remain in their village. They take care of the children whose parents have migrated in search of their daily wages. Poverty, discouragement and indifference are social prejudices that label their daily lives. '[110]' Why should this be permitted?[111] The indigenous communities, however, do not accept the labels that blemish their origin and traditional consciousness. Some recurring questions need to be addressed by the people in authority and decision-makers.[112] Is it too late today to reinstate the

[104] World Bank (2020).
[105] Ibid.
[106] *Samatha v State of Andhra Pradesh* (1997).
[107] *Mabo v Queensland* (1992).
[108] Supra note 89.
[109] Supra note 55, at p 150.
[110] Rodolfo Stavenhagen (2009: 20).
[111] Ibid.
[112] Ibid.

affairs? Would it be possible in India to protect the cultural, social and economic rights of these dying communities? Could India create opportunities for the young adults who immigrate for better lives?[113] Or would we indulge in cheap politics at the cost of our rich cultural and social heritage? Would we remain silent with the steady loss of diversity, forests and TK & TCEs? Or would we not reclaim our lost glory and help the vulnerable from their extinction. Would we not fight for their cause and help them to be compensated like their Australian and Canadian brothers and sisters? Why the modern legal minds not set up a strategy to combat the evils of policymakers and reinstate the right to life of millions of Indian indigenous peoples.

The significant limitations that are inherent in the Indian legal system are multidimensional. Primarily, the government do not recognize the term indigenous per se irrespective of them once using the word aboriginal in a document before the international community. Secondly, India still follows ILO 107, which has already been replaced by ILO 169. If Nepal can ratify ILO 169, why should India not do so to protect the rights of indigenous and tribal peoples in her jurisdiction? Thirdly, there is no positive protection parameters of these peoples possess towards their land and culture. As a matter of fact, there are many indigenous communities in India that are not recognized under the purview of Scheduled Tribes, making the process 'more of politics than of law'. In submitting the Universal Periodic Review reports, India has suppressed the atrocities these peoples have undergone in the hand of the state and non-tribal peoples. Millions of these peoples have been ousted from their habitat, forcing them to change their profession and contributed to the loss of traditional knowledge, their ancestral cultural expressions, their languages and traditional indigenous farming practices, amongst others. In the absence of any uniform legal framework proposed by WIPO, unlike other IPRs, TK has not been protected positively in India, unlike that of Malaysia or Kenya. In the said backdrop, efforts must be made at the international level to push WIPO to take this area of discourse more positively. In the meantime, India must take all reasonable measures to protect the TK that the country still possesses or may retain with corrective actions and decisions today. Thus *sui generis* efforts and legislations would be the key to provide adequate benefit to the people who have protected and carried on with these rich traditional practices. The tried and diffused concept of benefit sharing can be the best step forward in India to assist in these communities the right impetus to retain our lost art. This would also assist the country in fulfilling the promise and commitment made towards the UNSDGs.

Within the edifice of cultural diversity, a new global ethic needs to be incorporated, as has been reiterated by UNESCO, which would include human rights perspectives, where there should be a proper retrospection of the alternatives available amidst the atmosphere of tolerance mutual respect and democratic debate.[114] In consequence, we would be able to achieve, in building the tower of Babel, where humanity, per se, would reign supreme.

[113] Ibid.

[114] UNESCO's International Commission on Education for the Twenty-first Century identifies "Learning to live together, learning to live with others" as one of the four pillars of education necessary for preparing ourselves for life in the twenty-first century.

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References

Antons, Christoph. 2010. The role of traditional knowledge and access to genetic resources in biodiversity conservation in Southeast Asia. *Biodiversity and Conservation* 19 (4): 1189–1204.

Architha, Narayanan. 2018 Domestic Biological Diversity and ABS Laws, Policies and Practice in India. In A Primer on Biological Diversity Laws, Access and Benefit Sharing ed. M K Ramesh et al., Bangalore: UNDP & CELERA, NLSIU.

Austin, Regina. 1994. A nation of thieves: Securing Black people's right to shop and to sell in White America. *Utah Law Review* 1994 (1): 147.

Banner, Stuart. 2009. *How the Indians lost their land: Law and power on the frontier*. Cambridge: Harvard University Press.

Bareh, Hamlet. 1985. The history and culture of the Khasi People revised and enlarged edition. http://dspace.nehu.ac.in/bitstream/1/7798/1/The%20history%20and%20culture%20of%20the%20Khasi%20(H%20Bareh).pdf. Accessed 20 November 2020.

Biju. K.V. 2019. Don't drive indian farmers to suicide through rcEP, *John Hopkins Advanced School of Advanced International Studies*, (3 November 2019) at https://www.downtoearth.org.in/blog/economy/don-t-drive-indian-farmers-to-suicide-through-rcep-67565. Accessed 14 October 2020.

Boateng, Boatema. 2012. The copyright thing doesn't work here Adinkra and Kente Cloth and intellectual property in Ghana. *African Arts* 45 (3): 9.

Brooks, Harvey. 1994. The relationship between science and technology. *Research Policy* 23 (5): 477–486.

Bruchac, Margaret. 2014. Indigenous knowledge and traditional knowledge. In *Encyclopaedia of global archaeology*, ed. C. Smith, 3814–3824. New York: Springer.

Burgess, Matthew G.., Stephen Polasky, and David Tilman. 2013. Predicting overfishing and extinction threats in multispecies fisheries. *Proceedings of the National Academy of Sciences* 110 (40): 15943–15948.

Burnette, Catherine E., Sara Sanders, Howard K. Butcher, and Jacki T. Rand. 2014. A toolkit for ethical and culturally sensitive research: An application with indigenous communities. *Ethics and Social Welfare* 8 (4): 364–382.

Chakrabarty, Shambhu P.. 2018. *Tribal rights in India*. Singapore: Partridge Publishing Singapore.

Chambers, David Wade, and Richard Gillespie. 2000. Locality in the history of science: Colonial science, technoscience, and indigenous knowledge. *Osiris* 15 (1): 221–240.

Christopher, Free M.., Thorson T.. James, Pinsky L.. Malin, Oken L.. Kiva, John Wiedenmann, and P. Olaf Jensen. 2019. Impacts of historical warming on marine fisheries production. *Science* 363 (6430): 979–983.

Cole, Shawn Allen, and A. Nilesh Fernando. 2014. The value of advice: Evidence from the adoption of agricultural practices. *HBS Working Group Paper* 1 (13): 6.

Coombe, R.J. 1998. *The cultural life of intellectual properties: Authorship, appropriation, and the law*. Duke University Press.

Deb, Debal. 2014. The value of forest: an ecological economic examination of forest people's perspective. In *Challenges and opportunities for the world's forests in the 21st Century*, ed. Trevor Fenning, 123–159. Dordrecht: Springer.

Dickson, David. 1999. ICSU seeks to classify 'traditional knowledge.' *Nature* 401 (631): 2021. https://doi.org/10.1038/44235.Accessed10January.
Dutfield, Graham. 2004. *Intellectual property, biogenetic resources and traditional knowledge*. London: Earthscan.
Dutfield, G., R. Wynberg, S. Laird, and S. Ives. 2020. *Benefit Sharing and Traditional Knowledge: Unsolved Dilemmas for Implementation*. The Challenge of Attribution and Origin: Traditional Knowledge and Access and Benefit Sharing. Voices for BioJustice, Policy Brief.
Dwivedi, Anurag, and Monika Saroha. 2005. Copyright laws as a means of extending protection to expressions of folklore. *Journal of Intellectual Property Rights* 10 (4): 308–314.
Ezeanya-Esiobu, C. 2019. *Indigenous knowledge and education in Africa*. Berlin: Springer.
Fisher, William. 2017. The legal treatment of traditional knowledge. Streamed live on 23 March 2017 at https://youtu.be/z04fHLEOFs4. Accessed 20 November 2020.
Fisher, William. 2018. 2017 David L. Lange lecture in intellectual property: The puzzle of traditional knowledge. *Duke Law Journal* 67 (7): 1511–1578.
Gernigon, Bernard, Alberto Odero, and Horacio Guido. 2000. ILO principles concerning collective bargaining. *International Labour Review* 139 (1): 33.
Holland, Will. 2019. Biopiracy: The misuse of patenting systems at the disadvantage of local communities. *CABI* (21 March 2019) at https://blog.plantwise.org/2019/03/21/biopiracy-the-misuse-of-patenting-systems-at-the-disadvantage-of-less-affluent-communities. Accessed 20 December 2020.
Hsaio, J. 2015. GMOs and pesticides: Helpful or Harmful? *Science in the News*. The Harvard University, The Graduate School of Arts and Sciences Blog (10 August 2015), at https://sitn.hms.harvard.edu/flash/2015/gmos-and-pesticides/. Accessed 17 November 2020.
Ip, John. 2017. The legality of 'suspicionless' stop and search powers under the European convention on human rights. *Human Rights Law Review* 17 (3): 523–544. https://doi.org/10.1093/hrlr/ngw025.
Irwin, Lee. 1997. Freedom, law, and prophecy: A brief history of Native American religious resistance. *American Indian Quarterly* 21 (1): 35–55.
Jensen, Kyle. 2017. A comparison of indigenous and western land management; Case Studies of Ngāti Whātua Ōrākei and the East Bay Regional Park District. *Pomona Senior Theses*. 171 at http://scholarship.claremont.edu/pomona_theses/171. Accessed 10 January 2021.
Juden, Linda Kitchikeesic. 2003. Spiritual link is part of traditional knowledge. *Nature* 421 (6921): 313–313.
Kennedy, Jonathan, and Lawrence King. 2014. The political economy of farmers' suicides in India: Indebted cash-crop farmers with marginal landholdings explain state-level variation in suicide rates. *Globalization and Health* 10 (1): 1–9.
Kuruk, Paul. 1999. Protecting folklore under modern intellectual property regimes: A reappraisal of the tensions between individual and communal rights in Africa and the United States. *American University Law Review* 48 (4): 769.
Landau, Elezabeth. 2010. From a Tree, a "Miracle" Called Aspirin. CNN Health: Matters of the Heart. December 22, 2010, at http://edition.cnn.com/2010/HEALTH/12/22/aspirin.history/index.html. Accessed 20 October 2020.
Lewin, Brent. 2012. India's living Bridges. Readers Digest. 24 October 2012, at http://brentlewin.blogspot.com/2012/10/indias-living-bridges-for-readers-digest_24.html, Accessed 20 October 2020.
Li, Tani Murray. 2010. Indigeneity, capitalism, and the management of dispossession. *Current Anthropology* 51 (3): 385–414.
Márquez, Humberto. 2002. Rights-Venezuela: Indians want voice in use of botanical database. Inter Press Services News Agency December 2, 2002, at http://www.ipsnews.net/2002/12/rights-venezuela-indians-want-voice-in-use-of-botanical-database/. Accessed 18 August 2020.
Maps of World. 2020. World Map. http://www.mapsofworld.com. Accessed 19 August 2020.
McNeil, Kent. 1997. Extinguishment of native title: The high court and American Law. *Australian Indigenous Law Reporter* 2 (3): 365–370.
Mgbeoji, Ikechi. 2001. Patents and traditional knowledge of the uses of plants: Is a communal patent regime part of the solution to the scourge of bio piracy? *Indiana Journal of Global Legal Studies* 9 (1): 163–186.
Miller, R.J. 2005. The doctrine of discovery in American Indian law. *Idaho Law Review.* 42: 1.
Morsink, Johannes. 1993. World war two and the universal declaration. *Human Rights Quarterly* 15 (2): 357.
Myers, Ransom A.., and Boris Worm. 2003. Rapid worldwide depletion of predatory fish communities. *Nature* 423 (6937): 280–283.

Nagaraj, K., K. Sainath, P.R. Rukmani, and R. Gopinath. 2014. Farmers' suicides in India: Magnitudes, trends, and spatial patterns, 1997–2012. *Review of Agrarian Studies* 4 (2): 53–83.
National Research Council. 2013. *The mathematical sciences in 2025*. London: National Academies Press.
Neubauer, Philipp, Olaf P.. Jensen, Jeffrey A.. Hutchings, and K Julia Baum. 2013. Resilience and recovery of overexploited marine populations. *Science* 340 (6130): 347–349.
NIF. 2020. The National Innovation Foundation, at: https://nif.org.in/. Accessed 20 December 2020.
Odhiambo, Thomas, Johan Kamp, and Ran Kamp. 1990. You cannot fix indigenous knowledge. *ILEIA Newsletter* 6 (1): 3–5.
Oguamanam, Chidi. 2013. *Intellectual property in global governance: A development question*. London: Routledge.
Oguamanam, Chidi. 2019. Towards a tiered or differentiated approach to protection of traditional knowledge (TK) and traditional cultural expressions (TCEs) in relation to the intellectual property system. *The African Journal of Information and Communication* 2019 (23): 1–24.
Okediji, Ruth. 2018. Traditional knowledge and the public domain. *Centre for International Governance Innovation Papers* No. 176, at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3202976. Accessed 20 December 2020.
Perroni, Eva. 2017. Five indigenous farming practices enhancing food security. *Food Tank* (14 August 2017) at https://www.resilience.org/stories/2017-08-14/five-indigenous-farming-practices-enhancing-food-security/. Accessed 20 December 2020.
Peter, J. Jacques., and Jessica Racine Jacques. 2012. Monocropping cultures into ruin: the loss of food varieties and cultural diversity. *Sustainability* 4 (11): 2970–2997.
Pillai, Ramesh. 2015. *Linking the Past and the Future: Capturing Knowledge in Malaysia.* WIPO Magazine (February 2015), at https://www.wipo.int/wipo_magazine/en/2015/01/article_0005.html. Accessed 15 February 2020.
Ragavan, Srividhya. 2001. Protection of traditional knowledge. *Minnesota Intellectual Property Review* 2 (2): 1.
Reinhardt, Forest L.. 1999. Bringing the environment down to earth. *Harvard Business Review* 77 (4): 149–149.
Reuters. 2017. Canada will pay compensation to Thousands of Indigenous Stolen Children. The Guardian October 6, 2017, at https://www.theguardian.com/world/2017/oct/06/decades-after-government-seizure-of-children-indigenous-canadians-will-receive-compensation. Accessed 15 October 2020.
Robertson, Lindsay G.. 2005. *Conquest by law: How the discovery of America dispossessed indigenous peoples of their lands*. Oxford: Oxford University Press.
Robinson, Kwame Porter, R. Eglash, A. Bennett, S. Nandakumar, and L. Robert. 2021. Authente–Kente: Enabling authentication for artisanal economies with deep learning. *AI and Society* 36 (1): 369–379.
Sen, Saikat, and Raja Chakraborty. 2017. Revival, modernization and integration of Indian traditional herbal medicine in clinical practice: Importance, challenges and future. *Journal of Traditional and Complementary Medicine* 7 (2): 234–244.
Sengupta, Nirmal. 2019. *Traditional knowledge in modern India*. Berlin: Springer.
Shambhu Prasad, Chakrabarty and Debmalya, Sinha. Forthcoming 2021. 'Traditional knowledge and traditional cultural expressions of indigenous and tribal peoples: The era that was killed and we let die'. In *Tribal Justice,* ed. Yogesh Pratap Singh, Rita Ray, Suvrashree Panda, Soubhagya Sundar Nanda. Eastern Book Company, Lucknow.
Small, Garrick, and John Sheehan. 2008. The metaphysics of Indigenous ownership: Why Indigenous ownership is incomparable to Western conceptions of property value. In *Indigenous peoples and real estate valuation*, ed. Garrick Small, Rachel M. Malmgren, and Robert A. Simons, 103–119. Boston, MA: Springer.
Šokčević, Šimo. 2011. Identity and "Plural Monoculturalism." *Filozofska Istraživanja* 31 (4): 735–749.
Souravi, K., and P. Rahul. 2020. Intellectual property rights and threatened medicinal plants the scenario. In *Conservation and utilization of threatened medicinal plants*, ed. P.E. Rajasekharan and Shabir Hussain Wani. Berlin: Springer.
Stavenhagen, Rodolfo. 2009. Building Intercultural Citizenship: A challenge for our times. In *Indigenous peoples and human rights: The quest for justice*, ed. Subhram Rajkhowa and Manik Chakraborty, 1–21. Calcutta: R Cambray.

Travis, Hannibal. 2008. Cultural and intellectual property interests of the indigenous peoples of Turkey and Iraq. *Texas Wesleyan Law Review* 15: 415.
UNESCO's International Commission on Education for the Twenty-first Century, at https://unesdoc.unesco.org/ark:/48223/pf0000109590?posInSet=12&queryId=f9897ad1-e31b-4acf-a2d8-e64997ad28ab. Accessed 20 December 2020.
UNHRC. 2017. Universal periodic review—India, New York: UNO, Universal Periodic Review India, at https://www.ohchr.org/EN/HRBodies/UPR/Pages/INIndex.aspx. Accessed 22 December 2020.
Vyasanakere, P.J., K. Sudeesh, and B.S. Shylaja. 2008. Astronomical significance of the Gavi Gangadhareshwara temple in Bangalore. *Current Science* 95 (11): 1632–1636.
Wanzala, Justus. 2017. Kenya works with communities on Genetic Resources and Traditional Knowledge Protection, *Intellectual Property Watch* February 17, 2017, at. https://www.ip-watch.org/2017/02/15/kenya-works-communities-genetic-resources-traditional-knowledge-protection/. Accessed 15 October 2020.
Winkelman, Michael. 2005. *Cultural awareness, sensitivity and competence*. Peosta: Eddie Bowers Publication.
WIPO. 2020. International Patent Classification (IPC), at: https://www.wipo.int/classifications/ipc/en. Accessed 18 August 2020.
World Bank. 2020. 'Indigenous peoples', at https://www.worldbank.org/en/topic/indigenouspeoples. Accessed 15 August 2020.
Yang, Tony, Kadambot H.M.. Siddique, and Kui Liu. 2020. Cropping systems in agriculture and their impact on soil health—A Review. *Global Ecology and Conservation*, 23 (8), e01118. https://doi.org/10.1016/j.gecco.2020.e01118.

Cases

Samatha v State of Andhra Pradesh and Ors (1997) Appeal (Civil) 4601-02
Mabo v Queensland (1992) No 2. HCA 23

Legal Acts

American Indian Religious Freedom Act 1980. United States Congress
Protection of Traditional Knowledge and Cultural Expressions Act 2016, Kenya
Geographical Indications of Goods (Registration and Protection) Act, 1999,
Protection of Plant Varieties and Farmer's Rights Act, 2001, India
The Biological Diversity Act, 2002, India