Balancing Green Innovation and IP Protection

*Parikshet Sirohi**

ABSTRACT

The urgent global fight against climate change and environmental degradation has intensified the need for sustainable solutions. Innovations that reduce ecological harm and promote sustainability are essential to address challenges like resource depletion, global warming, water scarcity, and pollution. Green technologies—ranging from renewable energy sources such as solar, wind, and hydroelectric power to waste management strategies like carbon capture, recycling, and composting—play a vital role in this effort.

Intellectual Property (IP), particularly patents, has enabled innovation across sectors by incentivizing research and development. While patents reward creators and attract investment, they can also raise technology costs and limit accessibility, especially for startups and smaller enterprises. This duality may hinder the widespread adoption of environmentally beneficial technologies.

Patent laws are crucial for encouraging green innovation by offering exclusive rights and financial incentives. However, India's patent regime presents challenges: high filing costs, complex procedures, and slow enforcement deter small players. The compulsory licensing framework, though aimed at improving access, may discourage inventors fearing loss of control. Additionally, the absence of fast-track programs for green patents—unlike in the U.S. and Europe—delays market entry of eco-friendly technologies. This article explores the intersection of environmental innovation and IP, analyzing how patent laws can both foster and impede green technology development, and advocates for a balanced approach to support sustainability goals.

Keywords: *Green Technology, Innovation, Patents, Commercialize, Sustainable.*

* Assistant Professor, Faculty of Law, University of Delhi.

1. Introduction

Today, our planet faces multiple environmental challenges, ranging from climate change to atmospheric pollution. In many countries including ours, environmental issues are now at the centre stage of policymaking, and 'green innovation' is gaining prominence like never before.[1] The climatic changes that we face today, have given rise to a host of issues like global warming and resource degradation.[2] The latter category includes pollution of air, ground water, soil and food sources, as well as destruction/denudation of forests, and destruction of natural habitat of plants and animals. The threat posed is a real one, and necessitates a swift, determined, and synchronized global response. To ensure our very survival, it is absolutely imperative that we move towards a low-carbon, sustainable future, in the wake of rising temperatures, and increased sea levels.[3] In the coming years, such problems will become increasingly acute, on account of the increased occurrence of such adverse weather incidents.[4]

Several international and national instruments, ranging from the United Nations (UN) Framework Convention on Climate Change (UNFCCC), 1992[5] to the Paris Agreement, 2015,[6] have been created to protect our environment. The Sharm El-Sheikh Climate Implementation Summit,[7] better known as COP27, took place in Egypt in November 2022, and focused upon how climate change adversely impacted food production

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1 Rui Chen, Muhammad Ramzan, *et. al*., "Green Innovation-green Growth Nexus in BRICS: Does Financial Globalization Matter?" 8(1) *Journal of Innovation & Knowledge* 100286 (2023).

2 The Effects of Climate Change, *available at*: https://science.nasa.gov/climate-change/effects/ (last visited on Feb. 22, 2025).

3 Sustainable Development Goals, *available at*: https://www.un.org/sustainabledevelopment/climate-change/ (last visited on Mar. 13, 2025).

4 Shiv Bolan, Lokesh P. Padhye*, et. al*., "Impacts of Climate Change on the Fate of Contaminants Through Extreme Weather Events" 909 *Science of The Total Environment* 168388 (Jan. 20, 2024).

5 Treaty signed by 154 nations during the UN Conference on Environment and Development (UNCED) which was held at Rio de Janeiro in 1992. This treaty came into effect on March 21, 1994, and its aim was to resist "dangerous human interference with the climate system". See United Nations Climate Change, *available at*: https://unfccc.int/ (last visited on Jan. 31, 2025).

6 Negotiated by 196 parties during the 2015 UN Climate Change Conference in Paris. This Agreement has 195 parties, as of February 2023. Of the three UNFCCC members which have not signed this Agreement, only Iran is a major emitter. United States of America (USA) which is the second-largest emitter in the world, withdrew from the Agreement in 2020, rejoined it in 2021, and again announced its withdrawal in 2025. See United Nations Climate Change, "The Paris Agreement: What is the Paris Agreement?", *available at*: https://unfccc.int/process-and-meetings/the-paris-agreement (last visited on Jan. 31, 2025).

7 More than 92 heads of state, an estimated 35,000 representatives, and delegates from 190 countries attended the 27th UN Climate Change Conference, also known as the Conference of the Parties of the UNFCCC or COP27, which took place in Sharm El Sheikh, Egypt, from November 6–20, 2022, under the presidency of Egyptian Minister of Foreign Affairs Sameh Shoukry. See United Nations Climate Change, "About us", *available at*: https://unfccc.int/cop27 (last visited on Feb. 2, 2025).

and food security.[8][9] The summit attempted to develop measures to deal with these situations in the future, and Least Developed Countries (LDCs)[10] were invited to create, and present their adaptation plans.[11]

While industrial and technological development are certainly important for our economic well-being, these have also become critical reasons for environmental pollution and degradation. The march of technology is an essential facet of this dilemma, and both our public and private sectors need to consider green inventions for better sustainability. Scientists across the world have identified technologies, a good deal of which have enormous potential to cut emissions through solutions like efficient use of energy, reduction of carbon footprint, changes in urban mobility with increased use of electric transport, and newer forms of renewable energy.[12] Intellectual Property (IP) policies which encourage financing of Research and Development (R&D) activities are vital if we have to transport these solutions from the workshop to the outside world.

The present generation has a huge and often insatiable appetite for new technology which needs regular/constant updation. While it may be impossible to take steps backward to correct the harm which has already been caused; what can be done is to prevent further harm. That being the case, it is essential to involve a wide gamut of persons from industry, academia, and government to frame policies through which we can ensure that development can take place, without irreparably damaging the environment. 'Green technology' or 'greentech', which comprises technologically-advanced mechanisms, are increasingly being adopted the world over, in an attempt to address environmental concerns, without sacrificing

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[8] Alisher Mirzabaev, Rachel Bezner Kerr, *et.al.*, "Severe Climate Change Risks to Food Security and nutrition" 39 *Climate Risk Management* 100473 (2023).

[9] United States Environmental Protection Agency, "Climate Change Impacts on Agriculture and Food Supply", *available at*: https://www.epa.gov/climateimpacts/climate-change-impacts-agriculture-and-food-supply#:~:text=Climate%20impacts%20like%20sea%20level, taro%2C%20breadfruit%2C%20and%20mango.&text=These%20crops%20are%20often%20key,have%20cultural%20and%20economic%20importance. (last visited on Jan. 17, 2025).

[10] The UN listed the first set of LDCs in its resolution no. 2768 (XXVI) on November 18, 1971, and has, since then, identified developing nations with the lowest socio-economic development metrics. There are currently 44 economies which the UN has designated as LDCs, entitling them to preferential market access, aid, special technical assistance, and capacity-building on technology among other concessions. See UN trade & development, "UN List of Least Developed Countries", *available at*: http://unctad.org/topic/least-developed-countries/list (last visited on Feb. 13, 2025).

[11] LDC Expert Group, *National Adaptation Plans: Technical Guidelines For The National Adaptation Plan Process* 77 (United Nations Framework Convention on Climate Change, 2012).

[12] Xin Wang, Xiuping Dong, *et. al*., "Transportation Carbon Reduction Technologies: A Review of Fundamentals, Application, and Performance" 11(6) *Journal of Traffic and Transportation Engineering* 1346 (Dec. 2024).

technical advancements. The Happy Seeder technology[13], which was developed by the Reviving the Green Revolution (RGR) cell[14] of Tata Trusts[15] in Punjab, is a good example of this phenomenon. The RGR cell worked with researchers at the Punjab Agricultural University (PAU), Ludhiana[16] to develop this machine, which is a tractor-mounted machine which can directly drill wheat into rice stubble post-harvest. It sows seeds and removes straw at the same time, thus helping the field retain moisture, while encouraging seed germination. The advantages of this technology are manifold: on the one hand, it eliminates the need to burn the paddy stubble, thereby curbing atmospheric pollution; and on the other, it mulches the field with the straw, which improves soil fertility, and improves crop performance.[17]

Green technology aims to combine technology with the environment,[18] and therefore, it is also variously referred to as environmental technology, clean technology, or sustainable technology.[19] India has emerged as one of the leaders in the world in the field of clean and green technology, and aims to use it as a sustainable solution to several pressing problems[20] [21]. 'Green innovation' is a concept which has become increasingly popular in the

[13] Tata Trusts, "Ending Burning of Crop Stubble Through Happy Seeder Technology", *available at*: https://www.tatatrusts.org/our-work/livelihood/agriculture-practices/ending-burning-crop-stubble-through-happy-seeder-technology (last visited on Jan. 7, 2025).

[14] Reviving Green Revolution: An Initiative of Tata Trusts, "Reviving Green Revolution Cell", *available at*: https://www.rgrcell.org/ (last visited on Jan. 7, 2025).

[15] The Tata Trusts represent humanitarianism and the extraordinary force that pushes the boundaries of social and economic development for people all throughout the nation. See Tata Trusts, "About Tata Trusts", *available at*: https://www.tatatrusts.org/about-tatatrusts (last visited on Jan. 8, 2025).

[16] One of the best agricultural universities in the country, it is spread over an area of 494 hectares at Ludhiana with an off-campus area of 1793 hectares. It has several constituent colleges, viz., College of Agriculture, PAU-College of Agriculture located at Ballowal Saunkri, College of Agricultural Engineering & Technology, College of Basic Sciences & Humanities, College of Community Science, College of Horticulture & Forestry, and PAU Pre-Graduation Institutes of Agriculture, located at Gurdaspur and Bathinda. See Punjab Agricultural University, "About PAU: History", *available at*: https://www.pau.edu/index.php?_act= manageLink& DO=firstLink&intSubID=11 (last visited on Jan. 22, 2025).

[17] *Supra* note 13.

[18] Pablo Cisneros Chavira, Ahm Shamsuzzoha, *et.al.*, "Defining Green Innovation, Its Impact, and Cycle – A Literature Analysis" 17 *Cleaner Engineering and Technology* 100693 (Dec. 2023).

[19] Umme Habiba, Cao Xinbang, *et.al.*, "Do Green Technology Innovations, Financial Development, and Renewable Energy use help to Curb Carbon Emissions?" 193 *Renewable Energy* 1087-8 (June 2022).

[20] World Economic Forum: Energy Transition, "How India is Emerging as an Advanced Energy Superpower", May 27, 2024, *available at*: https://chemindigest.com/india-emerges-as-a-global-clean-energy-leader/#:~:text=India%20has%20achieved%20a%20major,a%20global%20clean%20energy%20superpower. (last visited on Jan. 29, 2025).

[21] CID Editorial Team, "India Emerges as a Global Clean Energy Leader" *Chemical Industry Digest*, Jan. 2, 2025, *available at*: https://chemindigest.com/india-emerges-as-a-global-clean-energy-leader/#:~:text=India%20has%20achieved%20a%20major,a%20global%20clean%20energy%20superpower. (last visited on Feb. 10, 2025).

West since 2009, and takes within its ambit, the development of new technology, products, and processes, which aim to reduce the impact of human activity upon the environment.[22] Intellectual Property Rights (IPRs), especially patents, can play a crucial role in encouraging such innovations. Patents are a powerful mechanism to stimulate 'green innovation' because they offer inventors a great deal of benefits, such as monopoly for a period usually extending up to twenty years, sharing of knowledge, and collaboration. However, patent protection also involves high costs of filing and enforcement, which can adversely affect smaller entities from obtaining such protection. Apart from patents, Traditional Knowledge (TK) of communities can also be harnessed to produce green technology. When we look at different ancient civilizations across the world, we can find a common thread of deep respect and interdependence with the natural environment. The cultures, beliefs, and daily practices of these civilizations were shaped by their relationship with nature, and often reflected a deep awareness of the importance of the environment. Thus, if we look at the practices and culture of rural societies, *Adivasis*, and nature worshippers across the country, we can get numerous ideas which can be used to further the cause of green tech.[23]

Green technology has to become widely accessible in order to become an effective tool to address global issues like climate change and resource degradation.[24] The present scenario wherein the developed economies of the West are effectively utilizing environment-friendly technology, while others are being left behind, can be inexpedient to the overall goal of green technology, as a whole.[25] If green technology is not widely accessible, the motivation to use it will be significantly diminished.[26] In the present scheme of things, 'green patents' have come to hold a prominent place, because they deal with the protection of diverse forms of green technology, under one umbrella.[27] However, some aspects, like 'compulsory licensing', still need clarification in order to ensure easy transfer of

[22] *Supra* note 18.

[23] Ayan Mondal and Maya Shanker Pandey, "Indigenous Festivals and Climate Sustainability in India: A Case Study of Cultural Practices and Performances" 16(1) *Rupkatha Journal on Interdisciplinary Studies in Humanities* (2024), *available at*: https://rupkatha.com/V16/n1/v16n103.pdf (last visited on Dec. 23, 2024).

[24] Arshian Sharif, Uzma Bashir, *et.al.*, "Exploring the Impact of Green Technology, Renewable Energy and Globalization Towards Environmental Sustainability in the Top Ecological Impacted Countries" 15(6) *Geoscience Frontiers* 101895 (Nov. 2024).

[25] Patrik Söderholm, "The Green Economy Transition: The Challenges of Technological Change for Sustainability" 3(6) *Sustainable Earth* (2020).

[26] Mohsin Shahzad, Ying Qu, *et.al.*, "Adoption of Green Innovation Technology to Accelerate Sustainable Development Among Manufacturing Industry" 7(4) *Journal of Innovation & Knowledge* 100231 (Oct.-Dec. 2022).

[27] Li Xiangning, "Green Technology and Patents: in the European Context*"* 19 (Spring 2020) (Master Thesis, Faculty of Law, Lund University).

these technologies. There is a pressing need to either update or modify some of the existing preconditions with regard to green technology. Nations must collaborate and align their efforts in order to best achieve the goals of sustainability.

2. International Instruments

In the twenty-first century, building a path to a sustainable future is of profound importance. Adopting green technology is not a matter of choice for the statesmen of today; rather, it is an idea whose time has come, because the very survival of mankind is at stake.[28] Green technology covers within its ambit, various technologies which are sustainable and environment-friendly, and is therefore, also called 'clean technology'. Greenhouse gas emissions, indiscriminate usage of fossil fuels, and large volume of carbon emissions have created environmental lopsidedness, and this is the foremost reason why we have been forced to develop and adopt green technology.[29] Thus, it can be said that climate change and resource degradation are the principal reasons behind the widespread adoption of green technology.

'Sustainable development' was at the heart of the UN Conference on Environment and Development[30] held at Rio de Janeiro in 1992, which was the first attempt at the international level to draw up strategies towards a more sustainable pattern of development. The Rio Summit witnessed participation by more than 100 Heads of State, representatives from 178 nations, and several prominent civil society organizations.[31] The Brundtland Commission[32] in its report titled *Our Common Future* (1987), propounded 'sustainable development' as the solution to the problems of environmental degradation.[33] The Sharm El-

[28] Z. A. Khan and Shireen Singh, "Intellectual Property Rights Regime in Green Technology: Way Forward to Sustainability" 22(4) *Nature Environment and Pollution Technology* 2148 (2023).

[29] *Ibid.*

[30] Gandura Omar Abagandura, Sangeeta Bansal, *et.al.*, "Soil Greenhouse Gas Emissions, Organic Carbon and Crop Yield Following Pinewood Biochar and Biochar–manure Applications at Eroded and depositional Landscape Positions: A Field Trial in South Dakota, USA" 38(1) *Soil Use and Management* 487-502 (2022).

[31] Major UN conference held at Rio de Janeiro from June 3-14, 1992, focusing upon reconciling economic development with environmental protection and promoting sustainable development. See United Nations: Conferences: Environment and Sustainable Development, "United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3-14 June 1992: Background", *available at*: https://www.un.org/en/conferences/environment/rio1992 (last visited on Jan. 11, 2025).

[32] *Ibid.*

[33] Formally known as the World Commission on Environment and Development (WCED), this Commission was a UN initiative established in 1983 to address global environmental and development challenges, culminating in the 1987 report titled 'Our Common Future', which defined sustainable development as meeting present needs without compromising the ability of future generations to meet their own needs. The UN Secretary-General appointed Gro Harlem Brundtland, former Prime Minister of Norway, as the chairperson of the Commission on account of her strong background in public health. See United Nations, *Our Common Future* 14 (United Nations, 1987).

Sheikh Climate Implementation Summit (COP27)[34] focused its attention upon how climate change adversely impacted food production and food security.[35] International instruments for sustainable development include a wide range of legal and policy tools, including the Sustainable Development Goals (SDGs)[36] of the UN, global environmental agreements, and international law initiatives, all of which are aimed at promoting sustainable development.

The UN General Assembly (UNGA)[37] set out the SDGs in the year 2015, setting out bolder objectives as compared to the Millennium Development Goals (MDGs),[38] 2000. SDG No. 9 aims to "build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation", clearly laying down the relationship between IP and the economy. Green IP can boost the development of new technology, which entails novel discoveries in the areas of production or operation, which create little or no adverse effect upon the environment.[39] It is for this reason that these technologies are also referred to as 'ecologically responsible technologies'.[40]

Similarly, SDG No. 2 aims to ending hunger, achieve food security, and improve nutrition. Green technologies can combine effectively with farm mechanisation to further the cause of sustainable agriculture, while also improving the quality and quantity of foodgrain production. SDG No. 7 entails providing access to affordable, reliable, sustainable, and modern energy for all. Green energy in the form of geothermal energy, hydro-energy, hydrogen energy, solar energy, tidal energy, and wind energy, can certainly be

[34] *Id.* at 6, 10.

[35] *Supra* note 7.

[35] Amit Hasan Anik, Maisha Binte Sultan, *et.al.*, "The Impact of Climate Change on Water Resources and Associated Health Risks in Bangladesh: A Review" 18 *Water Security* 100133 (2023).

[36] 17 interconnected goals adopted by the UN in 2015 to address global challenges and achieve a more sustainable future by 2030. SDGs are a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030. See United Nations Department of Economic and Social Affairs Sustainable Development, "The 17 Goals", *available at*: https://sdgs.un.org/goals (last visited on Jan. 12, 2025).

[37] Primary deliberative, policymaking, and representative organ of the UN, where all 193 member-states have equal representation and a vote, serving as a unique forum for multilateral discussion of international issues. See United Nations: General Assembly of the United Nations, "Workings of the General Assembly", *available at*: https://www.un.org/en/ga/ (last visited on Jan. 11, 2025).

[38] Eight international development goals, which were agreed upon by UN member states in 2000, aiming to address poverty, hunger, disease, and other issues by the year 2015. However, the goals could not be achieved within the stipulated time period. See United Nations, "Millennium Development Goals and Beyond 2015", *available at*: https://www.un.org/millenniumgoals/ (last visited on Jan. 7, 2025).

[39] Nerilie J. Abram, Benjamin J. Henley, *et.al.*, "Connections of Climate Change and Variability to Large and Extreme Forest Fires in Southeast Australia" 2 *Communications Earth & Environment* 8, 10 (2021).

[40] Ewa Jadwiga Lipińska, "Sustainable Development, Socially Responsible and Ecologically Managed, Increases the World's Ecological Security: Research on Poland and Polish Regional Cities", in Levente Hufnagel (ed*.), Globalization and Sustainability – Ecological, Social and Cultural Perspectives* 63-83 (IntechOpen, Rijeka, 2024).

the answer to many of the pressing problems which confront the energy sector in India and other parts of the world.[41] The Variable Wind Turbine[42], also known as '039 Patent',[43] serves as a good example of sustainable innovation, and comprises of a variable-speed wind turbine, which drives an Alternating Current (AC) generator. Using this apparatus, wind energy can be harnessed into electricity.

Under different international conventions, India has made certain key commitments towards global environment conservation goals,[44] beginning with the Kyoto Protocol[45] of 2005, which obligates member-states to establish binding emission reduction targets. Under the Paris Agreement of 2015 (COP21),[46] we have updated our first Nationally Determined Contribution (NDC) for lowering greenhouse gas emissions. All these commitments mandate a transition from fossil fuels to renewable energy sources, and thus, we have to completely change the way we look at our energy sector. In 2019, the Climate Change Finance Unit[47] of the Department of Economic Affairs, Ministry of Finance, Government of India brought out its Position Paper titled, 'Climate Summit for Enhanced Action: A Financial Perspective from India,' which unequivocally outlined our perspective on climate finance.[48] This article stressed that use of technology, and timely and appropriate financing, was essential to meet the challenges posed by climate change, and that global climate action needs to be characterised by "scope, scale, and speed".

[41] Max G. Adam, Phuong T.M. Tran, *et.al.*, "Biomass Burning-derived Airborne Particulate Matter in Southeast Asia: A Critical Review", 407 *Journal of Hazardous Materials* 124760 (Apr. 2021).

[42] Designed to adjust its rotor speed to capture the maximum power available from the wind, particularly in fluctuating wind conditions, by optimizing the blade-tip speed to wind speed ratio. See Igor Iliev, Chirag Trivedi, *et.al.*, "Variable-speed Operation of Francis Turbines: A Review of the Perspectives and Challenges" 103 *Renewable and Sustainable Energy Reviews* 110 (Apr. 2019).

[43] U.S. Patent No. 5,083,039 covers a variable-speed wind turbine, and was a subject of legal disputes, particularly concerning General Electric's claims of patent infringement in the variable-speed wind turbine market. See Google Patents, "Variable Speed Wind Turbine", *available at*: https://patents.google.com/patent/US5083039A/en (last visited on Dec. 29, 2024).

[44] Saswati Chanda and P.K.V.S. Ramarao, "Green Patent" 6(3*) Journal of Emerging Technologies and Innovative Research* 56-69 (2019).

[45] International treaty which aimed to reduce greenhouse gas emissions, particularly from industrialized nations, to combat climate change. It built upon the UNFCCC, and committed signatory nations to achieve specific emission reduction targets. See United Nations Climate Change, "What is the Kyoto Protocol?", *available at*: https://unfccc.int/kyoto_protocol (last visited on Jan. 7, 2025).

[46] *Supra* note 6.

[47] Its duties include preparing the chapter on climate change and sustainable development for the Economic Survey, contributing analytically to the National Climate Policy Framework, and participating in the discussion of climate finance issues in the multilateral climate change regime, and other international fora like the G20. See Press Information Bureau, "Climate Change Finance Unit" *Press Information Bureau*, Aug. 7, 2018, *available at*: https://pib.gov.in/newsite/PrintRelease.aspx?relid=181635 (last visited on Dec. 30, 2024).

[48] Rajasree Ray, Abhishek Acharya, *et.al.*, "Climate Summit for Enhanced Action: A Financial Perspective from India" (Climate Change Finance Unit, Department of Economic Affairs, Ministry of Finance, Government of India, Sep. 2019), *available at*: https://dea.gov.in/sites/default/files/Risk%20Vs%20Uncertainty %20Final.pdf (last visited on Jan. 3, 2025).

3. Sustainable Development

In the decades of the 1960s and 1970s, some important works were published which highlighted the negative impact of human activity upon the environment. These include *Silent Spring*,[49] *Tragedy of the Commons*,[50] *Blueprint for Survival*[51] and *Limits to Growth*[52] by the Club of Rome.[53] This concept received its first major international recognition at the UN Conference on the Human Environment,[54] which was held at Stockholm in 1972. Although the term was not out rightly used in this Convention, the international community agreed for the very first time, that both development and the environment, which were hitherto addressed as separate issues, could be managed in a manner which was mutually symbiotic/complementary.[55] The World Commission on Environment and Development, which is also referred to as the Brundtland Commission,[56] in its report titled *Our Common Future*, published in the year 1987, made this term a part of popular discourse.[57] The Report stressed upon the need for 'sustainable development', while discussing that environmental degradation, which was initially seen as a first-world problem and a by-product of industrial wealth, had now become a survival issue for the poorer countries.[58]

However, it was not until the Rio Summit that the global community began to recognize the significance and importance of 'sustainable development'.[59] More recently, the

[49] Rachel Carson, *Silent Spring* (Houghton Mifflin Company, Boston, 1962).

[50] Garrett Hardin, "Tragedy of the Commons" 162(3859) *Science* 1243-1248 (Dec. 13, 1968), *available at*: https://pages.mtu.edu/~asmayer/rural_sustain/governance/Hardin%201968.pdf (last visited on Dec. 29, 2024).

[51] The Ecologist, *A Blueprint for Survival* (Penguin Books, 1972).

[52] Donella H. Meadows, Dennis L. Meadows, *et.al.*, *Limits to Growth* (Potomac Associates, 1972).

[53] Non-profit, informal organization of intellectuals and business leaders founded in 1968, focused upon identifying and discussing pressing global issues and promoting solutions to complex challenges facing humanity and the planet. See The Club of Rome, "History", *available at:* https://www.clubofrome.org/history/ (last visited on Jan. 14, 2025).

[54] It was the first world conference to make the environment a major issue. The participants adopted a series of principles for sound management of the environment including the 'Stockholm Declaration and Action Plan for the Human Environment', and several resolutions. See United Nations: Conferences: Environment and sustainable development, "United Nations Conference on the Human Environment, 5-16 June 1972, Stockholm: Background", *available at*: https://www.un.org/en/conferences/environment/stockholm1972 (last visited on Jan. 19, 2025).

[55] Biswajit Das, Surya Narayan Mishra, *et.al*., "Green Technology for Attaining Environmental Safety and Sustainable Development" 9(3) *International Journal of Mechanical Engineering and Technology* 1087-94 (Mar. 2018).

[56] *Supra* note 32.

[57] Aldona Malgorzata Deren and Jan Skonieczny, "Green Intellectual Property is a Strategic Resource in the Sustainable Development of an Organization"14 *Sustainability* 4758 (2022).

[58] World Commission on Environment and Development, "Our Common Future" 6 (1987), *available at*: https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf (last visited on Feb. 10, 2025).

[59] Har Darshan Kumar and Enakshi Kumar, *Cleaner Production: Sustainable Trade & Industrial Ecology* 1-28 (Vitasta Publishing Pvt. Ltd, New Delhi, 2009).

World Summit on Sustainable Development was held in Johannesburg in 2002,[60] which was attended by as many as 191 national governments, UN agencies, multilateral financial institutions and other major civil society groups to assess the progress which had been achieved since Rio. The important commitments which emerged from the Johannesburg Plan of Implementation at the Johannesburg Summit were those on sustainable consumption and production, water and sanitation, and use of sustainable energy.[61] 'Sustainable development' can be interpreted in myriad ways, but essentially, it looks to balance different, and often competing, needs.[62]

In recent times, global momentum against climate change has gained traction, in the wake of reports emanating from the European Union (EU)'s climate service, which indicate that global warming, has for the very first time, crossed the threshold of 1.5 degrees Celsius, across an entire year.[63] India has often been at the forefront of global climate action, and has made multitudinous commitments, while setting ambitious targets to combat climate change.[64] The concerns of the global south must also be borne in mind while formulating strategies in this regard, because any climate action which does not take into account the developmental priorities of the global south, is unlikely to take-off.[65] We have often argued at world fora that mere reduction in carbon emissions would not be an effective solution, but what is needed is a transition to renewable energy.[66] While embarking upon such a transition, it would perhaps be correct to say that authorities are often forced to do a tightrope walk

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[60] This Summit adopted a Political Declaration and Implementation Plan which included provisions covering a set of activities and measures to be taken in order to achieve development which takes into account respect for the environment. See United Nations: Conferences: Environment and sustainable development, "World Summit on Sustainable Development, 26 August-4 September 2002, Johannesburg: Background", *available at*: https://www.un.org/en/conferences/environment/johannesburg2002 (last visited on Jan. 18, 2025).

[61] Danny Grajales, Perezy Soto, *et.al.*, "The Green Patents as a Way of Addressing Environmental Issues" 1(2) *Food Climate Change and Intellectual Property: Defining the Issue* 435 (2012).

[62] Justice Mensah, "Sustainable development: Meaning, History, Principles, Pillars, and Implications for Human Action: Literature Review" 5(1) *Cogent Social Sciences* 1653531 (2019), *available at*: https://www.tandfonline.com/doi/full/10.1080/23311886.2019.1653531 (last visited on Dec. 19, 2024).

[63] United Nations: Climate Action, "1.5°C: What It Means And Why It Matters", *available at*: https://www.un.org/en/climatechange/science/climate-issues/degrees-matter (last visited on Mar. 2, 2025).

[64] World Economic Forum, "India Holds the Key to Hitting Global Climate Change Targets. Here's Why", Jan. 19, 2023, *available at*: https://www.weforum.org/stories/2023/01/india-holds-the-key-to-hitting-global-climate-change-targets-here-s-why/ (last visited on Feb. 16, 2025).

[65] ANI, "Climate Action Must Ensure That Priorities of Global South are Not Compromised: PM Modi" *The Economic Times*, Dec. 1, 2023, *available at*: https://economictimes.indiatimes.com/news/india/climate-action-must-ensure-that-priorities-of-global-south-are-not-compromised-pm-modi/articleshow/105644022.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst (last visited on Dec. 28, 2024).

[66] Syed Momina Sultana, "Green Technology-An Emerging Trend" 6(3) *International Research Journal of Engineering and Technology* 3864-68 (Mar. 2019).

when they embark upon the journey to attain their developmental needs, and at the same time, attempt to balance the environmental rights of their citizenry.[67]

4. Green Technology and Sustainable Development

Very often, it is seen that development is driven by only one single point agenda, without fully considering the wider impacts of such an action. Sadly, we have already begun to see the damage that this kind of approach can cause. The longer we pursue such a line of action, the more frequent and severe its consequences are likely to be; which is why we need to act now. Green technology, also known as 'greentech' or 'cleantech', is today being used as an umbrella term to include all those technologies and practices which are aimed at minimizing the negative impacts of human activities upon the environment and promoting sustainability.[68] It encompasses a wide range of areas, including renewable energy (geothermal energy, hydro-energy, hydrogen energy, solar energy, tidal energy, and wind energy), energy efficiency, sustainable agriculture, waste management, and pollution control.[69] The primary goals of green technology are to reduce greenhouse gas emissions, conserve natural resources, protect ecosystems, and mitigate climate change.[70] Some of the examples of greentech are solar photo-voltaic cells, energy-efficient appliances, recycling, composting, electric vehicles, etc.

As seen in the previous section of this Paper, in order to achieve 'sustainable development', we may be required, rather forced, to alter our way of life or work. However, this does not necessarily entail that our quality of life will, in any manner, be impacted or reduced. An approach based on 'sustainable development' can certainly bring about a great deal of benefits. Let us take a very simple example: if a person were to make a simple lifestyle change, wherein (s)he chooses to walk or cycle for short distances instead of taking out his/her car, it would not only save money, but would also improve his/her health due to the cardiovascular workout. Such an action over short distances, would be just as quick and convenient, and would have no deleterious impact on the environment. Thus, it is a win-win situation for the person involved, as well as the environment.

The manner in which we approach development affects mankind as a whole, and each one of our decisions impacts society and other peoples' lives.[71] If a community were to

[67] Robert Fair, "Does Climate Change Justify Compulsory Licensing of Green Technology?" 6(1) *Brigham Young University International Law & Management Review* 21-41 (2010).

[68] Caoimhe Ring, "Patent Law and Climate Change: Innovation Policy for a Climate in Crisis" 35(1) *Harvard Journal of Law & Technology* 373-404 (Fall 2021).

[69] Lipika Sharma (ed.), *Green Intellectual Property and Climate Change Mitigation Technologies: Road Ahead* 14, 22 (Bharti Publications, New Delhi, 1st edn., 2021).

[70] *Id.* at 45.

[71] Hsin-Ning Su and Igam M. Moaniba, "Does Innovation Respond to Climate Change? Empirical Evidence From Patents and Greenhouse Gas Emissions" 122 *Technological Forecasting and Social Change*, 49-62 (Sep. 2017).

be poorly planned, it would certainly reduce the quality of life for the residents of that community. If a country were to rely upon food imports while having the capability to grow food locally, it would open itself to food shortages, apart from imposing an additional stress on its foreign exchange reserves. Today, there are various types of green technology which are in use across industries, and each of these technologies are based on innovative methods to make the technology environment-friendly.[72] The International Patent Classification (IPC)[73] has created a 'Green Inventory' with the objective to classify patent data with regard to various technologies in priority domains like agriculture, conservation of energy, forestry, transportation, and waste management.[74] In order to provide a greener alternative to existing sources of energy, green energy focusses upon developing newer sources of energy, such as geothermal energy, hydro-energy, hydrogen energy, solar energy, tidal energy, and wind energy.

There are a host of organizations working in the area of energy conservation technology, who aim to use technology which is less energy-intensive, and focus on improving efficacy in the areas of building insulation, electric appliances, and lighting.[75] The usage of such technologies has greatly helped to reduce the heating costs of building in western Europe, USA, and Canada.[76] Interventions in the area of transportation, especially urban intra-city mobility, aim to reduce the impact of automobile pollution by achieving lower emissions, using alternate fuels, and increased use of electrification.[77] Waste-management technologies attempt to reduce and segregate waste, and manage waste and

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[72] Raghu N. and Savitha R., "Green Technology: Innovation Status and Challenges in India" 6(3) *Journal of Emerging Technologies and Innovative Research* 176-184 (Mar. 2019).

[73] Hierarchical system established by the Strasbourg Agreement of 1971, which is used to classify patents and utility models according to the technology which they relate to, thereby facilitating efficient search and retrieval of patent documents. It is used in over 100 countries worldwide, making it a global standard for patent classification. A new version of the IPC enters into force each year on January 1. See WIPO, "International Patent Classification (IPC)", *available at*: https://www.wipo.int/en/web/classification-ipc (last visited on Jan. 7, 2025).

[74] The IPC divides technology into eight main sections: A (Human Necessities), B (Performing Operations; Transporting), C (Chemistry; Metallurgy), D (Textiles; Paper), E (Fixed Constructions), F (Mechanical Engineering; Lighting; Heating; Weapons; Blasting Engines or Pumps), G (Physics), and H (Electricity). See WIPO, "Guide to the International Patent Classification (2024)", *available at*: https://www.wipo.int/publications/en/details.jsp?id=4722&plang=EN (last visited on Dec. 18, 2024).

[75] Mohd. Wira Mohd. Shafiei and Hooman Abadi, "The Importance of Green Technologies and Energy Efficiency for Environmental Protection" 12(5) *International Journal of Applied Environmental Sciences* 937-51 (2017).

[76] Ashfaq Ahmad, Yuhuan Zhao, *et.al.*,"Carbon Emissions, Energy Consumption and Economic Growth: An Aggregate and Disaggregate Analysis of the Indian Economy" 96 *Energy Policy* 131-43 (Sep. 2016).

[77] Rahel Aichele and Gabriel Felbermayr, "Kyoto and the Carbon Footprint of Nations" 63(3) *Journal of Environmental Economics and Management* 336-54 (May 2012).

recyclable items in an environment-friendly manner.[78] Similarly, green technology solutions in farming and forest management encourage practices like usage of organic fertilizers, and proper land management techniques.[79]

The issues of climate change and resource degradation can be effectively managed through systematic adoption of innovative practices and use of environmentally sustainable alternatives.[80] Progress in the arena of green technology enables effective use of resources, reduces carbon footprints, and thereby, helps industries to move towards more environment-friendly models.[81] From the above discussion, it can be said that green technology attempts to implement the agenda of environment preservation, and employs green energy to protect our environment. At present, the thrust of 'cleantech' lies in the following major areas *viz.* energy, materials, transportation, and water. Green technology follows a twin approach – attempts to limit the usage of exhaustible non-renewable energy sources by providing alternatives thereto, and attempts to reduce hazardous emissions.[82] Green technology, is also referred to as 'environmentally sound technology' because it uses inputs which are less harmful for the environment, can adapt to sustainability, recycle materials and inputs after use, and handle waste matter more effectively.[83]

Patent protection can be used to safeguard these environmentally-beneficial technologies, in the interest of sustainable development. Apart from providing financial stimulus to undertake R&D activities, patents grants inventors exclusive monopoly rights over their inventions, which motivates further innovation.[84] This encourages the injection of more funds in the area of green technology, thereby leading to reduction in cost of the technology, and its eventual commercialization, and wider usage.[85] A strong IP framework

[78] Alessandro Antimiani, Valeria Costantini, *et.al.*, "Fossil Fuels Subsidy Removal and the EU Carbon Neutrality Policy" 119 *Energy Economics* 106524 (Mar. 2023).

[79] Ashoka Gamage, Ruchira Gangahagedara, *et.al.*, "Role of Organic Farming for Achieving Sustainability in Agriculture" 1(1) *Farming System* 100005 (Apr. 2023).

[80] *Supra* note 39 at 13.

[81] Muhammad Farhan Bashir, Muhammad Adnan Bashir, *et.al.*, "Linking Gold Prices, Fossil Fuel Costs and Energy Consumption to Assess Progress Towards Sustainable Development Goals in Newly Industrialized Countries" 15(3) *Geoscience Frontiers* 101755 (May 2024).

[82] Khan Baz, Deyi Xu, *et.al.*, "Nexus of Minerals-technology Complexity and Fossil Fuels with Carbon Dioxide Emission: Emerging Asian Economies Based on Product Complexity Index" 373 *Journal of Cleaner Production* 133703 (Nov. 2022).

[83] Abid Haleem, Mohd. Javaid, *et.al.*, "A Pervasive Study on Green Manufacturing Towards Attaining Sustainability" 1(2) *Green Technologies and Sustainability* 100018 (May 2023).

[84] Araken Alves de Lima, Patricia Carvalho dos Reis, *et.al.*, "Scenario-Patent Protection Compared to Climate Change: The Case of Green Patents" 4(3*) International Journal of Social Ecology and Sustainable Development* 61-70 (July 2013).

[85] Bronwyn H. Hall and Christian Helmers, "The Role of Patent Protection in (Clean/Green) Technology Transfer" 26(4) *Santa Clara High Technology Journal* 487-532 (2010).

can certainly accelerate the shift towards environment sustainability.[86] The Trade Related Intellectual Property Rights (TRIPS) Agreement acknowledges the contribution of IPRs towards innovation and growth.[87] Along with expeditious growth of innovation, there is a pressing need to develop a strong innovation ecosystem.[88] Thus, we need to match strategic methods leveraging IP with business practices in the area of green technology in order to ensure their economic effectiveness.

5. Green Technology in India

In order to ensure sustainable development, the use of green energy is absolutely crucial. India has developed specialized expertise in this area, giving it pole position in the 'green marathon'.[89] We are one of the leading players in the global green technology market, and have set an ambitious target for our energy sector. In 2022, the Government of India has set the target to achieve zero carbon emissions, by the year 2070[90]. 'Affordable and Clean Energy' is Goal No. 7 of the SDGs, and is required to be accomplished by the year 2030. As per the year-end review conducted by the Ministry of New and Renewable Energy (MNRE), our action plan for promoting green technology was deemed to be quite effective,[91] and the country is currently ranked fourth in the world in terms of installed renewable energy capacity[92]. The present government has committed to development of the sustainable energy sector in a big way, and therefore, we are currently seeing some very large green energy projects, including gigantic solar and wind energy ventures, across the length and breadth of the country.[93]

[86] *Supra* note 57 at 62.

[87] Mondaq, "Green Innovation And IP: Legal Frameworks For Sustainable Technologies In India", *available at*: https://www.mondaq.com/india/patent/1419990/green-innovation-and-ip-legal-frameworks-for-sustainable-technologies-in-india (last visited on Dec. 27, 2024).

[88] Sunny Li Sun and Yanli Zhang, "Enriching Innovation Ecosystems: The Role of Government in a University Science Park" 1 *Global Transitions* 104-19 (2019).

[89] Charles Rajesh Kumar J. and M.A. Majid, "Renewable Energy for Sustainable Development in India: Current Status, Future Prospects, Challenges, Employment, and Investment Opportunities" 10 *Energy Sustainability and Society* (Jan. 2020), *available at*: https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0232-1 (last visited on Feb. 3, 2025).

[90] Press Information Bureau, "India is Committed to Achieve the Net Zero Emissions Target by 2070 as announced by PM Modi, says Dr. Jitendra Singh" *PIB Delhi*, Sep. 28, 2023, *available at*: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1961797 (last visited on Jan. 31, 2025).

[91] *Supra* note 57 at 46.

[92] Press Information Bureau, "India's Renewable Energy Capacity Hits New Milestone" *PIB Delhi*, Nov. 13, 2024, *available at:* https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2073038 (last visited on Jan. 30, 2025).

[93] Somesh Kumar, "How India is Paving the Way for a Sustainable Energy Future", Feb. 13, 2025, *available at:* https://www.ey.com/en_in/insights/energy-resources/how-india-is-paving-the-way-for-a-sustainable-energy-future (last visited on Feb. 14, 2025).

The success of the National Solar Mission can be seen in the following paragraph. As of 2022, India was the fifth largest solar Photo-Voltaic (PV) deployment country in the world.[94] In January 2025, our total installed solar capacity is 97.86 GW, which includes ground mounted solar plants: 75.19 GW, grid connected solar rooftops: 15.67 GW, hybrid projects: 2.77 GW, and off-grid solar projects: 4.23 GW.[95] In 2021, our solar capacity was 40,085 Mega Watt Alternating Current (MWAC), which increased to 56,951 MWAC in 2022, and 66,781 MWAC in 2023.[96] In Q1 2024, India installed 10 GW of solar capacity, which was a 400% increase from Q1 2023.[97] As of December 2024, India's total installed renewable energy capacity is reported to be 209.44 GW.[98] This represents a significant increase of 15.84%, as compared to the previous year. Solar and wind power are the primary contributors to this capacity. As per data maintained by the International Renewable Energy Agency (IRENA),[99] India is today 4th in the world in terms of its installed renewable energy capacity.[100]

India has launched a slew of national initiatives to support green technology. The National Science and Technology Entrepreneurship Development Board (NSTEDB) was set up with the objective to aid knowledge-based, technologically advanced businesses engaged in development of environment-friendly solutions.[101] As part of its efforts to mitigate the impact of climate change,[102] the Government of India launched its ambitious National Action Plan on Climate Change (NAPCC) on June 30, 2008 outlining eight

[94] *Supra* note 92.

[95] Anu Bhambhani, "Utility-Scale Solar Powers India's Record 24.5 GW PV Installations in 2024" *Taiyang News*, Feb. 04, 2025, *available at:* https://taiyangnews.info/markets/india-installed-245-gw-solar-pv-capacity-2024-2 (last visited on Jan. 11, 2025).

[96] *Supra* note 92.

[97] ANI, "India Adds Record 10 GW of Solar Capacity in Q1 2024, Marking Almost 400 pc YoY Increase" *The Economic Times*, May 25, 2024, *available at:* https://economictimes.indiatimes.com/industry/renewables/india-adds-record-10-gw-of-solar-capacity-in-q1-2024-marking-almost-400-pc-yoy-increase/articleshow/110423265.cms?from=mdr (last visited on Feb. 2, 2025).

[98] Press Information Bureau, "India's RE Capacity Registers 15.84% Year-on-Year Growth" *PIB Delhi*, Jan. 13, 2025, *available at:* https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2092429#:~:text=Record%20 Capacity%20Additions,180.80%20GW%20in%20December%202023. (last visited on Jan. 30, 2025).

[99] Leading international intergovernmental organization for energy transformation, which delivers cutting-edge data and analyses on technology, innovation, policy, finance, and investment. See International Renewable Energy Agency, "About IRENA", *available at:* https://www.irena.org/About (last visited on Jan. 26, 2025).

[100] "India Ranks Fourth in the World in Renewable Energy Installed Capacity says PM" *Business Standard*, Feb. 6, 2024.

[101] India Science, Technology and Innovation Portal, "Startups: NSTEDB - National Science & Technology Entrepreneurship Development Board", *available at*: https://www.indiascienceandtechnology.gov.in/startups/nstedb-dst (last visited on Jan. 9, 2025).

[102] Department of Science & Technology, "Climate Change Programme", *available at*: https://dst.gov.in/climate-change-programme (last visited on Jan. 9, 2025).

National Missions on climate change. The Department of Science and Technology (DST)[103] has been entrusted with the responsibility of coordinating two of these missions, *viz.*, the National Mission for Enhanced Energy Efficiency (NMEEE),[104] and the National Mission on Strategic Knowledge for Climate Change (NMSKCC).[105] Each year, under the aegis of the NMSKCC, the DST publishes an annual report, which enables policy analysts and general public to know the extent of climate change in that particular year.[106]

Climate Launchpad,[107] which was co-founded by the EU, is the largest green company ideas competition in the world, and aims to realize the clean technology potential of our planet, so that we are better placed to tackle the climate challenge. Starting 2017, ClimateLaunchpad has been present in our country, and is currently running across four states.[108] Indian inventors have obtained a large number of patents in respect of green technology developed by them.[109] Between 2016 and 2022 alone, the Indian Patent Office (IPO) has issued over 61,000 green patents.[110] In August 2022, Pi Green Innovations,[111] which already enjoyed patents in nations like China, Singapore, and USA for its revolutionary 'carbon cutter technology',[112] which reduces suspended particulate matter in the atmosphere, obtained a patent from the IPO. Similarly, SunHydrogen Inc,[113] which

[103] Central Government department which plays a crucial part in advancing science and technology in the nation, and engages in a variety of activities, such as advancing basic research, high-end research, and the creation of innovative technologies. See Department of Science & Technology, "About Us", *available at*: https://dst.gov.in/climate-change-programme (last visited on Jan. 9, 2025).

[104] *Supra* note 102.

[105] *Ibid.*

[106] Government of India, "Annual Report 2022-23" (Ministry of Science & Technology, Department of Science & Technology, 2023), *available at*: https://dst.gov.in/climate-change-programme (last visited on Jan. 11, 2025).

[107] Climate Launchpad, "About ClimateLaunchpad", *available at*: https://climatelaunchpad.org/climatelaunchpad/ (last visited on Jan. 14, 2025).

[108] Climate Launchpad, "ClimateLaunchpad India is Running in 4 States and Looking to Expand", *available at*: https://climatelaunchpad.org/climatelaunchpad-india/ (last visited on Jan. 17, 2025).

[109] D.P.S. Parmar, "Fast-Tracking Cleantech Patenting in India" *Asialaw*, Apr. 8, 2024.

[110] Rashmita Das, "Green Technology Patenting Trends in India" *The Patent Lawyer*, Feb. 15, 2024.

[111] Technology business which seeks to provide sustainable solutions for a future free of pollution by utilizing design and technological advances to produce items that promise a cleaner environment domestically. See Pi Green Innovations Pvt Ltd, "About Us", *available at*: https://pigreeninnovations.com/ (last visited on Dec. 13, 2024).

[112] Up to 90% of the particulate matter (PM2.5 to PM10) that is released by automobiles, factories, and generator sets is captured by this filter-less, retrofit, fully automatic, and portable system, which stores the material in a container for later use. See Pi Green Innovations Pvt Ltd, "Carbon Cutter", *available at*: https://pigreeninnovations.com/ (last visited on Dec. 13, 2024).

[113] This business develops solar-powered nanoparticle devices which simulate photosynthesis. Its SunHydrogen Panels technology generates renewable hydrogen for fuel cells, renewable power, and other uses. See SunHydrogen, "Clean Hydrogen: From Water & Sunlight", *available at*: https://pigreeninnovations.com/ (last visited on Jan. 6, 2025).

engages in development of various green technology, received a patent from the IPO for its 'multi-junction artificial photosynthetic cell with enhanced photo-voltages', at a time when it already enjoyed similar patents in certain western countries. The very fact that such important inventions are now being patented in India apart from the developed world, indicates the growing importance of the country on the global innovation and patent landscape, which will certainly provide a fillip for the adoption of these technologies across the country.[114]

India is now placed third in Asia in the category of sales of Low Carbon Environmental Goods and Services (LCEGS),[115] demonstrating the great degree of demand in the country for such goods and services. Approximately 13% of the world's high-value green inventions are now taking place in India, which is quite notable, bearing in mind that we are still classified as a 'low-income country', and demonstrates a commitment towards 'green innovation'.[116] Another facet of the problem is that India, which has a large population, also stands to benefit from the labour-intensive nature of green technology.[117] Focus on such technology can not only help to achieve the goal of sustainability, but also promote long-term economic growth by generating jobs. Green technology can also help us to address certain other issues like urbanization, increased human activity, and globalization.[118] It is imperative for us to grow, diversify, and make our IP framework accessible on the global stage. Our priority should be to promote green inventions, and spread such innovations emanating from our shores, globally. This would not only incentivize domestic consumers to choose sustainable products over others, but will also accelerate the export of green technology to other countries.[119]

[114] Anasuya Haldar and Narayan Sethi, "Environmental Effects of Information and Communication Technology - Exploring the Roles of Renewable Energy, Innovation, Trade and Financial Development" 153 *Renewable and Sustainable Energy Reviews* 111754 (Jan., 2022).

[115] Includes activities which reduce greenhouse gas emissions, improve energy efficiency, and provide renewable energy or environmental benefits, thereby forming a key part of the overall green economy. See KMatrix: LCEGS 2023 – LCEGS Extended, "Low Carbon Environmental Goods and Services 2023 Definition", *available at*: https://kmatrix.co/lcegs2023/ (last visited on Jan. 19, 2025).

[116] DePenning & DePenning, "Green Innovation and IP: Legal Frameworks for Sustainable Technologies in India", Jan. 24, 2024, *available at*: https://depenning.com/blog/copyright-green-inventions/ (last visited on Jan. 17, 2025).

[117] Manisha Singh and Pradeep Kumar Kamal, "Incentivisation of Green Technologies in India" *Asia Law Business Journal*, Aug. 31, 2022, *available at*: https://law.asia/incentivisation-green-technologies-india/ (last visited on Jan 22, 2025).

[118] *Supra* note 24.

[119] Arunava Bandyopadhyay and Soumen Rej, "Can Nuclear Energy Fuel An Environmentally Sustainable Economic Growth? Revisiting The EKC Hypothesis For India" 28(44) *Environmental Science and Pollution Research International* 63065-86 (2021).

6. Case Study: *M.K. Ranjitsinh & Ors.* v. *Union of India & Ors.*

Recently, a very interesting case came up before the Hon'ble Supreme Court of India, wherein on the one hand, the Court was confronted with the interests of the solar power producers (solar energy being a form of greentech), and on the other, was the issue of protection of the natural habitat of the Great Indian Bustard (GIB),[120] which was an endangered bird species. On account of its taller and heavier built, and larger wingspan, this bird has poor eyesight as compared to other bird species. In the aforementioned matter, the Court has, while expanding the ambit of Articles 14[121] and 21[122], acknowledged the right to remain free from the ill effects of climate change, as a distinct standalone fundamental right. The Court made a reference to its earlier order dated April 19, 2021, wherein it was held that all low-voltage electricity lines in potential habitats of GIB should be laid underground, in all prospective cases.[123] However, the Court, in order to balance the interests of the solar power producers, ruled that a general prohibition could not be enforced, and such implementation must therefore, be on a case-to-case basis.[124]

The Apex Court recognised that the act of commissioning transmission lines was a tedious one, which took about three to five years, and each power producer was required to conform to the technical specifications prescribed by the Central Electricity Authority (CEA) for the maintenance and functioning of transmission lines.[125] Routing of a transmission line should be avoided through protected forests, national parks, and wildlife sanctuaries, with minimal tree cutting.[126] Further, section 89(2)(c) mandates that all clearances from trees and forest areas during the building of transmission lines must be as per the Forest Conservation Act, 1980, and any Rules made by the Central Government in this regard.[127]

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[120] This endangered species of bird, which weighs 15-18 kg, is easily identified by its black forehead crown, offering a contrast with its pale head and neck. It has a brownish body with black, brown, and grey markings on its wings, and its existence is seriously threatened by collisions with high tension electric wires, swift moving automobiles, and roving canines. See WWF, "Great Indian Bustard", *available at*: https://www.wwfindia.org/about_wwf/priority_species/threatened _species/great_indian_bustard/ (last visited on Jan 20, 2025).

[121] The Constitution of India, art. 14: "Equality before law-The State shall not deny to any person equality before the law or the equal protection of the laws within the territory of India."

[122] *Id.*, art. 21: "Protection of life and personal liberty-No person shall be deprived of his life or personal liberty except according to procedure established by law."

[123] AIR 2021 SC 209; 2021 SCC OnLine SC 326.

[124] 2024 SCC OnLine SC 570.

[125] The Electricity Act, 2003 (Act 36 of 2003), s. 70.

[126] Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010, s. 88.

[127] *Id.*, s. 89(2)(c).

On account of the intricacies occasioned by elements like the GIB's natural habitats, which today only exist in certain parts of Rajasthan and Gujarat, and the existence of overhead solar transmission lines in these areas, it was necessary to gain a better understanding of how exactly the standards outlined in the CEA Regulations, 2010 would respect citizens' rights to the environment.[128] It is in this backdrop that the Court constituted an Expert Committee to assess various aspects of the matter, namely grounds of feasibility, scope of overhead and underground transmission lines in potential GIB habitat areas, and identify further reasonable measures which could be undertaken to address the prevailing state of affairs.[129]

In our legal framework, there is no single effective statutory enactment which safeguards environment and climate change-related concerns, even though a large number of governmental policies, Rules and Regulations are operational. It is in this backdrop that the stand taken by the Court that absence of a law does not automatically translate to the non-existence of a right and its legal remedy, needs to be appreciated, and applauded.[130] The Court laid down that governmental authorities while allocating funds for infrastructural projects are, to a large extent, obligated to safeguard the environment, and natural habitats of birds and animals, especially species which are endangered under the Wild Life (Protection) Act, 1972.[131] Article 48A[132] of our Constitution entails that the State should endeavour to protect and improve the environment, and imposes a consequent duty upon the State to safeguard forests and wildlife. The Court emphasised upon the importance of Articles 14 and 21, which paved the way to recognise the "right to be free from the adverse effects of climate change" as a standalone fundamental right.[133] The Court ruled that the vulnerability of Article 14 can easily emerge in such cases. At some future date, the indigenous communities in the Andamans may fall into a precarious position as compared to their compatriots living in the Indo-Gangetic plains due to rising sea levels, leading to a serious risk to their constitutionally guaranteed right to equality.[134] The Court made a rather intriguing reference

[128] *Supra* note 124.

[129] *Ibid*.

[130] Fizza Zaidi, "Analysis: What does the New Supreme Court Judgment Mean for Climate Action in India?" *DownToEarth*, Apr. 8, 2024, *available at*: https://www.downtoearth.org.in/ governance/analysis-what-does-the-new-supreme-court-judgment-mean-for-climate-action-in-india--95462 (last visited on Jan. 19, 2025).

[131] Act 53 of 1972.

[132] *Supra* note 121, art. 48A: "Protection and improvement of environment and safeguarding of forests and wild life-The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country."

[133] Shreshtha Mathur, "M.K. Ranjitsinh v. Union of India: The Supreme Court's Very Own Sophie's Choice Moment" *Bar and Bench*, Apr. 27, 2024, *available at*: https://www.barandbench.com/topic/supreme-court-judgment (last visited on Jan. 20, 2025).

[134] *Supra* note 124.

to the climate asylum claim filed by a Kiribati citizen, which was rejected by the Supreme Court of New Zealand.[135]

7. Interface Between Green Technology and IPR

In the modern world, IPRs, especially patents, can assist in the shift towards a low-carbon regime, thereby helping to achieve the overall goal of sustainable development. Various entities like government organizations, investors, inventors and partners from different countries, have a role to play when it comes to developing and marketing green technology.[136] The concept of 'Green IP' emerged out of the need to create solutions to address the problems posed by climate change and resource degradation. 'Green IP' refers to the use of various IPRs tools to protect developments in green technology. Patents grant inventors and creators limited-time 'exclusive' rights, and are therefore, significant to ensure technological progress. When combined with proper collaboration between the government and private sectors, an effective Green IP framework can provide the most suitable environment for global dissemination of sustainable products and technologies.[137]

IPRs promote technological innovation, foster creativity, and provide legally-enforceable rights which cannot be infringed.[138] The importance of IP in the contemporary economy has grown by leaps and bounds, as is evident from the increased number of IP applications being filed worldwide, especially in the field of patents.[139] On similar lines, green technology has also grown many times over, especially when it comes to providing solutions to complex environmental problems. Patent laws are thus key to fostering 'green innovation' by incentivizing further R&D in the sustainable technologies sector. The financial reward, recognition and increased funding opportunities which patents offer innovators, motivates them to pursue breakthroughs in new technology.[140]

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[135] *Ioane Teitiota* v. *The Chief Executive of the Ministry of Business, Innovation and Employment* [2015] NZSC 107.

[136] Jennifer Brant, "Green Technology Diffusion: Insights from Industry" *WIPO Magazine*, Feb. 19, 2024, *available at*: https://www.wipo.int/web/wipo-magazine/articles/green-technology-diffusion-insights-from-industry-38710 (last visited on Jan. 13, 2025).

[137] Antra Kalnbalkite, Vita Brakovska, *et.al.*, "The Tango Between the Academic and Business Sectors: Use of Co-management Approach for the Development of Green Innovation" 2(4) *Innovation and Green Development* 100073 (Dec. 2023).

[138] Paula Kivimaa and Florian Kern, "Creative Destruction or Mere Niche Support? Innovation Policy Mixes for Sustainability Transitions" 45(1) *Research Policy* 205-17 (Feb. 2016).

[139] Seyi Saint Akadiri and Tomiwa Sunday Adebayo, "Asymmetric Nexus Among Financial Globalization, Non-renewable Energy, Renewable Energy Use, Economic Growth, and Carbon Emissions: Impact on Environmental Sustainability Targets in India" 29(11) *Environmental Science and Pollution Research* 16311-23 (Mar. 2022).

[140] Aline Bento Ambrosio Avelar, Keilla Dayane da Silva-Oliveira, *et.al.*, "Education for Advancing the Implementation of the Sustainable Development Goals: A Systematic Approach" 17(3) *International Journal of Management in Education* 100322 (Nov. 2019).

Article 7 of TRIPS highlights the role of IPRs in promoting technological innovation, for the benefit of the entire community as a whole.[141] It aims to facilitate 'transfer and dissemination of technology', besides stressing upon the significance of a proper balance between rights and obligations.[142] Such a balance helps to promote and preserve social and economic welfare. Despite TRIPS not having outrightly dealt with the aspect of 'green innovation', efforts are being made to promote the development and adoption of green technology, globally.[143] By ensuring protection of IP assets, IPRs can help to garner additional investments in green technology, thereby enabling inventors to commercialize their innovations.[144] Some countries like USA have introduced special provisions for green technology to further bolster environmental innovation. Initiatives such as the Green Patent Program in USA,[145] and similar measures across Europe, have attempted to fast-track the examination of patent applications in the case of environment-friendly inventions, thereby leading to an accelerated market entry for such products and technologies. Collaborative models, centred around patent pooling and open licensing, can also help in the widespread usage and adoption of green technology.[146] Such initiatives avoid duplication of R&D efforts, which would, in turn, make eco-friendly innovations more accessible globally. Greater worldwide collaboration in the area of green technology can be fostered through transfer of technology transfer in important areas like renewable energy. [147]

[141] Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), 1994, art. 7: "Objectives- The Protection and Enforcement of intellectual Property Rights Should Contribute to the Promotion of Technological Innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a Manner Conducive to Social and Economic Welfare, and to a Balance of Rights and Obligations."

[142] Marinella Favot, Leyla Vesnic, *et.al.*, "Green Patents and Green Codes: How Different Methodologies Lead to Different Results" 18 *Resources, Conservating & Recycling Advances* 200132 (Oct. 2023).

[143] Nicolò Barbieri, Alberto Marzucchi, *et.al.*, "Knowledge Sources and Impacts on Subsequent Inventions: Do Green Technologies Differ from Non-green Ones?" 49(2) *Research Policy* 103901 (Mar. 2020).

[144] Andrea Bellucci, Serena Fatica, *et.al.*, "Venture Capital Financing and Green Patenting" (Ispra: European Commission, 2021), JRC127059, *available at:* https://www.econstor.eu/bitstream/10419/250160/1/jrc127059.pdf (last visited on Feb. 12, 2025).

[145] Antoine Dechezleprêtre and Eric Lane, "Fast-tracking Green Patent Applications" *WIPO Magazine*, June 3, 2013, *available at:* https://www.wipo.int/web/wipo-magazine/articles/fast-tracking-green-patent-applications-38465 (last visited on Feb. 4, 2025).

[146] Rashmita Das, "Green Innovation and IP: How Patent Laws Encourage or Hinder Environmental Technologies", Oct. 24, 2024, *available at:* https://www.unitedandunited.com/green-innovation-and-ip-how-patent-laws-encourage-or-hinder-environmental-technologies/#:~:text=Collaborative%20IP%20models%2C%20such%20as,friendly%20innovations%20more%20accessible%20globally (last visited on Feb. 1, 2025).

[147] *Supra* note 28 at 53.

As part of the 2030 Agenda for Sustainable Development,[148] the World Intellectual Property Organization (WIPO)[149] has, once again, noted that IP-linked innovation is pivotal to develop a nation's capability towards innovation, and its ability to attract Foreign Direct Investment (FDI).[150] In order for green technology to reach its full potential, countries must necessarily have a reasonably strong IP protection infrastructure in place. High-value technological innovations should be developed on top priority, in order to ensure that green development includes top-notch innovations as well.[151]

The Patents Act, 2005 presents a catena of challenges in terms of promotion of green technology. The high cost and increased degree of complexity in the patent filing procedure continue to remain a significant factor, and can often be prohibitive for start-ups and small businesses, who may be involved in the development of green technology.[152] The high filing fees, large number of objections at various stages, and large amount of time involved in obtaining a patent, can pose an insurmountable hurdle for smaller entities who seek protection their green inventions.[153] Enforcement of patent rights remains another concern, on account of the lengthy litigation processes in the country, which may end up delaying the commercialization of green technology.[154] All these factors have the effect of reducing the incentive for companies to invest in R&D activities. A solution to this problem has been attempted by creating a separate Intellectual Property Division (IPD) in various High Courts across the country, starting with the Delhi High Court.[155] The objectives behind establishing these special courts is to resolve disputes related to IPR in an efficacious manner, uphold and protect IP rights of the inventor/creator, promote a vibrant IP adjudication ecosystem across

[148] Outlines the 17 Sustainable Development Goals (SDGs), which are intended to reduce poverty, hunger, and inequality while tackling climate change and safeguarding the environment in order to create a more sustainable and equitable future for all by 2030. See United Nations: Department of Economic and Social Affairs, "Transforming Our World: the 2030 Agenda for Sustainable Development", *available at:* https://sdgs.un.org/2030agenda (last visited on Jan. 22, 2025).

[149] One of the 15 specialized agencies of the UN, it supports the world's innovators and creators by ensuring that their ideas reach the market safely and enhance lives of people across the globe. See WIPO, "About WIPO", *available at:* https://www.wipo.int/about-wipo/en/ (last visited on Jan. 17, 2025).

[150] Kaiwen Chang, Lanlan Liu, *et.al.*, "The Impact of Green Technology Innovation on Carbon Dioxide Emissions: The Role of Local Environmental Regulations" 340 *Journal of Environmental Management* 117990 (Aug. 15, 2023).

[151] *Supra* note 18.

[152] *Supra* note 68 at 391.

[153] *Supra* note 68 at 391.

[154] Zoltan J. Acs, Luc Anselin, *et.al.*, "Patents and Innovation Counts as Measures of Regional Production of New Knowledge" 31(7) *Research Policy* 1069-85 (Sep. 2002).

[155] Reto M. Hilty and Pedro Henrique D. Batista, "Potential and Limits of Patent Law to Address Climate Change" 72(9) *GRUR International* 821-39 (Sep. 2023).

the country, and shape the legal landscape for IP in India. As of now, three High Courts in India, *viz*., the High Courts of Delhi, Madras, and Calcutta, currently have dedicated IPDs, with the Delhi High Court being the first to establish such a division,[156] whereas the High Courts of Bombay, Calcutta, and Gujarat have designated specialized IP Benches.[157] The Karnataka High Court is on its way to becoming the next High Court to have its own IPD. On June 20, 2024, the Chief Justice of the Karnataka High Court issued a notification announcing the formation of a sub-committee which had been tasked to draft the Rules for establishing the IPD.[158]

8. Compulsory Licensing of Green Technology

'Compulsory licensing' is a license/permission which permits a third-party to use a patented invention by paying a royalty to the inventor. The permission of the patent-holder is not required for this purpose, and compulsory licenses can be granted by the Central Government when certain conditions are satisfied. It is an essential concept in IPR, and creates a set of circumstances wherein a license created by statute enables a third-party to have access to the invention of a patent-holder. Under TRIPS, patents in respect of which a compulsory license has been issued, can be made available to certain third-parties for further use, whereas the Patents Act, 1970, provides for a detailed discussion of 'compulsory licensing' under Chapter XVI[159] of the Act. However, the phrase 'compulsory licensing' has not been used in TRIPS; rather, the Agreement refers to the use of the invention without the authorization of the rights-holder.[160] However, a third-party can only benefit under this clause if (s)he has previously attempted to obtain the consent of the rights-holder upon acceptable commercial conditions, and such attempts have not been successful. Situations of 'national emergency', 'extraordinary urgency', and 'public non-commercial purpose', are exceptions to this rule, and the period of such use shall be limited to the authorized purpose only.[161] The

[156] Surendra Sharma and Udayvir Rana, "Game-changer: The Intellectual Property Division of the High Court of Delhi" *ManagingIP*, Sep. 30, 2022, *available at*: https://www.managingip.com/article/2aoxdrzghl7fpb3f1ce80/sponsored-content/game-changer-the-intellectual-property-division-of-the-high-court-of-delhi (last visited on Dec. 19, 2024).

[157] Shiv Sahay Singh, "Calcutta HC Sets Up Separate Divisions for Intellectual Property Rights disputes" *The Hindu*, Nov. 16, 2024.

[158] RNA Technology and IP Attorneys, "Delhi High Court IP Division Sets the Bar High" *Lexology*, June 21, 2023, *available at*: https://www.lexology.com/library/detail.aspx?g=fdc68a78-094a-4f75-b103-51087787c487 (last visited on Dec. 18, 2024).

[159] High Court of Karnataka, Notification No. HCLC 59/2022, *available at*: https://karnatakajudiciary.kar.nic.in /old_website/noticeBoard/notfn-HCLC-59-2022-20062024.pdf (last visited on Dec. 21, 2024).

[160] The Patents Act, 1970 (Act 39 of 1970), chap. XVI: Working of Patents, Compulsory Licenses and Revocation.

[161] TRIPS Agreement, art. 31.

compulsory licensee shall be bound to pay to the patent holder, proper remuneration for the use of his/her invention. It is to be noted that 'compulsory licensing' under TRIPs can only be allowed in the event of any of the three conditions enumerated above. When seen under the prism of climate change, a great number of scholars argue that 'compulsory licensing' of green technology would not be forbidden under TRIPS, on account of the fact that the Agreement does not elaborate upon either 'public interest' or 'national emergency'.[162] Given this background, member-states would be required to show that there was such a situation, in order to resort to this provision.

In order to mandate use of green technology under the 'compulsory licensing' clause, member-states should first make out a watertight case of 'national emergency', 'extraordinary urgency', or 'public non-commercial purpose'. The onus is entirely upon member-states to prove that the given situation falls within any of the aforesaid categories. In its initial phase, the price of green technology is often very high, especially in low-income countries like ours, and therefore, 'compulsory licensing' may be resorted to, in order to address this issue, especially in the short term. It is to be noted that not all policy-framers favour 'compulsory licensing', and some opine that grant of such licenses may have the effect of abridging the rights of the patent-holder in cases involving unauthorized usage of the patent. In the long term, it may also prove to be harmful to nations where such licenses are granted, because it may obstruct development of a proper research-based environment.

India's 'compulsory licensing' regime, which aims to make essential technologies more accessible, may, in some cases, pose hurdles for innovators in the green technology sector. The fear of losing exclusive control over their patented technologies through issuance of compulsory licenses, could dissuade inventors from introducing their cutting-edge inventions.[163] Lastly, unlike other areas of the world like the USA and Europe, India lacks specific programmes which can put green patent applications on the fast-track.[164] This delay in grant of patent approvals can sometimes prove critical, and can impede the country's march towards sustainability.

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[162] Jingkun Zhou, Yunkai Zhou, *et.al.*, "Can Green-Technology Innovation Reduce Atmospheric Environmental Pollution?" 11(5) *Toxics*, 403 (Apr. 24, 2023).

[163] Jamie Feldman, "Compulsory Licenses: The Dangers Behind the Current Practice" 8(1) *Journal of International Business and Law* 137-67 (2009).

[164] Antoine Dechezleprêtre, "Fast-tracking 'Green' Patent Applications: An Empirical Analysis" (Centre for Climate Change Economics and Policy, Feb. 2013), *available at*: https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2014/02/WP107-fast-tracking-green-patent-applications.pdf (last visited on Jan. 5, 2025).

9. International Efforts to Promote Green Patents

Across the world, private and public sectors have worked together to strengthen and preserve Green IP. In this category, it would be useful to discuss the efforts of the World Business Council for Sustainable Development (WBCSD),[165] and multinational corporations like Sony and Nokia, which jointly established the Eco-Patent Commons[166] in the year 2008. This community seeks to share patents and knowledge about environmental issues, energy efficiency, control and prevention of pollution, recycling, and water conservation. In 2009, the Clean Energy Research Centre (CERC), which enables engineers, researchers and scientists to study and develop green technology, was developed a result of US-China cooperation.[167] A US-China Renewable Energy Forum was also created to promote collaboration on IP issues associated with new and renewable energy.[168] Along similar lines, the Joint Clean Energy Research and Development Centre (JCERDC) was established in 2009 as a US-India partnership, and seeks to resolve global issues concerning environmental sustainability and energy advancement.[169]

In December 2009, the United States Patent and Trademark Office (USPTO) launched the Green Technology Pilot Program to expedite the review of patent applications in the area of green technology, energy conservation, environmental protection, and carbon emission reduction.[170] The programme's objective was to expedite the process of 'green

[165] Assembles transformative organizations to create a worldwide community which improves the institutions in which they operate in order to create a better future. Its members work to reduce the climate disaster, restore nature, and address inequality by pushing the limits of what businesses can accomplish. See World Business Council for Sustainable Development, "The Building Blocks of Transformation", *available at*: https://www.wbcsd.org/ (last visited on Jan. 8, 2025).

[166] Several major multinational corporations came together to launched this non-profit project in 2008 to give people royalty-free access to patents for eco-friendly technologies. However, it ran into organizational and structural problems, and was shut down in 2016. See Jo Bowman, "The Eco-Patent Commons: Caring Through Sharing" *WIPO Magazine*, June 3, 2009, *available at*: https://www.wipo.int/web/wipo-magazine/articles/the-eco-patent-commons-caring-through-sharing-36818 (last visited on Jan. 6, 2025).

[167] Multidisciplinary research centre devoted to doing top-notch clean energy research, development, training, and demonstrations. Its objective is to become a global leader in the research, development, and demonstration of cutting-edge clean energy solutions to tackle the problems of sustainability and climate change. See The University of British Columbia: Clean Energy Research Centre, "CERC Intro", *available at*: https://cerc.ubc.ca/ (last visited on Jan. 18, 2025).

[168] Forum for policymakers, business executives, and scholars from both these nations to work together to advance renewable energy policies and technologies, with an emphasis on quickening the clean energy transition and decarbonization initiatives. See U.S. Department of Energy, "US-China Renewable Energy Forum", *available at*: https://www.energy.gov/ia/us-china-renewable-energy-forum (last visited on Jan. 17, 2025).

[169] Important project under the U.S.-India Partnership to Advance Clean Energy (PACE), which seeks to promote revolutionary research and development in the clean energy sector. See Press Information Bureau, "Setting Up of JCERDC with US" *PIB*, Dec. 30, 2010, *available at*: https://pib.gov.in/newsite/PrintRelease.aspx ?relid=68772 (last visited on Jan. 19, 2025).

[170] *Supra* note 164.

innovation' by examining the green patent applications before other applications. On similar lines, the United Kingdom Intellectual Property Office (UKIPO) launched the Green Channel[171] programme in 2009 to provide for accelerated processing of patent applications for inventions which offered any environmental benefits. Recently, Japan too has joined the queue, by joining the WIPO GREEN programme. The Japanese Patent Office (JPO) has made it clear that it shall endeavour to work with WIPO to help spread green technology to distant corners of the world. After partnering with WIPO, Japan has published the Green Transformation Technologies Inventory (GXTI), which will help enterprises explain their green transformation efforts.

The IPC 'Green Inventory' is a web-based database, which provides links to the IPC system.[172] It was introduced by WIPO in 2010, and makes it faster to search for patent data about Environmentally Sound Technologies (ESTs).[173] Launched in 2013, 'WIPO GREEN' is a green technology online marketplace, which aims to bring green technology suppliers and buyers together on one platform.[174] Through its database, which currently has within its purview, over 3,000 innovations and demands, it makes it easier to create, adopt, and implement solutions in the area of greentech.[175] It supports global efforts to address climate change by connecting providers and seekers of environmentally friendly technologies. Through its database, network and acceleration projects, it brings together key players to catalyse green technology innovation and diffusion. All these initiatives demonstrate a commitment towards promoting creativity, cooperation, and information exchange in the area of greentech, which will ultimately enable us to develop an increased amount of Green IP globally.

10. Conclusion

The worldwide climate catastrophe has disrupted supply chains, availability of labour, and adversely affected demand. Hence, corporations, authorities and policy framers

[171] Launched on May 12, 2009, with the goal of expediting the processing of patent applications pertaining to technologies that help the environment. This enabled applicants to request quicker processing of patent search, examination, and publishing processes. See Government of UK, Intellectual Property Office, "Green Channel", *available at*: https://www.gov.uk/guidance/patents-accelerated-processing (last visited on Jan. 6, 2025).

[172] WIPO, "International Patent Classification (IPC)", *available at*: https://www.wipo.int/en/web/classification-ipc (last visited on Dec. 27, 2024).

[173] Includes technologies which protect the environment, reduce pollution, and promote use of sustainable resources, recycling, and waste handling. See UN Environment Programme, "Environmentally Sound Technologies", *available at*: https://www.unep.org/regions/asia-and-pacific/regional-initiatives/supporting-resource-efficiency/environmentally-sound (last visited on Jan. 20, 2025).

[174] WIPO GREEN, "WIPO GREEN – The Marketplace for Sustainable Technology", *available at*: https://www3.wipo.int/wipogreen/en/ (last visited on Jan. 18, 2025).

[175] *Supra* note 150.

across the world, have banded together in an attempt to create viable solutions to tackle this rather formidable opponent. This cooperation has culminated in new ideas, and consequently, the concept of Green IP has emerged. Technical progress is absolutely essential in today's world. However, the march of science and sustainable development, have acquired an even greater significance, because the very survival of mankind is at stake, on account of the challenges posed by climate change and resource degradation. Countries must focus upon technical advancement in the area of green technology, thus contributing towards the ultimate goal of environmental sustainability. On account of their ability to safeguard both inventor's rights and ecological development, patents can be used as an effective instrument to accomplish a practical synthesis between environmental sustainability and commercial growth. Through patenting of green technology, we can achieve the twin goals of preservation of our ecosystem, as well as technological advancement.

One of the major criticisms of our existing IP system is that there is a plethora of patents, and relatively insufficient knowledge with regard to these.[176] Therefore, it may sometimes become difficult to eliminate patents which restrict innovators unfairly, and therefore, the current IP regime does not foster long-term innovation. Regulatory adjustments should emphasize upon the need to eliminate administrative and practical obstacles to patenting. In order to do so, we may need to look at abolition of the criteria of 'non-obviousness' in order to achieve sustainable advances.[177] The patent process must also be changed to make it easier for innovators to obtain patents at a lower cost, and in a lesser amount of time.[178] The judicial and administrative machinery should be strengthened in order to ensure effective enforcement of patents. Through stricter patentability criteria, lower patenting expenses, faster patent prosecution, and effective enforcement of patents, we can certainly have faster development and adoption of green technology, thereby leading to reduced emissions.

In order to provide incentives for Indian inventors to pursue green technology, and achieve the country's goal of becoming a significant player in this area, the government must provide inventors benefits, which are at par with developed countries. The cost associated with certification and processing of green technology in India has been identified as very

[176] Arho Suominen, Matthias Deschryvere, *et.al.*, "Uncovering Value Through Exploration of Barriers - A Perspective on Intellectual Property Rights in a National Innovation System" 123 *Technovation* 102719 (May, 2023).

[177] Claude Henry and Joseph E. Stiglitz, "Intellectual Property, Dissemination of Innovation and Sustainable Development" 1(3) *Global Policy* 237-51 (2010).

[178] Andre O. Laplume, S. Pathak, *et.al.*, "The Politics of Intellectual Property Rights Regimes: An Empirical Study of New Technology Use in Entrepreneurship" 34(12) *Technovation* 807-16 (2014).

high, and we must attempt to address this issue on a war footing.[179] The processing fees involved in the use of green technology in India is very high, and the case of batteries meant for use in electric cars is a case in point. It is on account of these reasons that many technological exchanges fail in our country. There is thus a fair case for the government to offer tax breaks and straightforward financing options. By building an infrastructure where patent-holders can form direct linkages with businesses, barriers to technology exchange can be diminished.

The future of balancing IP protection and 'green innovation' hinges upon the creation of an ecosystem which supports both technical advances and environmental sustainability. Even as we continue to grapple with the need to augment the usage of clean energy, ensure waste management, and effective pollution control, fostering 'green innovation' through a well-structured IP framework must always remain a priority. One key area for improvement is the introduction of a fast-track patent regime for green inventions, on the lines of similar programmes in USA and Europe. By accelerating the patenting process, innovators can bring their environment-friendly technologies to the market sooner, which would, in turn, lead to faster adoption and upscaling of sustainable solutions.

Finally, it needs to be said that our IP policy also needs to be tweaked suitably, in order to balance patent protection with green technology. While a strong IP framework would certainly encourage investment in R&D, it needs to be borne in mind that excessive monopolization could limit the widespread availability of critical environmental solutions. Collaborative models like patent pooling and open licensing can help the authorities to ensure that essential green technology remains accessible to all our people, and at the same time, rights of inventors and investors would be protected.[180] Government incentives, tax breaks, and subsidies for use of green technology, coupled with effective IP reforms outlined in the preceding paragraphs, can certainly provide a noteworthy boost to our country's progress towards sustainability. By striking the right balance between IP protection and accessibility, we can promote a thriving green technology sector, while, at the same time, also meeting our environmental obligations on a global scale.

[179] Rajat Gupta, Shirish Sankhe, *et.al.*, "Decarbonising India: Charting a Pathway for Sustainable Growth" 47 (McKinsey Sustainability, Oct. 2022).

[180] Jaakko Siltaloppi and Rosa Maria Ballardini, "Promoting Systemic Collaboration for Sustainable Innovation Through Intellectual Property Rights" 11(1) *Journal of Co-operative Organization and Management* 100200 (June, 2023).