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Traditional Ecological Knowledge and its Relevance to Sustainable Development

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ABSTRACT

Traditional ecological knowledge (TEK) is directly linked to lands, animals, ecology, and natural resources. It is an ancient practice that continued through generations over generations linked to spirituality and sustainability. Often referred to as indigenous knowledge, TEK represents a collective understanding attained over time of the relationship between traditional communities and the earth. TEK is preserved primarily as an oral tradition and is passed from generation to generation through storytelling, ceremonies, arts, crafts, and songs, media that provide rich context and can flexibly evolve to incorporate new observations and understandings. In this background, this paper highlights the significance and challenges of recognizing TEK in ensuring sustainable development. Central to this understanding is how the TEK is related to the right to development among indigenous communities. The extent that the TEK can contribute to mitigating global challenges shall also be discussed in this article.

INTRODUCTION

The interest in traditional ecological knowledge abbreviated as TEK has been growing in recent years, partly due to a recognition that such knowledge can contribute to the conservation of biodiversity, rare species, protected areas, ecological processes, and sustainable resource use in general.[1] The use of TEK is enormously essential for land and natural resources management, development planning, as well as for environmental assessment. TEK also plays an important role in ecological balance and wildlife management, like the indigenous community of Belcher Islands in Canadian low Arctic (*Sanikiluaq community*) has contributed a remarkable wildlife management system through their traditional knowledge of environment and natural resources. Indigenous communities throughout the world have been practicing their own development.[2]

TEK is gaining popularity in fisheries industries, predicting and preventing different natural disasters, mitigating climate change, proper utilization of land and other resources, and so forth. The methods for documenting TEK derive from the social sciences and include ethnography.[3] The strategies and knowledge of these indigenous peoples on land and ecology had hardly enough been recorded or given proper value for the greater possibilities shortly.[4]

Article 1 of the 1989 Convention concerning Indigenous and Tribal Peoples in Independent Countries, No. 169, adopted by the International Labour Organization (ILO) provides a working definition of

[1] Berkes, Fikret. Colding, Johan & Folke, Carl (2000). Rediscovery of Traditional Ecological Knowledge as Adaptive Management, *Ecological Applications, Ecological Society of America*, Volume 10, No. 5, (October, 2000), pp. 1251–1262.
[2] Doubleday, Nancy C. (2004). *"Finding Common Ground: Natural Law and Collective Wisdom"*. In: Traditional Ecological Knowledge: Concepts and Cases (ed). Ottawa, Canada: Trius Design Ltd.
[3] *Greenwood, Kim. Leonetti Crystal & Rinkevich, Sarah (2011). Traditional Ecological Knowledge for Application by Service Scientists.* U.S. Fish & Wildlife Service. Available at https://www.fws.gov/nativeamerican/pdf/tek-fact-sheet.pdf.
[4] Castille, Dorothy. Finn, Symma & Herne, Mose (2017). The Value of Traditional Ecological Knowledge for the Environmental Health Sciences and Biomedical Research, *Environmental Health Perspectives*, Vol. 125, No. 8.

indigenous communities, peoples, and nations stating that: Indigenous communities, peoples and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing on those territories, or parts of them. They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions, and legal system.[5]

The most controversial issue relating to this ancestral practice of indigenous communities over land and natural resources is to whom actual ownership belongs and to what extent the indigenous communities can exercise their rights over those lands and resources. This must be a very essential discussion as indigenous communities largely rely on their lands and natural resources and these are the basic elements on which TEK is exercised. This article specifically focuses on the TEK and practice of the indigenous peoples and on the importance of this knowledge for promoting sustainable development. The article also analyses the existing international legal frameworks and policies which provide recognition to the TEK. Finally, the complexities between the TEK and the right to development are addressed and concludes with some remarks.

CONCEPTUAL UNDERSTANDING AND PRACTICE OF THE TRADITIONAL ECOLOGICAL KNOWLEDGE

Traditional ecological knowledge abbreviated as TEK is an accumulating body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (human and non-human) with one another and with the environment.[6] It does not represent a single body of knowledge; rather, it is a useful construct that represents knowledge gathered from undertaking several different pursuits, such as hunting, medicinal collection, preparation for spiritual ceremonies, or maintenance of a household economy.[7] This knowledge is specific to a location and includes the relationships between plants, animals, natural phenomena, landscapes, and timing of events that are used for livelihood, including but not limited to hunting, fishing, trapping, agriculture, and forestry.[8]

Indigenous peoples emphasize that they share a distinct history, culture, language, and institutional structures[9] in accordance with their own specific values, traditions, and customs. They maintain a unique economic, religious, and spiritual relationship with their lands.[10] In this regard, one of the essential elements of the survival of this community is the preservation of indigenous knowledge. The term indigenous knowledge is part of a more inclusive category of traditional knowledge, which also includes

[5] The United Nations (2004). *Workshop on Data Collection and Disaggregation for Indigenous Peoples.* New York: UN Department of Economic and Social Affairs.
[6] Ibid., 3.
[7]Chipeta, Lucy. Kalanda-Joshua, Miriam. Ngongondo, Cosmo & Mpembeka, F. (2011). Integrating indigenous knowledge with conventional science: Enhancing localised climate and weather forecasts in Nessa, Mulanje, Malawi, *Physics and Chemistry of the Earth*, Volume 36, Issue 14–15, pp. 996–1003.
[8] Ibid., 3.
[9] Gayim, Eyassu (2006). *People, Minority and Indigenous: Interpretation and Application of Concepts in the Politics of Human Rights.* Helsinki: Erik Castren Institute of International Law and Human Rights.
[10] Daes, Erica-Irene (1993). *Discrimination against Indigenous Peoples: Explanatory note concerning the Draft Declaration on the Rights of Indigenous Peoples*, by Erica-Irene Daes, Chairperson of the Working Group on Indigenous Populations, UN Doc E/CN. 4/Sub/2/1993/26/Add.1.

folk knowledge that cannot be credited with such long historical roots as indigenous knowledge.[11] As acknowledged in the Principles and Guidelines for the Protection of the Heritage of Indigenous Peoples, indigenous knowledge is a "complete knowledge system with its own concepts of epistemology, and its own scientific and logical validity".[12] Indigenous knowledge is therefore vital for the survival of the historical and cultural heritage of a particular group as it "forms [its] backbone of social, economic, scientific and technological identity".[13]

However, mostly, the definitions of TEK have failed to include the perspective of indigenous peoples.[14] But in terms of defining traditional knowledge, it is not necessary to say that a particular knowledge has to be derived only from the indigenous people, rather it can also be originated from the local communities. In the case of *Saramaka People v. Suriname*[15], where the Saramakas, a non-indigenous community lives traditionally by fishing, hunting, and woodworking, their relationship with the land is more than economic, but also spiritual and cultural. In the 1990s, Suriname granted logging and mining concessions to private companies within the traditional Saramaka peoples' territory without consultation or their consent. This dispute was taken to the Inter-American Court of Human Rights which for the first time ruled that a non-indigenous community like the Saramakas can enjoy "indigenous rights" if they share some characteristics (spiritual relations with the land, distinct culture, language, traditions, etc.) and are considered as a tribal community protected by the international law. In this case, the Saramakas were thus entitled to recognition of their communal property. The Court once again confirmed the existence of a right to property in some circumstances even if there is no official title.

INTERNATIONAL LEGAL FRAMEWORK IN RECOGNISING TEK

The acknowledgment of TEK was first mentioned in the Brundtland Report in 1987. This landmark document, not only introduced the concept of "sustainable development" to mainstream discourse but also provided international recognition of the potentially vital contribution to be made by Aboriginal people to the resolution of global environmental issues.[16] The UN Declaration on the Rights of Indigenous Peoples, adopted in June 2006 by the UN Human Rights Council (but continuing to struggle to find adoption by the UN General Assembly), stresses that: a) Indigenous peoples have a right to maintain, control, protect and develop their cultural heritage, traditional knowledge, and traditional cultural expressions, as well as manifestations of their sciences, technologies, and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literature, designs, sports, and traditional games and visual and performing arts. They also have a right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions; and; b) in conjunction with indigenous peoples, States shall take effective measures

[11] Tone, Bleie (2005). *Tribal Peoples, Nationalism and the Human Rights Challenge: The Adivasis of Bangladesh*. Dhaka: University Press Limited.
[12] The United Nations (1995). *U.N. Sub-Commission on Prevention of Discrimination and Protection of Minorities, Report of the Sub-Commission on Prevention of Discrimination and Protection of Minorities* on its 46th Session, U.N. Doc. E/CN.4/Sub.2/1994/56 (1994). Available at http://hrlibrary.umn.edu/demo/1994min.html.
[13] Odora Hoppers (2001). *Decolonising the curriculum, indigenous knowledge systems and globalization.* Pretoria: HSRC.
[14] Chowdhury, Rokeya (2013). *Traditional Ecological Knowledge v. Development: Revisiting the Chittagong Hill Tracts.* Dhaka: Dhaka: Empowerment Through Law of the Common People (ELCOP).
[15] Orellana, Marcos A. (2008). Saramaka People v. Suriname, *The American Journal of International Law*, Vol. 102, No. 4 (Oct., 2008), pp. 841–847.
[16] McGregor, Deborah (2006). Traditional Ecological Knowledge, *Ideas: the Arts and Science Review*, Volume. 3, Issue. 1, Faculty of Arts & Science, University of Toronto.

to recognize and protect the exercise of these rights. Thereafter the Rio Declaration (Principal 22) acknowledged the vital role of indigenous peoples in management and development and calls for recognition of their culture, identity, and interests in participation aimed at sustainable development.[17]

The 2010 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (Nagoya Protocol), establish the preeminent international regime for the recognition and protection of TEK. This is a legally binding protocol that establishes that access to traditional knowledge associated with genetic resources is based on prior informed consent or approval and involvement. The exploitation of traditional knowledge of medicinal plants by academics and pharmaceutical manufacturers is a classic example of the inequitable distribution of benefits as well as the unequal application of laws designed to protect intellectual property.[18]

The Framework Convention on Climate Change, the Convention on Biological Diversity, in its Article 8 (j), acknowledges the importance of recognizing the knowledge held by indigenous communities and calls for equitable sharing of benefits arising from commercial utilization of such knowledge and practices. TEK is further recognized in Article 16 as a vital 'technology' for effective practices of conservation and sustainable use of biodiversity.[19]

Under international law, minorities are considered as having collective rights and indigenous peoples as having group rights. But the right to development has widely been regarded as a right of all (not of only minorities and indigenous peoples) to be exercised collectively. While the beneficiary of the right to development is an individual, protecting indigenous economic production systems, recognition of lands, territories, and resources, and traditional knowledge and lifestyles, as well as accessing participation rights that will ensure linguistic and religious rights in the development process, are rights of the group within the collective process of (state) development.[20] A contrary argument made by the Westerners had been universal ownership of TEK, as the world is regarded as a global village and the global economy rejects single ownership of a particular idea. Removing TEK from the community and worldview which created it and 'integrating' it into the dominant Western scientific management paradigm to achieve sustainability can be seen to represent a misappropriation of that knowledge.[21]

In order to provide proper recognition of the traditional knowledge of a particular community and continuing its wide range practices, not being persuasive rather being a mandatory action, it is essential to have national policies relating to this practice and to share benefits with the original knowledge-bearers. For instance, to incorporate TEK into various environmental decision-making processes, such as a growing body of Canadian environmental legislation that includes the Canadian Environmental Assessment Act, the Canadian Environmental Protection Act, and the Species at Risk Act. Also, importance of the obligation of states to consult indigenous peoples before engaging in development,

[17] The United Nations (2007). *United Nations Declaration on the Rights of Indigenous Peoples*. United Nations Document available at https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf.
[18] The UN Environmental Programme (2011). *Nagoya Protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization to the convention on biological diversity: Text and Annex.* Canada: United Nations Environmental Programme.
[19] Ibid.
[20] Salomon, Margot E. & Sengupta, Arjun (2003). *The right to development: obligations of states and the rights of minorities and indigenous peoples.* London: Minority Rights Group International.
[21] Casimirri, G. (2003). *Problems with integrating traditional ecological knowledge into contemporary resource management*. Available at http://www.fao.org/3/XII/0887-A3.htm#P24_2299.

extraction, or investment loans is highlighted by its codification in the national laws of various states such as Bolivia and Chile.[22] In India, where the largest number of indigenous communities can be found, has regulated policies[23] and intellectual property rights have been emerging for possessing TEK and sharing benefits to the local indigenous communities.[24] Recognizing the customary values and determining the concept of knowledge ownership would be beneficial in benefit-sharing. For example, "the Jeevani (Aarogyapachha)" and decision-making process which would result in designing local tools to protect TEK based on customary laws and practices.

THE NOTION OF RIGHT TO DEVELOPMENT

Universally, the right to development has been regarded as an inalienable human right[25] and this right also implies the full realization of the right of peoples to self-determination[26] which includes the exercise of their inalienable right to full sovereignty over all their natural wealth and resources.[27] Article 1 of the Declaration on the Right to Development states that *'The right to development is an inalienable human right by virtue of which every human person and all peoples are entitled to participate in, contribute to, and enjoy economic, social, cultural and political development, in which all human rights and fundamental freedoms can be fully realized.'* The right to development, then, is not a right of states to be developed; it is a right that entails a process of development for all people, respecting all human rights, which necessarily means a development process where effective participation allows for people to determine the terms and nature of development.[28]

The right to development is, of course, a right of all individuals in a country exercised collectively.[29] Whether minorities constitute 'peoples' in a legal sense matters only if they are required to claim their rights within a constructed legal fiction which attributes certain rights, such as self-determination, to peoples but not to individuals as collectives (as per ICCPR Article 27), and further which does not recognize those collectives as groups.[30] On an individual basis, an indigenous person is one who belongs to these indigenous populations through self-identification as indigenous (group consciousness) and is recognized and accepted by these populations as one of its members (acceptance by the group). This preserves for these communities a sovereign right and power to decide who belongs to them, without

[22] Moeckli, Daniel. Shah, Sangeeta & Sivakumaran, Sandesh (2007). *International Human Rights Law*, 3rd edition. UK: Oxford University Press.
[23] Ministry of Law and Justice (2002). *The Biological Diversity Act, 2002 (No. 18 of 2003).* New Delhi, India. Available at http://nbaindia.org/uploaded/Biodiversityindia/Legal/31.%20Biological%20Diversity%20%20Act,%202002.pdf; Ministry of Law and Justice (2006). *The Forest Act, 2006.* New Delhi, India. Available at https://hpforest.nic.in/files/Forest%20Right%20Act%202006.pdf.
[24] Harisha, R.P. Padmavathy, S. & Nagaraja, B.C (2016). Traditional Ecological Knowledge and Its Importance in South India: Perspective from Local Communities, *Applied Ecology and Environmental Research*, 14 (1). pp. 311–326.
[25] The United Nations (1986). Article 1(1), Declaration on the Right to Development, Adopted by General Assembly Resolution 41/128 of 4 December 1986. Available at https://www.ohchr.org/en/professionalinterest/pages/righttodevelopment.aspx.
[26] Which is a group right.
[27] Ibid, 25.
[28] Ibid, 20.
[29] Ibid, 10.
[30] Gayim, Eyassu (2001). The Concept of Minority in International Law: A Critical Study of the Vital Elements, *Netherlands International Law Review*, Volume 49, Issue 3, pp. 408–412.

external interference".[31] But for an indigenous community as a whole, the right to development in a certain sense should be regarded as a group right, and such a group right is also entangled with a right to development within the community. It has been mentioned in the 2030 Agenda for Sustainable Development that *"Indigenous peoples….should have access to life-long learning opportunities that help them to acquire the knowledge and skills needed to exploit opportunities and to participate fully in society."*[32]

The rights of indigenous peoples within the right to development can therefore be closely linked to several broad international legal standards and principles: participation rights, the right to self-determination, and recognition and implementation of related group rights, such as those pertaining to land and natural resources. To this extent, it can be said that the indigenous communities have their rights to or not to take part in any kind of project that relates to their right to development and they shall have full possession over land and resources to continue practicing TEK without facing any hindrance from the government. This argument is also favored by Article 14-18 of Indigenous and Tribal Peoples Convention, 1989 (No.169)[33], where it has been specifically mentioned that the land and resources of the indigenous communities which they traditionally occupy shall be recognized and governments must identify such lands and guarantee effective protection of their (indigenous community) rights of ownership and possession. In this way, though much debated, the right to self-determination of the indigenous people of a State can also be ensured.

For instance in Bangladesh, the Chakmas are called *Jumma* people (who do the *Jum* cultivation). The *Jum* cultivation in the Chittagong Hill Tracts (a special type of cultivation done by the Chakma indigenous community for their livelihood) has been the sole source of livelihood to the Chakmas and this has been continuously disrupted and eventually banned by the government in the name of soil erosion. The State never acknowledged that the lands of Chittagong Hill Tracts are for those indigenous peoples and has permanently set up a military base on the territory of the Chittagong Hill Tracts where they used to cultivate *Jum* (which is contrary to Article 30 of the United Nations Declaration on the Rights of Indigenous Peoples). Furthermore, the government initiated policies against *Jum* cultivation and even imposed heavy land taxes upon those willing to continue such cultivation in any way. In reality, nothing would possess soil erosion from this practice rather this prohibition has led a threat to the survival of this community. Moreover, it has also created a knowledge-sharing gap between the elders and young generations in this community which put a hindrance to the continuance of TEK usage and their right to self-determination.

On one hand, people who are dependent on local resources for their livelihood are often able to assess the true costs and benefits of development better than any evaluator coming from outside, on the other, the use of TEK may benefit development in providing more realistic evaluations of environment, natural resources, and production systems.[34] Traditional Ecological Knowledge is particularly well suited for identifying environmental changes attributable to climate change at the local and regional level.[35]

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[31] Ibid, 5.
[32] The United Nations (2015). *UNGA: Transforming our world-2030 Agenda for Sustainable Development*, 18 September 2015, 17th Session, UN DOC A /70/L.1. Available at https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf.
[33] ILO (1989). *Indigenous and Tribal Peoples Convention, 1989 (No. 169).* Available at https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C169.
[34] Ibid, 2.
[35] Ibid, 3.

In these circumstances, the most crucial part is striking a balance between the two. Undoubtedly, TEK can play a vital role in expanding ideas over food security, global economy, health issues, biodiversity conservation, etc. All these are elements leading to sustainable development. Moreover, indigenous knowledge provides a crucial foundation for community-based adaptation and mitigation actions that sustain the resilience of social-ecological systems at the interconnected local, regional, and global scales.[36]

COMPLEXITIES BETWEEN TEK AND THE RIGHT TO DEVELOPMENT

The duty-bearers of the right to development, as the DRD makes clear are the state acting at the national level and acting individually or collectively at the international level.[37] In practical terms, this implied that infusing TEK into development would mean considering local specifics or biodiversity, involving indigenous people in resource identification and monitoring, and equitable distribution of outcomes.[38] A question arises in this regard, what if the right to the development itself puts a barrier towards TEK usage? Unfortunately, in the name of development, indigenous knowledge systems were altered and disrupted in Africa during the colonial period.[39] It has still continued its legacy. For instance in Mongolia, a government policy enacted in 2002 led to combining of townships and shifting of key social services, including schools, to city centers in the region (e.g., Xiwu Qi Autonomous Region People's Congress 2006). This shift in government services has required children to move away from extended families and herding land to participate in compulsory education, which has increased barriers to the transmission of herding knowledge across generations. In addition, as Mongolian children spend at least nine years in cities for education, they interact extensively with other cultural groups and are exposed to alternative and increasingly western lifestyles. As a result, many Mongolian youths have turned away from traditional herding practices in favor of city-based livelihoods.[40]

Another crucial aspect of TEK usage has been the vast commercialization of lands and natural resources. Sometimes for the sake of development and globalization, both states and private sectors (e.g. development agencies and international organizations) enter into agreements without considering the customs and practices of the indigenous communities, allowing them to interfere with indigenous practices and affecting much to their living. In some cases, the indigenous communities are forcibly relocated to other areas and this leads to their physical displacement from the ancestral lands. The World Commission on Dams revealed that indigenous and tribal peoples have suffered disproportionately from the negative impacts of large dams, while often being excluded in sharing the benefits created in the name of promoting development.[41] Especially for indigenous peoples and ethnic minorities, dam-induced displacement has already triggered a spiral of events and spreads beyond the submerged area.[42] For

[36] Raygorodetsky, Gleb (2011). *Why Traditional Knowledge Holds the Key to Climate Change*. Available at https://unu.edu/publications/articles/why-traditional-knowledge-holds-the-key-to-climate-change.html.
[37] The United Nations (2013). *Realizing the Right to Development: Essays in Commemoration of 25 Years of the United Nations Declaration on the Right to Development.* The United Nations Publication. Available at https://www.ohchr.org/Documents/Publications/RightDevelopmentInteractive_EN.pdf.
[38] Houde, Nicolas (2007). The Six Faces of Traditional Ecological Knowledge: Challenges and Opportunities for Canadian Co-Management Arrangements, *Ecology and Society*, 12(2), 34, pp. 1–17.
[39] Lalonde, Andre (2004). *"African Indigenous Knowledge and its Relevance to Sustainable Development"*. In: Traditional Ecological Knowledge: Concepts and Cases (ed). Ottawa, Canada: Trius Design Ltd.
[40] Gawin, Michael C. &Tang, Ruifei (2016). A classification of threats to traditional ecological knowledge and conservation responses, *Journal of Conservation and Society*, Vol 14 Issue 1, pp.57–70.
[41] Haque, Mahfuzul (2014). *"Dams and Development-Revisiting Kaptai Hydro-Project in Bangladesh"*. In: Human Rights and Religion (eds). Dhaka: Empowerment Through Law of the Common People (ELCOP).
[42] Ibid, 41.

instance, the Bayano dam in Panama forced indigenous Kuna and Embera peoples from their traditional territories and resettled them in less fertile land subject to encroachment by loggers. This is due to the failure of fulfilling agreements by the Panamian government to the affected indigenous people during the time of construction. Similarly, around 100,000 Chakma people were displaced due to the massive collapse of the Kaptai hydropower dam in the Chittagong Hill Tracts, Bangladesh, which submerged two-fifth of their cultivable land. Not only had this, eventually, among these 100,000 Chakma people, but 40,000 of them also left to India and another 20,000 to Myanmar.

In most cases, the concerned indigenous community remains uninvited for any consultation before the commencement of any project within the territory where they live. In some cases, the indigenous communities have their own land and resources management system, which should not be disrupted. For instance, in New Zealand, Maori use the practice of *Kaitiakitanga*, which refers to a form of common property management used to ensure the guardianship of the natural environment and resources, as well as its sustainable use for the survival of the community. Article 7(2) of the Indigenous and Tribal Peoples Convention, 1989 (No. 169) states that 'their participation and co-operation, shall be a matter of priority in plans for the overall economic development of the areas they inhabit'.[43]

The Guide on Convention 169 suggests that while Article 7 does not provide for a right of veto by indigenous peoples over development plans, there must be: 'actual consultation in which [indigenous and tribal] … peoples have a right to express their point of view and a right to influence the decision. This means that governments have to supply the enabling environment and conditions to permit indigenous and tribal peoples to make a meaningful contribution.'[44] In 2002, the Inter-American Court of Human Rights (IACHR) ruled on the importance of consent and the implied need for prior participation in decision-making regarding indigenous peoples and their land in Awas Tingni Indigenous Community of Mayagna v. the State of Nicaragua. Finding that Nicaragua had violated the right to property, judicial protection, and due process of law, by granting logging concessions on the lands of indigenous peoples without taking steps to title and demarcate those lands, the IACHR held that: 'The State of Nicaragua is actively responsible for violations of the right to property, embodied in Article 21 of the Convention, by granting a concession to the company SOLCARSA to carry out road construction work and logging exploitation on the Awas Tingni lands, without the consent of the Awas Tingni Community.'[45]

In reality, this is a violation of indigenous people's rights. It is not easy and acceptable to adjust to a new location and start using a different land after leaving their own lands and resources along with the age-long practices with TEK. This form of land eviction and therefore a sudden change of occupation has over time resulted in less interaction with their surroundings and less interaction with elders leading to a knowledge gap between younger and elderly people within the indigenous communities. The Court has also developed a system of reparations that are applicable in the case of violations of indigenous peoples' rights.[46]

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[43] Ibid, 37.
[44] Espiell, Hector G. (1991). *"Introduction: Community-oriented rights".* In: International Law: Achievements and Prospects (ed). The Netherlands: Martinus Nijhoff Publishers.
[45] Inter-American Court of Human Rights (2001). *Case of the Mayagna (Sumo) Awas Tingni Community v. Nicaragua Judgment of August 31, 2001 (Merits, Reparations and Costs).* Inter-Am. Ct. H.R., (Ser. C) No. 79 (2001). Available at http://oas.org/dil/XXXV_Course_IACHR_Case_Mayagna_v_Nicaragua_Luis_Toro.pdf.
[46] Inter-American Court of Human Rights (2007). Case of the Saramaka People v. Suriname, Saramaka People v. Suriname, Preliminary objections, merits, reparations and costs, IACHR Series C no 172, IHRL 3046 (IACHR 2007), 28th November 2007. Available at https://www.corteidh.or.cr/docs/casos/articulos/seriec_172_ing.pdf.

SIGNIFICANCE OF TEK IN PROMOTING SUSTAINABLE DEVELOPMENT

The term "sustainable development" was first mentioned in the report of the World Commission on Environment and Development, Our Common Future. It was here defined as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs".[47] It has been argued recently that TEK is a key element in sustainable development; it also offers solutions to problems arising due to globalization and changes in components of human well-being.[48]

Many indigenous and local communities are situated in areas where vast majority of the world's genetic resources are found.[49] Proper utilization of the traditional knowledge in managing these resources would be a profitable step for both the indigenous communities and therefore to the concerned countries. Many studies also suggest that TEK is progressively seen more as an efficient and viable tool for tackling forest sustainability by involving the local communities.[50] Indigenous knowledge has been therefore used increasingly to "remedy many of the problems [caused] by development strategies during the past five decades".[51]

The 1992 United Nations Conference on Environment and Development in Rio de Janeiro (Rio Earth Summit) conceptually endorsed and empowered the model concurrent to the opening for signature of the Rio Treaties: 1992 United Nations Convention on Biological Diversity (CBD), the 1992 United Nations Framework Convention on Climate Change (UNFCCC), and the 1994 United Nations Convention to Combat Desertification (UNCCD), which collectively establish rules and regimes committed to sustainable development.[52] Rio 20+ Declaration was a commitment to establish a 2030 Agenda for Sustainable Development. Amongst 17 Sustainable Development Goals (SDGs) with 169 goal-specific targets, the 2030 Agenda mentions goal 2 titled "sustainable development to end hunger, achieve food security and sustainable agriculture", acknowledges that such a goal can be achieved through inputs and traditional knowledge of indigenous peoples in the world.[53]

In the report "Realizing the Future We Want", the UN System Task Team on the Post 2015 UN Development Agenda acknowledges the importance of indigenous knowledge for environmental sustainability stating that "traditional and indigenous knowledge, adaptation and coping strategies can be major assets for local response strategies".[54] Work on indigenous knowledge provides support to understanding the role of customary livelihoods within sustainable development and the links between environmental management, science, and well-being.[55] Because many indigenous peoples holistically

[47] The United Nations (1987). *Our Common Future: Report of the World Commission on Environment and Development*. Available at https://www.are.admin.ch/are/en/home/sustainable-development/international-cooperation/2030agenda/un-_-milestones-in-sustainable-development/1987--brundtland-report.html.
[48] Ibid., 24.
[49] The UNDP (2011). *Human Development Report 2011 Sustainability and Equity: A Better Future for All*. New York: Palgrave Macmillan.
[50] Ibid.
[51] Magni, Giorgia (2017). Indigenous knowledge and implications for the sustainable development agenda, *European Journal of Education*, No. 52, pp. 437–447.
[52] Birnie, Patricia. Boyle, Alan & Redgwell, Catherine (2009). *International Law and the Environment*, 3rd edition. New York: Oxford University Press.
[53] Ibid, 32.
[54] Ibid, 37.
[55] The United Nations (2014). *Thematic paper towards the preparation of the 2014 World Conference on Indigenous Peoples*. Available at

view their environment, they may be aware of linkages between various ecological processes, multiple species, and abiotic factors that influence species biology.[56]

Therefore, the World Conference on Science, organized by UNESCO and the International Council for Science (ICSU) in 2002, in its Declaration on Science and the Use of Scientific Knowledge, explicitly recognized the importance of TEK and the need to respect and encourage its use for various forms of human endeavor. Most commonly accepted is the role of TEK in the "traditional" or primary sectors of the economy: agriculture and pastoralism, forestry, fisheries, water, and products made from natural resources such as crafts, furniture, housing, and so on.[57] On the other hand, without addressing fundamental issues like self-determination, restitution of lands and resources, and compensation, how can power be shared in a way which will ensure that traditional knowledge is not misunderstood or misused?[58]

The 2007 United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) vests rights relating to 'control, protection and development' of TEK, as well as Intellectual Property Rights relating to TEK, with Indigenous and Local Communities (ILCs).[59] Since 2009, the World Intellectual Property Organization (WIPO) members have embarked on formal negotiations towards one or more international legal instruments that would ensure an effective protection of genetic resources, traditional knowledge, and traditional cultural expressions. Furthermore, it has established a voluntary fund to facilitate indigenous and local communities' participation in the work of the WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional knowledge, and Folklore (IGC).

The new pharmaceutical industries can now mimic or copy chemical properties of plants and herbs used by native healers at least over centuries and probably over much longer periods. As a result of patent taking, these multinationals are likely to earn enormous profits.[60] At the United Nations Conference on Sustainable Development, with support of New Zealand, Brazil, and Norway, Australia's Prime Minister, announced the development of the World Indigenous Peoples and Local Communities' Land and Sea Managers' Network (WIN). The WIN aims to connect Indigenous peoples and local communities around the world to share their experiences in using traditional knowledge and practices with contemporary management systems to better manage their environments and support sustainable livelihoods. In addition, public institutions with honorable intentions of saving biodiversity create gene banks and national parks without consulting native peoples, often imposing new restrictions on them.[61]

CONCLUSION

Traditional ecological knowledge is based on mutual well-being and sharing. Its greater practice would serve a positive change to the severely disrupted global environment. This was reaffirmed at the 32nd

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https://www.un.org/en/ga/69/meetings/indigenous/pdf/IASG%20Thematic%20Paper_Participation%20-%20rev1.pdf.

[56] Drew, Joshua A. (2005). Use of Traditional Ecological Knowledge in Marine Conservation, *Conservation Biology*, Volume 19, No. 4 (August 2005), pp. 1286–1293.

[57] *Posey*, Darrell A. (1999). *Cultural and Spiritual Values of Biodiversity*. Nairobi: United Nations Environment Programme.

[58] Ibid, 11.

[59] Ibid, 17.

[60] Ibid, 11.

[61] Bengwayan, Michael A. (2003). *Intellectual and Cultural Property Rights of Indigenous and Tribal Peoples in Asia*. London: Minority Rights Group International.

Session of the IPCC in 2010 where indigenous or traditional knowledge may prove useful for understanding the potential of certain adaptation strategies that are cost-effective, participatory, and sustainable. But the growing need to TEK will achieve little if the rights and responsibilities towards the indigenous peoples and other traditional communities to whom it genuinely belongs are not duly respected. At present, the indigenous communities are facing gradual extinction due to lack of recognition of their traditional knowledge, values, and practices and therefore their right to self-determination has also been at stake.

These communities indeed are the repositories of vast accumulations of traditional knowledge and experience that link humanity with its ancient origins. Their disappearance is a loss for the larger society, which could learn a great deal from their traditional skills of sustainably managing very complex ecological systems. It is a terrible irony that as formal development reaches more deeply into rain forests, deserts, and other isolated environments, it tends to destroy the only cultures that have proved able to thrive in these environments.

Despite the challenges, indigenous peoples and local communities have much to contribute to global discussions concerning sustainability and have a right to participate in matters that may affect them. Otherwise, this will lead to an unfortunate situation, like the avert and dramatic disruptions of *Karuk* management and knowledge systems began with the intensive influx of non-Natives to the mid-Klamath, the failure of the U.S. Congress to ratify the treaties it signed with the Karuk people, and the direct genocide of the gold rush era in the 1850s. Also, mechanisms for incorporating local knowledge into regional-specific policy should be developed. Therefore, the TEK research community should undertake more studies at the national or subnational or regional level to evolve a framework for TEK policy.