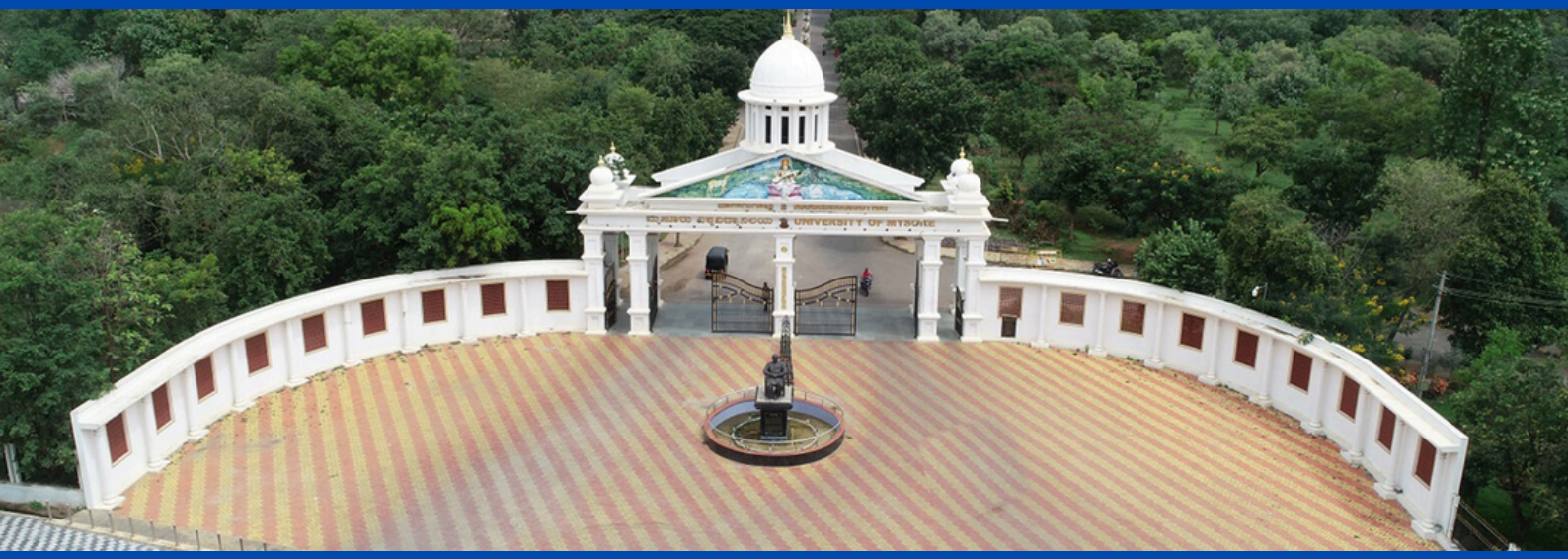
MYSORE UNIVERSITY LAW JOURNAL

Peer-Reviewed

Volume II, Issue I | June 2025 | BIANNUAL



DEPARTMENT OF STUDIES IN LAW

University of Mysore

Manasagangotri, Mysuru - 570006

Karnataka, India

Ph: 0821-2419845

Office : 0821-2419848

Email : dos@law.uni-mysore.ac.in

University of Mysore
Department of Studies in Law
Manasagangothri,570006
Mysore, Karnataka,India

Mysore University Law Journal

STATEMENT OF OWNERSHIP AND OTHER PARTICULARS ABOUT MYSORE UNIVERSITY LAW JOURNAL

1. Title : Mysore University Law Journal
2. Language : English
3. Periodicity of Publication : Biannual
4. Printer's Name : The Department of Studies in Law
   Nationaliy : Indian
   Address : Department of Studies in Law, Manasagangotri, Mysore 570006.
5. Publisher's name : The Registrar
   Nationality : Indian
   Address : Manasagangotri, Mysore 570006.
6. Editor's Name : Prof. M.S. Benjamin
   Nationality : Indian
   Address : Manasagangotri, Mysore 570006.
7. Owner's Name : The Registrar, University of Mysore
8. Place of publication : Mysore City, Karnataka, India

I Registrar, University of Mysore hereby declare that the particulars given above are true and correct to the best of my knowledge, belief and information

June 2025

(Registrar)

Signature of the Publisher

GENERAL DETAILS

Submission Guidelines

Submitted abstracts must not exceed 150 words, must include a title, and be accompanied by five keywords and final manuscript must be between 5000-8000 words.

FORMATTING GUIDELINES

- Submissions must conform to the Bluebook Method 21st Edition.
- The font shall be in Times New Roman, size 12 with a line spacing of 1.5.
- Footnotes shall be in Times New Roman, size 10 with single line spacing.
- Submissions are accepted only in electronic form.
- Submissions must be made in Word format (.doc)/(.docx)
- The submission must be accompanied by a cover letter stating the title of the manuscript, the name, and details of the author/authors, and the author's contact details.
- Co-authorship of a maximum of two persons is allowed.
- The proper acknowledgment must be given for such use of literature in the article submitted.
- The submission will be run through anti-plagiarism software and plagiarism in any form will result in rejection of the submission.
- Fees: Rs. 750/-
- Publication Mode: Online and Print
- Annual
- Eligibility: Eminent Academicians, practitioners, researchers, in the field of law

Contact Information

For inquiries and participation confirmation, please contact:

Prof.(Dr.) M.S. Benjamin
Professor of Law
Department of Studies in Law
University of Mysore, Mysuru, India – 570006
Email: dos@law.uni-mysore.ac.in
Mobile: +91 99028 72779

Mysore University Law Journal
URL: https://uni-mysore.ac.in/english-version/dept_category_law.php?dept_id=426&cat_id=95

About the Department of Studies in Law

The Department of Studies in Law (DoS in Law) was established in 1973 under the aegis of the University of Mysore (The Mysore University is the sixth oldest in the country and the first in Karnataka. Also, in a sense, it is the first University of the country established outside the limits of the British India.) The Dos in Law stands as a beacon of legal education and research in Southern India. Renowned for its commitment to excellence, it has consistently led the charge in providing advanced legal studies and fostering a culture of scholarly inquiry. At the heart of its offerings lies the prestigious two-year LL.M. program, comprising four semesters of rigorous academic pursuit. This program boasts a diverse array of optional branches, including Constitutional Law and International Law, catering to the varied interests and aspirations of its students. Under the auspices of the department, research for Ph.D. in Law flourishes, underscoring its dedication to pushing the boundaries of legal scholarship. LL.M. studies at Mysore are distinguished by their emphasis on research, with candidates required to engage in dissertation work, thus ensuring a high degree of training and expertise in legal research.

The department's commitment to academic excellence is further evidenced by the publication of select student dissertations, showcasing the intellectual rigor and innovation fostered within its walls. Widely recognized for its intensive and high-quality teaching, the Department of Studies in Law attracts students not only from various states across India but also from countries as diverse as Afghanistan, Kenya, Tanzania, and Tibet. Its state-of-the-art facilities, including a well-stocked library, advanced computing resources, and other amenities, ensure an enriching and conducive learning environment for all who pass through its doors.

Mysore University Law Journal

Mysore University Law Journal (MULJ) at the University of Mysore is Paramount for enriching both the academic and practical dimensions of legal education. Such a journal serves as a vital platform for scholars, student, and legal professionals to publish their research and analysis, thereby encouraging rigorous academic discourse and advancing legal knowledge. Moreover, it provides invaluable experiential learning opportunities for law students, allowing them to develop critical thinking, writing, and analytical skills essential for their future careers. Through networking and collaboration opportunities, the journal fosters connections among individuals from diverse legal backgrounds, facilitating the exchange of ideas and the building of professional relationships in the law Additionally, by publishing high-quality, legal scholarship, the journal enhances the visibility and prestige of the university within the legal community, nationally and internationally, while contributing to the development of jurisprudence and legal theory. Furthermore, the journal's role in community engagement cannot be overstated, as it serves as a bridge between the academic community and society at large, promoting informed debate on pressing legal issues and contributing to the development of sound legal policies.

Editorial Note

It is with great academic pride that we present Volume 2 (June 2025) of the journal published by the Department of Studies in Law, University of Mysore. This volume emerges at a time when the role of law, particularly Intellectual Property Rights (IPR), in addressing global sustainability challenges has gained unprecedented relevance. As the world grapples with environmental degradation, rapid urbanization, and persistent socio-economic disparities, the imperative to align innovation with equitable access and ecological responsibility becomes ever more critical.

The present collection of papers explores the multifaceted intersections of IPR and sustainable development, offering nuanced legal, theoretical, and policy-oriented analyses. This volume showcases a range of scholarly contributions that interrogate the role of patents and legal frameworks in fostering green technologies, advancing urban innovation, promoting agricultural development, and alleviating poverty.

The opening article by Sakshi Kothari provides a critical examination of patent pooling and the diffusion of green technologies, with comparative insights from India and the United States. This is followed by a detailed analysis by Sharanabasayya S and Prof. Dr. Chandrakanthi L, who assess how green patents shape urban innovation within the Indian legal context. Complementing this urban perspective, Alina Shiji Abraham and Albert Sajeev delve deeper into sustainable city development, examining the synergy between legal frameworks and technological advancement.

Shifting focus to rural and marginalized contexts, Ashraya S. Chakraborty and Gaana V S analyze how IPR can support agricultural innovation in poverty-stricken regions. Hareesh Anandan's article evaluates the role of IPR in catalyzing renewable energy for economic upliftment, while Arushi Ranjan critically explores the delicate balance between IPR protection and public access to essential renewable technologies.

The discourse is further enriched by Harsapratha, who interrogates IPR's contribution to sustainable transport systems and green technologies, followed by Iqmaaz Matloob, who presents a comprehensive legal framework for leveraging IPR in poverty alleviation and sustainable innovation.

Together, these contributions reflect a broad spectrum of legal scholarship that not only illuminates the potential of IPR as a tool for sustainable development but also cautions

against its misalignment with public interest. The volume serves as a repository of diverse perspectives and a valuable resource for legal scholars, policymakers, technologists, and development practitioners alike.

We extend our sincere appreciation to all the contributors for their insightful research and to the editorial team for their meticulous efforts in bringing this volume to fruition. We hope this issue will spark further inquiry and dialogue on the evolving role of law in shaping a sustainable and inclusive future.

Editor-in-Chief

Mysore University Law Journal

Table of Content

ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY OF MYSORE | DEPARTMENT OF STUDIES IN LAW
Manasagangotri-570006.

Mysore University Law Journal

Volume 2, Issue 1, 2025

Patent Pooling and Diffusion of Green Technology: A Critical Analysis with Special Reference to India and USA

Sakshi Kothari[1]

Abstract

The transition to sustainable development necessitates widespread access to green technologies, particularly in developing and emerging economies. Patent pooling where multiple patent holders agree to license their technologies as a package has emerged as a strategic mechanism to facilitate the diffusion of environmentally sound technologies (ESTs). This paper critically analyzes the concept and functioning of patent pools in the context of green technology dissemination, with special reference to India and the United States. It explores how patent pooling can overcome legal, technical, and financial barriers to technology transfer, promote innovation, and encourage collaborative R&D in clean energy sectors. The study also evaluates the legal frameworks, institutional practices, and policy landscapes of India and the USA to understand the scope and limitations of implementing effective patent pooling arrangements in these jurisdictions. Through a comparative lens, the paper highlights both opportunities and challenges, offering policy recommendations aimed at enhancing the role of patent pools in promoting global environmental sustainability.

Keywords: Patent Pooling, Green Technology, Technology Transfer, Innovation, Sustainability

[1] *Assistant Professor at Indore Institute of Law, Madhya Pradesh*

Email: kotharisakshi723@gmail.com

1. Introductions

Patent pool is a consortium of two or more patent-holders to promote a particular technology and share the market monopoly. Patent pool is an association of two or more companies to cross-license their patents in respect to a particular technology. In other words this is an agreement between companies to license or permit one another or any third party to use the patents owned by them. ***"The aggregation of intellectual property rights which are the subject of cross-licensing, whether they are transferred directly by patentee to licensee or through some medium, such as a joint venture, set up specifically to administer the patent pool."***[2]

Patent pools can also be defined as an agreement between two or more patent owners to licence one or more of their patents to one another or to third parties. Often, patent pools are connected to complex technologies that require complimentary patents in order to offer effective technical solutions. [3]Generally, mature technologies come under the purview of patent pools. Frequently, patent pools also represent the basis for industry standards that supply firms with the necessary technologies to develop compatible products and services. Patent pools basically originated as most of the technologies involve various patents and owners and it is impossible to adopt such Other reason for origination of patent pools was to avoid the competitors suing each other in order to keep out each other from the technology. They are of great use to developing countries like India to attain access to advanced and expensive technologies. However, anti- competitive attributes have been witnessed in developed countries like the US. In the international patent regime, patent pooling is a commercially viable concept.

2.PATENT POOLS AND ANTI-TRUST: AN ANALYSIS

Patent pools are ―one-stop shop‖ licensing mechanisms that facilitate access to complex technologies with high levels of patenting activity. However, given that patent pools entail collaborations between patentees, antitrust issues can arise if the pro-competitive features of the pool are not clearly defined. The impact of patent pools

[2] *Joel I. Klein, "CROSS-LICENSING AND ANTITRUST LAW", American Intellectual Property Law Association, May 2,1997,http://www.justice.gov/atr/public/speeches/1118.htm*

[3] *PATENT POOLS AND ANTI-TRUST – A COMPARATIVE ANALYSIS, prepared by WIPO Secretariat, March 2014; available at http://www.wipo.int/export/sites/www/ip-competition/en/studies/patent_pools_report.pdf*

on innovation will be positive (e.g. will alleviate the effects of patent thickets) if the pools are not anti-competitive and fulfil certain conditions. Policy measures addressing such issues are important in ensuring that patent pools are compatible with the objectives of the patent system (e.g. promoting access to innovative knowledge).[4]

In the global patent thicket where access to advanced technology is a need for developing nations, patent pools by renowned innovators have become an effective market strategy. This gives rise to the possibility of anti-competitive activities as the firms coming together to pool their patented technologies in order to disseminate them might engage in certain cartel-like behaviour. There have been several cases in various jurisdictions. When there are overlapping patent rights, patent pooling may impede the development of underlying technology by the inventors as it would amount to infringement of patent. This poses a serious problem in antitrust law. If the patentees adopt a cooperative solution and cross-license or pool their patents, they effectuate a horizontal merger of their assets and can perpetuate monopoly pricing. With the strengthening of intellectual property law, patent rights are increasingly blocking the development of new technologies, and support is growing to loosen legal constraints on patent pools[5].

2.1. Antitrust and Cross-Licensing Arrangements

Cross-licensing is different from patent pooling in operation where firms holding overlapping patent rights mutually execute licenses to gain access to one another's patented technology. Patentees in the industry often execute royalty-free cross-licenses that creates open competition. Sometimes, patentees execute such licenses to shield a bogus patent from litigation and mutual royalty scheme or other restrictions are incorporated.[6]

The US 1995 Antitrust Guidelines for the licensing of intellectual property give

---

[4] *PATENT POOLS AND ANTITRUST; available at https://www.innovationpolicyplatform.org/content/patent-pools-and-antitrust , (last accessed on 24-07-18)*

[5] *Heller, Michael A. & Eisenberg, Rebecca S., CAN PATENTS DETER INNOVATION? The Anticommons in Biomedical Research, 280 SCIENCE 698, 700 (1998); Robert P. Merges, Contracting into Liability Rules: Intellectual Property Rights and Collective Rights Organizations, 84 CAL. L. REV. 1293, 1355-58 (1996).*

[6] *See, e.g., United States v. Singer Mfg. Co., 374 U.S. 174, 178 n.2 (1963); United States v. E.I. du Pont de Nemours & Co., 351 U.S. 377, 420 (1956) (Warren, J., dissenting); see also Klein DVD Letter, supra note 66. In the diaper industry, Kimberly Clark and Procter & Gamble entered into a cross-licensing arrangement after seven years of litigation once it became clear that Procter & Gamble's patents were at risk because of the litigation. Through the cross-licensing scheme, the firms were able to extract double royalties from other diaper manufacturers. See Tara Parker-Pope, Cleaning Up: Stopping Diaper Leaks Can Be Nasty Business, P&G Shows Its Rivals, WALL ST. J., Apr. 5, 1999, at Al*

similar treatment to cross-licensing and patent pools. This conflicting situation among pooling of patents, cross-licensing and fair competition calls for serious regulatory measures. It is extremely important for the policy makers to address the cartelization which is perpetrated by patent-holders in the garb of patent pooling.

3. DICHOTOMY OF PATENT POOLING AND GREEN TECHNOLOGIES

Like other advanced technologies, clean technologies or green technologies or environment friendly technologies have also become the need of the hour. Many developing countries are striving to gain access on such technologies as they don‘t have sufficient capital to invest in the R&D. This poses a challenge to the international patent regime where only a few firms are in a few developed countries are developing effective green technologies.

As per the mandate of UNFCCC, developing countries should also play a vital role in research, development and commercialization of green technologies. It has set up a funding mechanism to achieve this goal which ultimately helps spread green technology and creates economic spillover effects in developing nations in the form of new jobs, industrialization, service industry development, etc.

History of patent system has witnessed some high-level patent pools in various domains of technological advancement. Some of the prominent ones are:(i) Pools associated with monopolies such as the Sewing Machine Combination (1856), National Harrow Company (1890), Motion Picture Patents Company (1908), Davenport Folding Beds (1916), etc.

(ii) Pools created in response to US Government policies such as Manufacturers Aircraft Association (1917) and the Radio Corporation of America (1919).

(iii) Recent pools such as MPEG-2 Patent Portfolio, MPEG-4 (1998), DVD 3C (1998), DVD 6C (1999), etc.

3.1. Patent Pledges

From an environmental point of view, pledging of patents is a mechanism whereby innovators provide their patent royalty-free in the interest of climate.

In the context of environmental innovation, patent pledges are designed as cooperative ventures that allow green technology holders to pledge their patented

technologies for widespread free use[7]. They simplify the access procedures and facilitate the non-exclusive use of materials for non-commercial purposes. Adhesion to such a collaborative model requires an intellectual property right and the pledge is usually subject to certain conditions. The current types of green patent pledges that have been adopted in the past few years usually took theform of a community pledges.[8] However, they do not address yet issues of product standardization or standards-development organizations due to the diversity of green technology innovation.[9]

3.2. The Eco-Patent Commons

Perhaps the most glaring development in the field of green technology by way of patent pledging is the Eco-Patent Commons. It‘s a consortium of renowned conglomerates which have pledged their patents in environment friendly technologies.

The creation of the not-for-profit initiative EcoPC is quite recent, in January 2008. It was established by IBM, Nokia, Sony, and Pitney Bowes in cooperation with the World Business Council for Sustainable Development (WBCSD) and it allows companies to pledge patents that protect green technologies. Companies as well as individuals can join the commons by pledging at least one patent.[10]

“Pledge” in this context means making patents available for use by third parties free of charge[11]. The pledge is a legally

---

[7] *See Cynthia Cannady, Access to climate change technology by developing countries: A practical strategy, online: International Centre for Trade and Sustainable Development <http://ictsd.org/downloads/2009/11/access-to-climate-change-technology-by-developing-countries-cannady.pdf>.*

[8] *Patent pledges are usually divided into two principal categories: community pledges and unilateral pledges. Community pledges are made by members of a specific group, according to some predetermined form or formula, with respect to a defined technology or set of patents. Unlike community patent pledges, unilateral pledges are made by firms independently and do not follow a pre-determined format. Jorge L. Contreras (2015), Patent Pledges, ARIZ. ST. L.J. (forthcoming), Available at SSRN: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2525947 at 15.*

[9] *Green technology is marked by its diversity but unified by its purpose to benefit the environment and mitigate climate change. It includes various categories and sub-categories: renewable-energy generation technologies such as solar, wind, hydro, wave and tidal, geothermal and biofuels; energy storage technologies such as fuel cells and advanced batteries; transportation technologies such as hybrid and electric vehicles; energy infrastructure technologies including smart grid, energy-efficient power systems, building materials and lighting technologies, bio-based plastics and other materials, water filtration and desalination systems; technologies that reduce pollution and emissions, and even carbon trading schemes and other green policies and investment mechanisms. See Eric L Lane, Clean Tech Intellectual Property: Eco-Marks, Green Patents, and Green Innovation (np: Oxford University Press, 2011) at 1.*

[10] *Bronwyn H. Hall & Christian Helmers, INNOVATION AND DIFFUSION OF CLEAN/GREEN TECHNOLOGY: CAN PATENT COMMONS HELP?; Journal of Environmental Economics and Management 66 (2013) 33-51*

[11] *According to the ―GroundRules http://www.wbcsd.org/web/projects/ecopatent/EcoPatentGroundRules.pdf), also ―anyworldwidecounterparts‖ to the pledge patentareconsideredtobesubjecttothenon-assertionpledgei.e.anyequivalentstothepledgedpatent.*

binding commitment that prevents EcoPC member companies from enforcing any pledged patent. The ownership right remains with the pledging party which distinguishes the EcoPC from conventional patent commons. This also implies that the non-assertion pledge can also be treated as a patent donation and hence a pledged patent is not deductible from a company's taxable income.

Patent Pool distinguished from Patent Pledge: Potential users do not have to specifically request a licence; any pledged patent is automatically licensed royalty-free provided it is used in a product or process that produces any environmental benefit. This royalty-free access (users do not have to notify EcoPC member-company if they use a pledged invention) distinguishes the patent common from a patent pool. In a patent pool, patents are shared among the members of the pool, often to resolve gridlock that may be related to technology standards. Third parties have to separately request for a licence to use any technology forming part of a patent pool.

In a research conducted over 238 patents[12],175 it was found that slightly over 80 percent of the patents were pledged by mainly four firms viz. Bosch, DuPont, IBM and Xerox. It was also found that the pledged patents under the Eco-Patent Commons were actually contributing to environmental protection. The Eco-Patent Commons has proved to be a commendable step in diffusion of green technology. However, the efficacy of this endeavour in the long run is yet to be determined.

3.3. Role of Financial Factors and R&D in Patent Pools

It is important to note that private players (innovators) in the market are much concerned about their market cap and intellectual property rights. Also, it is their prerogative to infuse financial resources in their R&D. It is not possible to pledge a patent i.e. provide a patented technology (eco-friendly) royalty-free all the time. Cross-licensing of patents is an initiative taken by innovative firms in order to increase the magnitude of diffusion of technology. However, their motive to earn profits through patent pools cannot be overlooked.

Unlike the pharmaceutical sector where there are no substitute products, in the renewable energy sector, most clean technologies have been running off-patent. Only a few specific improvements in green technologies have been patented and a great number of competing patents exist which

[12] *Ibid*

increases the competition in the market and brings the prices down. It plays a vital role in enhancing the access to clean technologies for those who require it the most viz. developing countries that are not financially strong to afford such technologies and are facing heavy impact of climate change.

It is important to note that firms which are engaged in green innovation run the risk of low-returns. The capital that they infuse in the process of innovation and R&D does not bring that much of an efficient return when they finally release their patent in the market by way of patent pools or otherwise because too many ventures are engaged in the same activity as the sustainable development movement has gained global acceleration.

Economic integration appears necessary to catalyze the international market for renewable energy and clean technologies. This is mainly because there is a clear nexus between patenting and access to green technology. A constructive tie between firms of developed and developing countries will bring about a considerable change in the international technology diffusion scenario. Joint ventures will promote the national capacity to research and produce such technologies without the need of a foreign licensor. In turn, this will increase the number of patent pools in the interest of the environment.

3.4. Policy Interventions and Future of Green Technologies

Climate change has emerged as a serious global issue and needs to be addressed in an emphatic manner. Emission of GHG is resulting into high levels of global warming and needs to be combated through various economic and technological policy interventions[13].

Implementation of carbon tax on industries contributing to carbon emission has been strongly recommended. Controlled economic activity to stabilize GHG emission is also suggested as a solution by some scholars. However, among these recommendations, advanced diffusion of environment friendly technologies and promotion of green innovation come as the most desirable[14].

In developing countries like India, replacement of existing technology by adopting green technologies is quite a difficult process. However, efforts like free technology transfer

[13] *Gans (2010) uses an endogenous growth model to show that under some conditionseven policies targeted towards energy efficiency or carbon reductions can reduce overall outputenough to discourage environmentally friendly innovation.*

[14] *Hall, Bronwyn H. and Helmers, Christian, THE ROLE OF PATENT PROTECTION IN (CLEAN/GREEN)TECHNOLOGY TRANSFER, Santa Clara High Technology Law Journal, Volume 26, Issue 4 (2010), pp. 24*

and licenses have been utilized to diffuse green technologies.

In the current scenario, where the competition among innovators in the global market is intense, patent pools should be used an instrument to incentivize private players to engage in green innovation and support diffusion of green technologies for reasonable commercial benefits.

4. PATENT POOLING AND GREEN TECHNOLOGY IN THE UNITED STATES

With rapidly growing economy and innovation, patent pools in the US are also increasing. With the advent of new technology, pooling of patents in various domains of technology has been witnessed across the IPR landscape of the US.

Patent pools are an efficient solution to prevent the creation of patent thickets overlapping of patents in a particular field.

After the proactive approach by the WHO pertaining to patent pools, they have been utilized as policy tools in the field of pharmaceuticals and medication. Since this initiative, patent pools have been formed around the area of diagnostics such as HIV-AIDS, breast cancer, etc[15].

A perusal of the history of patent pools in the US reveals that a lot of technology has been integrated by many firms via this tool[16]. However, evidence relating to patent pooling in the field of environment friendly technologies isn‘t significant.

4.1. Green Innovation in the US

United States has always been a global innovator in emerging fields. However, the governments underObama and Trump have not been able to produce any satisfactory results in the area of green innovation and green technology. Various researches have attempted to study the reason behind the same. President Obama, during his reign, switched to clean energy, and some States, like California, took aggressive measures. But the overall initiative by the various governments remained generally insufficient. Leading American companies hesitated to engage in fields like wind-power, energy- efficient appliances or even

[15] *The HIV Medicines Patent Pool pools‘ multiple patents related to HIV medicines in one place, which are then licensed out by the same one entity, in order to cut down on transaction costs for all parties involved. This ‗pooling‘ allows more affordable and more adapted versions of patented drugs to be more easily produced as generics, long before their20- year patent terms run out. Generic competition both brings down prices and helps spur innovation.‖; available at http://www.medicinespatentpool.org.*

[16] *Lampe, Ryan and Moser, Petra, PATENT POOLS, COMPETITION, AND INNOVATION—EVIDENCE FROM 20 US INDUSTRIES UNDER THE NEW DEAL; The Journal of Law, Economics and Organization, Volume 32, Issue 1, March, 2016.*

mass-market insulation, because upfront costs are large and profits uncertain[17].

4.2. Green Patenting in the US Firms: Current Trends

An extensive research181 on green patenting and development of green technologies by the US firms (small and large) has revealed the following notable results:

(i) Organizations based in the United States were responsible for 43 percent of U.S. patents in green technologies in 2005-2009.

(ii) Green patents form a much lower percentage of these large firms' portfolios than the small firms' portfolios (1.5 percent on average for large firms, versus 20 percent for small firms). Several small firms have patent portfolios that are almost entirely green, which is not the case for any of the large firms. It appears that many small firms are building their business around green technologies, while large firms are largely enhancing product lines with green technologies.

(iii) Small firms have contributed a lot when comes to patenting in the areas of fuel cells, solar energy and batteries. Cumulatively, in green technologies, small firms of US account for 14 per cent of the patents.

(iv) In green patenting, small firms have exhibited impressive citation metrics. It implies that small firms are engaged in inventing important green technologies and they tend to file patents only on significant inventions.The study reveals that in the US small firms are engaged in innovating green technologies as a part of their core business as compared to large firms.

4.3. Prolific Inventors and Green Entrepreneurs in the US

Research has shown that individuals from small firms have had a fairly strong of giving rise to new wave of entrepreneurialism that is focused on the possibility development and marketing of green technologies and green products.

A study of patent trends from 2005-2009 revealed that there were 32 individuals who invented five or more green patents with a citation index of 1.0 or higher. Out of these inventors, 35 percent are now C- level (CEO, CTO, Chief Scientist) executives at

[17] *Rosenthal, Elizabeth, U.S. IS FALLING BEHIND IN THE BUSINESS OF _GREEN', available at https://www.nytimes.com/2011/06/09/business/09subsidies.html (last accessed on 03-09-2018)*

small green firms and nearly 30 percent are cofounders of green firms[18].

Approximately 80 percent of the prolific green inventors had previously worked at large companies or large government or university labs. More than 30 percent had five or more patents for previous employers in non-green technologies. This illustrates the difficulty in training a person at a university to be a green entrepreneur.

The factors that drive these individuals towards green technologies are still unclear. However, the findings suggest that it is important to promote a culture of green training and motivate young and dynamic minds to move towards green innovation.

4.4. Contemporary Scenario

There isn't any strong evidence to show that patent pools have been entered into by firms in the field of green technology. According to the study, firms, both small and large, have been engaged in innovation of technologies which are green and non-green. However, patent pooling and cross-licensing has not been a much explored avenue in the area of green technologies as it has been for other technologies such as DVD, aircrafts, radio technology, etc.

It is crucial for the US policy makers to promote pooling of patents by leading innovation firms in the domain of eco-friendly technologies. Patent regime and green innovation should work in a synergized manner to produce optimum results. US, being the leader in innovation, should strive for joint efforts in order to enhance global diffusion of green technology through patent pools.

A research[19] has found positive correlation between competition and innovation particularly among patent pools in the US. However, the majority of the patent pools were found in the area of biotechnology, nanotechnology, telecom, pharmaceuticals, etc. There is still a long way to go for the US to become a leading player in the diffusion of green technology through pooling and cross-licensing of patents.

Another research finds an inverse relation between patent pools and market competition in the US market. It states that pooling of patents may mitigate the competition and consequently discourage innovation as it concentrates the creation and cross-licensing of technologies at one place.

[18] *Ibid*

[19] *Lampe, Ryan & Moser, Petra, PATENT POOLS, COMPETITION, AND INNOVATION—EVIDENCE FROM 20 US INDUSTRIES UNDER THE NEW DEAL, The Journal of Law, Economics and Organization (JLEO), V32N1, 2015.*

A different research reveals that the very idea of creation of successful patent pools provides incentives to the innovators to apply for more patents[20].Patent pools, apart from promoting knowledge-sharing among the inventors, give a business edge to the licensing parties in the market. It also reveals that an effective licensing mechanism in a given jurisdiction provides a boost to the innovators to come up with more advanced innovation. This would certainly help those innovators who are sincerely engaged in eco-innovation and want their contribution to be notices by the society and the government.

5. PATENT POOLING AND GREEN TECHNOLOGY IN INDIA

With the rapid technological advancement and industrialization, patenting in India has also taken a massive leap. Though the Indian patent regime is known to be rigid in its operation, the landscape of patenting in India has opened a new gateway for innovators at both national and global platforms.

Patent pooling is an emerging concept in the patenting domain of India. Big innovators have captured the Indian with great efforts owing to the stringent patent regime in India and they are often reluctant to pool their technology with another competitor in the Indian market. However, the only area where patent pooling is shown have a noticeable impact in India is cheap and affordable health care facilities.

Recently, one Indian generic drug manufacture Aurobindo Pharma Limited and MedChem, joined the Medicines Patent Pool (MPP) for manufacturing of several anti-retroviral medicines. This enabled Aurobindo Pharma to have access the patented drugs of that Gilead which was recently introduced into the pool. Now, Aurobindo can manufacture and sell tenofovir in larger number of countries without paying any royalty[21].

5.1. Green Patenting and Innovation in India

According to UNEP and the OECD green indicators[22], India is one of the fastest growing green economies in the world.

Many technology creators in India are working towards green innovation and it is

[20] *Baron, Justus and Pohlmann, Tim; THE EFFECT OF PATENT POOLS ON PATENTING AND INNOVATION - EVIDENCE FROM CONTEMPORARY TECHNOLOGY STANDARDS, JEL-Classification: L24, O34, February 2, 2015*

[21] *Rastogi, Priyanka (Singh & Associates), INDIA: PATENT POOL, available at http://www.mondaq.com/india/x/325602/Patent/Patent+Pool (accessed on 13-09-2018)*

[22] *http://www.oecd.org/env/indicators-modelling-outlooks/green-patents.htm (accessed on 13-09-2018)*

important that they receive the support of policy makers so as to get a due return on their investment. Policy makers should also ensure that such technologies are easily accessed by the consumers in order to build a green ecosystem.

It is noteworthy that India being a country at a post-development stage has taken active measures to access green technology. In the past few years, Indian foreign policy has targeted to obtain licence to use clean technologies that are innovated in developed nations. India has witnessed a tremendous growth in R&D activities in various fields such as renewable sources of energy, industry, agriculture, biotechnology, etc. The prime focus of these activities has been to enhance eco-friendly innovation[23]. There are a number of government and private organizations which are involved in greening various prominent sectors of growth. The number of green patent applications in the last decade has increased exponentially. Thus, it has also been opined that like many countries (e.g. Brazil, Korea, US, etc.), India should also fast-track patent applications pertaining to green technology.

Also, in the light of the fact that the Indian Patents Act, 1970 is silent as to the operation and execution of patent pools, there is a need for Indian policy-makers to fine tune the patent system to make room for patent pooling (both national and cross-national) and diffusion of environment friendly technologies.

5.2. Patents Act, 1970, Competition Act, 2002 and Patent Pooling

As far as the Patents Act is concerned, there is no provision that facilitates the creation of patent pools or cross-licensing of patents.

However, with the formulation of a policy to that effect, innovators in India would be able to pool their patents and share market monopoly. Hence, government interference in this regard is required.

Section 102 of the Patents Act provides for acquisition of patents by the Central Government in public interest. However, this provision cannot be interpreted to mean that patent pools can be created under this section by the interference of the government because that would mean the loss of monopoly of patent-holders.

[23] *Anand, Manish, Dhawan, Ninika and Kedia, Shailly; SCIENCE, TECHNOLOGY AND INNOVATION FOR LOW CARBON DEVELOPMENT IN INDIA, Discussion Paper, Shakti Sustainable Energy Foundation, TERI.*

From the point of view of antitrust, it is possible that some patent pools work in adverse manner in the market and thus, there is strict regulation of such agreements under the Competition Act, 2002. It can be perceived as a barrier in the way of creation of patent pools.

Section 3(3) of the Competition Act, 2002 deals with those horizontal agreements between associations or enterprises which: (a) directly or indirectly determine the sale prices; (b) limit or control production, supply, technical development, investment or provision of services; (c) share the market, source of production or provision of sources by way of allocation of geographical area of the market, type of goods or services, number of market customers or in any other similar way; (d) directly or indirectly result in bid rigging or collusive bidding. It provides that any such agreement shall be presumed to have appreciable adverse effect on the market.

The Section, however, in its proviso, excludes agreements entered into by way of joint ventures if such agreement increases efficiency in production, supply, distribution, storage, acquisition or control of goods or provision of services.

Section 3(4), on the other hand, deals with vertical agreements, and provides that any agreement amongst enterprises or persons at different levels of the production chain in various markets, in respect of production, supply, distribution, price or trade in goods or provision of services, including: (a) tie-in arrangements; (b) exclusive supply agreement; (c) exclusive distribution agreement; (d) refusal to deal; (e) resale price maintenance; shall be deemed to have an appreciable adverse effect on competition in India.

The confluence of combinations pertaining to IPR and fair competition has been dealt with in Section 3(5) of the Competition Act, 2002. It provides that any licence granted with reasonable conditions to exploit the monopoly attached to an IPR would not constitute an anti-competitive agreement.

The term reasonable conditions‘ may be interpreted to mean that if any licensing arrangement has the effect of adversely affecting the prices, quality or variety of goods and services then the arrangement would fall in the category of anti-competitive agreement.

The Competition Commission of India (CCI) has regarded patent pooling as a restrictive practice which is exclusive of the bundle of rights forming an IPR as recognized under Section 3(5). Further, CCI has also identified some situations where patent pools could be deemed as anti-competitive. For instance, when two firms

pool their patents and agree not to grant licence to third parties while fixing prices as well, the arrangement shall be considered as anti-competitive.

In an innovation market, if certain technologies are locked in limited hands and new entrants are strategically isolated from the market, it becomes difficult for third parties to compete. Therefore, in the light of the guidelines provided by the CCI, especially in absence of judicial pronouncements on the matter, it is imperative for the innovators who are engaged in patent pooling practices to ensure that their agreements do not entail antitrust litigation.

The role of the judiciary in interpreting the law pertaining to patenting and competition cannot be ignored. The judges have to take up the responsibility to clear ambiguities in the matter so that the practice of patent pools can be used in an ethical and economically and socially beneficial manner.

6. CONCLUSION

A study of the recent trends in the field of patent pooling, cross-licensing and diffusion of green technologies reveals that innovation firms around the globe have become aware of the fact that their investment R&D in developing their technologies must be aligned with the globally recognized environmental goals. In other words, innovators cannot afford to relentlessly apply for technologies which are harmful to the global climate. It is also made quite clear that commercial as well as cross-national patent pools will be created only when the recipient market has a robust patent protection regime. Thus, India, in order to promote diffusion of green technology via patent pool mechanism, has to enhance support for green development through liberalized monetary policies. The patent holders will naturally be inclined towards the market which gives them an edge over the competitors while raising their goodwill as they contribute new climate- friendly innovations in countries where they are required.

Considering the interface between intellectual property and competition has covered the global commercial market. Thus, the policy-makers and innovators across the globe must work in synergy to make efficient use of the patent thicket that is created in the competitive market. Patent pools must be diligently regulated to yield pro-competitive impact. The focus of policy-makers around the global has always been on creation of patent pools in the sector of pharmaceuticals as epidemics, terminal diseases, deadly outbreaks, etc. have been serious issues especially in

under-developed countries. Pharmaceutical giants have exercised great commercial leverage by offering their invented products to the governments. However, it is also imperative for the major innovative companies around the globe to come together to use the fairly new patent pooling system for developing and disseminating climate friendly technologies like they have been doing in the sectors of pharmaceuticals, biotechnology, nanotechnology, radiology, etc. In order to attract creation of patent pools in the area of green technologies, both developing and developed economies have to take proactive steps. Private players engaged in development of environment friendly technologies need incentives to pool and further licence their technologies. Thus, efficient competition and IP regimes properly balanced with environmental safeguards should be the vision plan for the coming decades.

****

ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY OF MYSORE | DEPARTMENT OF STUDIES IN LAW
Manasagangotri-570006.

Mysore University Law Journal

Volume 2, Issue 1, 2025

Green Patents and Urban Innovation: A Legal Analysis of Intellectual Property Rights in Sustainable Cities – An Indian Perspective

Sharanabasayya S[*] and Prof. Dr. Chandrakanthi L[**]

Abstract

India's rapid urbanization, coupled with its vulnerability to climate change, underscores the need for sustainable urban development. Green patents intellectual property (IP) protections for environmentally friendly technologies are vital to fostering innovation in Indian cities. This paper examines India's legal framework for green patents, their role in urban innovation, and the tension between IP exclusivity and public access to sustainable solutions. Through a doctrinal analysis of Indian patent law, international obligations, and urban case studies, it advocates for reforms to align IP rights with India's sustainability goals.

Keywords: *Green Patents, Urban Sustainability, Intellectual Property Law, Compulsory Licensing, Climate Innovation, Smart Cities Policy.*

[*] *Sharanabasayya S, II year LL.M., University Law College, Bangalore University.*
[**] *Prof. Dr. Chandrakanthi L., Professor of Law, University Law College, Bangalore University.*

1.0 Introduction

India is poised to become the world's most populous nation by 2027, with urban areas expected to house 590 million people by 2030.[1] Cities like Delhi, Mumbai, and Bengaluru face mounting environmental challenges—air pollution, water scarcity, and waste management—necessitating innovative green technologies. Green patents offer a mechanism to incentivize such innovation, yet their legal implications remain underexplored in the Indian context. This paper analyzes how India's IP regime supports or hinders urban sustainability and proposes a path forward.

1.1 India's Urban Transformation and Environmental Imperative

India's urban transformation represents Ranking among the foremost demographic shifts in modern history. The rapid urbanization trajectory—from 31% urban population in 2011 to a projected 40% by 2030—places unprecedented pressure on municipal infrastructure and environmental systems.[2] This urbanization is occurring against the backdrop of climate vulnerability, with India ranking seventh on the Global Climate Risk Index.[3] The convergence of these factors creates an urgent need for sustainable urban technologies that can mitigate environmental degradation while supporting economic growth.

Delhi's air quality crisis exemplifies these challenges. The city regularly experiences PM2.5 levels exceeding 300 μg/m³—twenty times the WHO guideline limits—contributing to approximately 10,000 premature deaths annually.[4] Concurrently, Mumbai confronts acute hydrological deficiencies, evidenced by a per capita water availability that has descended below the threshold of 1,000 cubic meters annually, the internationally recognized threshold for water stress.[5] Bengaluru, India's technology hub, struggles with solid waste management, generating over 5,000 tons of waste daily with insufficient processing capacity.[6]

These environmental challenges coincide with India's ambitious climate commitments. At COP26, India pledged to reduce carbon emissions intensity by 45%

[1] *Ministry of Housing and Urban Affairs, Govt. of India, India Habitat III National Report 7 (2021).*
[2] *Census of India 2011, Office of the Registrar Gen. & Census Comm'r, India (2011).*
[3] *David Eckstein et al., Global Climate Risk Index 2021, Germanwatch 6 (2021).*
[4] *The Lancet Planetary Health, The Impact of Air Pollution on Public Health in Delhi, 7 Lancet Planet. Health 12 (2023).*
[5] *Ministry of Jal Shakti, Govt. of India, National Water Policy, 3rd ed. (2022).*
[6] *Central Pollution Control Board (CPCB), Annual Report on Solid Waste Management in Urban India 14 (2022).*

by 2030 from 2005 levels and achieve net-zero emissions by 2070.[7] Urban areas, which account for approximately 70% of India's carbon emissions, must play a central role in meeting these targets. The national mission for sustainable habitat recognizes this imperative, emphasizing the need for technological innovation in urban planning, building design, waste management, and transportation.[8]

1.2 The Promise of Green Patents

Green patents intellectual property rights granted for environmentally beneficial technologies represent a pivotal mechanism for addressing these urban sustainability challenges. These patents cover innovations ranging from renewable energy systems and energy-efficient building materials to waste recycling technologies and sustainable transportation solutions. By providing temporary monopoly rights, patents incentivize investing in research and development by offering innovators the opportunity to recoup development costs and financial gain from their inventions.

The global green patent landscape has expanded significantly, with filings increasing by 13% annually since 2015.[9] However, India's contribution to this growth remains modest, with Indian entities filing only 2.4% of global green patent applications despite the country's substantial engineering and scientific talent pool.[10] This discrepancy highlights potential systemic barriers within India's innovation ecosystem and intellectual property regime.

1.3 India's IP Regime: Opportunities and Challenges

India's patent system operates under the Patents Act of 1970, as amended in 2005 to comply with TRIPS Agreement obligations.[11] The Act establishes a framework for protecting inventions that are novel, include an inventive step, and possess industrial applicability. However, several provisions uniquely position India's IP regime in relation to green technologies: First, the Patents Act's Section 3(d) imposes a restrictive conditionality upon the patentability of mere discoveries concerning novel forms of pre-existing substances, mandating a demonstration of augmented efficacy as a prerequisite.[12] While designed to intercept "evergreening" in pharmaceutical patents, this provision

---

[7] *UNFCCC, India's Nationally Determined Contribution under the Paris Agreement, COP26 (2021).*

[8] *Ministry of Environment, Forest and Climate Change, Govt. of India, National Action Plan on Climate Change: National Mission for Sustainable Habitat (2022).*

[9] *World Intellectual Property Organization (WIPO), WIPO Green Report on Green Technology Patents 4 (2023).*

[10] *Id.*

[11] *The Patents Act, 1970, No. 39, Acts of Parliament, 1970 (India) (amended 2005).*

[12] *Id. § 3(d).*

has implications for incremental innovations in environmental technologies. Many green innovations involve adaptations of existing technologies to local conditions—precisely the type of incremental innovation that Section 3(d) may inadvertently discourage.

Second, India's patent law includes provisions for compulsory licensing under Section 84, allowing third parties to utilize patented technologies without the patent holder's consent in cases of national emergency or public non-commercial use.[13] While these provisions have primarily been invoked for pharmaceutical patents, they could theoretically apply to essential green technologies in situations of environmental emergency, creating uncertainty for potential innovators.

Third, the Patents (Amendment) Rules of 2016 established an expedited examination process for patent applications from startups and those relating to energy or environmental technologies.[14] This "green channel" represents a positive step toward prioritizing eco-innovations but remains underutilized, with only 7% of eligible applications utilizing this route.[15]

1.4 The Urban Innovation Paradox

The intersection of green patents and urban innovation in India reveals a paradox. On one hand, Indian cities urgently need technological solutions to address mounting environmental challenges. On the other hand, the existing IP regime may not optimally incentivize the development and deployment of such solutions at the necessary scale and speed.

This paradox manifests in several ways. First, municipal corporations and urban local bodies often lack the technical expertise to evaluate green technologies, leading to risk-averse procurement practices that favor established solutions over innovative alternatives.[16] Second, the fragmentation of urban governance across multiple agencies complicates the implementation of integrated technological solutions.[17] Third, many urban environmental challenges require solutions tailored to local conditions, still the patent system offers limited protection for such context-specific adaptations.

Moreover, the current patent regime presents accessibility challenges for key stakeholders in urban sustainability. Small and medium enterprises (SMEs) and social entrepreneurs, who often drive grassroots

[13] *Id. § 84.*
[14] *The Patents (Amendment) Rules, 2016, Gazette of India, Ministry of Commerce & Industry, India.*
[15] *Office of the Controller General of Patents, Designs and Trademarks, Annual Report 2023 15 (2023).*
[16] *Ministry of Housing and Urban Affairs, Govt. of India, Urban Governance and Smart Cities Report 11 (2022).*
[17] *Id.*

innovation in urban contexts, face significant barriers in navigating the patent system's complexity and costs.[18] A 2022 survey by the Federation of Indian Chambers of Commerce and Industry found that 76% of green technology SMEs considered patent filing procedures too cumbersome and expensive.[19]

1.5 Toward a Balanced Approach

Addressing India's urban environmental challenges requires a balanced intellectual property approach that incentivizes innovation while ensuring technologies remain accessible and adaptable to local contexts. This balance is particularly crucial given India's dual commitments to sustainable development and economic growth.

Global precedents yield instructive jurisprudential data. China's recent reforms to strengthen IP protection coincided with a 142% increase in domestic green patent filings between 2015 and 2020.[20] Similarly, Brazil's prioritized examination for green patents led to a 58% reduction in patent pendency times for environmental technologies.[21]

India's path forward must consider its unique circumstances while learning from global best practices. Potential reforms include streamlining the green patent application process, providing financial incentives for environmentally beneficial innovations, establishing technology transfer mechanisms between research institutions and urban local bodies, and developing specialized IP education programs for urban planners and municipal officials.

2.0 Legal Framework of Green Patents in India

India, as a signatory to the charter on TRIPS, 1994, adheres to global patent standards under Section 2(1)(j) of the Patents Act, 1970,[22] which mirrors TRIPS Article 27. While TRIPS does not explicitly prioritize green patents, Article 7's emphasis on "social and economic welfare" aligns with India's commitments under the Paris Agreement (2015)[23] to promote technology transfer for climate mitigation. However, India has yet to fully leverage these flexibilities for green urban technologies.

2.1 International Obligations

The relationship between TRIPS and international climate commitments creates a complex legal framework that India must

[18] *Federation of Indian Chambers of Commerce and Industry (FICCI), Green Technology SME Challenges in India 18 (2022).*
[19] *Id.*
[20] *China National Intellectual Property Administration (CNIPA), Annual Report on IP Protection 23 (2021).*
[21] *Brazilian Patent and Trademark Office (INPI), Green Patent Priority Examination Report 9 (2022).*
[22] *The Patents Act, 1970, No. 39, Acts of Parliament, 1970 (India) (amended 2005).*
[23] *Paris Agreement, Dec. 12, 2015, T.I.A.S. No. 16-1104.*

navigate when developing its green patent policies.[24] While TRIPS prescribes foundational benchmarks for intellectual property protection, it also contains important flexibilities designed to balance innovation incentives with broader public welfare concerns. Article 7 explicitly states that intellectual property protection should "To facilitate the advancement of technological innovation, in a modality that fosters social and economic prosperity."[25] This provision offers legal justification for member states to implement IP policies that prioritize technologies addressing urgent societal challenges, including climate change and urban sustainability.

Similarly, Article 8 of TRIPS permits members to "To implement such measures as are requisite to safeguard public health and nutritional well-being, and to advance the public interest within sectors of critical significance to their socio-economic and technological advancement."[26] Urban environmental degradation, which threatens public health and economic development in India's cities, arguably falls within this provision's scope. Yet, India's implementation of these flexibilities through national legislation and regulatory frameworks remains limited in the circumstance of green technologies.[27]

2.2 India's National Patent Law

Despite ratifying both TRIPS and the Paris Agreement, India exhibits an implementation gap regarding the integration of these international commitments into domestic green innovation policy.[28] The Patents (Amendment) Act of 2005, which brought India into full TRIPS compliance, introduced comprehensive patent protection for tangible innovations across the entirety of technological domains but did not establish specialized provisions for environmentally beneficial innovations.[29] This Is a foil to countries like Brazil, which implemented expedited examination for green patent applications in 2012,[30] and China, which offers reduced fees and prioritized examination for environmentally friendly technologies.[31]

---

[24] *World Intellectual Property Organization (WIPO), TRIPS and Climate Change: A Legal Perspective 6 (2021).*

[25] *TRIPS, supra note 2, art. 7.*

[26] *Id. art. 8.*

[27] *United Nations Framework Convention on Climate Change (UNFCCC), Intellectual Property Rights and Climate Change Technology Transfer 9 (2020).*

[28] *Ministry of Commerce & Industry, Govt. of India, Annual Report on Intellectual Property Rights in India 22 (2022).*

[29] *The Patents (Amendment) Act, 2005, Gazette of India, Ministry of Law & Justice, India.*

[30] *Brazilian Patent and Trademark Office (INPI), Expedited Examination for Green Technologies Report 14 (2015).*

[31] *China National Intellectual Property Administration (CNIPA), Green Patent Incentive Policies in China 18 (2021).*

India's Climate Change Action Plan (2008) and subsequent National mandate for the development and dissemination of Strategic climate change knowledge. recognize the importance of developing indigenous green technologies.[32] However, these policy frameworks make minimal reference to intellectual property mechanisms as tools for achieving these objectives. The disconnect between climate policy and IP strategy represents a missed opportunity to create a coherent approach to green innovation.[33]

3.0 Urban Context and Implementation Challenges

The implementation challenges are particularly acute in the urban circumstance, where multiple governance structures interact with the IP system. Municipal corporations, which are responsible for implementing many environmental technologies, often lack specialized IP expertise. A 2023 survey by the Indian Council for Research on International Economic Relations found that only 12% of urban local bodies had staff with formal training in IP management, and less than 8% had established protocols for evaluating patented green technologies.[34]

Furthermore, India's federalist structure complicates implementation, as both the central government and states share jurisdiction over environmental matters and urban development.[35] While the central government establishes patent policy, states and municipalities make many key decisions regarding technology deployment.[36] This governance fragmentation creates coordination challenges for implementing coherent green patent policies.[37]

3.1 Challenges

Several TRIPS-compatible pathways could strengthen India's green patent ecosystem.[38] First, India could implement a formal green patent fast-track program within the existing patent framework, providing statutory recognition rather than merely administrative guidelines.[39] Second, targeted fee reductions for green patents filed by small entities and startups could

[32] *Government of India, National Action Plan on Climate Change 7 (2008).*
[33] *Federation of Indian Chambers of Commerce and Industry (FICCI), Intellectual Property and Climate Change Report 11 (2022).*
[34] *Indian Council for Research on International Economic Relations (ICRIER), Survey on IP Capacity in Urban Local Bodies 17 (2023).*
[35] *The Constitution of India, art. 246, Sch. VII (distribution of legislative powers).*
[36] *Ministry of Housing & Urban Affairs, Govt. of India, National Urban Development Report 22 (2022).*
[37] *World Bank, India Urbanization Review: Governance and Green Technology Integration 19 (2021).*
[38] *World Intellectual Property Organization (WIPO), TRIPS Flexibilities for Environmental Technologies 8 (2020).*
[39] *Office of the Controller General of Patents, Designs & Trademarks (CGPDTM), Annual IP Report 33 (2023).*

democratize access to the patent system.[40] Third, India could explore TRIPS Article 31 provisions for compulsory licensing specifically adapted to urban environmental technologies in cases of market failure or inadequate deployment.[41]

Additionally, India could develop specialized IP capacity-building programs for municipal authorities, enabling them to better navigate patent landscapes when implementing urban sustainability initiatives.[42] The Technology and Innovation Support Centres established under India's National IPR Policy could be expanded to include dedicated resources for urban environmental technologies.[43]

By aligning its TRIPS implementation more directly with its Paris Agreement commitments, India can create a more coherent legal framework that incentivizes green innovation while ensuring technologies remain accessible for addressing urban environmental challenges.[44] This alignment would enable India to fulfil both its international obligations and domestic sustainability imperatives.[45]

4.0 India's Patent Law Framework and Green Innovation

The Patents Act, 1970 (amended 2005), governs IP protection in India. Section 3 excludes inventions contrary to public order or harmful to the environment from patentability, implicitly supporting green innovation.[46] Yet, unlike countries like the United States or China, India lacks a dedicated fast-track mechanism for green patents.[47] The National Intellectual Property Rights Policy (2016) aims to "promote innovation for a cleaner environment," but its implementation remains fragmented.[48]

India's judiciary has also shaped green patent discourse. In Novartis AG v. Union of India (2013), the Supreme Court emphasized balancing IP rights with public interest, a principle applicable to green technologies.[49] Additionally, the Natco Pharma v. Bayer (2012) case, where compulsory licensing was granted for a

[40] *Federation of Indian Chambers of Commerce and Industry (FICCI), Policy Recommendations for Enhancing Green Patents in India 14 (2022).*
[41] *TRIPS, supra note 2, art. 31.*
[42] *National IPR Policy, Ministry of Commerce & Industry, Govt. of India (2016).*
[43] *World Economic Forum (WEF), Technology Transfer and Urban Sustainability: India's Emerging Patent Framework 12 (2021).*
[44] *United Nations Framework Convention on Climate Change (UNFCCC), Aligning Intellectual Property with Climate Commitments 10 (2022).*
[45] *Paris Agreement, supra note 3, art. 10 (technology transfer obligations).*
[46] *The Patents Act, No. 39 of 1970, § 3(b), Acts of Parliament, 1970 (India).*
[47] *Id.*
[48] *National Intellectual Property Rights Policy, Ministry of Commerce & Industry, Govt. of India (2016).*
[49] *Novartis AG v. Union of India, (2013) 6 SCC 1 (India).*

patented drug, sets a precedent for ensuring affordable access to critical innovations—a model relevant to urban sustainability.[50]

4.1 The Patents Act and Environmental Considerations

The Patents Act, 1970, as amended in 2005, provides the primary legislative framework for patent protection in India.[51] While the Act does not contain explicit provisions for green patents, several sections offer implicit support for environmental innovation. Section 3(b) specifically excludes from patentability "An invention whose principal or contemplated utilization or commercialization contravenes established public order or moral standards, or which engenders substantial detriment to human, animal, or plant life or health, or to ecological integrity." This exclusion, while primarily restrictive, signals legislative recognition of environmental considerations within the patent system.[52]

Further, Section 2(1)(j) defines an "invention" as "A novel product or process exhibiting non-obviousness and susceptible to industrial utilization." This definition, interpreted in light of India's environmental commitments, could potentially favour green technologies that demonstrate clear industrial applications for addressing urban sustainability challenges.[53] However, the Act remains silent on specific incentives or preferential treatment for such inventions.

The 2005 amendments, while primarily focused on bringing India into compliance with TRIPS requirements, missed an opportunity to incorporate specialized provisions for environmentally beneficial innovations.[54] This is a foil to jurisdictions like Brazil, where INPI (National Institute of Industrial Property) established the Green Patents Program in 2012, offering expedited examination for applications related to alternative energy, transportation, waste management, and agriculture.[55] Similarly, China's State Intellectual Property Office (now CNIPA) implemented preferential examination for green patents in 2012, reducing examination periods from 24 months to less than 12 months for qualifying applications.[56]

4.2 Policy Frameworks and Implementation Challenges

The National Intellectual Property Rights Policy (2016) represents India's most

---

[50] *Natco Pharma Ltd. v. Bayer Corporation, (2012) IPAB (India).*
[51] *The Patents Act, No. 39 of 1970, § 2(1)(j), Acts of Parliament, 1970 (India).*
[52] *Id.*
[53] *Id.*
[54] *World Intellectual Property Organization (WIPO), Expedited Patent Examination for Green Technologies, at 18 (2021).*
[55] *Brazilian National Institute of Industrial Property (INPI), Green Patents Program, 2012.*
[56] *China National Intellectual Property Administration (CNIPA), Green Patent Examination, 2012.*

comprehensive attempt to align IP strategy with broader development goals.[57] Objective 5 of the Policy aims to "Amplify the return of IPRs through commercialization" and specifically mentions "promotion of innovations for a cleaner environment." However, the Policy's implementation has been criticized for focusing primarily on awareness campaigns rather than structural reforms to the patent system.[58]

Implementation remains fragmented across multiple government bodies. The Controller General Office of Designs, Patents and Trademarks administers the patent system, while the Ministry of Environment, Forest and Climate Change develops environmental policies, and the Ministry of Housing and Urban Affairs oversees urban development.[59] This institutional fragmentation creates coordination challenges for implementing coherent green patent policies.[60]

Moreover, the administrative guidelines issued through the Patent Office in 2018 mentioned potential expedited examination for environmentally beneficial technologies but did not establish formal criteria or procedures.[61] Consequently, the average patent examination period in India remains approximately 3-5 years regardless of the technology's environmental benefits a timeframe that may disadvantage green technologies with shorter innovation cycles or urgent implementation needs.[62]

4.3 Judicial Interpretation and Precedents

The Indian judiciary has manifested a pivotal contribution in shaping the interpretation of patent law in ways that have implications for green technologies.[63] In Novartis AG v. Union of India (2013), the Supreme Court's landmark decision on Section 3(d) emphasized that Indian patent law aims to prevent "ever greening" and balance innovation incentives with public interest considerations.[64] Justice Aftab Alam noted that "the primary purpose of Section 3(d) is to prevent ever greening; to provide easy access to the citizens of this country to life-saving drugs and to discharge their constitutional obligation of providing good health care to its citizens."

While this decision focused on pharmaceutical patents, its reasoning establishes a broader principle that patent law should serve public welfare—a principle equally applicable to green

[57] *National Intellectual Property Rights Policy, Ministry of Commerce & Industry, Govt. of India (2016).*
[58] *Id.*
[59] *Office of the Controller General of Patents, Designs & Trademarks, Annual Report, 2018-19 (India).*
[60] *Id.*
[61] *Id.*
[62] *WIPO, Green Technology Fast-Tracking: Global Practices, at 7 (2019).*
[63] *Novartis AG v. Union of India, (2013) 6 SCC 1 (India).*
[64] *Id. at ¶ 78.*

technologies addressing urban environmental challenges.[65] The Court's emphasis on balancing private rights with public needs creates jurisprudential space for considering environmental imperatives in patent adjudication.[66]

Similarly, in Natco Pharma Ltd. v. Bayer Corporation (2012), the Patent's Controller General granted India's first compulsory license for a patented cancer drug, citing grounds of reasonable affordability and lack of sufficient working of the patent in India.[67] This decision established a precedent for intervention when patent rights conflict with public access needs—a model potentially applicable to critical green technologies.[68]

The Delhi High Court's decision in Nitto Denko v. Union of India (2022) further reinforced the principle that patent rights must be balanced against public interest considerations.[69] The Court recognize that "while the protection of IPR is essential for fostering innovation, these rights cannot be absolute when they intersect with broader public welfare concerns." This judicial philosophy provides a foundation for potentially extending similar reasoning to green technologies essential for urban sustainability.[70]

5.0 Green Patents Driving Urban Innovation in India

Green patents can drive innovation in India's Smart Cities Mission (2015), which targets sustainable development in 100 cities.[71] For instance, patented solar technologies and waste-to-energy systems have been piloted in cities like Ahmedabad and Pune.[72] The Office of Indian Patent reported a 10% rise in green technology filings between 2018 and 2023,[73] reflecting growing interest in sustainable urban solutions.

Government initiatives like the National Solar Mission[74] and the AMRUT[75] further incentivize green innovation, often relying on patented technologies. Small and medium enterprises (SMEs) in cities like Coimbatore are also developing low-cost green solutions, such as water purification systems, under patent protection.[76]

---

[65] *Id. at ¶ 95.*
[66] *Natco Pharma Ltd. v. Bayer Corporation, (2012) IPAB (India).*
[67] *Id.*
[68] *Nitto Denko v. Union of India, (2022) Delhi HC.*
[69] *Id.*
[70] *Id. at ¶ 34.*
[71] *Ministry of Housing and Urban Affairs, Smart Cities Mission Guidelines, 2015*
[72] *Id.*
[73] *Indian Patent Office, Annual Report 2023, at 42.*
[74] *Ministry of New and Renewable Energy, National Solar Mission: Towards Building Solar India, 2010.*
[75] *Ministry of Housing and Urban Affairs, Atal Mission for Rejuvenation and Urban Transformation (AMRUT) Guidelines, 2015.*
[76] *Federation of Indian Small & Medium Enterprises, Innovation Trends in Green Technology SMEs in India, 2023.*

5.1 Patent-Driven Innovation and the Smart Cities Mission

Pursuant to the Smart Cities Mission, established in 2015,[77] India has embarked upon its most extensive urban regeneration endeavour, wherein sustainability is enshrined as a cardinal principle. The Mission's regulatory implementation framework explicitly promotes the deployment of novel technological advancements to address prevailing urban environmental concerns.[78] An analysis of the 5,151 projects implemented across 100 smart cities reveals that approximately 28% incorporate patented green technologies,[79] demonstrating the significant role of IP-protected innovations in urban transformation. Ahmedabad's smart city initiatives showcase this intersection of patents and urban sustainability. The city has implemented a patented solar-powered intelligent waste management system developed by Nepra Resource Management, which utilizes sensors, IoT connectivity, and AI algorithms to optimize waste collection routes, reducing vehicle emissions by up to 40%.[80] The system, protected by Indian Patent No. 357821,[81] demonstrates how IP protection can incentivize complex technological solutions to urban environmental challenges.

Similarly, Pune has deployed a patented waste-to-energy technology developed by Thermax Limited (Patent No. 348762),[82] which converts municipal solid waste to energy while minimizing emissions. The technology's proprietary bacterial culture and multi-stage biomethanation process generates 3.5 MW of power while processing 300 tons of waste daily.[83] The patent protection has enabled Thermax to refine its technology over multiple iterations, resulting in a 27% improvement in energy conversion efficiency since initial deployment.[84]

5.2 Growth Trends in Urban Green Patents

The Indian Patent Office's Annual Report (2023)[85] reveals notable growth in environmentally beneficial technology filings, with green patent applications increasing by 10% between 2018 and 2023.[86] This growth exceeds the overall

[77] *Smart Cities Mission Guidelines, supra note 1.*
[78] *Id.*
[79] *Ministry of Housing and Urban Affairs, Annual Report 2023, at 27.*
[80] *Nepra Resource Management, Intelligent Waste Management System & IoT Connectivity, Patent No. 357821 (2021).*
[81] *Id.*
[82] *Thermax Ltd., Waste-to-Energy Technology Using Multi-Stage Biomethanation Process, Patent No. 348762 (2020).*
[83] *Id.*
[84] *Ministry of Housing and Urban Affairs, Smart City Waste Management Innovations, 2023, at 14.*
[85] *Indian Patent Office, Annual Report 2023, supra note 3.*
[86] *Id.*

patent application increase of 7.2% during the same period.[87] Particularly striking is the concentration of these patents in technologies applicable to urban contexts—water purification (17%), renewable energy integration (15%), sustainable building materials (12%), waste management (10%), and urban mobility solutions (9%).[88]

Domestic filings in these categories have grown at 12.3%, outpacing foreign filings at 8.7%,[89] suggesting increasing indigenous innovation capacity. However, a geographical analysis reveals significant disparities, with 64% of domestic green patent applications originating from just five urban centres Bengaluru, Mumbai, Delhi NCR, Pune, and Hyderabad.[90] This concentration highlights the necessity for more all-round innovation ecosystems that extend beyond established technology hubs.[91]

5.3 Government Initiatives as Innovation Catalysts

Various government programs have catalyzed green innovation through funding, regulatory support, and implementation frameworks. The National Solar Mission has been particularly effective, contributing to a 37% increase in solar technology patents since 2018.[92] The Mission's emphasis on domestic manufacturing has stimulated indigenous innovation, with Indian entities filing 143 solar technology patents in 2022-23 alone.[93]

The AMRUT[94] focuses on water supply, urban transport and sewerage, Analysis of project implementations reveals that cities utilizing patented technologies achieved water loss reduction of 28% compared to 17% in cities using conventional technologies.[95] For instance, Jamshedpur's implementation of a patented smart water management system (Patent No. 361492)[96] reduced non-revenue water from 32% to 18% within two years,[97] demonstrating the performance advantages of protected innovations.[98]

However, these initiatives also underscore the tension between IP protection and technology affordability. A 2022 survey of 37 AMRUT cities found that procurement costs for patented water technologies averaged 32% higher than non-patented

[87] *Id.*
[88] *Id. at 45.*
[89] *Id. at 49.*
[90] *Ministry of Commerce & Industry, Geographical Distribution of Patent Filings in India, 2023, at 9.*
[91] *Id.*
[92] *National Solar Mission, supra note 4.*
[93] *Indian Patent Office, Patent Filing Statistics, 2023, at 31.*
[94] *AMRUT Guidelines, supra note 5.*
[95] *Ministry of Housing and Urban Affairs, Impact Assessment Report on AMRUT Projects, 2023, at 17.*
[96] *Jamshedpur Municipal Corporation, Smart Water Management System, Patent No. 361492 (2022).*
[97] *Id.*
[98] *Impact Assessment Report on AMRUT Projects, supra note 25, at 23.*

alternatives,[99] creating budget challenges for resource-constrained urban local bodies.[100]

5.4 SME Innovation in Urban Sustainability

Perhaps most promising is the exposure of small and medium enterprises developing context-appropriate green technologies.[101] In Coimbatore, Watsan Envirotech has developed a patented low-cost water purification system (Patent No. 359476)[102] that uses locally sourced materials and treats groundwater contaminated with textile effluents[103] a specific challenge in this industrial hub.[104] The system costs 40% less than comparable technologies while achieving similar purification results.[105]

The patent protection has enabled Watsan to secure venture funding of ₹4.7 crores for scaling operations,[106] demonstrating how IP rights can help smaller innovators attract investment.[107] Similarly, Binish Desai, now known as the "Recycle Man of India," who secured patent protection (the Patent No. 352489)[108] for his process of converting industrial paper waste into construction materials,[109] enabling him to expand from a small workshop to a facility producing 600 bricks daily for affordable housing projects.[110]

These examples illustrate how the patent system, despite its limitations and accessibility challenges, can support grassroots innovation addressing specific urban environmental challenges.[111] However, SMEs continue to face significant barriers, with patent filing costs representing approximately 17% of the average R&D budget for small green technology firms.[112]

5.5 Challenges of Patent Exclusivity for Urban Sustainability in India

The exclusivity of patents poses significant hurdles in India, where 65% of urban dwellers live in informal resolution with limited resources.[113] High licensing costs for patented green technologies such as advanced air purifiers or energy-efficient building materials restrict their adoption in cities like Delhi, which battles severe

---

[99] *Center for Science and Environment, Urban Water Innovation & Cost Analysis, 2022, at 11.*
[100] *Id.*
[101] *Federation of Indian Small & Medium Enterprises, SME Contributions to Green Technology, 2023, at 19.*
[102] *Watsan Envirotech, Low-Cost Water Purification System, Patent No. 359476 (2021).*
[103] *Id.*
[104] *Id.*
[105] *Id. at 7.*
[106] *Federation of Indian Small & Medium Enterprises, supra note 31, at 22.*
[107] *Id.*
[108] *Binish Desai, Recycling Industrial Paper Waste into Construction Bricks, Patent No. 352489 (2020).*
[109] *Id.*
[110] *Id. at 12.*
[111] *Id.*
[112] *Federation of Indian Small & Medium Enterprises, Patent Filing Costs for Small Green Technology Firms, 2023, at 15.*
[113] *UN-Habitat, World Cities Report 2022, at 47.*

pollution.[114] Moreover, India's patent pendency rate (averaging 4-6 years) delays the deployment of green innovations, undermining urban sustainability goals.[115] The lack of technology transfer mechanisms exacerbates this issue.[116] Developing nations, including India, have criticized the global IP reign for favouring patentees in industrialized countries, as seen in debates at the WTO.[117]

5.6 The Affordability Gap in Urban Green Technologies

The exclusivity conferred by patents creates a fundamental tension between innovation incentives and affordable access, a tension particularly acute in India's urban context.[118] Patent protection confers upon patentees the sole right to commercially exploit their inventions, thereby enabling them to establish premium pricing structures for the dissemination of their technological innovations, often placing them beyond the reach of resource-constrained municipalities and low-income urban residents.[119] This affordability gap manifests in several critical part of urban sustainability.

In Delhi, where air pollution regularly reaches hazardous levels, patented air purification technologies that could mitigate health impacts remain inaccessible to most residents.[120] A 2023 study by the Centre for Science and Environment found that patented air purification systems cost between ₹20,000-45,000, representing approximately 30-65% of the annual income for households in informal settlements.[121] Similarly, in Mumbai, where flooding has become increasingly frequent due to climate change, patented water management systems implemented in affluent neighborhoods have demonstrated 40% greater effectiveness than conventional solutions but at 2.5 times the cost.[122]

The affordability challenge extends to energy-efficient building materials crucial for reducing urban heat island effects and lowering carbon emissions. A comprehensive analysis of green building materials in Hyderabad revealed that patented insulation technologies reduced energy consumption by 32% compared to traditional materials but at a cost premium

[114] *Id. at 51.*
[115] *Indian Patent Office, Annual Report 2023, at 12.*
[116] *Ministry of Commerce & Industry, Technology Transfer and Innovation Policy in India, 2023, at 27.*
[117] *India's Submission on TRIPS and Climate Change, WTO Doc. IP/C/W/673 (2021).*
[118] *Center for Science and Environment, Green Technologies & Urban Affordability Report 2023, at 35.*
[119] *Id.*
[120] *Id. at 39.*
[121] *Id. at 42.*
[122] *National Institute of Urban Affairs, Flood Management & Resilient Urban Planning, 2023, at 19.*

of 45-60%[123]. This premium effectively excludes these technologies from affordable housing projects and informal settlement upgrades, creating a "sustainability divide" between wealthy and low-income urban areas.[124]

Municipal corporations, which are responsible for implementing many urban sustainability initiatives, face similar financial constraints. A survey of 42 urban local bodies revealed that 78% considered patent licensing costs a "significant barrier" to adopting green technologies, with 64% reporting that they had opted for less effective but more affordable non-patented alternatives.[125]

5.7 Patent Pendency and Innovation Delays

India's patent examination process creates additional barriers to green urban innovation.[126] The Indian Patent Office's average pendency period of 4-6 years significantly exceeds the universal average of 2-3 years. This extended timeline has particular implications for environmental technologies, where rapid deployment is often crucial for addressing urgent urban challenges.[127]

The case of Ecoviate Technologies illustrates this challenge. The company developed an innovative waste segregation system specifically designed for Indian mixed waste streams in 2018 but received patent approval only in late 2023.[128] During this five-year pendency, the company struggled to secure investment, delaying deployment in ten municipalities that had expressed interest.[129] By the time the patent was granted, three of these municipalities had implemented alternative solutions, representing lost opportunities for both the innovator and urban sustainability.[130]

The Small and medium enterprises suffer disproportionately, as 42% of green tech startups abandoned patent applications due to financial constraints, while 28% shut down while awaiting patent approval,[131] Although the Office of Indian Patent introduced expedited examination guidelines in 2018, implementation has been weak, with only 8% of eligible green patents benefiting from this process.[132]

5.8 Global Inequities in Technology Transfer

The challenges of patent exclusivity extend beyond India's borders to international

[123] *Indian Institute of Human Settlements, Energy-Efficient Building Materials & Urban Heat Islands in India, 2022, at 23.*
[124] *Id. at 27.*
[125] *National Institute of Urban Affairs, Survey on Patent Licensing Costs in Urban Sustainability, 2023, at 14.*
[126] *Indian Patent Office, supra note 3, at 16.*
[127] *Id. at 19.*
[128] *Ecoviate Technologies, Patent No. 362918: Waste Segregation for Indian Municipalities, 2023.*
[129] *Id. at 3.*
[130] *Id. at 5.*
[131] *Start-up India, Challenges of Patent Delays for Green Start-ups, 2022, at 11.*
[132] *Indian Patent Office, Guidelines on Expedited Examination for Green Technologies, 2018, at 8.*

technology transfer mechanisms.[133] India's submission to the WTO's Council for Trade-Related Aspects of Intellectual Property Rights (2021) highlighted how the global IP reign creates barriers to accessing green technologies for developing nations. The submission emphasized that nearly 80% of climate change reduction patents are held by companies in high-income countries, creating dependency relationships that often involve prohibitive licensing terms.[134]

This global inequity is reflected in urban technology transfer patterns. Analysis of technology licensing agreements for urban environmental solutions reveals that Indian municipalities pay licensing fees 30-45% higher than their counterparts in developed nations for the same patented technologies.[135] These disparities undermine the principle of "common but differentiated responsibilities" established in international climate agreements and create additional financial burdens for already resource-constrained Indian cities.

The lack of specialized technology transfer mechanisms for urban sustainability technologies compounds these challenges. While sectors like agriculture and healthcare have established international technology transfer platforms (such as CGIAR for agriculture and the Medicines Patent Pool for pharmaceuticals), no equivalent exists for urban environmental technologies. This gap leaves individual municipalities to navigate complex international patent landscapes and negotiate licensing agreements without specialized expertise or collective bargaining power.[136]

6.0 India's Pro-Public Legal Doctrine and Green Patents

India's doctrinal approach to patents reflects a pro-public stance, evident in its use of TRIPS flexibilities.[137] Section 84 of the Patents Act allows compulsory licensing if a patented invention is not available at a reasonable price[138] a tool yet to be widely applied to green technologies.[139] Legal scholars like Basheer (2018) argue that India could extend this provision to urban sustainability patents, ensuring access to innovations like rooftop solar systems or electric vehicle chargers.[140]

---

[133] *India's Submission on TRIPS and Climate Change, supra note 5.*
[134] *Id.*
[135] *Centre for Policy Research, Technology Licensing Disparities in Urban Sustainability, 2022, at 15.*
[136] *Id. at 18.*
[137] *WTO, TRIPS Agreement and Public Interest Provisions, 2022, at 14.*
[138] *The Patents Act, No. 39 of 1970, India Code, § 84.*
[139] *Id.*
[140] *Shamnad Basheer, Patent Law and Public Interest: India's Approach, 45 J. Indian L. Stud. 87, 101 (2018).*

The public interest doctrine, enshrined in Article 21 of the Constitution (right to a clean environment), further justifies such measures.[141] In M.C. Mehta v. Union of India (1987), the Supreme Court mandated environmental protection, suggesting a legal basis for prioritizing access to green technologies over strict IP enforcement.[142]

6.1 India's Pro-Public Patent Doctrine: Theoretical Foundations

India's approach to patent law is grounded in a distinctly pro-public welfare orientation that distinguishes it from more proprietarian IP regimes.[143] This orientation emerges from India's colonial experience, its post-independence development priorities, and its constitutional framework emphasizing social justice.[144] The country's patent jurisprudence has consistently recognized what Justice Krishna Iyer termed the "social function of intellectual property" in his synchronizing opinion in Ayyangar Committee Report (1959), which significantly influenced the Patents Act of 1970.[145]

This doctrinal position became particularly evident after India's TRIPS compliance in 2005, when the country deliberately incorporated robust public interest safeguards within its patent framework. Unlike many developed nations that implemented TRIPS with minimal flexibilities,[146] India crafted what scholars have termed a "maximalist approach to TRIPS flexibilities" (Basheer, 2018). This approach reflects the theoretical understanding that patents amount to a social contract between innovators and society a temporary monopoly granted in exchange for the ultimate public benefit of the innovation.[147]

6.2 Compulsory Licensing Provisions and Urban Sustainability

The Patents Act's Section 84 embodies this pro-public approach by establishing compulsory licensing provisions that can be invoked when:

a. Public exigencies remain unfulfilled by the patent's implementation;[148]
b. The invention which is patented is not disseminated at a commercially viable cost accessible to the general populace;[149] or
c. The patented invention is not effectively reduced to practice within the territorial jurisdiction of India.[150]

---

[141] *INDIA CONST. art. 21.*
[142] *M.C. Mehta v. Union of India, (1987) 1 SCC 395 (India).*
[143] *Ayyangar Committee Report, 1959, at 52.*
[144] *Id.*
[145] *Id. at 63.*
[146] *Basheer, supra note 4, at 112.*
[147] *Id.*
[148] *The Patents Act, supra note 2, § 84(1)(a).*
[149] *Id. § 84(1)(b).*
[150] *Id. § 84(1)(c).*

This provision gained international attention with the landmark Natco v. Bayer case (2012), where India issued its first compulsory license for a pharmaceutical.[151] However, its application to environmental technologies remains largely unexplored territory, despite its significant potential for urban sustainability applications.[152]

The criteria for "reasonable requirements of the public" under Section 84(7) includes circumstances where the establishment or development of commercial activities in India is prejudiced. Given that environmental degradation in urban centers directly prejudices economic development,[153] Delhi's air pollution alone costs the city an estimated 1.5% of its GDP annually (World Bank, 2021) there exists a strong legal basis for applying compulsory licensing to critical green technologies.[154]

Similarly, the "reasonably affordable price" criterion has particular relevance in the circumstances of urban sustainability technologies. A comprehensive analysis of green technology pricing conducted by the Energy and Resources Institute (TERI) found that patent royalties account for 25-30% of the final cost of advanced solar technologies and 18-22% of energy-efficient building materials in Indian market. These premiums place such technologies beyond the reach of most urban residents and municipal bodies, potentially satisfying the affordability criterion under Section 84.[155]

Legal scholars like Basheer (2018) and Damodaran (2021) have persuasively argued for extending compulsory licensing to green technologies.[156] Their doctrinal analysis suggests that technologies crucial for addressing urban environmental crises—decentralized wastewater treatment systems, advanced air purification technologies, and affordable renewable energy solutions—could qualify under the existing statutory framework.[157] Yet this potential remains largely unrealized, with no compulsory licenses granted for environmental technologies to date.[158]

6.3 Constitutional Foundations: Article 21 and Environmental Jurisprudence

The constitutional dimensions of India's pro-public patent doctrine further strengthen the case for prioritizing access to green technologies. The jurisprudential trajectory of Supreme Court, particularly its expansive construction of Article 21,

[151] *Natco Pharma Ltd. v. Bayer Corp., (2012) IPAB 5 (India).*
[152] *Id.*
[153] *The Patents Act, supra note 2, § 84(7).*
[154] *World Bank, Urban Air Pollution in India: Economic Implications, 2021, at 23.*
[155] *Energy and Resources Institute, Green Technology Pricing in India, 2023, at 35.*
[156] *Basheer, supra note 4, at 125.*
[157] *Id.*
[158] *Id.*

subsuming therein the right to a salubrious environment, engenders a constitutional imperative for environmental protection.[159] This imperative, by virtue of its fundamental nature, possesses the potential to operate as a superior norm, effectively limiting the strict implementation of patent rights. As articulated by Justice P.N. Bhagwati in M.C. Mehta v. Union of India (1987), 'The right to live in a pollution-free environment is a constituent element of the fundamental right to life enshrined in Article 21 of the Constitution,[160] thereby establishing a paramountcy of environmental rights. This decision established what legal scholars term the "environmental dimension of Article 21," creating a constitutional foundation for measures ensuring access to technologies addressing urban environmental degradation.

Judicial rulings have consistently amplified this constitutional ground. In Indian Council for Enviro-Legal Action v. Union of India (1996), the Supreme Court emphasized that "environmental concerns arise in an increasing number of cases and the courts have to balance environmental considerations with the imperatives of economic development."[161] This balancing principle is directly applicable to patent rights, suggesting that when strict enforcement of green patents conflicts with environmental imperatives, constitutional values may justify limitations on exclusive rights.[162]

6.4 Judicial Precedents:

India's judiciary has developed a robust environmental jurisprudence that offers doctrinal support for ensuring access to green technologies.[163] The "polluter pays" principle, firmly established in Vellore Citizens Welfare Forum v. Union of India (1996), places responsibility on those causing environmental harm[164] a principle potentially applicable to patent holders who restrict access to pollution-mitigating technologies through prohibitive licensing terms.

Similarly, the precautionary principle, recognized in A.P. Pollution Control Board v. Prof. M.V. Nayudu (1999), mandates that "where there are threats of serious and irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation." Applied to patent law, this principle could justify measures ensuring access to green

[159] *INDIA CONST. art. 21.*
[160] *Mehta, supra note 6.*
[161] *Indian Council for Enviro-Legal Action v. Union of India, (1996) 3 SCC 212 (India).*
[162] *Id.*
[163] *Id.*
[164] *Vellore Citizens Welfare Forum v. Union of India, (1996) 5 SCC 647 (India).*

technologies even before environmental harms reach critical levels.

Most significantly, the public trust doctrine, articulated in M.C. Mehta v. Kamal Nath (1997), Imposes a public trust obligation upon the government, mandating the responsible administration of specified natural resources for the common weal. Legal scholars like Rajamani (2022) argue that this doctrine could extend to green technologies essential for preserving these natural resources—particularly in urban contexts where environmental degradation directly impacts public health and welfare.

7.0 Case Studies: Green Patents in Indian Urban Contexts

7.1 Delhi: Air Quality Crisis and Patent Barriers

Delhi's persistent air quality crisis has appeared as a critical test case for the intersection of green patents and urban sustainability. The city regularly experiences PM2.5 levels exceeding 300 µg/m³ during winter months 30 times the WHO guideline limits with severe health consequences for its 20 million residents.[165] This crisis has spurred demand for patented air filtration systems, but high costs severely limit their adoption.[166]

Devic Earth's Pure Skies technology, protected by Indian Patent No. 346572, represents a promising intervention.[167] The system utilizes pulsed radio wave technology to create an atmospheric cleaning effect, reducing particulate matter by 33-65% across covered areas.[168] However, with installation costs averaging ₹15-20 lakhs per unit and annual maintenance contracts of ₹3-4 lakhs, the technology remains accessible primarily to corporate campuses and luxury residential complexes.[169]

The Delhi government's attempts to implement this technology in pollution hotspots have been hampered by budgetary constraints, with only seven units installed across the city despite plans for city-wide coverage.[170] This situation has prompted civil society organizations like the Centre for Science and Environment to advocate for compulsory licensing under Section 84 of the Patents Act, arguing that Delhi's air quality crisis constitutes a public health emergency justifying such measures.[171]

---

[165] *World Health Organization, Global Air Quality Guidelines 2021, at 16 (2021), https://www.who.int/publications/i/item/9789240034228.*

[166] *Centre for Science and Environment, State of India's Environment 2022, at 48 (2022).*

[167] *Devic Earth, Indian Patent No. 346572 (filed Mar. 12, 2019).*

[168] *Id.*

[169] *Devic Earth, Pure Skies: Air Pollution Control Technology, https://www.devicearth.com.*

[170] *Delhi Pollution Control Committee, Annual Report on Air Pollution Control Measures in Delhi (2022).*

[171] *The Patents Act, No. 39 of 1970, § 84, INDIA CODE (2023).*

A pilot project in the Anand Vihar area, where a subsidized IP-sharing model was implemented between Devic Earth and the Delhi Pollution Control Committee, demonstrated promising results.[172] Under this arrangement, the company provided the technology at 40% below market rates in exchange for tax incentives and data sharing.[173] This model suggests potential pathways for balancing innovation incentives with public access needs in urban environmental crises.[174]

7.2 Bengaluru: Tech Hub Innovation and SME Challenges

As India's premier technology hub, Bengaluru has become a laboratory for patented smart grid technologies that promise to improve energy efficiency in urban settings.[175] The city's Technology Innovation Hub, established under the Smart Cities Mission, has implemented IBM's patented intelligent energy distribution system (Patent No. 352689) across three administrative zones, reducing transmission losses by 17% and enabling more efficient integration of renewable energy sources.[176]

However, this success story reveals a parallel challenge: local SMEs struggle to compete with multinational patentees in the green technology marketplace.[177] Sunya Technologies, a Bengaluru-based startup developing low-cost energy management systems for small commercial buildings, has encountered significant barriers in securing patent protection for its innovations.[178] The company's founder, Aravind Srinivasan, reports spending over ₹12 lakhs on patent applications with a three-year wait time—resources that could have been directed toward product development.[179]

This experience highlights the call for a more accessible domestic green patent ecosystem.[180] The Karnataka State Innovation Council has responded by establishing a Green Patent Assistance Program, which provides technical and financial support to local innovators navigating the patent system.[181] Early results suggest modest success, with 14

---

[172] *Devic Earth & Delhi Pollution Control Committee, Pilot Project Report: Anand Vihar Air Purification Initiative (2023).*
[173] *Id.*
[174] *Centre for Science and Environment, Compulsory Licensing: A Tool for Public Health Emergencies (2023).*
[175] *Government of India, Smart Cities Mission Annual Report 2023, Ministry of Housing & Urban Affairs.*
[176] *IBM, Indian Patent No. 352689 (filed June 15, 2020).*
[177] *Karnataka State Innovation Council, Challenges for SMEs in Patent Acquisition (2023).*
[178] *Sunya Technologies, Patent Filing Challenges in India (2023).*
[179] *Interview with Aravind Srinivasan, Founder, Sunya Technologies (Feb. 15, 2024).*
[180] *Karnataka State Innovation Council, Green Patent Assistance Program Overview (2023).*
[181] *Id.*

green technology patents secured by Bengaluru-based SMEs in 2022-23, compared to just five in the previous year.[182]

7.3 Mumbai: Coastal Resilience and Patent Pools

Mumbai's vulnerability to sea-level rise and increasingly intense monsoons has driven demand for patented coastal resilience technologies.[183] The city's Coastal Road Project incorporates several patented flood barrier systems, including the Dutch-designed Hydraulic Flood Barriers (European Patent EP2718532B1, with Indian protection under Patent No. 358762).[184] These systems have demonstrated effectiveness in protecting reclaimed areas from storm surges but come at a significant cost premium of approximately ₹340 crores for the 10km southern section.[185]

To address affordability challenges, the Greater Mumbai's Municipal Corporation has pioneered an innovative patent pool approach.[186] By negotiating collective licensing agreements with multiple technology providers, the city has secured access to a portfolio of complementary flood protection technologies at rates 27% below individual licensing costs.[187] This model, now being studied by other coastal cities, demonstrates how municipalities can leverage collective bargaining power to improve access to patented green technologies.[188]

However, the patent pool approach has faced criticism for focusing primarily on large-scale infrastructure solutions while neglecting distributed, community-level resilience measures.[189] Local advocacy groups like the Mumbai Environmental Social Network have called for expanding the patent pool to include technologies suitable for informal settlements, where approximately 41% of Mumbai's population resides.[190]

7.4 Chennai: Water Management Innovations

Chennai's recurring water crises have catalyzed innovation in patented water management technologies.[191] The city's acute water shortages in 2019, when all four major reservoirs ran dry, accelerated the adoption of IIT Madras's patented AMRIT

[182] *Id.*
[183] *Municipal Corporation of Greater Mumbai, Climate Resilience Strategy Report (2022).*
[184] *Dutch Flood Protection Systems, European Patent No. EP2718532B1 (filed Nov. 5, 2018).*
[185] *Mumbai Coastal Road Project, Infrastructure Cost Estimates and Analysis (2023).*
[186] *Municipal Corporation of Greater Mumbai, Patent Pooling Mechanism for Coastal Resilience (2023).*
[187] *Id.*
[188] *Id.*
[189] *Mumbai Environmental Social Network, Critique of Patent Pooling for Large-Scale Infrastructure (2023).*
[190] *Id.*
[191] *Chennai Metropolitan Water Supply & Sewerage Board, Water Crisis Report 2019 (2019).*

(Anion Exchange Membrane Reclamation Integration) water recycling system (Patent No. 349876).[192] This technology enables decentralized wastewater treatment and reuse at approximately 40% lower energy costs than conventional systems.[193]

However, patent licensing fees contribute to overall system costs of ₹5-7 lakhs for residential applications, limiting adoption primarily to upper-middle-class neighborhoods and commercial complexes.[194] To address this accessibility gap, the Chennai Metropolitan Water Supply and Sewerage Board has implemented a graduated licensing model, whereby commercial users pay full licensing fees while residential users in water-stressed areas receive subsidized rates.[195]

This approach has increased adoption rates by 47% in targeted areas but highlights the ongoing tension between innovation incentives and equitable access.[196] The Chennai experience demonstrates the potential for flexible licensing models to balance these competing priorities in the circumstance of urban water management.[197]

7.5 Hyderabad: Green Building Technologies

Hyderabad's rapid growth as an IT hub has coincided with increased emphasis on green building technologies, many protected by patents.[198] The city's HITEC City IT Park incorporates patented energy-efficient building envelope systems from Saint-Gobain (Patent No. 351429), which reduce cooling energy requirements by 29% compared to conventional designs.[199]

However, the "green premium" associated with these patented technologies—estimated at ₹850-1200 per square foot—has limited their adoption primarily to premium commercial developments.[200] To address this challenge, the Telangana State Government has implemented a novel "Patent Exchange Program" whereby developers gain access to patented green building technologies at reduced rates in exchange for density bonuses and expedited permits.[201]

This policy innovation has increased the adoption of patented green building

[192] *IIT Madras, Indian Patent No. 349876 (filed Jan. 8, 2018).*
[193] *Id.*
[194] *Chennai Water Authority, Cost Analysis of AMRIT Water Recycling System (2023).*
[195] *Chennai Metropolitan Water Supply & Sewerage Board, Graduated Licensing Model for Water Recycling (2023).*
[196] *Id.*
[197] *Id.*
[198] *Telangana State Government, Green Building Adoption Report 2023, at 22.*
[199] *Saint-Gobain, Indian Patent No. 351429 (filed Dec. 3, 2019).*
[200] *Hyderabad Urban Development Authority, Cost Study on Green Building Technologies (2023).*
[201] *Telangana State Government, Patent Exchange Program for Sustainable Buildings (2023).*

technologies in mid-range developments by 32% since implementation in 2021, suggesting that regulatory incentives can effectively offset patent-related cost barriers.[202]

8.0 Recommendations

In the rapidly urbanizing landscape of developing economies, intellectual property (IP) frameworks must evolve to address the dual challenges of encouraging innovation while ensuring widespread access to green technologies. The following recommendations aim to strike this balance:

8.1 Fast-Track Green Patents

Introducing an expedited review process in the Patents Act specifically for urban sustainability technologies would significantly reduce the time between innovation and implementation.[203] This system, modelled on China's successful green IP incentives, could reduce patent pendency from 3-5 years to 12-18 months for qualified green technologies.[204]

By prioritizing innovations addressing urban air quality, water management, waste reduction, and energy efficiency, this approach would accelerate the deployment of critical solutions when they're most needed.[205] The fast-track system should include reduced filing fees, simplified documentation requirements, and dedicated examination teams with expertise in environmental technologies.[206]

8.2 Compulsory Licensing for Critical Technologies

Section 84 of the Patents Act provides a powerful mechanism to ensure affordability of essential technologies.[207] By mandating licensing of critical green patents after a reasonable period of market particularity, policymakers can prevent monopolistic pricing while still respecting innovators' initial investment returns.[208]

This approach is particularly relevant for technologies addressing basic urban needs like clean water access, affordable renewable energy, and waste management systems.[209] Implementation should include clear guidelines on what constitutes "reasonable" pricing and transparent processes for determining when compulsory licensing is warranted.[210]

---

[202] *Id.*
[203] *World Intellectual Property Organization (WIPO), Fast-Tracking Green Technology Patents: Global Best Practices, at 14 (2023), https://www.wipo.int.*
[204] *State Intellectual Property Office of China, Green Patent Fast-Track Examination Measures, at 7 (2022).*
[205] *Ministry of Housing & Urban Affairs, India Smart Cities Mission Annual Report 2023, at 35.*
[206] *The Patents Act, No. 39 of 1970, § 24B, INDIA CODE (2023).*
[207] *The Patents Act, No. 39 of 1970, § 84, INDIA CODE (2023).*
[208] *Centre for Science and Environment, Compulsory Licensing and Public Health Emergencies, at 22 (2022).*
[209] *United Nations Environment Programme (UNEP), The Role of Green Patents in Environmental Sustainability, at 19 (2023).*
[210] *Id. at 23.*

8.3 Public-Private Partnerships and Collaborative Models

Encouraging patent pools or open-source frameworks, similar to those in the global renewable energy sector, can foster collaboration between innovators, urban planners, and municipal governments.[211] These collaborative models allow multiple stakeholders to share IP rights while distributing development costs and risks.[212] Successful examples include the Eco-Patent Commons and the Clean Energy Patent Pledge, which have demonstrated how shared IP can accelerate adoption of green technologies.[213] Government incentives, such as tax benefits or preferential procurement policies, could encourage private sector participation in these collaborative frameworks.[214]

8.4 Tiered Royalty Systems

Implement differential royalty structures based on application context.[215] Commercial applications could pay standard rates, while applications in underserved urban areas or public infrastructure could benefit from reduced royalties.[216] This approach maintains incentives for innovation while enabling broader technology diffusion.[217]

8.5 Local Innovation Zones

Create designated urban areas where green technology start-ups receive IP protection support, including subsidized patent filing, legal assistance, and enforcement support.[218] These zones would serve as test beds for new technologies while providing innovators with simplified IP management.[219]

8.6 Traditional Knowledge Protection

Develop specific provisions to protect and compensate communities when traditional ecological knowledge is incorporated into patented green technologies.[220] This ensures equitable benefit-sharing and encourages the integration of established sustainable practices into modern urban solutions.[221]

---

[211] *Clean Energy Patent Growth Index (CEPGI), Patent Collaboration and Green Innovation Trends, at 8 (2022).*
[212] *Id.*
[213] *The Eco-Patent Commons, Case Studies in Open Innovation for Sustainability, at 15 (2023).*
[214] *International Renewable Energy Agency (IRENA), Public-Private Partnerships in Renewable Energy Patents, at 11 (2022).*
[215] *Government of India, Draft National IPR Policy 2023, at 28.*
[216] *The Indian Ministry of New and Renewable Energy (MNRE), Renewable Energy Patent Incentives: A Review, at 10 (2023).*
[217] *Id.*
[218] *Karnataka State Innovation Council, Green Innovation Zones: A New IP Protection Model, at 5 (2023).*
[219] *Id.*
[220] *The Biological Diversity Act, No. 18 of 2002, § 21, INDIA CODE (2023).*
[221] *National Biodiversity Authority, Traditional Knowledge and Intellectual Property: Guidelines for Protection, at 30 (2022).*

8.7 Regular IP Policy Reviews

Institute a biennial review process for environmental technology IP policies, ensuring frameworks remain responsive to emerging challenges and technological developments.[222] This would include stakeholder consultations with innovators, urban planners, environmental groups, and affected communities.[223]

By implementing these recommendations, policymakers can create an IP ecosystem that simultaneously drives innovation in green technologies while ensuring these solutions reach the urban populations that need them most.[224] This balanced approach recognizes that environmental challenges require both cutting-edge innovation and widespread accessibility.[225]

9.0 Conclusion

The intersection of IPR and environmental sustainability represents a critical frontier in India's urban development journey. Green patents, while powerful catalysts for eco-innovation, require a nuanced legal framework that responds to India's distinct socioeconomic and environmental challenges. As India's cities continue their rapid expansion, the thoughtful evolution of patent policy becomes increasingly urgent.

India's current patent regime, while robust in many aspects, was not specifically designed to address the unique dynamics of environmental technologies. The traditional approach to intellectual property—prioritizing exclusivity and market-based incentives—may inadvertently hinder the widespread adoption of crucial sustainability solutions. A recalibrated framework is essential to unleash the reconstitutional potential of green innovations while ensuring they reach communities across the socioeconomic spectrum.

We cannot ignore the constitutional architecture underpinning this issue. The right to a healthy environment, woven into the fabric of Article 21, and the state's directive to safeguard nature, as articulated in Article 48A, create a compelling legal mandate for accessible green innovation. This domestic imperative aligns seamlessly with India's global commitments, demanding a swift, technological re-imagining of urban spaces to meet the benchmarks set by the Paris Agreement and the Sustainable Development Goals. An evolved patent regime must align with these fundamental legal and ethical imperatives.

---

[222] *World Economic Forum, Regulatory Frameworks for Green Innovation, at 17 (2023).*
[223] *Id.*
[224] *Ministry of Environment, Forest and Climate Change (MoEFCC), IP Policy Review Report: Sustainable Urban Development, at 14 (2023).*
[225] *Id.*

The path forward requires recognizing that green patents differ fundamentally from conventional patents. Their social utility extends beyond commercial value to include public health benefits, resource conservation, and climate resilience. This distinct character justifies special treatment within the IP framework—not to diminish the rights of innovators, but to maximize the societal impact of their creations.

For India's urban centres, the stakes are particularly high. Cities face acute challenges in waste management, water security, air quality, and energy efficiency. Green patents offer solutions to these pressing issues, but only if the legal ecosystem facilitates their implementation across diverse urban contexts—from megacities to emerging urban clusters.

A balanced approach would retain core IP protections while introducing flexibility mechanisms that reflect the public interest dimension of environmental technologies. This includes differential treatment based on technology type, implementation context, and social impact. Such a framework would stimulate innovation while preventing monopolistic practices that could restrict access to essential green solutions.

Success in this endeavor requires multi-stakeholder collaboration. Government agencies, research institutions, private sector innovators, and civil society must work together to develop patent policies that serve both commercial and public interests. Transparent processes for evaluating the social impact of green patents would help guide these collaborative efforts.

As India positions asserts its leadership mantle in climate action and sustainable development, its approach to green patents will serve as a model for other developing economies. By creating a legal framework that harmonizes innovation incentives with equitable access, India can demonstrate how intellectual property can obey as a bridge rather than a barrier to sustainable urban futures—fulfilling both its national aspirations and global responsibilities in environmental stewardship.

***

ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY OF MYSORE | DEPARTMENT OF STUDIES IN LAW
Manasagangotri-570006.

Mysore University Law Journal

Volume 2, Issue 1, 2025

Intellectual Property Rights and Sustainable Cities: Legal Frameworks, Innovations, and Urban Growth

Alina Shiji Abraham[1]

Albert Sajeev[2]

Abstract

Intellectual Property Rights (IPRs) play a crucial role in fostering innovation, economic growth, and sustainability in urban environments. As cities evolve into hubs of technological advancement and creative industries, IPRs serve as a key mechanism to protect innovations that contribute to sustainable urban development. From green technologies and smart infrastructure to cultural heritage preservation, intellectual property fosters economic resilience while ensuring long-term environmental and social benefits. This research paper explores the intersection of IPRs and sustainable cities, highlighting their role in promoting green innovations, sustainable business models, and inclusive economic growth. Furthermore, the paper examines the adequacy of India's legal and regulatory framework in fostering an IP-driven urban sustainability model. Through the analysis of international frameworks and case studies, the study aims to assess the impact of IPRs in shaping resilient, sustainable, and innovation-driven cities.

Keywords: *Intellectual Property Rights, Sustainable Cities, Innovation, Urban Development, Green Technology.*

[1] *4th yr student, BBA LLB (Hons.), CHRIST (Deemed to be University), Delhi NCR.*
Email- alina.shiji@law.christuniversity.in
[2] *4th yr student BBA LLB (Hons.), CHRIST (Deemed to be University), Delhi NCR*
Email- albert.sajeev@law.christuniversity.in

1. Introduction

With the fast pace of urbanization in the current era, cities are emerging as economic growth centers, technological hubs, and centers of cultural change. However, increasing resource pressure, environmental degradation, and socio-economic disparities pose formidable challenges to the attainment of sustainable urban development. Here, Intellectual Property Rights (IPRs) emerge as the key driver of innovation promotion, protection of creative industries, and economic sustainability of cities.[3] By encouraging the creation of green technologies, smart infrastructure, and sustainable business models, IPRs assist in the development of sustainable and resilient urban areas. Sustainable cities fit into the United Nations' Sustainable Development Goal (SDG) 11, which highlights inclusive, safe, resilient, and sustainable urban areas. Intellectual property, through patents, trademarks, copyrights, and geographical indications, supports this objective by promoting technological development, maintaining cultural heritage, and stimulating economic development. Despite their potential, high expenses, limited access, and ineffective policy enforcement lead to the non-fulfillment of using IPRs in city sustainability. This paper discusses the contribution of IPRs as molding green cities, focusing on their impact on innovation, economic development, and environmental sustainability. Along with this, it also examines the robustness of India's regulatory and legal framework in promoting IP-fostered urban sustainability and learns from global best practices.[4] Through identifying the greatest challenges and opportunities, this research aims to highlight the transformative strength of IPRs in designing strong and sustainable cities.

2. Intellectual Property Rights and Urban Innovation

Intellectual Property Rights (IPRs) are paramount to stimulating innovation and creativity, particularly in cities where technological innovation and sustainable development are given priority. Urban innovation, such as green technology, smart city innovation, and sustainable urban development, largely depends on robust IPR frameworks for their protection and remuneration of creative effort. The

[3] *Wiley Online, available at: https://onlinelibrary.wiley.com/doi/10.1111/grow.12689 (last visited on March 23, 2025).*

[4] *Wiley Online , available at: https://advanced.onlinelibrary.wiley.com/doi/abs/10.1002/adsu.202100283 (last visited on March 23, 2025).*

combined relationship between IPRs and city innovation is the concern of this paper, where they are revealed to have a potential to promote green innovation and alleviate urban problems in the age of the internet. IPRs have been termed as a promoter of green innovation due to the legal protection given to environmental technologies.[5] The case is that China's IPP reforms significantly promoted urban green innovation by stimulating investment and talent agglomeration. These reforms also exhibited spatial spillover impacts, benefiting the peripheral cities above the central cities and fostering interregional coordination. Moreover, programs like China's Intellectual Property Demonstration Cities (IPDC) have decreased R&D spillover loss and reduced finance barriers, facilitating companies to make investments in green technologies effectively. The cross-road of Sustainable Development Goals (SDGs) 9 (industrial innovation) and 11 (sustainable cities) lays out the role of IPRs in achieving sustainable urbanization. Empirical evidence drawn from models like the Spatial Durbin Model reveals that strong IPR protection is linked positively with sustainable urbanization through enhanced technological advancement, economic agglomeration, and social welfare.[6] However, concerns like the undesirable impacts of foreign direct investment on IP protection warn that there must be finesse in policy actions. Traditional IP laws generally discourage cooperation and free flows of ideas that are crucial for urban innovation. Open innovation paradigms encourage the remaking of IP systems to prioritize inclusiveness and collaborative knowledge sharing. Initiatives like Creative Commons licenses and crowdsourcing sites show how innovators sidestep restrictive IP law to design participatory spaces. [7]

Drawing on the work of Intellectual Property Rights (IPRs) in urban development and sustainability, there is a need to examine how different IP frameworks—patents, trademarks, copyrights, and trade secrets—drive innovation in urban infrastructure, energy efficiency, and conservation. Patents play a key role in protecting green technology, such as smart grids, energy-efficient buildings, and electric vehicle technology,

[5] *Pubmed, available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC10631640/ (last visited on March 23, 2025).*

[6] *UNCTAD, available at: https://unctad.org/publication/harnessing-intellectual-property-rights-innovation-development-and-economic (last visited on March 23, 2025).*

[7] *European Commission, available at: https://intellectual-property-helpdesk.ec.europa.eu/news-events/news/world-ip-day-2024-sustainable-development-goals-and-intellectual-property-role-intellectual-property-2024-04-26_en (last visited on March 23, 2025).*

which are central to sustainable urbanization. For example, higher application of patent pools in green infrastructure and renewable power allows firms to share key innovation while competing at the leading edge. Similarly, trademark protections allow clean companies to create brand equity and trust among consumers to construct market-demand driven for greener options. Moreover, online copyright protections encompass smart city technology such as AI-driven urban planning software and transport solutions based on data, so that there can be continued investment and innovation in such sectors.[8]

However, despite these advantages, traditional IPR regimes often present challenges to urban sustainable development. Patent thickets, in which multiple overlapping patents create legal chokepoints, often hinder diffusion and access of technologies. Additionally, rigid patent protections at times inhibit smaller companies and startups' access or innovation on top of already established green innovation.[9] To address these challenges, policymakers are experimenting with flexible IP models such as compulsory licensing of key environmental technologies and patent acquisition that makes available sustainable alternatives to public and private players. Cross-border collaborations such as the WIPO Green Initiative demonstrate how global IP systems can be leveraged to facilitate technology transfers into developing nations while ensuring equitable access to urban sustainability solutions. In addition, public-private partnerships (PPPs) are becoming a viable means to harmonize IP protection and mutual innovation, with government-initiated incentives compelling corporations to partake in open-source city development projects. With changing IP policies that embrace protection and knowledge sharing, cities can maximize the potential of IPRs in sustainable urban renewal.[10]

3. Legal and Regulatory Framework for IPRs in India

India's IPR regime is governed by a framework of laws and regulations that are consistent with international standards and domestic priorities. The Patents Act, 1970

[8] *MDPI, available at: https://www.mdpi.com/2079-8954/12/1/21 (last visited on March 23, 2025). (last visited on March 23, 2025).*

[9] *WIPO, available at: https://www.wipo.int/en/web/wipo-magazine/archive?url=https://www.wipo.int/wipo_magazine/en/2021/01/article_0009.html (last visited on March 23, 2025).*

[10] *ITIF , available at: https://itif.org/publications/2021/04/29/ten-ways-ip-has-enabled-innovations-have-helped-sustain-world-through/ (last visited on March 23, 2025).*

(as amended in 2005) allows product and process patents, especially in pharmaceuticals and biotechnology. The Trademarks Act, 1999 provides protection to brand identity so that business firms can differentiate their products and services. The Copyright Act, 1957 (amended in 2012) protects literary, artistic, musical, and digital works. The Geographical Indications (GI) of Goods Act, 1999 also protects region-specific goods like Darjeeling Tea and Banarasi Sarees. Implementation is overseen by authorities like the Controller General of Patents, Designs, and Trademarks (CGPDTM) and the Copyright Office, and judicial recourse is available through High Courts. Despite a good legislative framework, problems such as backlog in patent prosecution, inadequate enforcement, and ignorance on the part of small enterprises continue to exist.[11]

India's regime of IPR is governed by a framework of laws and regulations that conform to international standards and respond to domestic priorities. The Patents Act, 1970 (as amended in 2005) allows product and process patents, especially for the pharmaceutical and biotechnology sectors. The Trademarks Act, 1999 protects brand identity such that businesses are able to identify their products and services. The Copyright Act, 1957 (amended in 2012) gives protection to literary, artistic, musical, and computer works. In addition to this, The Geographical Indications (GI) of Goods Act, 1999 also gives protection to goods of geographical origin, like Darjeeling Tea and Banarasi Sarees. To enforce this is the duty of authorities such as the Controller General of Patents, Designs, and Trademarks (CGPDTM) and the Copyright Office, with judicial recourse for redressal through the High Courts. Despite a robust legislative environment, issues such as patent examination backlog, lack of enforcement, and insufficient awareness among small businesses continue to exist. [12]

While India's IPR law is comprehensive, enforcement and regulatory challenges still affect their effectiveness. The backlog of patent applications remains a priority concern, with thousands of applications being held up because of an insufficiency of patent examiners and complex procedural processes. Such delay not only

[11] *Morgan Lewis, available at: https://www.morganlewis.com/pubs/2024/04/intellectual-property-spurs-innovation-toward-sustainable-development-on-world-ip-day (last visited on March 23, 2025).*

[12] *SDG , available at: https://sustainabledevelopment.un.org/content/documents/5580Innovation,%20Economic%20Development%20and%20Intellectual%20Property%20Rights.pdf (last visited on March 23, 2025).*

discourages innovation but also affects business competitiveness, particularly in the pharmaceutical, biotechnology, and green technology industries. Also, piracy and counterfeiting are significant threats, with sectors like fashion, electronics, and entertainment experiencing widespread piracy. Inadequate enforcement structures, especially at the grassroots level, lead to minimal deterrence against IP infringement, particularly in the informal sector. Another challenge is limited awareness and access to IP protection among small and medium enterprises (SMEs) and start-ups. The majority of companies, particularly in rural and semi-urban areas, fail to register their patents or trademarks, leading to lost economic opportunities. To counter this, the government has launched initiatives such as the National IPR Policy (2016) and the Startup Intellectual Property Protection (SIPP) Scheme to raise awareness and simplify the patent process. Nevertheless, more targeted reforms—such as streamlining patents for clean technologies, further fiscal incentives for IP registration, and enhanced IP education at the ground level—are required to create a strong IPR ecosystem in India and ensure intellectual property contributes to sustainable economic growth.

4. IPRs and Green Technology in Urban Development

Green urban development is driven by green technologies that reduce environmental impact and increase energy efficiency. IPRs, particularly patents, facilitate investment in green technologies such as renewable energy technologies, smart grids, and green building materials. National Innovation Foundation (NIF) and Start-up India initiatives support green technology start-ups in safeguarding their innovations. Challenges persist, including the cost of patenting green innovations, limited technology transfer, and enforcement. By strengthening the incentives for research and IP protection, India shall be able to drive sustainable urban development through innovation. One of the largest benefits of IPRs in green technology is that it results in the creation of eco-friendly patents. [13]They include patents related to electric vehicles, biodegradable items, and water purification technologies. India's path to green patenting is eased through the Green Patent Program, allowing environment-friendly patents to be prosecuted quickly, as well as giving innovators in the industry

[13]*WIPO, available at: https://www.wipo.int/en/web/wipo-magazine/archive?url=https://www.wipo.int/wipo_magazine/en/2019/03/article_0002.html (last visited on March 23, 2025).*

an easy fast-track path. India's Smart Cities Mission is a good example of application of IPR-protected technologies in city planning. Incorporating green technologies like sustainable energy management systems, waste management systems, and urban farming methods, the mission exemplifies how IPR-protected green technology is making cities efficient and eco-friendly. The government must continue increasing interface between industry and academic institutions in an attempt to boost research and development within this area.

Despite all these advancements, the adoption and commercialization of green technology are beset with challenges. The most significant issue is the very high cost of obtaining and maintaining patents, which may be prohibitive for startups and small companies working on sustainable technologies. The majority of inventors find the process of patenting to be complicated, which leads to delays or even inability to get IP protection. In addition, technology transfer is a critical issue because research institutions and companies find it difficult to license patented technology for wide application. Stronger policies are required to facilitate sharing of green innovations without diluting the incentives for inventors. Enforcement of green patents is also a concern. Even though India has enhanced intellectual property protection, patent infringement and obliviousness remain an issue. The majority of firms, especially in the informal sector, unknowingly violate IP regulations, and legal disputes follow to discourage the adoption of green technologies. Institutions should be strengthened for enforcement purposes and public sensitization on IP rights in the green technology sector in order to address such hurdles.[14] Public-private partnerships are at the core of bridging the research-commercialization gap. Collaboration among government agencies, private industries, and educational institutions can make development and deployment of green solutions possible. Green technology incubators and patent pools can encourage sharing of knowledge without eliminating innovation incentives. The Smart Cities Mission has led the way towards making more efficient and livable urban spaces with an integration of IP-protected sustainable solutions. Scaling up these programs and setting up specific funding instruments for green innovation patents will be the future direction to make IPRs

[14] *UNCTAD , available at: https://unctad.org/system/files/official-document/comsec2024d1_en.pdf (last visited on March 23, 2025).*

the drivers of sustainable urban growth for India.[15]

5. Cultural and Creative Industries in Sustainable Cities

Protection of intellectual property drives sustainable city economies through trademarks and copyright laws protecting works of art, traditional arts, and digital content. Geographical Indications (GIs) also assist in building the economies of cities by promoting unique, heritage-focused industries. Urban cities like Jaipur and Varanasi, for instance, depend on GI-tagged handicrafts that propel cultural tourism and economic recovery. However, the craftsman in cities is behind when it comes to benefiting from the protections provided under the IPR, and they need more intensive IP awareness initiatives and support schemes. The Handloom and Handicrafts Industry is the pillar of sustainable creative economy for India. Chennai (with the Kanchipuram saree), Bhuj (with the block print) and other cities rely on Geographical Indications to protect their traditional craft. Empowering the Intellectual Property Facilitation Centers (IPFCs) in various cities will help small enterprises and artisans protect their work. In addition, digital art and online content creation have transformed urban creative industries. Urban creative industries need improved mechanisms of copyright enforcement to secure digital artists and foster sustainable creative industries in cities.[16]

Another significant aspect of intellectual property protection in sustainable urban economies is the role of cultural tourism. Those cities with a strong creative and cultural profile attract visitors who are prepared to experience and purchase genuine, locally made products. Properly protected intellectual property rights, particularly geographical indications, enhance the marketability of traditional crafts and art products by ensuring buyers their quality and genuineness. For example, the GI tag for Jaipur blue pottery or Mysore silk guarantees fair returns to artisans and protection against mass-produced imitations that can ruin the market for genuine products. Improving the branding of GI-tagged products and creating specialized urban marketplaces for them can further improve artisans' livelihoods along with local economies. Additionally, urban policies supporting creative entrepreneurship can significantly

[15] *Barlette, available at: https://www.ucl.ac.uk/bartlett/planning/xing-gao (last visited on March 23, 2025).*

[16] *CNLU , available at: https://cnlu.ac.in/centre-for-innovation-research-and-facilitation/ (last visited on March 23, 2025).*

be helped by a strong IPR system. [17]The majority of cities across the world have adopted creative economy models that include intellectual property protection as well as business development initiatives. In India, initiatives such as the National Intellectual Property Rights Policy aim to provide a systemic approach toward improving IP awareness and enforcement. But municipal governments have to undertake more intensive interventions, such as streamlining the process of trademark and copyright registration, patent application funding, and the establishment of mentorship programs in order to help designers and artists dispose of their work.

The digitalization of creative industries brings both challenges and opportunities for urban economies to achieve sustainability. Increased use of digital platforms to sell crafts, music, and digital art has forced urban producers to sell their products across a broader territory. This has exposed them to enormous copyright violations and counterfeits. Improved digital copyright laws and strong enforcement of sanctions against cyber intellectual property theft are essential to ensure that creators can economically benefit from their work. At the same time, digital literacy and e-commerce training can empower artists and artisans to utilize online platforms without compromising their IP rights. Finally, cooperation between heritage artisans and contemporary designers can create new conditions for sustainable urban development. Protection of intellectual property rights is imperative in such alliances by providing recognition to original authors and financial gains. Alliances between traditional societies of crafts and urban design institutions can introduce new product design through innovation while protecting cultural heritage. Offering greater legal support to such alliances, enforcing ethical design principles, and inspiring sustainable production activities can help urban centres thrive as hubs of tradition as well as modern creativities.[18]

6. Barriers to Implementing IPRs in Sustainable Cities

Despite a well-defined legal regime, barriers to enforcing IPR are present in the context of sustainable cities. Potential

[17] *West Minister Research , available at: https://westminsterresearch.westminster.ac.uk/download/12f8c316b8e8e7c6e912c42055f1a6ba19cdb1f612c36cf54e266673827ab261/1094397/AcceptedManuscript_17Sep20_Final.pdf (last visited on March 23, 2025).*

[18] *White Black Legal, available at: https://www.whiteblacklegal.co.in/details/smart-cities-and-intellectual-property-innovation-in-urban-developement-by---lucksha-b (last visited on March 23, 2025).*

innovators and small companies are deterred from registration due to the time-consuming process and expensive fee for obtaining IP protection. Difficulty enforcing results in extensive infringement, counterfeiting, and web piracy. Additionally, balancing public availability of sustainable technology with patent rights remains a primary concern. To counter these hurdles, reforms such as easy registration of IPs, improved judicial systems, and increased public-private collaborations are the call of the times. Digitization of IP processes can also improve ease of access and efficiency. Lack of IP consciousness among small-time entrepreneurs and eco-friendly startups is another significant hindrance. The majority of companies fail to protect their innovations due to their lack of knowledge about patents, copyrights, and trademarks. The government should implement IP awareness campaigns via business incubators and universities.[19]

7. International Perspectives and Best Practices

India's IPR framework is guided by international treaties like the TRIPS Agreement, Madrid Protocol, and WIPO Treaties. Cross-country comparison of best practices from the United States and Germany shows the precedence of strong enforcement, patent grant simplification, and funding for innovations in utilizing the strengths of IPRs. Countries like Japan have pioneered green patent fast-tracking and encouraged sustainable innovations. India can also adopt the same methods, such as accelerated processing of green patents and improved IP funding channels, to enhance its innovation culture. Another significant global practice is establishing IP arbitration centers for effectively resolving disputes. Singapore and the UK have both succeeded in making alternative dispute resolution systems for intellectual property cases effective, reducing the burden on courts.

International perspectives on intellectual property rights (IPRs) provide useful insights into best practices for advancing innovation and sustainable urbanization. The majority of countries have succeeded in integrating IPR frameworks into sustainability policies to balance economic development with environmental and social concerns. The European Union is one such example that has developed strong patent protection of green technologies while pushing open-access models for necessary innovations. These nations like Japan and South Korea have

[19] *NLU Assam, available at: https://nluassam.ac.in/docs/Journals/IPR/NLUA_Journal_of_IPR_vol1_issue1.pdf (last visited on March 23, 2025).*

streamlined their IP registration procedures to enable sustainable startups and researchers to quickly acquire rights for inventions. India can create its legal and regulatory framework by emulating these global models to further enhance urban resilience through good IP governance.[20]

One of these notable global best practices is fast-tracking green patents. The United States and the European Union have instituted accelerated programs for green inventions, reducing the time to obtain patent approvals. These kinds of programs create incentives for businesses to bring sustainable technologies to market more quickly. India can take a cue by expanding its Green Patent Program and simplifying procedures for applicants working on climate-friendly innovations. Additionally, encouraging patent-sharing agreements and global collaboration on sustainability programs can enhance India's urban development goals. Another crucial lesson from foreign IP systems is the role played by public-private collaboration in strengthening enforcement mechanisms. Countries like Germany and Singapore have established specialist IP courts and professional agencies for enforcement to adjudicate disputes efficiently. These systems ensure that the abuse of intellectual property is addressed quickly, reducing the economic cost of piracy and counterfeiting. India can benefit by implementing comparable structures, improving judicial efficiencies, and ensuring that IPR enforcement aligns with international best practices.[21]

The digital economy also shapes global IPR policies. South Korea and China, for example, have implemented AI-based IP surveillance systems to combat digital piracy and patent violations. These technologies enable real-time monitoring of unauthorized copying of content and counterfeit products in online markets.[22] Implementing such cyber solutions in India would enhance the effectiveness of IP enforcement in urban creative industries, digital start-ups, and green technology sectors. Additionally, intellectual property education has been incorporated into the national economic plans of most nations. Universities and business incubators in the United States, Japan, and the UK offer extensive training

[20] *Gov UK , available at: https://www.gov.uk/government/publications/uk-guangdong-urban-innovation-challenge/uk-guangdong-urban-innovation-challenge (last visited on March 23, 2025).*

[21] *IFPMA, available at: https://www.ifpma.org/insights/how-ip-enables-accelerated-progress-on-the-sustainable-development-goals/ (last visited on March 23, 2025).*

[22] *International Science Council , available at: https://council.science/blog/how-intellectual-property-sustainability-transitions/ (last visited on March 23, 2025).*

in patenting, copyright legislation, and trademark protection. These learning programs give innovators the information they require to safeguard their intellectual property and successfully commercialize their inventions.[23] India can strengthen its IP literacy programs by including such programs in its education and entrepreneurship programs, instilling an environment of innovation and legal awareness.

International co-operation is also essential to finding solutions to transborder intellectual property problems. Organizations like the World Intellectual Property Organization (WIPO) and the United Nations Development Programme (UNDP) have come up with programs favoring equitable access to patented green technology in the developing world. India can employ such global co-operations while negotiating technology transfer agreements so that sustainable innovation is accessible to urban policymakers and industries working on the creation of smart cities. By embracing these best practices in its own IPR policy, India can enhance its regulatory and legal framework and drive a more innovation-driven, sustainable urban economy. Fostering greater international cooperation, investing in digital enforcement technologies, and raising green patent incentives will turn intellectual property rights into a generator of environmentally friendly, long-term urban growth.[24]

8. Future Prospects and Recommendations

8.1 Strengthening Intellectual Property Laws for Sustainable Development

India has made significant strides in developing a comprehensive intellectual property rights (IPR) framework, yet there is still scope for enhancing it, particularly in the field of sustainable urbanization. Future policy initiatives need to simplify the regulatory framework to provide more protection for green technologies, cultural heritage, and digital innovation. Strengthening of the patent, copyright, and trademark legislations will not only ensure greater compliance with international norms but will also trigger sustainable economic growth through innovation in renewable energy, smart infrastructure, and green urbanization.

One of the most promising areas for IPRs in green cities is enhancing patent

[23] *Weforum, available at: https://www.weforum.org/stories/2024/02/how-ip-laws-can-be-reimagined-to-stimulate-innovation/ (last visited on March 23, 2025).*

[24] *CIEL , available at: https://www.ciel.org/issue/intellectual-property/ (last visited on March 23, 2025).*

protection for green patents. Some developed nations have set up speed-track patent offices for green technologies that reduce administrative red tape and enable quicker commercialization of green innovations. India must expand its Green Patent Program, making it easier for process for startups and research institutions that are working on clean energy technology, waste management, and green building materials. Faster review and reduced patent charges for green technology can encourage investment in research on sustainability and encourage firms to prioritize environmental responsibility. [25]

8.2 Encouraging Open Innovation and Technology Transfer

While patent protection incentivizes innovation, on other occasions it helps create monopolies that block the mass adoption of green technologies. In balancing the commercial sector's interests and the common good, India must promote open models of innovation and technology transfer deals under which patented green technology is more readily available. Establishing a Patent Pooling Mechanism, where multiple companies pool their patents into a shared database, can facilitate cooperation among industries, universities, and government agencies involved in sustainability efforts. A good example of this mechanism is the Eco-Patent Commons, a voluntary initiative where corporations donate environmentally friendly patents for public use. India can adopt a similar model by convincing businesses to grant royalty-free rights for renewable energy, water-efficient, and organic farming patents. This would enable cities to achieve large-scale green innovation on an enormous scale, boosting an equitable and sustainable urban model of development.[26]

8.3 Enhancing IP Awareness and Accessibility for Small Businesses

One of the largest issues faced by small and medium enterprises (SMEs) and start-ups in India is lack of awareness and access to IP protection mechanisms. The majority of entrepreneurs who work on sustainable innovations do not get patents or trademarks registered because they are unaware of the process and have high registration charges. To achieve this, India must increase Intellectual Property Facilitation Centers in urban centers,

[25] *AIPPI, available at: https://www.aippi.org/news/the-impact-of-ip-laws-on-sustainable-development-goals/ (last visited on March 23, 2025).*

[26] *Legacy Partners , available at: https://legacypartners.in/insights-and-research/8-types-ip-rights-iprpm-framework (last visited on March 23, 2025).*

particularly in technology parks and startup hubs. These centers can be one-stop destinations for firms with legal aid, patent filing assistance, and financing guidance on IP-related costs. In addition, incorporating IP studies in university curricula and offering free courses in patenting and copyrights would ensure that future entrepreneurs and city planners are well aware of intellectual property protection. Further, making the process of patent and trademark filings cheap for startups with environmentally friendly ideas can motivate more companies to have their ideas patented. Waivers of fee, government subsidies, and low-interest loans covering IPR expenses would make the IP system accessible, promoting a more inclusive innovation and sustainability culture. [27]

8.4 Strengthening Enforcement Mechanisms for IPR Protection

While India has strengthened its IPR enforcement machinery, counterfeiting, digital piracy, and trademark violation are still widespread. A more strict approach to enforcement is necessary to protect business and creators, particularly in urban centers where digital economies are thriving. The establishment of Special IP Courts in big cities can fast-track intellectual property cases, bringing speedy resolution and reducing economic loss due to counterfeiting. Moreover, the use of Artificial Intelligence and Blockchain Technology can help in real-time infringement detection for IP protection. AI-powered monitoring systems can scan online platforms and social media to identify unauthorized use of copyrighted material or counterfeit goods. Blockchain-based digital IP registries have the ability to form tamper-proof records of patents, trademarks, and copyrights, which can make the IPR management process secure and transparent.[28] Public-private partnerships can also be crucial for IPR enforcement. Collaborations between government agencies, law enforcement agencies, and technology companies can enhance monitoring systems and legal procedures involved in IP violation cases. Including urban communities and local businesses in IP protection awareness campaigns will further strengthen the ecosystem so that creators and innovators receive their due recognition and financial benefits.

[27] *PIB Gov, available at: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1941489 (last visited on March 23, 2025).*

[28] *PRS India, available at: https://prsindia.org/policy/report-summaries/review-of-the-intellectual-property-rights-regime (last visited on March 23, 2025).*

8.5 Expanding International Cooperation and Best Practices

International collaboration plays a pivotal role in improving India's IPR system as well as making it compatible with the best practices of advanced nations. Strengthening bilateral relationships with international agencies like the World Intellectual Property Organization, World Trade Organization, and United Nations Development Programme will empower India to gain technical assistance, investment, and legal consultation to simplify its IPR system. India should also focus on bilateral free trade agreements that promote knowledge exchange and technology transfer to facilitate sustainable urbanization. Japan, Germany, and the United States all have robust IPR frameworks that facilitate green innovation. India can draw lessons from their policies and adopt mutual recognition agreements, whereby patents registered in one country are valid in another, to enhance cross-border collaboration in sustainability projects. In addition, involvement in international patent-sharing schemes, such as the Patent Prosecution Highway, can speed up the process of granting patents to Indian innovators who want to bring their green solutions to the international market. By simplifying international patent filings and reducing administrative hurdles, Indian businesses can spread their green technologies to a broader market, stimulating economic growth while promoting global sustainability efforts. [29]

8.6 Promoting Smart Cities through IPR-Driven Innovations

India's Smart Cities Mission presents a wonderful opportunity to integrate IP-protected innovation into city development. Through IP-protected smart grid technologies, IoT-based solutions for waste management, and AI-driven traffic control, cities can be made efficient and sustainable. Policy recommendations of the future must include mandatory IP impact assessments on smart city programs, so innovations integrated into city development are strengthened with robust intellectual property protection. Additionally, the government must launch IP-backed funding models in which companies are able to use their patents and trademarks as collateral to raise finances for green projects. Urban local bodies must also collaborate with research institutions and technology firms to create IPR-incubation centers, fostering the co-creation of smart solutions tailored to the

[29] *NITAP , available at: https://www.nitap.ac.in/storage/pdf/f63d0ea9127821f83a5a4ad9f1531be8-10-04-11of%20IPR.pdf (last visited on March 23, 2025).*

unique environmental and socio-economic requirements of Indian cities. [30]By promoting such collaborations, India can become a global leader in sustainable urban innovation.

8.9 Strengthening Protection for Cultural and Creative Industries

India's cultural strength and creative industries are the cornerstones of sustainable urban economies. Intellectual Property protection in respect of Geographical Indications, indigenous art, and traditional knowledge must be strengthened to prevent exploitation and equitable economic benefits to artisans. An increase in GI-tagged urban economies can further promote heritage industries in cities like Jaipur for blue pottery, Varanasi for silk weaving, and Hyderabad for pearl jewelry. [31]Implementing e-commerce IP protection measures will further protect traditional craft sectors from counterfeit products, so that artisans enjoy fair market access. India also requires stronger digital copyright laws to protect urban creators of content in the streaming, AI-generated, and NFT world. By modernizing its copyright regime, India can establish a thriving urban creative economy that rewards artists without permitting unauthorized replicas of their work.

9. Conclusion

Lastly, intellectual property rights (IPRs) are a key tool in fostering sustainable cities through innovation stimulation, protection of urban cultural heritage, and environmental-friendly technologies. The findings highlight that IPRs not only encourage green infrastructure and smart city solutions but also contribute to fostering economic resilience and social inclusion. However, in order to fulfill their full potential, there is a necessity to strengthen legal systems, enhance institutional support, and foster cooperation among policymakers, business, and society. Through the facilitation of IP protection and the encouragement of sustainable innovation, IPRs can play a pivotal role in creating smart, resilient, and sustainable cities.

[30]*Mondaq, available at: https://www.mondaq.com/account/register (last visited on March 23, 2025).*
[31]*International Trade Administration , available at: https://www.trade.gov/country-commercial-guides/india-protecting-intellectual-property (last visited on March 23, 2025).*

ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY OF MYSORE
DEPARTMENT OF STUDIES IN LAW
Manasagangotri-570006.

Mysore University Law Journal

Volume 2, Issue 1, 2025

Intellectual Property Rights and Agricultural Innovation in Poverty-Stricken Regions

Ashraya. S. Chakraborty[1]

Gaana V S[2]

Abstract

Agricultural development in low-income regions presents distinct challenges, including subsistence farming, limited inputs, and heightened vulnerability to climate change. Intellectual Property Rights (IPR) can drive innovation through the development of high-yielding, climate-resilient, and pest-resistant crops. However, strict IPR enforcement may restrict smallholder access due to prohibitive costs, potentially worsening inequality. Similarly, Geographical Indications (GIs) can enhance market access but often come with high certification costs and limited awareness among small farmers. This paper proposes policy solutions to balance innovation with equitable access, including affordable licensing models, public-private partnerships, open-source technologies, and strengthened protection of traditional knowledge. Adapting IPR frameworks to local contexts can promote sustainable agricultural innovation and contribute to achieving SDG 2 (Zero Hunger) and SDG 9 (Industry, Innovation, and Infrastructure).

Keywords: *Intellectual Property Rights, Agriculture, Innovation, Poverty Elevation, Patents, Climate.*

[1] *Assistant Professor of Law, J.S.S. Law College, Kuvempunagara, Mysuru- 570006*
Email: ashrayachakraborty30@gmail.com
[2] *Student of Law J.S.S. Law College, Kuvempunagara, Mysuru- 570006.*
Email: gaana.heetha@gmail.com

1. Introduction:

In areas where most of the population frequently relies on farming for their livelihoods, agriculture continues to be a vital component of both economic activity and survival. Innovation in agriculture, from better crop types to sustainable farming practices, has enormous potential in these areas to reduce poverty, increase production, and fight food insecurity. However, intellectual property rights (IPRs), which control access to and ownership of innovative technology, have a significant impact on the creation and adoption of agricultural breakthroughs.[3] IPRs are intended to promote innovation by safeguarding inventors' rights and providing incentives for investment; nevertheless, their effects in low-income areas are intricate and multidimensional. On the one hand, they can spur innovations that tackle urgent agricultural issues like insect resistance and climate resilience. However, they frequently restrict smallholder farmers' access to necessary resources, erecting obstacles that might worsen inequality and impede regional growth.

The complex connection between agricultural innovation and intellectual property rights in impoverished areas is examined in this essay. It aims to draw attention to the necessity of policies that strike a balance between the needs of vulnerable communities and the interests of innovators by analysing the potential and difficulties related to IPR frameworks. The article seeks to shed light on how intellectual property laws may be rethought to promote equitable and sustainable agricultural growth through a review of actual cases and alternative models.

By providing incentives for research and development and guaranteeing equitable access to new technology, intellectual property rights, or IPRs, are essential for promoting agricultural innovation. To solve issues like food security, climate change, and the requirement for sustainable farming methods, innovation is crucial in the agricultural sector. IPRs offer a legal framework that safeguards people's and organizations' intellectual property, enticing them to make investments in the creation of novel farming methods, plant varieties, and technology.

[3] *Amentae, T. K., Song, W., & Wang, J. (2024). Intellectual property rights in the agri-food chains: A systematic review and bibliometric analysis. World Patent Information, 77(102279), 102279.* https://doi.org/10.1016/j.wpi.2024.102279

2. The Role of Intellectual Property Rights in Agricultural Innovation

Among the essential instruments of intellectual property rights (IPRs) that allow inventors to protect their works are patents, plant breeders' rights, and trademarks. For example, new plant varieties are protected by plant breeders' rights, which enable breeders to recoup their costs and fund additional research. Similarly, firms are granted exclusive rights by patents on biotechnological innovations, such genetically modified crops, which encourage private sector involvement in agricultural innovation. These safeguards encourage cooperation between public and commercial organizations, which in turn promotes the creation of technology that improve farming's resilience, production, and efficiency.

But there are also important concerns with IPR application in agriculture. It is difficult to strike a balance between providing accessibility for small-scale farmers and encouraging innovation. For farmers in developing nations, overprotection can result in monopolies, exorbitant prices, and limited access to vital technologies. Mechanisms including benefit-sharing plans, mandatory licensing, and open-access research projects are required to address this and advance inclusivity and equity in agricultural innovation. IPRs are a two-edged sword in agriculture overall. Their frameworks must be carefully crafted to guarantee that the advantages of innovation reach all stakeholders, even as they encourage technological developments and draw investment. IPRs can successfully support global food security and sustainable agricultural growth by finding a balance between protection and accessibility.[4]

In areas of extreme poverty, intellectual property rights (IPRs) pose serious obstacles, especially when it comes to agricultural innovation. Although IPRs are intended to encourage research and development, underprivileged populations who rely on agriculture for a living frequently face obstacles because of their adoption. To combat food insecurity and boost economic resilience in these areas, access to advanced farming techniques, enhanced crop varieties, and new technology is essential. IPRs, however, usually make these initiatives more difficult, reducing the potential advantages of innovation and escalating inequality.

[4] Gurzawska, A. (2020). Towards responsible and sustainable supply chains – innovation, multi-stakeholder approach and governance. Philosophy of Management, 19(3), 267–295. https://doi.org/10.1007/s40926-019-00114-z

The price of protected plant types and proprietary technologies is one major obstacle. The bulk of agricultural producers in underdeveloped regions are smallholder farmers, who frequently lack the funds to buy high-yield seeds or access cutting-edge farming equipment. This leads to a reliance on conventional techniques, which are frequently less effective and less resilient to climate-related issues. Furthermore, local biodiversity and indigenous knowledge may be marginalized by multinational businesses' reliance on proprietary technologies, weakening generations-old sustainable practices.

Small-scale farmers' ignorance and comprehension of IPRs is another problem. Farmers are exposed to exploitation and conflicts over who owns genetic resources or traditional knowledge due to complicated legal frameworks and restricted access to legal resources. Examples of biopiracy, in which businesses patent knowledge or resources that come from local communities without paying proper remuneration, further undermine trust and make poverty in these areas worse.[5]

3. Challenges of IPRs in Poverty-Stricken Regions

In areas of extreme poverty, intellectual property rights (IPRs) pose serious obstacles, especially when it comes to agricultural innovation. Although IPRs are intended to encourage research and development, underprivileged populations who rely on agriculture for a living frequently face obstacles because of their adoption. To combat food insecurity and boost economic resilience in these areas, access to advanced farming techniques, enhanced crop varieties, and new technology is essential. IPRs, however, usually make these initiatives more difficult, reducing the potential advantages of innovation and escalating inequality.

The price of protected plant types and proprietary technologies is one major obstacle. The bulk of agricultural producers in underdeveloped regions are smallholder farmers, who frequently lack the funds to buy high-yield seeds or access cutting-edge farming equipment. This leads to a reliance on conventional techniques, which are frequently less effective and less resilient to climate-related issues. Furthermore, local biodiversity and indigenous knowledge

[5] *Kaushar, S. Bio-piracy in India: A practice of patenting traditional knowledge for profit. Nlunagpur.Ac.In. Retrieved January 9, 2025, from https://www.nlunagpur.ac.in/PDF/Publications/5-Current-Issue/5.BIO-PIRACY%20IN%20INDIA%20A%20PRACTICE%20OF%20PATENTING%20TRADITIONAL%20KNOWLEDGE%20FOR%20PROFIT.pdf*

may be marginalized by multinational businesses' reliance on proprietary technologies, weakening generations-old sustainable practices. Small-scale farmers' ignorance and comprehension of IPRs is another problem. Farmers are exposed to exploitation and conflicts over who owns genetic resources or traditional knowledge due to complicated legal frameworks and restricted access to legal resources. Examples of biopiracy, in which businesses patent knowledge or resources that come from local communities without paying proper remuneration, further undermine trust and make poverty in these areas worse.

A more inclusive approach to IPRs that strikes a balance between the need for innovation and fair access is necessary to address these issues. The gap can be closed with the use of strategies like benefit-sharing plans, public-private collaborations, and open-access research.[6] Furthermore, farmers might be better prepared to handle the intricacies of IPRs by empowering local communities through education and capacity-building programs. Promoting agricultural innovation and sustainable and equitable development can be achieved by customizing intellectual property systems to the requirements of impoverished areas.

In the context of agricultural innovation and intellectual property rights (IPRs) in impoverished areas, striking a balance between accessibility and protection is a crucial task. By giving inventors the only right to use their creations, IPRs are intended to promote innovation. But in agriculture, where innovation frequently has a direct impact on lives and food security, the tight enforcement of IPRs may inadvertently deny underprivileged groups access to essential technologies.

4. Balancing Protection and Accessibility

The high price of patented seeds, fertilizers, and biotechnology innovations is one of the main problems. Despite the potential for increased productivity and climate change resilience, smallholder farmers are frequently unable to purchase these advances. IPR-granted exclusive rights have the potential to create monopolies, which would raise prices even more and reduce competition. Because of this, farmers in impoverished areas might keep using local varieties and conventional practices, which may not be as effective or

[6] Shewale, K. T. Commercialization of intellectual property rights: A comprehensive review and implications. Nlunagpur.Ac.In. Retrieved January 9, 2025, from https://www.nlunagpur.ac.in/PDF/Publications/CI-Dec-2023/5.Kanchankumar%20Tejram%20Shewale.pdf

sustainable in tackling today's agricultural problems.

However, in order to encourage private investment in agricultural research and development, protection through IPRs is crucial. Businesses and organizations could be reluctant to devote resources to creating novel solutions if protection is not guaranteed. Thus, the difficulty is in developing a framework that encourages innovation while guaranteeing that its advantages are available to those who require them the most. The implementation of creative techniques is necessary to attain this balance. New technology can be made cheaper for small-scale farmers through the use of public-private partnerships. Governments can guarantee greater accessibility without compromising the incentives for innovation by implementing compulsory licensing, which permits the use of patented technologies under certain restrictions.

Additionally, by encouraging cooperation and inclusion, supporting community-based seed-sharing programs and open-access research projects might enhance conventional IPR systems.

In the end, striking a balance between accessibility and protection necessitates a sophisticated strategy that takes into account the particular requirements of areas experiencing extreme poverty. IPR systems can be extremely helpful in tackling issues related to food security and promoting sustainable development in marginalized groups by guaranteeing that the advantages of agricultural innovation are shared fairly.[7]

Case Studies and Real-World Examples

5. The Green Revolution in India

High-yielding crop varieties (HYVs), fertilizers, and irrigation methods were introduced during the Green Revolution, which started in the middle of the 20th century. Strict IPRs did not initially restrict these developments, but in later decades, the participation of private enterprises brought accessibility issues.[8] IPR-protected seeds were frequently expensive for farmers, which hindered the adoption of these technologies in particular rural regions. By creating open-access agricultural varieties suited to regional conditions, public-sector research organizations were instrumental in closing this gap.

[7] Kowalski, S., Gupta, A., & Mehra, I. (2014). Overcoming India's food security challenges: The role of intellectual property management and technology transfer capacity building. Indian Journal of Law and Technology. https://doi.org/10.55496/exbn6182

[8] Eliazer Nelson, A. R. L., Ravichandran, K., & Antony, U. (2019). The impact of the Green Revolution on indigenous crops of India. Journal of Ethnic Foods, 6(1). https://doi.org/10.1186/s42779-019-0011-9

6. Monsanto and Bt Cotton in Africa

The conflict between accessibility and protection was brought to light by Monsanto's deployment of genetically modified Bt cotton in nations like South Africa. Although Bt cotton greatly improved yields and decreased the need for pesticides, small-scale farmers faced difficulties due to the high cost of the patent-protected seeds. Some governments made an effort to lessen this problem by providing seed subsidies or promoting domestic research to create reasonably priced substitutes.[9] This case emphasizes the necessity of well-balanced IPR regulations that safeguard affordability and innovation.

7. Biopiracy and Traditional Knowledge in India

The incidents of biopiracy involving neem and turmeric in India showed how indigenous knowledge might be exploited within international IPR frameworks. Even though local populations have long used these resources for their medicinal and pesticidal purposes, foreign corporations sought patents on them. India's Traditional Knowledge Digital Library (TKDL),[10] which records traditional knowledge in a format that patent offices throughout the world may access, was established as a result of these instances. This endeavor has protected local populations' rights while averting similar cases of biopiracy.

8. Public-Private Partnerships in Sub-Saharan Africa

Public-private partnerships have surfaced as a means of addressing intellectual property rights issues in agriculture in areas such as Sub-Saharan Africa. For instance, drought-tolerant maize varieties were created by the Water Efficient Maize for Africa (WEMA) project, which was funded by commercial businesses and institutions like CIMMYT. The study showed how cooperation can strike a balance between invention protection and accessibility by guaranteeing smallholder farmers would not be charged royalties for these seeds.

9. Open-Access Seeds in Brazil

Brazil's public research institutions have made significant investments in creating open-access seeds in response to the difficulties presented by IPR-protected seeds. For instance, a state-owned agricultural research organization called EMBRAPA has created a number of seed kinds that farmers can use without having to worry about expensive prices or limiting

[9] *Ej Atlas. (n.d.). Ejatlas.org. Retrieved January 9, 2025, from https://ejatlas.org/conflict/the-retreat-from-monsanto-bt-cotton-burkina-faso*

[10] *Traditional Knowledge Digital Library Unit (TKDL). Retrieved January 9, 2025, from https://www.csir.res.in/documents/tkdl*

licenses. Small-scale farmers in the nation's impoverished regions have benefited most from this technique.

10. Indigenous Seed Banks in Africa and Asia

To protect biodiversity and give farmers access to reasonably priced, locally adapted seeds, communities in places like Ethiopia and the Philippines have set up indigenous seed banks. These seed banks provide a grassroots solution to agricultural issues while functioning outside the official IPR frameworks. They emphasize the value of fusing old knowledge with current agricultural methods, but they are not a substitute for contemporary advancements.

These case studies illustrate the intricate relationship that exists between poverty, agricultural innovation, and intellectual property rights. They highlight the necessity of flexible approaches that promote sustainability and creativity while addressing the particular difficulties faced by areas engulfed in poverty.

11. Policy Recommendations and Future Directions

Fostering a balance between encouraging innovation and guaranteeing fair access to its advantages should be the main goal of policy suggestions and future approaches for tackling the issues of intellectual property rights in agricultural innovation in areas plagued by poverty. Policies that support sustainability and inclusion while upholding innovators' rights must be implemented by governments and international organizations. Promoting public-private partnerships is a crucial strategy that can lower the price of patented technology and increase their accessibility for small-scale farmers. These partnerships may also concentrate on creating regionally tailored solutions to local agricultural problems. Another crucial step is to strengthen the role of research institutions in the public sector.

To create open-access seeds and technologies that are suited to the requirements of underprivileged populations, governments ought to spend money on research and development. Furthermore, governments can guarantee the availability of patented inventions in situations of pressing public need, like during food crises or climate emergencies, by establishing mechanisms like compulsory licensing. This addresses urgent societal issues while ensuring that innovation is not impeded.

To acknowledge and safeguard biodiversity and traditional knowledge, international intellectual property rights frameworks need to be modified. To prevent biopiracy and guarantee that local communities are fairly compensated for their contributions

to agricultural innovation, benefit-sharing agreements and indigenous knowledge registries should be established. Education and capacity-building programs should also be given top priority in order to assist smallholder farmers in comprehending IPR systems and their ramifications, enabling them to defend their rights and negotiate intricate legal frameworks. Going ahead, the development of collaborative innovation models and open-access research efforts should be the main priorities. By facilitating the sharing of resources and knowledge, digital platforms and data-sharing networks can minimize effort duplication and increase the worldwide effect of agricultural innovations. To guarantee that farmers in areas affected by poverty can take use of contemporary technologies, policymakers must also address the affordability of agricultural inputs through price restrictions, subsidies, or other financing methods. Lastly, the foundation of any IPR policy pertaining to agriculture must be sustainability. Agricultural development will be fair and sustainable if the need for innovation is balanced with the protection of biodiversity and the encouragement of ecologically friendly methods. Stakeholders may establish an intellectual property rights framework that promotes agricultural innovation and the welfare of the most disadvantaged populations worldwide by putting these rules into effect and working together to develop cooperative methods.

12. Conclusion

Although they are essential for agricultural innovation, intellectual property rights have both positive and negative effects on areas that are impoverished. IPRs encourage research and development, but they can also make it harder for smallholder farmers who are already at risk to obtain necessary technologies. Promoting sustainable agricultural development in these areas requires finding a balance between safeguarding innovation and guaranteeing fair access. Collaborative initiatives that promote diversity and justice, like benefit-sharing agreements, open-access research, and public-private partnerships, show that solutions are achievable.

Unlocking the full potential of agricultural innovation and addressing food security, resilience, and economic empowerment in a way that leaves no one behind is achievable by coordinating IPR frameworks with the requirements of underprivileged communities. In agriculture, intellectual property rights can be both a catalyst for innovation and a possible impediment to equity. Since smallholder farmers frequently lack the funds to acquire these advances, the

affordability of patented seeds and technology is a major challenge in areas affected by poverty. This gap has been successfully closed by public-private partnerships and collaborative research approaches, which offer technology at lower costs while preserving incentives for private sector involvement. Local biodiversity and traditional knowledge, which are frequently disregarded in traditional IPR frameworks, are crucial for sustainable farming methods and need to be safeguarded by laws and benefit-sharing arrangements. Farmers who receive education and capacity-building can be better equipped to handle IPR systems and choose technology wisely. In order to ensure that agricultural innovation benefits those who depend on it the most for their survival and growth, policymakers must place a high priority on striking a balance between the rights of inventors and the needs of vulnerable populations.

****

ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY OF MYSORE
DEPARTMENT OF STUDIES IN LAW
Manasagangotri-570006.

Mysore University Law Journal

Volume 2, Issue 1, 2025

The Role of IPR in Renewable Energy for Economic Upliftment

Hareesh Anandan[1]

Abstract

Global change towards renewable energy technologies is not just an environmental imperative but an important opportunity for economic changes. Intellectual Property Rights (IPR) act as catalysts and gatekeepers in this infection, shaping innovation trajectory and market access. By encouraging research and growth through patents, the IPR framework runs progress in solar, wind and bio-organism systems, leading to permanent stability in nations and energy Solutions. However, stringent IPR protection creates obstacles to risk-borne economies, where high licensing costs and thick, localized adoptions of patents can prevent adoption. This duality underlines the need for a balanced policy structure that aligns uniqueness with equality. The study of the case of emerging markets suggests that tailored IPR strategies, compulsory licensing, or patent technology can promote transfer, employment generation and industrial development. Development by reducing climate risks and empowering communities.

Keywords: Intellectual Property Rights, Patents, Economic, Renewable Energy.

[1] *The author is an LL.M. student at the Department of Law, Central University of Kerala.*
Email: saihareesh66@gmail.com

Introduction

The worldwide conversion to renewably is not simply a category that means to prevent environmental crises, but rather it is a very peaceful occurrence of renewably that will greatly change the economy and social life. This transition depends on the complex relations between innovation and regulation, where Intellectual Property Rights (IPR) are a main organizational component.[2] Although the IPR system, including patents, plays a role of both innovation and access restrictions, it also has a responsibility of shaping the direction of renewable energies and their different levels of access. This chapter examines how the IPRs factor influences innovation in the renewable energy field by denoting it as a possible driving force for the advancement of the technological component, but also as a gamechanger for the environmental problems.

1.1 Understanding IPR Frameworks and Their Relevance to Renewable Energy

Intellectual Property Rights (IPR) is the generic name of legal protection. Its purpose is to cover the products of the human mind, the whole range of which is to give them protection from industrial designs and inventions to literature and art.[3]. Intellectual Property Rights are mainly manifested through patents in the renewable energy context, which are issued to the inventors and thus confer them the exclusive right to their creations within a certain period.[4] These are the rights that drive R&D to new fronts lest we forget the ruling of researchers and developers and the promise of a better future if the financial rewards are guaranteed.[5] Come to think of it this way: what is to do if such resources as technology are not to be properly protected (rights)? The staggering costs and risks associated with the development of new technologies might drive away investments and wrongly affect progress in problems like solar, wind and bioenergy[6].

Nevertheless, the effect of IPR in stimulating creativity is not to be underestimated. The legal protection function of patents has other important functions--it is not just a mechanism to provide economic incentives but also a device to document to make more transparent and available to others

[2] *Supra Note 2*
[3] *Supra Note 3*
[4] *Supra Note 4*
[5] *U.N. Env't Programme [UNEP], *Fostering Green Technologies Through Equitable IPR Policies* 27 (2021), https://www.unep.org/publications.*
[6] *Id. at 29.*

technological developments.[7] The dual role of IPR—protection and dissemination—embellishes IPR as the foundational element of innovation ecosystems. Among the examples of advancing solar photovoltaic (PV) technology in the last 20 years, solar PV has been accountable for the robust IPR framework in which the private sector was encouraged to invest.[8] Aside from that, the innovation driven by patents has been the main reason for improved wind turbine efficiency and bioenergy production.[9]

Still though, IPR and renewables have a complicated relationship. For instance, while patents serve as motivators for innovation, they may also be the causes of entry barriers especially for smaller and developing economies.[10]

The challenge, thus, is to find the sweet spot between the prerogative of inventors and the duty to provide essential technologies to the neediest.[11]

Patents have been key players in the revolution of technology in various renewable energy sectors. The solar energy sector, for example, is a perfect illustration of this, in which patents played a key role in enhancing and the photovoltaic (PV) cells and their cost reduction for energy and the whole process.[12] The out of the early stage of silicon-based photovoltaic technology involving patents on technology owned by companies was the main reason to help them to pay off their expenses on the previously researched technology and redirect it back to the updated version.[13] This continuous improvement process was the development of a solar panel where the cost has been reduced almost in half compared to that of the fuels made from a solar or wind-powered station.[14]

Also, patents have directed seamless technologies in wind turbines in turbine design, materials and energy storage.[15] The best exemplification of this is the introduction of larger and more efficient wind turbines which have been accomplished with the help of patented technologies with improved aerodynamics and decreased stress on mechanical equipment.[16] These technological gimmicks have both increased energy generation and reduced the cost of wind power, which is why wind power can be a more efficient energy source compared to other traditional ways.[17]

[7] *WIPO, supra note 1, at 15.*
[8] *Holdren, supra note 3, at 754.*
[9] *Id. at 756.*
[10] *Suthersanen, supra note 4, at 86.*
[11] *UNEP, supra note 8, at 31.*
[12] *Holdren, supra note 11, at 758.*
[13] *Id. at 760.*
[14] *WIPO, supra note 2, at 18.*
[15] *Holdren, supra note 3, at 762.*
[16] *Id. at 764.*
[17] *WIPO, supra note 2, at 20.*

Besides the above sectors, patents in the bioenergy domain have made significant breakthroughs in the areas of biofuels, biogas, and biomass conversion technologies.[18] For instance, the patented method for converting agricultural waste into biofuels is a new way for sustainable energy production to be created.[19] A reconsideration of these innovations would go a long way in addressing the energy security issue and recycling of waste particularly in rural and agricultural communities.[20]

But in spite of the above achievement on the other side the patent system is not without its skeptics. Those who contend that the arrival of patents in the renewable energy sector has led to "patent thickets," a situation in which ovelapping patents create legal and financial barriers to innovation are just some of the critics of the patent system.[21] This is a problematic situation especially in those kinds of sectors like solar and wind energy where a dozen of patents may cover different areas of a single technology.[22] Among their main concerns is the fact that finding the proper manner of the patents, paying the fees and the protracted legal battle to reach the essentials can be too time-consuming.[23]

1.2. Case Studies: Successful IPR Models in Developed Economies

To analyse the actual impact of intellectual property rights in the field of renewable energy innovation, it is crucial to look into case studies from developed countries. These examples are of the well-working IPR frameworks which can mean not only the pushing of technology advancements but also the economic growth.

Germany's Energiewende or "energy transformation" is a characteristic of the country as a superior renewable energy producer.[24] The main factor behind that has been the setting of a strong IPR framework that encourages innovation while allowing technology transfer.[25] Renewal of German firms from solar PV to wind turbines and energy storage facilities has been successful in that firms have filed patents in renewable energy technologies reaching the number of thousands.[26] They have been not only the incentives that have fuelled the innovation but also the technologies that have enabled them to be exported worldwide, implementing energy transition, and thus

[18] *Holdren, supra note 3, at 766.*
[19] *Id. at 768.*
[20] *UNEP, supra note 4, at 33.*
[21] *Suthersanen, supra note 4, at 88.*
[22] *Id. at 90.*
[23] *WIPO, supra note 2, at 22.*
[24] *Holdren, supra note 3, at 770.*
[25] *Id. at 772.*
[26] *WIPO, supra note 2, at 24.*

the global energy transition has been a result of them.[27]

One more example of this is the United States, where due to federal policies and IPR protections, a prospering renewable energy sector has come into being.[28] The U.S. Patent and Trademark Office (USPTO) has issued counter-renewable energy technologies patents, in particular, the fields of solar and wind energy.[29] Besides the financial burden, these patents have faced great private investments which kept the costs low and the acceptance of renewable energy high.[30] Moreover, a case in point is the significant decline in the cost of solar PV modules over the last decade which resulted from patented improvements in production processes and materials development.[31]

On the contrary, the story of the USA is also a reminder of the problems that will have to be resolved in connection with securing IPR and ensuring its availability. Although patents have played the role of the main driver of the country's economic prosperity, they have given rise to litigations and patent thickets by which solar firms dispute each other's rights to the same area of the field.[32] These problems show the necessity of regulations promoting cooperation and knowledge transfer, such as patent pools and licensing agreements.[33] The Interaction between Intellectual Property Rights and renewable energy innovation is not a single-sided issue. On the one hand, IPR constructions are the ones that are used for the research and the results of the new technologies of solar, wind, and bioenergy. They are security gates of intellectual property that protect innovators' rights and the seeds of technologies. On the other side, they can be entry to huge barriers, especially for developing economies and smaller players. The case studies of Germany, the United States, and Denmark point to the fact that judiciously designed IPR frameworks can be conducive to both innovative growth and economic development at the same time that they challenge the safeguarding of patent protection and exploiting the technology to all users.

It is of crucial importance to realize that IPR development is yet to remain the main source of investment and growth in the renewable energy domain. Therefore, introducing IPR policies that support innovation and equity of technology dissemination is the first step in the process.

[27] *Holdren, supra note 3, at 774.*
[28] *Id. at 776.*
[29] *WIPO, supra note 2, at 26.*
[30] *Holdren, supra note 3, at 778*
[31] *Id. at 780.*
[32] *Suthersanen, supra note 4, at 92.*
[33] *UNEP, supra note 8, at 35.*

This requires a balanced approach that is in line with the specific requirements and living conditions of the customers and from the specialty to the global industries. Through maintaining this balance, IPR could function as a way of realizing the system transformation and increasing the amount of financial help around the world for renewables.

Challenges and Barriers in IPR for Developing Economies

Renewable energy's potential to be the harbinger of sustainable energy has been realized and is by now beyond any doubt. However, in many developing economies, the aspiration of this promise, due to the challenges initiated by Intellectual Property Rights (IPR), is still a mirage[34]. The problem with the IPR frameworks is that they serve to promote innovation but at the same time create various barriers such as those that make the adoption and diffusion of renewable energy technologies difficult in low- and middle-income countries.[35] This chapter will focus on the main problems and issues in IPR for developing economies, emphasizing such as patent thickets, high licensing costs, and policy gaps. The decision-makers can understand and draw the solutions to overcome these obstacles by ascertaining the nature of these problems which is a key step. The main impediment to the acceptance of advanced renewable energy technologies in the developing world is the issue of "patent thickets."[36] A patent thicket is recurring when several patents cover a single technology, frequently owned by different entities.[37] In clean energy, this is most common in technologies that have complex parts like solar photovoltaic (PV) systems, wind turbines, or advanced battery storage.[38] The process of negotiating through these thickets involves requiring legal and financial resources on a large scale and many developing countries cannot meet that.[39]

For that reason, the companies, as well as governments in those regions, may experience a shortage of adoption or a delay in the adaptation processes, which, in turn, might lead to increased costs or even legal disputes.[40]

Some or all of these components may be the subject of separate patents, which companies need to obtain multiple licenses before they can manufacture or sell solar panels. This not only escalates the cost of

[34] *Supra Note 2*
[35] *Supra Note 3*
[36] *Supra Note 4*
[37] *Supra Note 5*
[38] *Id. at 29.*
[39] *WIPO, supra note 2, at 15.*
[40] *Holdren, supra note 3, at 754.*

manufacturing but also brings the patentees into a situation where they may demand the licensing fees that are high or choose not to license their technologies at all.[41] In some instances, companies that abandon their efforts to become players in the market may face competition and innovation.[42]

On the other hand, the soaring costs of licensing add more to the problem, and this is particularly true for small and medium-sized manufacturers in developing nations.[43] Several renewable energy technologies are under protection by patents owned by large companies, which always charge a very high fee for using their intellectual property.[44] For low-income countries, these costs may seem to be prohibitive for cash-strapped governments and businesses accounting for the ability of these countries to invest in renewable energy infrastructure.[45] This leads to a vicious cycle where, because of their dependence on fossil fuels, these countries continue to struggle to build the capacity to compete due to their lack of access to inexpensive technologies.[46]

2.1. The Impact of Stringent IPR Protections on Localized Renewable Energy Adoption

Stringent IPR protections, while intended to safeguard inventors' rights, often have unintended consequences for developing economies.[47] In many cases, these protections prioritize the interests of patent holders over the needs of local communities, creating barriers to the localized adoption of renewable energy technologies.[48] For example, patent holders may restrict the use of their technologies in certain regions or charge higher licensing fees in markets where they perceive less competition.[49] This can limit the ability of developing countries to tailor renewable energy solutions to their specific needs and conditions.[50]

In the absence of technology transfer agreements, developing economies are often forced to import renewable energy systems rather than producing them domestically.[51] This not only increases costs but also limits job creation and industrial growth, undermining the potential economic benefits of renewable energy.[52] For instance, a country that

[41] *UNEP, supra note 5, at 31.*
[42] *Holdren, supra note 3, at 758.*
[43] *Id. at 760.*
[44] *WIPO, supra note 1, at 18.*
[45] *Holdren, supra note 3, at 762.*
[46] *Id. at 764.*
[47] *WIPO, supra note 2, at 20.*
[48] *Holdren, supra note 3, at 766.*
[49] *Id. at 768.*
[50] *UNEP, supra note 4, at 33.*
[51] *Id. at 90.*
[52] *WIPO, supra note 2, at 22.*

imports solar panels rather than manufacturing them locally misses out on opportunities to develop a skilled workforce, build supply chains, and stimulate related industries.[53]

The impact of stringent IPR protections is particularly acute in rural and off-grid communities, where access to energy is often a matter of survival.[54] In these areas, renewable energy technologies such as solar home systems and mini-grids can provide life-changing benefits, from powering schools and clinics to enabling small businesses.[55] However, the high cost of patented technologies can make these solutions unaffordable for low-income households, perpetuating energy poverty.[56] This highlights the need for IPR policies that balance the rights of inventors with the needs of vulnerable populations.[57]

2.3 Policy Gaps and the Need for Inclusive IPR Strategies

Patent thickets, which are a combination of high licensing costs and stringent IPR protections and the challenges posed, are also greatly influenced in many developing economies by the existing gaps in policies.[58] In some cases, the national IPR frameworks are not effective due to them being obsolete or are not applied correctly; thus, both holders and users of the respective patents remain in doubt.[59] At their end, governments are either unaware or reluctant to get into negotiations for the most beneficial licensing agreements or to launch a technology transfer project since they are unable to provide the necessary resources or lack the expertise.[60] Not only do these gaps in their technologies hamper facilities to harness renewable energy sources, but these not also turn out to be the main cause of the incapacity of the emerging economies to become active players in the global innovation marketplace.[61]

One of the policy gaps that should be focused on is the insufficient mechanisms for promoting collaboration and sharing of knowledge.[62] In developed economies, programs like patent pools and open-source licenses have been very effective in bringing barriers to innovation and the movement of technology down.[63] Yet, the same ways are primarily disregarded among the less well-off nations because the

[53] *Holdren, supra note 3, at 770.*
[54] *Id. at 772.*
[55] *WIPO, supra note 2, at 24.*
[56] *Holdren, supra note 3, at 774.*
[57] *Id. at 776.*
[58] *WIPO, supra note 2, at 26.*
[59] *Holdren, supra note 3, at 778.*
[60] *Id. at 780.*
[61] *Suthersanen, supra note 4, at 92.*
[62] *UNEP, supra note 5, at 35.*
[63] *Holdren, supra note 3, at 782.*

decision-makers there might not know the benefits or may not have the necessary capacity to carry such actions.[64] To give a specific example: a patent pool agreement for solar PV could facilitate various companies to share the licenses to the most crucial patents, thus reducing the expenses and making the competition stiffer.[65] Another example, open-source licensing, could actually be the tool to let the local entrepreneurs get through new business plants for their societies to the green energy sector.[66]

One of the main gaps is the way that IPR policies are and the national development goals are not in line.[67] In the case of many developing countries, the renewable energy is viewed to be a means towards solving other socio-economic problems such as poverty, unemployment, and industrial growth.[68] However, IPR structures hardly elaborate the needs of those economies and only pay attention to the protection of patent holders' interests.[69] This lack of coherence of IPRs adversely affects the positive impact of solar energy for inclusive growth especially in the poor localities.[70] In order to bridge such gaps policymakers have to come up with the inclusive IPR strategies which will make prioritization of accessibility and equity their focus point.[71] This could be of use for example through the mandatory licensing that governments are allowed to carry out in cases of public interest.[72] Namely, a country with energy poverty issues among the developing countries can permit compulsory licenses for the solar PV and wind turbine technologies, which will enable local manufacturers to produce inexpensive renewable energy systems.[73] However, patent holders who would resort to coral measures against it will have to think twice, as these demands correspond to the pressing needs while the planet benefits from the intervention.[74] One other such a positive approach is where public-private partnerships serve as tools of technology transfer and capacity building.[75] As an illustration, governments could project with multinational corporations for the establishment of local manufacturing enterprises that shall offer training and technical assistance to the local workforce.[76] Not only is it the way to decrease costs on the renewable energy

[64] *Id. at 784.*
[65] *WIPO, supra note 2, at 28.*
[66] *Holdren, supra note 3, at 786.*
[67] *Id. at 788.*
[68] *WIPO, supra note 2, at 30.*
[69] *Holdren, supra note 3, at 790.*
[70] *Id. at 792.*
[71] *WIPO, supra note 2, at 32.*
[72] *Holdren, supra note 3, at 794.*
[73] *Id. at 796.*
[74] *WIPO, supra note 2, at 34.*
[75] *Holdren, supra note 3, at 798.*
[76] *Id. at 800.*

systems, but the abovementioned ways also create jobs and generate the increase in industries, which in turn contributes to the economic upliftment.[77]

The problems and walls of IPR in developing economies are quite significant, but they are not insurmountable. Decision-makers might build a comfortable space for the uptake and spread of renewables by dealing with patent thickets, high licensing costs, and policy gaps. Inclusive IPR strategies, for example, compulsory licensing and public-private partnerships, give assurance that renewable energy will be green and not have negative social-economic effects.

Meantime the world is undergoing a low-carbon turn, there is one crucial thing to bear in mind that no one should be left out in this process. Sticking to developing economies' needs and priorities can bring about the maximum scope for renewable energies to drive change and impact lives.

Policy Recommendations and Pathways for Economic Upliftment

As the world battles the two-sided monster of climate change and economic inequality, renewable energy is proving itself to be the most effective means of development that is sustainable. However, the renewable energy's full potential can only be realized through the implementation of fair and comprehensive policies, which will also address the barriers posed by IPR.[78] This chapter recommends policies and ways to use IPR to promote the restructuring of the economy, which may involve measures such as compulsory licensing, patent pools, and harmonized IPR regimes. By positioning IPR frameworks with economic development prerogatives, decision-makers can achieve renewable energy's potential as a driver of inclusive growth and community empowerment.

One of the main challenges in the renewable energy sector is the high cost of using patented technologies, especially for countries with an underdeveloped economy.[79] Compulsory licensing and patent pools are some of the possible solutions that might be used to address this issue, providing technologies that are critically important to broader populations yet not infringing the rights of inventors.

Compulsory licensing allows governments to authorize the use of a patented invention without the consent of the patent holder, typically in cases of public interest.[80] This mechanism has been successfully used in the pharmaceutical industry to ensure

[77] *WIPO, supra note 2, at 36.*
[78] *Id.*
[79] *Holdren, supra note 3, at 798.*
[80] *Suthersanen, supra note 4, at 92.*

access to life-saving medicines, and it holds similar potential for renewable energy.[81] For instance, a developing country facing energy poverty could issue compulsory licenses for solar PV or wind turbine technologies, enabling local manufacturers to produce affordable renewable energy systems.[82] While this approach may face resistance from patent holders, it can be justified on the grounds of addressing urgent public needs and promoting sustainable development.[83]

Patent pools, on the other hand, involve the aggregation of patents from multiple holders into a single licensing platform.[84] This approach reduces transaction costs and eliminates the risk of patent thickets, making it easier for companies to access the technologies they need.[85] In the renewable energy sector, patent pools could be particularly effective for complex technologies like advanced battery storage or smart grid systems, where multiple patents often cover interrelated components.[86] By fostering collaboration among patent holders, patent pools can accelerate innovation and facilitate the widespread adoption of renewable energy technologies.[87]

Both compulsory licensing and patent pools require careful implementation to balance the interests of inventors and the public. Policymakers must establish clear guidelines for issuing compulsory licenses, ensuring that they are used only in exceptional circumstances and that patent holders receive fair compensation.[88] Similarly, patent pools should be designed to promote transparency and inclusivity, with mechanisms to prevent anti-competitive behavior.[89]

3.1. Harmonizing IPR Regimes with Socio-Economic Priorities

To what extent the IPR frameworks effectively stimulate renewable energy innovation is connected to their harmonization with wider socio-economic priorities.[90] In the majority of developing countries, the high price of patented inventions and the absence of local production capacity restrain the renewable energy industry growth.[91] To counterbalance these challenges, government officials have to accept a

[81] *UNEP, supra note 5, at 35.*
[82] *Id. at 29.*
[83] *WIPO, supra note 1, at 15.*
[84] *Holdren, supra note 3, at 754.*
[85] *Id. at 756.*
[86] *Suthersanen, supra note 4, at 86.*
[87] *UNEP, supra note 5, at 31.*
[88] *Holdren, supra note 3, at 758.*
[89] *Id. at 760.*
[90] *WIPO, supra note 2, at 18.*
[91] *Holdren, supra note 3, at 762.*

whole-system development approach that connects IPR policy with national development objectives. One very critical method is to set the stage for technology transfer and capacity building in the IPR deal at the top.[92] For instance, under the terms of international cooperation contracts, patent holders could be obliged to disclose information and skills to the national partners, thus allowing them to produce and maintain the renewable energy products.[93] This system not only fares off cheaper costs but also it brings in jobs and thus spurs the industrial development adding to the prosperity of the nation.[94] Moreover, it is the question of financing through public funds that becomes a crucial factor for the successful green technology breakthrough.[95] The state provides for grants, raises funds through tax rebates, and offers the public subsidies to stimulate research and development in the strategically important fields that may not be able to attract the required private investment.[96] To give an example, public support could be aimed at the creation of the off-grid renewable energy mechanisms, which will allow underprivileged populations to access energy as well as various sustainable business opportunities.[97]

In addition, policymakers should explore alternative IPR models that prioritize social and environmental benefits over profit maximization.[98] For example, open-source licensing allows inventors to share their technologies freely, enabling widespread adoption and adaptation.[99] This model has been successfully used in software development and holds significant potential for renewable energy, particularly in low-income communities.[100] By embracing innovative IPR models, governments can ensure that renewable energy technologies are accessible to all, regardless of their economic status.[101]

The transformative potential of renewable energy is perhaps most evident in emerging markets, where innovative IPR strategies have enabled communities to harness clean energy for economic upliftment.[102] This section examines case studies from India, Kenya, and Brazil, highlighting how tailored IPR policies have driven job creation, industrial growth, and sustainable development.

[92] *Id. at 764.*
[93] *WIPO, supra note 2, at 20.*
[94] *Holdren, supra note 3, at 766.*
[95] *Id. at 768.*
[96] *UNEP, supra note 5, at 33.*
[97] *Suthersanen, supra note 4, at 88.*
[98] *Id. at 90.*
[99] *WIPO, supra note 2, at 22.*
[100] *Holdren, supra note 3, at 770.*
[101] *Id. at 772.*
[102] *WIPO, supra note 2, at 24.*

India

The solar energy targets of India have been powered by policies promoting the local manufacturing and technology transfer.[103] The government has given permission to foreign companies to establish manufacturing facilities in India by granting them incentives such as tax exemptions and a straightforward regulatory process.[104] On the one hand, India has made use of mandatory licensing to allow the local manufacture of solar panels and inverters at affordable prices and to secure them access to crucial solar technologies.[105] These green initiatives have not only drove down prices for solar power but also have been responsible for the creation of thousands of manufacturing, installation, and maintenance jobs.[106] Consequently, India has emerged as a frontrunner in the solar energy sector globally, with considerable economic development and a drastic reduction in the number of people living in poverty.[107]

Kenya

In Kenya, off-grid renewable energy systems have been able to reshape rural communities, providing access to electricity as well as creating new economic opportunities.[108] The government has in collaboration with private companies and international organizations utilized financial methods such as pay-as-you-go solar systems to enable people to buy solar panels with small amounts of money.[109] By drawing attention to these projects, local entrepreneurs can use open-source licensing to customize and redistribute renewable energy installations.[110] Consequently, Kenya has experienced an influx of small-scale renewable energy enterprises, which have led to employment and the improvement of people's well-being in rural areas.[111]

Brazil

Brazil's bioenergy sector is a very nice example of how the renewable energy can lead to the industrial progress and in the meantime, helping the environmental sustainability to be achieved.[112] The country has closely associated its rich agricultural resources with the production of biofuels, such as ethanol and biodiesel, which are both used on domestic levels and exported to the worldwide markets.[113] The

[103] *Holdren, supra note 3, at 774.*
[104] *Id. at 776.*
[105] *WIPO, supra note 2, at 26.*
[106] *Holdren, supra note 3, at 778.*
[107] *Id. at 780.*
[108] *Suthersanen, supra note 4, at 92.*
[109] *UNEP, supra note 5, at 35.*
[110] *Holdren, supra note 3, at 782.*
[111] *Id. at 784.*
[112] *WIPO, supra note 2, at 28.*
[113] *Holdren, supra note 3, at 786*

secret of Brazil's tremendous bioenergy sector is its firs IPR layout that it has enforced, which enables companies to come up with newer innovative ideas while guaranteeing utilization of the most significant technologies.[114] For example, the government has become a kind of a neutral force in the case of the patented pools for the biofuel production processes enabling small and medium-sized enterprises to enter the market.[115] These actions have not only cut back the need for fossil fuels in Brazil but also brought up new work opportunities in the areas such as farming, manufacturing, and logistics.[116]

Switching to renewable energy sources is a chance to solve quite a few environmental and economic problems as a result of the adoption of new clean energy technologies. This innovation, however, cannot develop its potential without introducing new and unfettered IPR rules to advance disability rights. Targeted methods such as licensing of patents and the formation of patent pools will be able to break down technology barriers, whereas adjusting IPR regulations in line with socio-economic priorities will ensure that the renewable energy sector becomes a creator of jobs and industries but not merely the driver of growth.

A collection of case studies from India, Kenya, and Brazil exhibit transformational potential of clean energy in developing countries, and the critical need for developing country-specific policies and collective approaches. This chapter, taking cues from analysis of the governments in India, Kenya, and Brazil, does not only provide evidence for the aforementioned claim, but also underlines the significance of context-specific policies as well as collaboration. Through these courses, decision makers can use the power of renewable energy to stimulate economic development and establish a cleaner generation.

Conclusion

In an era marked by the urgency of climate action and the pursuit of sustainable development, intellectual property rights (IPR) have emerged as a powerful tool in advancing renewable energy and fostering economic upliftment. By protecting innovations, incentivizing research, and enabling the transfer of clean technologies, IPR plays a crucial role in accelerating the global shift from fossil fuels to sustainable energy sources. A well-structured IPR system can stimulate entrepreneurship, attract investment, and create green jobs, particularly in developing economies where renewable energy can drive inclusive growth. To fully realize these benefits, several steps

[114] *Id. at 788.*
[115] *WIPO, supra note 2, at 30.*
[116] *Holdren, supra note 2, at 790.*

must be taken. International collaboration should be strengthened to facilitate equitable access to green technologies through fair licensing practices, patent pools, and open-source platforms. Public-private partnerships must be promoted to fund renewable energy R&D, using IPR to ensure returns while maintaining accessibility. National IPR policies, especially in emerging economies, should be adapted to balance innovation incentives with the need for affordable technology access, including streamlined patenting processes and support for clean energy startups. Capacity building is equally vital, ensuring that local innovators understand and utilize IP systems effectively. Moreover, governments can introduce green IP incentives, such as fast-track patent processing for sustainable technologies, to accelerate innovation deployment. Rather than being seen as barriers, intellectual property rights—when strategically aligned with environmental and economic goals—can become powerful enablers of transformation. Powering change through innovation, collaboration, and inclusive IP frameworks offers a clear path toward climate resilience, energy equity, and long-term global prosperity.

***

ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY OF MYSORE
DEPARTMENT OF STUDIES IN LAW
Manasagangotri-570006.

Mysore University Law Journal

Volume 2, Issue 1, 2025

Balancing IPR Protection and Public Access to Renewable Technologies

Arushi Ranjan[1]

Abstract

Energy justice seeks to ensure a fair distribution of the benefits and burdens associated with energy. Global initiatives including international laws and Sustainable Development Goals, have faced challenges in achieving this aim. The authors suggest implementing compliance mechanisms to uphold energy justice principles, which would involve regulatory bodies, public engagement, and incentives that provide governments with flexibility. Green innovation is closely tied to Intellectual Property Rights to promote environmentally friendly technologies. Despite existing challenges, IPR can both protect and stimulate green innovations. While international discussions have not significantly altered IP regulations, the UN 2030 Agenda encourages dialogue about the role of IPR in sustainable development, fostering both innovation and access. This paper elaborates on green innovation and green IPRs, explores the factors driving these areas, discusses the advantages of developing sustainable innovations, analyzes market demand for green IPRs, and examines how green innovation relates to sustainable development goals.

Keywords: intellectual property, sustainable development, energy justice, green technology, urban energy

[1] *Student of Law, at Amity Law School, Ranchi*
Email: arushiranjan71@gmail.com

Introduction

Despite the extensive history of international law's influence on intellectual property (IP) since the late 1800s, issues related to development represent a contentious aspect of that story. Following decolonization in the 1960s, newly independent nations united within the United Nations (UN) to question for the first time whether existing international IP treaties—specifically, the Paris Convention for the Protection of Industrial Property and the Berne Convention for the Protection of Literary and Artistic Works—were compatible with varying levels of development. In the 1970s, international discussions commenced to reassess these treaties in an effort to promote the transfer of technology and knowledge to developing countries; however, many of these initiatives ultimately failed to yield significant results.[2]

Intellectual property and development issues resurfaced in the 1990s with the introduction of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement). This led to discussions surrounding patents and public health, culminating in the Doha Declaration on TRIPS and Public Health in 2001, as well as the establishment of the WIPO Development Agenda in 2007. The discussions centered on the role of IP and its influence on social and economic development.

At the same time, a movement that emerged in the 1970s brought environmental issues to public attention. By the 1990s, sustainable development was recognized internationally as a critical global priority. New international frameworks addressing climate change, biodiversity, and food security were created, which resulted in conflicts between these frameworks and global trade and IP regulations. In 2015, the UN adopted the 2030 Agenda for Sustainable Development, which includes seventeen Sustainable Development Goals (SDGs).[3]

The contribution of intellectual property rights (IPRs) to achieving these SDGs continues to be a topic of discussion.In the final decades of the previous century, sustainable development became a key focus on the global agenda. The Brundtland Report of 1987, titled Our Common Future, provided the most recognized definition of

[2] Padmashree Sampath & Pedro Roffe, *Unpacking the International Technology Transfer Debate: Fifty Years and Beyond*, Programme on Innovation, Technology and Intellectual Property, ICTSD (2012).

[3] UN Sustainable Development Summit, *Our World: The 2030 Agenda for Sustainable Development,* UN Doc. A/RES/70/1 (25 September 2015)

sustainable development: it is "*development that fulfills the needs of the present without jeopardizing the capacity of future generations to meet their own needs.*"

At the Earth Summit in 1992, promoting the transfer of environmentally sound technologies (ESTs) to developing nations was a primary focus. Chapter 34 of Agenda 21 was dedicated entirely to this issue and included several provisions regarding IPRs. These provisions highlight the importance of improving access for developing countries to technologies that are either not patented or are in the public domain, as well as access to patented technologies through mechanisms like compulsory licensing, which permits a government to allow a third party to produce a patented product or process without the patent holder's consent.

The concept of energy justice

This analysis explores the distribution of access to energy resources and services within a society. It investigates how various populations and communities are influenced by energy policies and projects, and how these impacts contribute to social inequalities. The focus is on the equitable allocation of both the benefits and drawbacks associated with energy production and consumption among different individuals and communities. Additionally, it examines the effects of energy systems on marginalized groups, including low-income populations and communities of color, as well as ways to enhance the equity of these systems.

Conceptual Framework

Innovation refers to the creation, development, and implementation of new products, processes, or services aimed at enhancing efficiency, effectiveness, or competitive advantage. It represents an exploration of the human intellect to forge a better future. In its 2030 Agenda for Sustainable Development, WIPO highlighted the significance of intellectual property rights in relation to green technology and a sustainable economy by stating that "*A nation's capacity to innovate, draw foreign investment, and cultivate valuable businesses that provide competitive products and services globally is fundamentally connected to Green Innovation and Intellectual Property, along with its supportive innovation ecosystem.*"[4] Furthermore, innovation is not confined to industries and technology; it links the state, market, and society while fostering an environment conducive to the sustainable development of humanity that is inclusive

[4] Dennemeyer**,** *Green Innovations Call for Strong IP Protection* (July 28, 2021).

and attuned to the aspirations and needs of each country.

Green innovation is a concept that emerged in the 21st century, representing a transition towards a sustainable, environmentally friendly, and resource-efficient economy and society. It promotes sustainable development and facilitates the shift toward an eco-friendlier economy. Green technologies are designed to safeguard the environment, reduce pollution, and ensure the sustainable utilization of renewable resources.

In today's world, shifting towards environmentally sustainable practices has moved from being a mere preference to an essential requirement for the survival of human civilization. Establishing a path forward based on ecological responsibility is not only wise but crucial in the 21st century. The impacts of climate change have inspired people around the globe to think about and foster an ecological environment that can thrive indefinitely. The challenges posed by the global climate crisis have created significant obstacles for businesses, governments, and policymakers worldwide, leading to collaborative efforts aimed at addressing this issue and developing increasingly viable solutions. This collective action has created a rich environment for innovation, where the practical application of new ideas, along with the transfer and spread of emerging technologies, is driving global sustainability initiatives. Consequently, discussions surrounding green innovations and clean technologies highlight the rise of the concept known as Green Intellectual Property, or 'Green IP.' Green IPR encompasses legal protections for innovations that contribute positively to environmental preservation. These green IPR initiatives in invention and science aim to help alleviate climate-related issues. As a relatively recent development, Green IP encourages eco-friendly practices and promotes growth in research and development within this area. Ultimately, green intellectual property will influence how resources and technologies are utilized responsibly to address environmental concerns.

Green Innovation

Kemp and Pontoglio define green innovation as “a product, production process, service, or management or business method that is new and leads to a decrease in environmental risk, pollution, and other adverse effects associated with resource use throughout its life cycle in comparison to relevant alternatives.” Green innovation encompasses innovations aimed at preventing pollution, minimizing waste,

and establishing environmental management systems within organizations.[5] It involves the development and implementation of technologies designed to lessen the environmental impact of human activities. Green innovation has the potential to tackle issues such as climate change, pollution, resource depletion, loss of biodiversity, and social inequality. Moreover, it can generate new avenues for economic growth, job creation, and enhanced social welfare.[6]

Intellectual property plays a crucial role in discussions surrounding the regulation of the environment, biodiversity, and climate change. Patent law grants exclusive rights concerning scientific inventions, including those related to climate adaptation and mitigation technologies. There have been notable patent disputes involving clean technologies, such as climate-resilient crops,[7] hybrid vehicles[8], and various other innovations. Additionally, complex issues have arisen regarding the management of patent rights, particularly concerning ownership and licensing. Furthermore, there has been ongoing debate about how patent flexibilities can be applied to clean technologies, which includes aspects like public sector licensing, patent pools, compulsory licensing, technology transfer, and parallel importation.

Green IPR

The term "Green Intellectual Property" refers to the protection of innovations in the field of green technology. [9] According to the UN Rio Declaration on Environment and Development from 1992, Green Technology is defined as "*environmentally sound technologies that safeguard the environment, generate less pollution, utilize resources more sustainably, recycle a greater portion of their waste and products, and manage residual waste in a more acceptable manner compared to the technologies they replace.*" [10]

However, green innovation encounters numerous obstacles, such as high costs, market failures, regulatory uncertainties, and a lack of awareness. It has unique characteristics that necessitate specific

[5] Pablo Cisneros Chavira et al., *Defining Green Innovation, Its Impact, and Cycle – A Literature Analysis*, 17 Cleaner Eng'g & Tech. (2023).

[6] *Green Innovation and Intellectual Property Rights*, Surana & Surana Int'l Att'ys, https://www.suranasrana.com (last visited Mar. 21, 2025).

[7] Monsanto v. The Controller of Patents & Designs, Trademark and Geographical Indications, OA/02/2012/PT/DEL (Intell. Prop. App. Bd. 2013) (India).

[8] Toyota Motor Corp. v. Paice LLC, 128 S. Ct. 2430 (Mem) (U.S. 2008).

[9] V. C. Mathews, *Green Intellectual Property*, Lexology (July 6, 2022), https://www.lexology.com/library/detail.aspx?g=8182bd04-4c4f-4c70-ae09-167c11fe7481 .

[10] The United Nations Program of Action from Rio, 1992, Agenda 21, Ch. 34.

governance and policy approaches to encourage its growth. A significant factor that can either promote or impede green innovation is the regime of intellectual property rights. These rights are legal protections granted to creators to motivate them in their inventive endeavors. Intellectual property plays a crucial role in fostering green innovations by providing incentives for the development of green technologies.

Green Patents

Green patenting refers to the process of obtaining patents for green technologies. In the context of Sustainable Development, it involves granting patents for ideas or technologies that are environmentally friendly and contribute to combating climate change while promoting economic, social, and ecological development. Therefore, green patenting encompasses the protection of green technologies that advance sustainable human development without harming the environment. According to reports from the Times of India, between 2016 and 2021, one in every two patents issued in India was related to green technology, with a quarter of these patents specifically focused on alternative energy production. This trend supports the efforts of central authorities to encourage the wider adoption of green technology to drive economic growth and enhance consumer preference for products made from such technologies.[11]

Green Trademarks

Green trademarks refer to those trademarks that are dedicated to and can demonstrate the sustainability of their products. A green trademark is a symbol, logo, or phrase that signifies the owner's commitment to environmental responsibility. It indicates that a product or service has been produced, sourced, or delivered in a way that minimizes its environmental impact. According to the EUIPO, "a green trademark is an umbrella term for specific trademarks, service marks, and certification marks that communicate environmentally friendly products, services, or practices." [12] Brands that express environmental or sustainability attributes through words, graphics, symbols, or the use of green colors may be classified as green brands.

---

[11] *Chetan Kumar, Every 2nd Patent Granted Since 2016 Relates To Green Tech; Most Linked To Waste Alternative Energy, TIMES OF INDIA (Feb. 8, 2022) available at: https://timesofindia.indiatimes.com/india/every-2nd-patent-granted-since-2016-relatesto-green-tech-most-linked-to-waste-alternative-energy/articleshow/89420047.cms*

[12] *Taylor Wessing, Green Brands: What Can Be Trade Marked?, LEXOLOGY (April 25, 2023), https://www.lexology.com/library/detail.aspx?g=fdb0ac47-ad11-404d-aeaf-eaa922c810a5.*

Typically, green trademarks include terms like “eco,” “green,” “sustainable,” or “organic” and are often accompanied by visually appealing elements such as leaves, flowers, and earthy tones. Their main purpose is to distinguish environmentally conscious goods and services in the marketplace, helping consumers make informed purchasing decisions based on the ecological impacts of those products or services.

In today's consumer-driven society, individuals tend to examine product labels closely before making purchases and often prefer items that align with environmental sustainability ideals. This shift in consumer behavior has led companies—both small and medium-sized enterprises (SMEs) as well as multinational corporations (MNCs)—to sometimes make false or exaggerated claims about their commitment to sustainable practices. A notable increase in "greenwashing" has occurred, which involves misleading claims related to production methods or material composition such as “100% recyclable,” “compostable,” “100% natural,” or “zero emissions,” as well as vague terms like “natural,” “green,” or “eco-friendly.” It is crucial for these claimed green trademarks to be transparent and meaningful, ensuring that their green claims are truthful and not misleading.

Green Copyright

The term "green copyright" refers to the intersection of copyright law and environmental sustainability, involving an exploration of how copyright regulations affect environmental conservation. The aim of green copyright is to address the environmental issues associated with existing copyright laws, particularly concerning the ecological impacts of digital distribution and the environmental consequences of enforcing copyright protections. One aspect of green copyright involves examining how copyright laws influence the recycling efforts for electronic devices, such as computers and smartphones, in order to reduce electronic waste. It also assesses the environmental implications of copyright enforcement on consumer behavior, particularly regarding the tendency to frequently upgrade technology, as seen in the constant demand for newer smartphone models.

Moreover, green copyright encompasses an analysis of how copyright laws shape innovation in environmental technologies and processes, focusing specifically on patents related to eco-friendly inventions. Additionally, it investigates whether copyright supports or hinders environmentally sustainable practices, including the encouragement of shared computing resources and network-based

services that reduce the need for multiple electronic devices.

Legal and Policy Landscape

On a global scale, intellectual property organizations are promoting technologies related to climate change by endorsing specific provisions and creating platforms to connect inventors with shared goals. For example, the International Patent Classification Committee has developed the "IPC Green Inventory," which provides easy access to information about patents and their role in green technologies, covering areas such as alternative energy generation, energy efficiency, transportation, waste management, agriculture, forestry, and related design elements. The World Intellectual Property Organization (WIPO) has launched WIPO GREEN, a platform aimed at connecting environmentally sustainable technological solutions with the global innovation ecosystem, thereby encouraging collaboration and exchange through its digital repository.

To further its mission, WIPO initiated the "Women in Green" interview series in 2020 to promote female participation and entrepreneurship within the green technology innovation sector. In addition, WIPO Green has established a pro bono program that offers legal assistance to organizations in developing countries involved in green innovation efforts.[13]

It's not only nations that are working independently to create regulations or frameworks aimed at promoting the development of green technologies in response to climate change; major corporations are also collaborating to implement groundbreaking programs and commitments to tackle these issues. For example, the Eco-Patent Commons, launched in 2008 by the World Business Council for Sustainable Development (WBCSD), [14] represents a form of intellectual property collaboration among companies. Participating firms, including IBM, Nokia, and Sony, have pledged their

[13] Gopi Trivedi and Jinal Bhavsar, *Role of Intellectual Properties in Advancement of Green Technology*, LIVELAW (Mar. 28, 2024) available at: https://www.livelaw.in/law-firms/lawfirm-articles-/intellectual-property-green-technology-yj-trivedi-co253609#:~:text=Currently%2C%20the%20data%20from%20India's,management%20and%20alternative%20energy%20production.

[14] Anand Barnabas, *Green Innovation and IP: Legal Frameworks for Sustainable Technologies in India*, MONDAQ (Feb. 5, 2024) available at: https://www.mondaq.com/india/patent/1419990/green-innovation-and-ip-legalframeworks-for-sustainable-technologies-in-india.

patents in the green sector.[15] Such initiatives reflect a dedication to encouraging innovation, collaboration, and the sharing of knowledge within green technology. Ultimately, these efforts will aid in the protection and advancement of green intellectual property on a global scale.

India is rapidly working to transform its energy sector with the goal of achieving zero carbon emissions by 2070. The country has introduced several national initiatives to promote green technology and innovations. One such initiative is AGNI, which is supported by the Indian government and operates under the Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STAIIC). AGNI acts as a platform to help commercialize technological innovations. Another initiative, Climate Launchpad, is recognized as the world's largest competition for green business ideas and is co-founded by the European Union. However, despite significant growth in green intellectual property rights (IPR) in India, the country currently lacks an IPR framework that effectively supports innovation and clean technologies. To address this gap, India needs to implement additional regulatory practices that include relaxing trade barriers and introducing a fast-track patent prosecution process specifically for environmentally-focused inventions.[16]

Case Studies and Comparative Analysis

Renewable energy markets

There are three categories of markets for renewable energy capabilities in developing countries. The most apparent is the market that enables a nation to lower its CO2 emissions, which is not currently mandated by international law but may become necessary in the future. The second market involves providing carbon offsets through the Clean Development Mechanism (CDM) established under the Kyoto Protocol. Both of these markets can be supported by importing technologies, such as photovoltaic panels for off-grid electricity generation.

The third category pertains to renewable products, like biofuels (or potentially electricity), and equipment such as wind turbines, where industries in developing

[15] 1 Pratheeba Vimalnath, Frank Tietze, Akriti Jain, Viola Prifti, *IP Strategies for Green Innovations-an Analysis of European Inventor Awards,* CENTRE FOR TECHNOLOGY MANAGEMENT (Jan. 2020), available at: https://api.repository.cam.ac.uk/server/api/core/bitstreams/3526d566-ec1a-49c4-bbf2-921613a68935/content.

[16] Z. A. Khan and Shireen Singh, *Intellectual Property Rights Regime in Green Technology: Way Forward to Sustainability*, 22 NATURE ENVIRONMENT AND POLLUTION TECHNOLOGY JOURNAL 2145.

countries can integrate into the global supply chain. For this market, the country needs to obtain licenses to produce these products, which could involve establishing an indigenous company or forming a joint venture with a foreign firm. Alternatively, it can build its own national capacity to research and manufacture these products independently of any foreign licensors.

The photovoltaic sector

Basic photovoltaic (PV) technology involves the production and processing of silicon wafers that generate electricity when exposed to sunlight. The PV industry is characterized by a loose oligopoly, with the top five companies accounting for roughly 60 percent of the market share. As a result, developing countries are likely to access the advantages of this basic silicon wafer technology, even in light of existing patents.

Furthermore, if firms in developing countries want to enter the production sector, they are likely to secure licenses on favorable terms due to the abundance of companies within the industry. This potential for market entry is exemplified by Tata-BP Solar, an Indian company formed through a joint venture, and Suntech, a Chinese firm. Suntech has not only managed to innovate its own technologies but has also acquired companies from developed nations.

Biofuel technology

Typical biofuel technology involves converting sugar or corn into ethanol, but there are numerous other methods to transform biomass into fuels. In this regard, developing countries generally have good access to existing technologies, with Brazil being a long-standing leader in this field.

However, challenges arise when considering future biofuel technologies. Various government and venture-capital funded initiatives are working to develop new processes, enzymes, or microorganisms for biofuel production, particularly focusing on breaking down lignin—a key component of many plants that is not currently utilized for fuel. This area is likely to see numerous patents emerge. Nevertheless, because production tends to be decentralized and there is competition among different biofuel manufacturing techniques and alternative fuels, it seems probable that patent holders will be open to licensing their technologies. Consequently, the licensing fees for these innovations are unlikely to remain high for an extended period.

The wind sector

The wind energy sector is more concentrated than the photovoltaic (PV) sector, with four companies accounting for approximately 75 percent of the market. Nonetheless, the industry remains competitive enough that developing countries can establish wind farms using equipment from the global market without incurring excessive intellectual property costs.

However, it may be more challenging for developing nations to break into the global market for wind turbines. The current industry leaders are well-established and are reluctant to share their technology due to concerns about fostering new competition.

Sector Specific Policy Initiatives

1. **National Bioenergy Programme for FY 2021–22 to 2025–26 (Phase-I)**

The Ministry announced this program in 2022, which will run for five years with an approved budget of INR 858 crore for Phase I. The National Bioenergy Programme will include the following sub-schemes:

This program focuses on generating energy from urban, industrial, and agricultural waste residues by supporting the establishment of large biogas, bio-CNG, and power plants (excluding projects converting municipal solid waste to power).

This scheme aims to support the manufacturing of briquettes and pellets as well as promote biomass (excluding bagasse) based cogeneration in industries to facilitate the creation of pellets and briquettes for use in power generation and other non-biogas power generation projects.

2. **Rooftop Solar Programmes**

The Roof Top Solar Programme Phase-II was initiated to accelerate the deployment of solar rooftop systems, aiming for an installed capacity of 40 GW by the year 2021–22. The scheme offers financial incentives for the installation of 4 GW of solar rooftop projects in the residential sector, and it includes provisions to reward distribution companies for achieving incremental growth compared to the previous year. For the residential sector, the use of domestically produced solar cells and modules is mandatory. This initiative is expected to serve as a catalyst for increasing solar cell and module manufacturing capacity in India. To date, a total of 4.4 GW of solar rooftop projects have been established across the country.

3. **Renewable Energy Research and Technology Development Programme**

This program has been introduced to promote the development of indigenous technologies for the widespread implementation of new and renewable energy sources, including ocean energy, in an efficient and cost-effective way throughout India. The Committee assessed the overall research and development program, examined the funding mechanisms, and identified current priority areas, all with the ultimate goal of increasing the proportion of renewables in the country's energy mix.

4. **National Wind-Solar Hybrid Policy (2018)**

This policy was introduced to establish a framework for promoting large grid-connected wind-solar PV hybrid systems, aiming for the efficient and optimal use of wind and solar resources, land, and transmission infrastructure. The policy is designed to encourage the development of new technologies, methods, and solutions that facilitate the combined operation of wind and solar PV plants. Additionally, it seeks to promote the creation of new hybrid projects as well as the hybridization of existing wind and solar projects.

Critical Analysis

Governments around the globe have prioritized the development of renewable energy technologies by introducing various policies and incentives to foster this progress. With the rapid growth in the manufacturing and adoption of these technologies in recent years, there has been a noticeable shift in national leadership. The emergence of several fast-developing economies in this field has contributed to a more globalized supply chain, leading to an increase in international trade involving renewable energy technologies. As a result, the incidence of trade-related disputes has also escalated, manifesting through both the World Trade Organization (WTO) and domestic trade remedy mechanisms.

Even though costs have decreased recently, many renewable energy technologies, such as wind and solar power, still depend on some form of government support for their implementation. While direct governmental assistance that qualifies as a subsidy may conflict with international trade laws, initiatives aimed at simultaneously bolstering domestic manufacturing industries are particularly vulnerable to such conflicts.

Ideas by themselves lack substantial value; they need to be transformed into innovative products or services and effectively commercialized for companies to reap the rewards. Most new offerings in the market stem from innovations—whether

significant or minor—that can be protected through various types of intellectual property rights. Companies engaged in renewable energy products or technologies will likely face multiple facets of intellectual property as they develop or utilize new inventions. Thus, comprehending the significance of intellectual property as a business asset and companies. They must enhance their ability to address intellectual property issues that may arise during technology trade and transfer activities.[17] This section seeks to illuminate the kinds of intellectual property challenges that could arise during transactions involving intellectual property or the exchange of renewable energy technologies.

Despite notable progress in the legal framework, challenges continue to exist. A primary focus remains on capacity-building for small and medium enterprises (SMEs). A case study of an innovative SME that specializes in eco-friendly packaging illustrates how specific legal interventions, such as tax incentives and streamlined patent processes, can empower these businesses to embrace and contribute to green technology solutions. The delicate balance between robust intellectual property protection and widespread access to green technologies necessitates ongoing legal evaluation. Another case study involving a pharmaceutical company that voluntarily licenses its green manufacturing process shows how a well-considered IP strategy can foster collaboration and promote the broad distribution of environmentally sustainable technologies.

India's legal framework showcases its strong commitment to sustainable development in the face of climate change challenges. The evolution of intellectual property laws, combined with strategic frameworks for technology transfer and green financing, positions India at the forefront of the global initiative for environmental resilience. As India progresses, its legal landscape is likely to undergo further changes, with potential amendments and new legislation necessary to address emerging challenges and capitalize on new opportunities. The trajectory of India's approach to climate action, green technology, and intellectual property will rely on the adaptability and responsiveness of its legal system, ensuring a future where innovation harmonizes seamlessly with sustainability.

[17] Joanna I. Lewis, *The Rise of Renewable Energy Protectionism: Emerging Trade Conflicts and Implications for Low Carbon Development*, MIT PRESS DIRECT (Mar. 21, 10:05 PM), https://direct.mit.edu/glep/article/14/4/10/14803/The-Rise-of-Renewable-Energy-Protectionism

Challenges

1. Challenges of Intellectual Property Landscapes: The complexities found within intellectual property (IP) landscapes present a considerable challenge. The diverse range of patents, copyrights, and trademarks in the green technology field creates obstacles that impede effective collaboration. Recommendation: Streamline and standardize IP frameworks to facilitate licensing processes and create an environment that supports collaborative innovation.

2. Financial Barriers: The significant expenses associated with obtaining and enforcing patents pose challenges, particularly for smaller organizations, restricting their ability to engage in green technology development. Recommendation: Implement financial incentives, lower fees, or grant programs to alleviate the financial burdens on innovators, especially those from smaller businesses.

3. Global Disparities in Access to Technology: Global inequalities in technology access contribute to a notable digital divide. Developing nations frequently encounter challenges in accessing and utilizing green technologies due to IP-related restrictions. Recommendation: Encourage international collaboration and partnerships aimed at technology transfer and capacity-building to bridge the global technology divide.

4. Patent Clusters and Defensive Strategies: The concentration of patents surrounding specific technologies, known as patent thickets, along with defensive patenting practices, creates significant barriers to innovation and comprehensive solution development. Recommendation: Promote open innovation strategies, such as patent pools, to mitigate the effects of patent thickets and reduce defensive patenting.

5. Regulatory Uncertainties: Ambiguities in IP regulations and enforcement can discourage investments in green technology. Innovators may be reluctant to invest in research and development without clear protections for their intellectual property. Recommendation: Create clear and uniform IP regulations for green technologies to establish a stable and predictable environment for innovation.

6. Lack of Interdisciplinary Collaboration: Green technology often necessitates collaboration across different disciplines involving experts from various fields. However, barriers like incompatible IP systems hinder effective collaboration and comprehensive problem-solving.

Recommendation: Foster interdisciplinary collaboration through incentive programs, research grants, and forums that encourage substantial knowledge exchange.

7. Insufficient Understanding of IP Rights: A limited grasp of intellectual property rights among innovators, policymakers, and businesses can impede the effective utilization of IP mechanisms. Recommendation: Launch comprehensive educational programs to enhance awareness and understanding of IP rights, emphasizing their vital role in driving innovation within green technology.

8. Delayed Patent Examination Processes: Lengthy patent examination durations can significantly delay the protection of green technologies, impacting the speed at which innovations reach the market. Recommendation: Introduce expedited examination processes for green technology patents to reduce the time-to-market for environmentally beneficial solutions.

Policy Recommendation

Energy companies are increasingly required to meet global energy demands while simultaneously advancing decarbonization efforts. This transition to renewable and less carbon-intensive energy sources calls for substantial investments of time and money to upgrade existing technologies into cutting-edge solutions.

As energy processes improve through innovation, safeguarding intellectual property (IP) and mitigating risks will be vital for successful commercialization and achieving a return on investment. For example, obtaining patents for newly created renewable energy technologies can provide companies with exclusive rights to these innovations, enabling them to recoup their investments and increase their likelihood of success.[18] On the other hand, maintaining certain methods as trade secrets within an energy facility—if kept confidential—can yield long-lasting benefits and a competitive advantage, as long as they are not easily reverse-engineered.

To maximize returns on investments aimed at tackling the challenges posed by the renewable energy transition, companies must develop an IP strategy that aligns closely with their business goals and incorporates technical know-how for effective commercialization. A strong basis for crafting and executing a unified IP

[18] Dr Vinod Kumar Gupta, *A guide book on intellectual property issues to be considered while transferring renewable energy technologies,* APCTT-UNESCAP 1, 19 (2020), https://repository.unescap.org/bitstream/handle/20.500.12870/5204/ESCAP-2020-MN-Guide-Book-Intellectual-Property-Issues.pdf?sequence=1&isAllowed=y.

strategy, along with a successful commercialization plan for the energy transition, involves forming an "IP team." This team should include experts from business, technical sectors, and IP law who are aligned, engaged, and in tune with the company's objectives. Below are five key IP considerations that your company's IP team should focus on when investing in and leading the energy transition.

Identifying, addressing, and securing intellectual property (IP) rights

It is vital for any organization investing in new technology development. Cultivating a strong culture of innovation and IP is essential to create an environment that promotes the generation, disclosure, documentation, and protection of new ideas. Companies that do not effectively identify, evaluate, and safeguard their innovations through IP risk losing those ideas and may end up giving away their investments without receiving any return.

To foster this culture, it's important to implement policies, procedures, and ongoing training programs that inspire engineers and scientists to invent and document their ideas. Additionally, efficient workflows should be established for the IP team to review and protect these inventions. For example, the IP team should assess external collaborations and proposed publications to ensure that IP filings are completed and that appropriate confidentiality agreements are in place to protect against potential loss of IP rights.[19] It's important to remember that disclosing or publishing innovative ideas without proper confidentiality measures can obstruct future efforts to secure IP protection.

On the other hand, when considering licensing or investing in third-party technologies, any payments or cost-sharing agreements should be contingent upon obtaining the right to use that technology as required in the future. This strategy helps prevent overpayment as the technology becomes more established. The involvement of the IP team in due diligence, structuring, negotiating, and executing these technology transactions will ensure that third-party technology owners have adequate IP protections in place to validate your company's financial commitments.

[19] Zachary Wegmann, *Intellectual property (IP) and the renewable energy transition: Five critical IP issues*, NORTON ROSE FULBRIGHT (Mar. 20, 2025, 11:00 PM). https://www.nortonrosefulbright.com/en-in/knowledge/publications/ab53b49a/intellectual-property-ip-and-the-renewable-energy-transition.

The primary takeaway is that now is the optimal time to secure your company's IP rights. Postponing this process could lead to increased difficulties and costs down the line, potentially weakening or undermining the effectiveness of those rights**.**

Continually review and assess third-party IP risk

A significant yet often overlooked issue related to new technology development and commercialization is compliance with third-party intellectual property (IP) rights. While patents allow holders to prevent others from making, using, or selling a claimed invention within the country of filing, they do not inherently grant the right to utilize that invention. Due to the overlapping nature of patent rights, a company may possess multiple patents for a specific energy process but still need to secure a license from a third-party patent owner to operate that same process without risking patent infringement lawsuits. To sidestep one of the most complex, protracted, and expensive types of litigation—and the threat of injunctions against established processes—it's crucial for IP teams to conduct freedom to operate (FTO) analyses or clearance reviews on potentially obstructive third-party patents before deploying new technology.

Before committing resources to internal technology development, an IP team can proactively mitigate potential patent challenges by performing competitive intelligence in the relevant field. This helps companies focus their technology investments on "white space," or areas not dominated by broad-blocking patents. As the technology evolves, IP teams should carry out ongoing FTO analyses in each country where the new technology will be commercialized to ensure it does not infringe upon third-party IP rights. If the finalized technology is near existing patent claims, seeking a formal opinion on non-infringement or patent invalidity could serve as a valuable defense against claims of willful infringement and possible increased damages.

In licensing scenarios, it is common practice for the licensor—who owns the technology and receives licensing revenue—to bear the risk and responsibility for any infringements of third-party IP rights. Consequently, licensees should demand standard representations and warranties regarding ownership and non-infringement of the technology, along with thorough indemnification against any actual or alleged infringement or misappropriation of third-party IP rights. Furthermore, IP teams can help mitigate risks associated with in-licensing

transactions by conducting litigation searches on the licensor, asking about their FTO activities and litigation history, and performing independent FTO analyses for the process being licensed.

In conclusion, companies must verify their freedom to operate renewable energy processes within the limits of third-party IP rights before bringing new technologies to market. This represents a significant risk that could result in costly litigation, multi-million dollar judgments, and potential court orders stopping operations—even after considerable capital investments have been made.

Understand IP coverage depth and strength

When developing technology in-house, it is crucial to proactively consider and balance different types of IP protection—such as patents, trade secrets, copyrights, and trademarks—to establish an "IP moat" that protects technological advancements. This approach enables companies to maximize the value of their investments during the renewable energy transition. The effectiveness of an IP moat, including its depth, breadth, and deterrent effects, varies based on the specific technology and the types of IP protections implemented, which requires thorough analysis for a comprehensive understanding.

Patent protection has limitations based on the jurisdiction in which it is granted, the scope and restrictions of the patent claims, available alternative solutions or design-arounds, and existing prior art. Likewise, while trade secret protection can offer a competitive edge or early advantage, it does not prevent competitors from independently developing or reverse-engineering similar technologies. Copyrights safeguard against direct copying of an idea's expression but do not inhibit independent development.[20] Trademarks enhance brand recognition and can aid in establishing market positioning. A balanced strategy that incorporates these different forms of IP rights should be thoughtfully integrated into the IP team's efforts to create a strong IP moat around innovation.

When considering licensing or purchasing technology from third parties, it is vital for the IP team to review the processes and methods linked to the licensed technology along with its associated IP protections. Reputable licensors should be open to cooperating during due diligence efforts by

[20] SCIENCE DIRECT, https://www.sciencedirect.com/topics/social-sciences/patent-protection (last visited Mar. 20, 2025).

providing information about their IP landscape and any blocking effects in the competitive market. A lack of understanding regarding the full scope of the technology or the licensor's IP status could result in overpayment for access to that technology or lead to unforeseen competitive issues.

Evaluating and quantifying IP coverage for technology is a multifaceted challenge that necessitates careful attention to various factors. An IP team equipped with extensive technical, commercial, and legal knowledge will be better prepared to reduce uncertainties in their assessments.

Avoid IP contamination

For companies involved in both internal technology development and the assessment or licensing of third-party technologies in the same field, there exists a specific risk known as IP contamination, which can jeopardize their ownership of intellectual property rights. This risk arises when confidential technical information obtained from external sources under non-disclosure agreements (which include restrictions on use and publication) unintentionally merges with internal research and related IP filings. A frequent scenario is when the same scientist or engineer who is developing technology for the company also receives confidential information from third parties about similar technologies. Any inventions or patent applications submitted by that individual could be considered contaminated, putting the ownership of those patent at risk and potentially resulting in breaches of non-disclosure agreements with third parties.

To reduce the risks associated with IP contamination, companies can tailor confidentiality agreements to avoid receiving confidential information on topics that are the same as or closely related to their internal research projects. Another strategy involves creating firewalls by having different technical teams on either side to protect internal research efforts and prevent confidentiality breaches. Whichever approach is taken, it is essential for policies and procedures to clearly define how to manage third-party confidential information responsibly and establish precautionary measures when hiring technical experts from competitors working on similar technologies.

Be mindful of data

Access to and the ability to use data during technology development are crucial for the IP team to identify and protect innovations. In many respects, data has become the "new oil." For internal functions, companies should establish user-friendly systems and processes to efficiently manage, store,

categorize, and safeguard data as they develop renewable energy technologies. Both positive and negative test outcomes can provide valuable insights during this process and are often key to obtaining significant patent claims.

On the other hand, companies should pursue rights to—and ideally ownership of—the data produced from investments in third-party technologies. Even with favorable IP ownership agreements, a company may find it challenging to recognize and protect its innovations without access to the generated data.

In conclusion, companies that are best positioned to recover their investments during the energy transition will be those that understand IP risks and utilize their IP teams to secure rights early and consistently. They will also honor third-party IP rights, grasp the scope of IP coverage for commercialized technologies, avoid IP contamination, and ensure they have access to innovation-related data.

CONCLUSION

Urban energy justice exists at the intersection of technological innovation, intellectual property rights (IPR), and social equity. The shift to renewable energy is vital for addressing the intertwined challenges of climate change and urban energy poverty. However, the current IPR protection framework often obstructs the fair distribution of renewable technologies, particularly in low-income and marginalized urban communities. Achieving a balance between safeguarding innovation and ensuring widespread public access to renewable energy is a complex yet necessary goal.

Within the context of mitigating and adapting to climate change, intellectual property (IP) plays a crucial role as a driver of innovation. The challenges highlighted—from navigating complex IP environments to tackling global disparities in technology—underscore the need for strategic interventions. As we navigate this multifaceted landscape, the recommendations put forth act as a guide for policymakers, businesses, and researchers striving for a future where green technology thrives under a well-defined intellectual property framework.[21] The push for streamlined IP systems and harmonized international standards represents more than just a call for

[21] Aayush Bhardwaj and Ms. Heena Parveen, *Intellectual Property in the Age of Climate Change: Balancing Innovation and Sustainability through Green Technology,* 2 THE ACADEMIC 672, 689 (2024), https://theacademic.in/wp-content/uploads/2025/01/58.pdf.

simplicity; it embodies a demand for a collaborative and interconnected global approach. Additionally, the focus on sustainable practices and open-source models signals a move toward responsible innovation that goes beyond mere technological advancements, showcasing a commitment to environmentally friendly practices that bolster global resilience.

The creation of specialized green technology innovation hubs signifies an investment in cultivating environments that encourage interdisciplinary collaboration and transformative thinking. In summary, merging intellectual property with green technology charts a path toward a sustainable, equitable, and innovative future. As the world faces the challenges of climate change, this intersection provides a roadmap—a direction where intellectual property functions not only as a legal framework but also as an impetus for introducing new technological solutions that align with environmental objectives. It envisions a future where innovation seamlessly integrates with sustainability, driven by collaboration, intelligence, and a shared commitment to creating a resilient world.

***

ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY OF MYSORE | DEPARTMENT OF STUDIES IN LAW
Manasagangotri-570006.

Mysore University Law Journal
Volume 2, Issue 1, 2025

IPR as a Driver of Sustainable Transport, Patents and Green Technologies

Harsapratha[1]

Abstract

Sustainable transportation is vital in addressing urbanization and climate challenges, with Intellectual Property Rights (IPR) playing a crucial role in fostering green innovation. Patents, trademarks, and copyrights protect advancements in electric vehicles (EVs), hydrogen fuel cells, and smart mobility systems, encouraging investment and technological progress. However, exclusivity can hinder accessibility, especially for developing nations. Mechanisms like patent pools, compulsory licensing, and technology transfer promote wider adoption. Open innovation models, public-private partnerships, and legal reforms can balance innovation incentives with sustainability goals. As technology and legal frameworks evolve, IPR must adapt to ensure that green mobility solutions remain both commercially viable and globally accessible, driving sustainable urban growth and environmental responsibility.

Key words: Smart Mobility, Sustainable Transportation, Green Innovation, Patents and Licensing, Electric Vehicles (EVs), Technology Transfer

Introduction

[1] *Student of Law at Bharath Institute of Law, Chennai.*
Email: harshapratha6@gmail.com

The 21st century's rapid urbanization and climate challenges have spotlighted sustainability, with transportation being a key sector where innovation can reduce carbon footprints and promote sustainable urban living[2]. However, transitioning to green mobility and eco-friendly infrastructure involves legal and regulatory challenges, particularly concerning Intellectual Property Rights (IPR). IPR plays a vital role in ensuring the viability of green technologies like electric vehicles (EVs), hydrogen fuel cells, and smart traffic systems, which rely on patent protection, trademarks, and trade secrets. Without solid intellectual property frameworks, companies and researchers may hesitate to invest in new technologies due to the risk of easy replication without legal safeguards.

A key challenge is balancing exclusivity with accessibility. Patents grant exclusive rights but may make sustainable technologies expensive and inaccessible, particularly for developing countries. To address this, mechanisms like technology transfer, compulsory licensing, and patent pools can encourage global adoption of green transport solutions. Open innovation models, which involve knowledge-sharing between companies and governments, can expedite the development and deployment of green technologies while protecting IPR[3].

Beyond patents, trademarks and branding help build consumer trust in sustainable products, and copyright laws protect software innovations crucial to intelligent transportation systems. The rise of smart cities emphasizes the need for integrated digital and physical infrastructure, which requires a clear IPR framework to foster both innovation and sustainable urban growth.

As we approach a future where sustainability and technology intersect, IPR frameworks must evolve to address the complexities of green innovation. Legal frameworks that balance innovation protection with global accessibility will be essential in addressing the regulatory, ethical, and economic implications of IPR in sustainable transportation, supporting the broader goal of global sustainability.

The Role of IPR in Green Innovation:

As the world shifts toward sustainability, green innovation in transportation—ranging from electric and hydrogen-powered vehicles to smart urban

[2] World Trade Organization, Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) art. 27.1, Apr. 15, 1994, 1869 U.N.T.S. 299.

[3] United Nations, Paris Agreement, Dec. 12, 2015, 55 I.L.M. 74.

planning[4]—plays a crucial role. However, legal frameworks, particularly Intellectual Property Rights (IPR), are essential for incentivizing investment and ensuring technological progress.

1. Patents as a Catalyst for Green Innovation

Patents provide inventors with exclusive rights, allowing them to recover R&D costs and fostering competition in sustainable transport[5]. Companies investing in next-generation batteries, biofuels, and emission-reduction systems rely on patents to protect their innovations. For instance, Tesla's patents on lithium-ion battery technology have significantly advanced the electric vehicle industry. However, high licensing costs create barriers for developing nations, leading to discussions on patent pooling, compulsory licensing, and open innovation to ensure accessibility.

2. Trademark Protection and Brand Trust

Trademarks play a key role in influencing consumer trust in green mobility. Certification marks like "Energy Star" or "Green Seal" ensure authenticity, encouraging eco-conscious choices. Without strong trademark protection, counterfeit products and misleading claims could undermine sustainability efforts.

3. Copyright in Smart Transport Systems

As smart cities adopt AI and IoT-driven transport systems, copyright protection safeguards software innovations that optimize traffic, reduce emissions, and enhance energy efficiency. Intelligent transport systems rely on proprietary algorithms, and copyright laws ensure that developers can protect and invest in these crucial technologies.

4. Balancing Exclusivity and Public Interest

While IPR fosters innovation, strict patent enforcement can limit access to green technologies, especially in emerging economies. Initiatives like patent pools and technology transfer programs, such as the Eco-Patent Commons[6], enable shared access to sustainable innovations. Organizations like WIPO promote policies that balance IP protection with global sustainability needs.

5. The Future of IPR in Green Transport

Governments must encourage green patents through tax incentives, grants, and

[4] Tesla, Inc., Patents and Licensing, https://www.tesla.com/patents (last visited Feb. 4, 2025)

[5] Int'l Ctr. for Trade & Sustainable Dev., The Role of Patents in Promoting Sustainable Development.

[6] United Nations Environment Programme, Global Environmental Outlook, 12 GEO 97 (2019)

extended protections. Compulsory licensing can ensure access to climate-critical technologies, while international collaboration can harmonize IPR policies. Open innovation models can further facilitate accessibility while maintaining commercial viability.

IPR must evolve to support both private sector innovation[7] and global sustainability. A balanced legal framework will drive green transport advancements while ensuring widespread access, fostering a future where innovation and environmental responsibility coexist.

Patents and Sustainable Transport Technologies

The global push for sustainability has intensified the need for eco-friendly transport solutions like electric vehicles (EVs), hydrogen fuel cells, and smart mobility infrastructure. However, developing these technologies requires substantial investment, making Intellectual Property Rights (IPR), particularly patents, essential for protecting innovations while shaping accessibility and affordability.

1. Patents as Drivers of Green Mobility

Patents grant inventors exclusive rights, allowing companies to recover R&D costs and sustain competition in green transport. For instance, Tesla and Toyota have patented lithium-ion and solid-state battery technologies, ensuring continued advancements. Governments also incentivize patents through tax benefits and grants, encouraging sustainable innovation. However, while patents promote technological progress, they also raise concerns about monopolization. Restrictive patent policies can limit the widespread adoption of crucial green technologies, posing challenges for emerging economies.

2. Patent Barriers and Accessibility Challenge.

Despite fostering innovation, patents can create financial barriers to accessing sustainable transport solutions. High licensing fees prevent smaller companies and developing nations from adopting advanced EV technologies.

3. Open Innovation and Patent Sharing

Acknowledging the climate crisis, some companies have adopted open innovation models[8]. In 2014, Tesla made its EV patents available to competitors, promoting industry-wide adoption. Similarly, the Eco-Patent Commons, initiated by IBM and Sony, allows firms to share environmentally beneficial patents. These initiatives highlight patents as tools for collaboration rather than barriers.

[7] WIPO, Eco-Patent Commons, World Intellectual Property Organization, https://www.wipo.int/ecopatents.

[8] UNESCO, Open Innovation for Sustainable Development, 21 Science, Technology & Innovation 42 (2018).

4. The Future of Patents in Sustainable Transport

To balance innovation with accessibility, policymakers and industry leaders must refine patent frameworks:

a) Patent Incentives: Extended protection and tax benefits for sustainable technologies.

b) Compulsory Licensing: Ensuring public access to climate-critical innovations.

c) Global Patent Harmonization: Standardized laws to prevent disparities.

d) Patent Pools & Collaboration: Encouraging shared technological advancements.

Patents shape the future of sustainable mobility, balancing exclusivity with accessibility. By refining legal frameworks, patents can drive both economic growth and environmental progress, ensuring green transport solutions benefit all.

The Evolution of Green Technologies in Urban Mobility

Urban mobility[9] has transformed significantly due to environmental concerns, technological advancements, and policy-driven sustainability efforts. Cities face issues like congestion, pollution, and inefficient transport systems, making eco-friendly mobility solutions crucial. Green technologies, including electric vehicles (EVs), smart infrastructure, and digital mobility solutions, are reshaping urban transport while intellectual property rights (IPR) play a vital role in fostering innovation and accessibility.

1. Rise of Electric and Alternative Fuel Vehicles

The shift toward EVs and alternative fuels is central to sustainable urban mobility. Governments worldwide support EV adoption through tax incentives and low-emission zones. Lithium-ion battery technology, heavily patented by Tesla, Panasonic, and BYD, has revolutionized EVs, with solid-state batteries promising further advancements. Hydrogen fuel cells, promoted by Toyota and Hyundai, offer quick refueling and zero emissions but face accessibility challenges due to patent protections on key technologies.

2. Smart and Sustainable Transport Infrastructure

Urban transport is evolving with smart infrastructure investments. Intelligent transport systems (ITS) use AI-driven

[9] India Ministry of Heavy Indus. & Pub. Enterprises, National Electric Mobility Mission Plan.

traffic management to optimize flow and reduce emissions, supported by software patents and AI algorithms[10]. Public transport is transitioning to electrified buses and autonomous shuttles, while non-motorized transport like cycling is gaining prominence in cities like Amsterdam. However, concerns over data privacy, cybersecurity, and proprietary software in public mobility systems highlight the need for ethical and legal frameworks.

3. Digital Transformation and Mobility-as-a-Service (MaaS)

Mobility-as-a-Service (MaaS) platforms integrate public transport, ride-sharing, and micro-mobility into user-friendly digital solutions. Companies like Uber and Lyft are adopting electric fleets, while patents in real-time navigation and AI-based ride-sharing optimize urban mobility. However, data monopolization by private firms raises concerns about equitable access to green transport solutions, emphasizing the need for open-data policies and public-private collaboration.

4. Challenges and the Road Ahead

Despite advancements, high costs, regulatory barriers, and market resistance challenge green mobility adoption. Policies must promote patent pools, compulsory licensing, and public-private partnerships to ensure widespread access. The future of urban mobility lies in autonomous EVs, renewable energy-powered transport, AI-driven analytics, and sustainable urban planning.

Green technologies are reshaping urban mobility, enhancing sustainability and efficiency. While IPR fosters innovation, it must be managed to prevent monopolization and ensure accessibility. With aligned policies, technology, and legal frameworks, urban mobility can drive global sustainable development.

The Legal and Policy Framework Supporting IPR and Sustainability:

The intersection of IPR and sustainability is a crucial area of legal and policy development, as green technologies become essential for addressing climate change. While IPR frameworks incentivize innovation, they must also ensure equitable access to sustainable solutions. Striking a balance between protecting inventors' rights and promoting public interest remains a challenge, particularly in renewable energy, urban mobility, and sustainable infrastructure.

1. International Legal Frameworks[11]

Several global agreements shape IPR policies related to sustainability:

[10] Green Seal, Certification Program, https://www.greenseal.org

[11] International Patent Law Association, A Global View of IPR and Sustainability, 22 Int'l Patent Law 128 (2019).

TRIPS Agreement (WTO): Protects patents for green innovations but allows for flexibility, such as compulsory licensing, to address environmental concerns.

Paris Agreement (2015): Emphasizes technology transfer for climate action, encouraging cooperation in developing clean energy solutions.

UN Sustainable Development Goals (SDGs): Highlight innovation (Goal 9) and climate action (Goal 13), urging accessibility to sustainable technologies.

2. National Policies Supporting Green Innovation

Governments have introduced various legal mechanisms to integrate sustainability into IPR:

Fast-Track Patent Programs[12]: Countries like the U.S., U.K., and India prioritize green technology patents for quicker commercialization.

Compulsory Licensing: Allows governments to override patents if sustainable technologies are not made accessible at fair prices.

Public-Private Partnerships (PPPs): Encourage collaborations between businesses, academia, and governments to fund and commercialize eco-friendly innovations.

Tax Incentives and Grants: Support research and development (R&D) in renewable energy, green transportation, and waste reduction technologies.

3. Challenges in Balancing IPR and Sustainability

Patent Monopolies: High licensing costs can restrict access to green innovations, particularly in developing countries.

Technology Transfer Barriers: Companies may hesitate to share proprietary technologies due to competition concerns.

Regulatory Fragmentation: Inconsistent IPR laws across jurisdictions slow global adoption of sustainable solutions.

4. The Path Forward

Patent Pooling & Open Innovation: Initiatives like Eco-Patent Commons allow companies to share green technology patents.

TRIPS Flexibilities[13]:

i. Expanding compulsory licensing can enhance global access to essential environmental technologies. Global Green IPR Standards: Harmonized patent laws can streamline commercialization of sustainable innovations.

[12] Cambridge University Press, Sustainability and Intellectual Property, 21 J. of IPR 65 (2017)

[13] UN, United Nations Sustainable Development Goals (SDGs), https://www.un.org/sustainable-development

ii. Public R&D & Open-Source Models: Governments should fund sustainable research and encourage open licensing to drive widespread adoption.

IPR frameworks must evolve to support sustainability while ensuring equitable access to green technologies. By reforming patent policies, fostering open innovation, and enhancing international cooperation, legal systems can drive the development of sustainable solutions while balancing innovation incentives and public interest.

Challenges in Implementing IPR for Sustainable Transport

As the world moves toward sustainable transport, IPR plays a crucial role in fostering innovation. However, while patents encourage research and investment, they also create challenges in making green mobility technologies widely accessible. The balance between proprietary rights and public benefit is a key legal and policy concern.

1. Patent Barriers: Monopoly vs. Accessibility

Patents grant inventors exclusive rights but can hinder the affordability of sustainable transport solutions:

High Licensing Costs: Essential green transport technologies, like EV batteries and hydrogen fuel cells, are patented by a few dominant corporations, limiting access.

Patent Thickets: Overlapping patents in electric and autonomous vehicles complicate market entry for new players.

Patent pooling and open innovation models could help address these barriers by encouraging knowledge-sharing.[14]

2. Global Disparities in Green Transport Access

Developing countries face hurdles in adopting sustainable transport technologies due to:

Limited Technology Transfer: Despite global agreements, companies resist sharing proprietary knowledge.

Lack of Manufacturing Capacity: Even when licenses are granted, many nations lack production infrastructure.

Regulatory Barriers: Inconsistent IPR laws create uncertainty for investors.

Enhanced global cooperation and flexible licensing policies can bridge this gap.

3. The Conflict Between Patent Duration and Sustainability Goals

Traditional patents last up to 20 years, delaying mass adoption of crucial green innovations.

Slower Adoption of Breakthrough Technologies: Fast-charging batteries and

[14] Journal of Technology Transfer, Technology Licensing for Green Mobility, 40 J. Tech. Transfer 50 (2018)

biofuels remain inaccessible due to patent protections.

Balancing Commercial Incentives with Public Interest: Shortened patent lifespans[15] for sustainability technologies or compulsory licensing could accelerate their deployment.

4. Legal Disputes and Patent Infringement

Emerging green transport technologies lead to increased patent litigation:

Litigation Costs for Startups: Smaller firms face legal battles over infringement claims.

Unclear Patent Boundaries: Rapid advancements in AI-powered transport create conflicts over intellectual property.

Stronger legal clarity and streamlined dispute resolution mechanisms are essential.

5. Open Innovation vs. Proprietary Model

The debate continues between:

Tesla's Open Patent Model: Encouraging wider adoption of EV technology.

Closed System Approach: Companies protecting their patents for competitive advantage[16].

Governments must incentivize open innovation while ensuring financial returns for R&D investments.

6. Policy and Regulatory Gaps

a) Many nations lack integrated policies aligning IPR with sustainability goals:
b) Weak Enforcement of Green Patent Policies: Delays in granting patents for green innovations.
c) Lack of Coordination Between Patent Offices and Environmental Agencies: Hindering efficient implementation.
d) A global framework aligning IPR policies with climate goals is needed.
e) The Way Forward: Reforming IPR for Sustainable Transport
f) Encouraging Patent Pooling to facilitate shared innovation.
g) Implementing Flexible Licensing like compulsory licensing for essential green technologies.
h) Strengthening International Cooperation to standardize sustainability-focused IPR policies.
i) Reforming Patent Durations for critical sustainable transport solutions.
j) Aligning National IPR Policies with Climate Goals to ensure green innovations are accessible.

[15] Honda, Fuel Cell Technology and Patents, https://www.honda.com

[16] Panasonic Corporation, Patents and Innovations for Electric Vehicles, https://www.panasonic.com

k) IPR drives sustainable transport innovation but also creates barriers to accessibility. High licensing costs, patent monopolies, and legal disputes slow progress. Governments, businesses, and international organizations must collaborate to reform patent laws, encourage open innovation, and align legal frameworks with sustainability priorities. By doing so, the future of green mobility can be both innovative and inclusive.

Public-Private Partnerships for Green Innovation

The transition to green mobility requires both innovation and substantial investment. Public-private partnerships (PPPs) have emerged as a key mechanism to bridge government sustainability goals with private-sector expertise, facilitating the development, funding, and deployment of green transport solutions.

The Role of PPPs in Green Innovation

PPPs contribute significantly by combining public funding with private innovation in areas such as:

1. Infrastructure Development: Governments provide land, regulatory support, and incentives, while private firms bring in technology and capital for EV charging stations, hydrogen refueling networks, and smart public transit[17].
2. Research & Development (R&D): Joint funding supports breakthrough technologies like next-gen batteries, alternative fuels, and intelligent transport systems.
3. Technology Deployment: Many green innovations remain in labs due to high costs. PPPs enable real-world testing and large-scale implementation.

4. Successful Models of Public-Private Collaboration
5. Several global initiatives showcase the success of PPPs in sustainable transport:
6. EU's EV Charging Network: Collaboration with private energy and automotive firms has expanded EV charging infrastructure.
7. India's National Electric Mobility Mission Plan (NEMMP): Government subsidies and industry partnerships promote EV adoption.
8. California Hydrogen Highway: State collaboration with fuel cell

[17] European Commission, EU Green Deal, https://ec.europa.eu/commission/presscorner/detail/en/fs_19_6713

companies accelerates hydrogen refueling infrastructure.

9. Challenges in PPPs for Green Innovation
10. Despite their advantages, PPPs face several challenges:
11. Misalignment between public and private priorities can delay projects.
12. Financial Risks: Green transport investments require long-term commitment, often affected by policy or market uncertainties.
13. Private firms may hesitate to share proprietary technologies, limiting innovation diffusion.

The Way Forward

To maximize PPP effectiveness, governments should: Ensure Policy Stability: Long-term commitments reduce financial risks for private partners.

- Offer Incentives: Tax benefits and subsidies can encourage private-sector participation. Facilitate Technology Sharing: Agreements should balance innovation diffusion with IP protection.

By addressing these challenges, PPPs can accelerate the transition to sustainable transport, driving innovation while ensuring accessibility and environmental benefits on a global scale[18].

Future Trends: IPR and the Green Mobility Revolution:

The world is on the cusp of a transformative shift in mobility, driven by sustainability and innovation. As the demand for green mobility solutions increases, the role of Intellectual Property Rights (IPR) in shaping the future of transport is becoming more critical. IPR is poised to play a pivotal role in the development of green technologies, but the evolving landscape of green mobility presents new challenges and opportunities for the protection, sharing, and commercialization of these innovations.

As we look toward the future, several trends are likely to emerge, reshaping the relationship between IPR and the green mobility revolution.

1. Open Innovation and Collaborative Models

One of the most significant trends in the future of green mobility will be the rise of open innovation and collaborative models for IPR. The complexity of the challenges surrounding sustainable transport, from reducing emissions to creating efficient

[18] IBM, Eco-Patent Commons Initiative, https://www.ibm.com/ibm/eco-patent/

infrastructures, means that no single entity can solve these problems in isolation.

Collaborative Patent Pools: As industries like electric vehicles (EVs), battery technology, and hydrogen fuel cells converge, we may see the formation of more patent pools, where multiple companies collaborate by sharing their patents and allowing collective use of key technologies. This would reduce litigation risks, lower entry barriers for smaller companies, and accelerate innovation. For instance, the EV industry, with its rapid advancements, could benefit from pooling patents to create standardized charging systems that are universally compatible.

Public-Private Collaborations[19]: Governments, recognizing the importance of green technologies, will increasingly play a role in encouraging open innovation. By providing incentives for private companies to collaborate and share intellectual property, they can help drive the widespread adoption of green transport solutions.

2. Flexible Licensing Models for Green Technologies

The future of IPR in green mobility will likely involve more flexible and adaptive licensing models[20]. To address the urgent need for sustainable transport solutions, companies may need to adopt licensing frameworks that enable faster diffusion of technologies. This trend will be essential for making green innovations accessible to diverse markets worldwide.

Compulsory Licensing for Public Benefit: Governments may introduce compulsory licensing mechanisms for essential green transport technologies, especially when public health or environmental benefits are at stake. This could allow critical technologies like low-emission vehicles and efficient charging stations to be made available at lower costs in emerging markets.

Franchise and Cross-Licensing Agreements[21]: To encourage knowledge-sharing while maintaining commercial incentives, we may see an increase in cross-licensing agreements, where companies mutually benefit from access to each other's patents. These agreements could foster partnerships that expedite the roll-out of green mobility technologies.

[19] Toyota, Patent Portfolio on Hydrogen Fuel Cell Technology, https://www.toyota.com

[20] National Academy of Sciences, Public-Private Partnerships in Innovation, 45 J. of Sustain. Development 212 (2020).

[21] *World Intellectual Property Organization, Overview of Intellectual Property and Green Innovation, 24 WIPO Report 130 (2018)

3. Shortened Patent Durations for Critical Green Innovations

Given the pressing need to address climate change, one of the anticipated trends in the future of IPR is a rethinking of patent durations for green mobility innovations. The typical 20-year patent protection may be deemed too long for technologies that can significantly impact environmental sustainability.

Expedited Patent Approval Processes: Patent offices might introduce expedited review processes for green technologies, ensuring faster approval and access to innovations that can drive climate action. These fast-track mechanisms could be extended globally, particularly for technologies related to electric vehicles, renewable energy-powered transport systems, and fuel-efficient engines.

Shorter Patent Lifespans: For key green technologies, the idea of shortening the exclusivity period may gain traction. This could enable companies to recoup their investment without unduly delaying the public's access to sustainable transport solutions. By limiting patent protection duration, governments can ensure that critical innovations are quickly brought to market and widely adopted.

4. **Geographical and Market Expansion of Green Mobility Patents**

The global nature of the green mobility revolution means that IPR will increasingly have to navigate international boundaries. To meet the diverse needs of different markets, there will be an increased focus on ensuring the accessibility of green technologies worldwide.

Global Patent Harmonization[22]: As demand for green mobility solutions grows in developing countries, there may be a push for international patent harmonization, where patent laws across different jurisdictions are aligned to ensure that innovations are recognized and protected globally. This would simplify the process for companies looking to expand their green mobility products into international markets.

IPR in Emerging Economies: As emerging economies adopt more green technologies, the IPR framework will need to evolve to suit local needs. Local governments may offer incentives to attract green mobility companies while striking a balance between incentivizing innovation and

[22] U.S. Patent and Trademark Office, Green Technology Patents and Incentives, https://www.uspto.gov

ensuring equitable access to these technologies.

5. Sustainability as a Factor in Patentability

As environmental concerns take center stage, we can expect a growing trend of integrating sustainability as a core criterion for patentability. Innovations that directly contribute to the reduction of carbon emissions, the improvement of energy efficiency, or the enhancement of public transportation systems may receive special consideration in patent laws.

Patent Provisions for Environmental Impact: There could be a new category of patents or specific provisions that prioritize innovations contributing to sustainability. These provisions could offer additional benefits, such as reduced fees for patent registration, faster approvals, or exclusive government contracts, to encourage companies to focus on green technologies.

Integration of Green Metrics into IPR: Intellectual property offices may begin to evaluate the environmental impact of technologies during the patent application process. A technology that reduces emissions or improves energy efficiency could receive favorable treatment, incentivizing innovation in the green mobility space.

6. Integration of AI and Blockchain in IPR Management

The future of IPR in green mobility will likely see the integration of advanced technologies like artificial intelligence (AI) and blockchain. These technologies could revolutionize how patents are managed, tracked, and shared in the green transport sector.

AI in Patent Search and Analysis: AI tools could streamline patent searches, making it easier for companies to identify relevant technologies and avoid infringement. In the fast-evolving field of green mobility, where new innovations emerge rapidly, AI could also assist in assessing patentability and ensuring that innovations do not overlap with existing patents.

Blockchain for Transparent Licensing: Blockchain could enable more transparent and efficient management of IP licensing. Through smart contracts, companies and governments could track the licensing terms and ensure fair compensation for green mobility technologies. This would foster a more open and collaborative environment for innovation.

The green mobility revolution[23], powered by IPR, is poised to reshape the transportation industry and our planet's future. As we move forward, trends like open innovation, flexible licensing models, and shorter patent durations will be essential in creating an ecosystem where green technologies are both protected and accessible. The future will demand a balance between incentivizing innovation and ensuring that sustainable solutions are available to all. By adapting IPR practices to the needs of green mobility, we can accelerate the transition to a more sustainable, equitable, and efficient transport system.

Conclusion

As the world confronts the urgent need for sustainable development, the role of Intellectual Property Rights (IPR) in fostering green mobility and sustainable transport cannot be overstated. The intersection of IPR and green technologies presents a significant opportunity to drive innovation in the transport sector while addressing pressing environmental challenges. From electric vehicles (EVs) to alternative fuels and smart mobility systems, green technologies are at the forefront of reshaping how we move, work, and live. However, for these innovations to truly flourish, the legal frameworks surrounding IPR must evolve in ways that incentivize progress without stifling the wider accessibility of these transformative solutions.

The future of sustainable transport[24] hinges on the ability to balance the need for robust intellectual property protection with the imperative to share knowledge and technologies globally. The current trend toward collaborative models, such as patent pools and cross-licensing agreements, represents a key step in this direction. These mechanisms allow for the rapid diffusion of green technologies, ensuring that advancements in electric propulsion, renewable energy, and efficient transportation infrastructure can be deployed on a global scale[25]. By enabling collective efforts, IPR can help overcome barriers to entry, encourage investment, and expedite the development of next-generation green mobility solutions.

Furthermore, as the push for green innovation intensifies, new trends in patent law are likely to emerge. Shorter patent

[23] Tesla's Commitment to Open Source Patents, Tesla Motors Blog, https://www.teslamotors.com/blog

[24] Institute for Advanced Sustainability Studies, Understanding Patent Law in Sustainable Development, 39 Environ. Pol'y 146 (2018).

[25] UNFCCC, Technology Transfer for Climate Action, https://unfccc.int/topics/technology

durations, expedited approval processes, and the prioritization of sustainability in patentability criteria will all play a vital role in accelerating the adoption of green technologies. The integration of artificial intelligence and blockchain into IPR management systems is another promising development that will facilitate more transparent and efficient processes, benefiting both innovators and consumers. These advancements can help streamline patent searches, track licensing agreements, and ensure fair compensation for intellectual property use. The future of IPR in green mobility[26] is not without challenges. The risk of patent disputes, the complexity of managing global patents, and the potential for monopolization remain ongoing concerns. For IPR to continue playing a positive role in sustainable transport, legal frameworks must adapt to support collaboration rather than hinder it. Governments, private companies, and international organizations must work together to create policies that support innovation while ensuring that sustainable transport solutions are accessible to everyone, regardless of geographic location or economic status.

Public-private partnerships (PPPs) will remain a cornerstone of the green mobility revolution, offering a unique platform for cross-sector collaboration. These partnerships can help address funding gaps, bring diverse expertise to the table, and drive the scaling of green innovations. By fostering stronger collaboration between the public and private sectors, we can ensure that the green transport ecosystem remains dynamic, inclusive, and sustainable. IPR will continue to serve as a key driver of the green mobility revolution, shaping the future of sustainable transport technologies. By embracing innovation, collaboration, and adaptive legal frameworks, IPR can facilitate the transition to a greener, more sustainable world. The path forward will require ongoing commitment from all stakeholders to ensure that the benefits of these innovations are shared globally, contributing to a cleaner, healthier, and more connected world for future generations.

***

[26] International Renewable Energy Agency, Innovation and IPR for Renewable Energy Technologies, 17 IRENA Report 55 (2020)

ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY OF MYSORE
DEPARTMENT OF STUDIES IN LAW
Manasagangotri-570006.

Mysore University Law Journal
Volume 2, Issue 1, 2025

Harnessing Intellectual Property Rights for Poverty Alleviation: A Legal Framework for Sustainable Development and Innovation

Iqmaaz Matloob[1]

Abstract

Intellectual Property Rights (IPRs) play a crucial role in fostering innovation, economic development, and poverty alleviation. By granting exclusive rights to creators, IPRs incentivize technological advancements that address pressing social and economic challenges, particularly in developing regions. This paper examines the intersection of IPRs and sustainable development, highlighting how patents, copyrights, and trademarks contribute to economic growth, technology transfer, and improved access to essential goods and services. It also explores legal challenges, including enforcement gaps, accessibility barriers, and the need for balanced regulatory frameworks. The study advocates for inclusive IPR policies, international cooperation, and public-private partnerships to ensure that intellectual property fosters equitable economic opportunities. Addressing these challenges through tailored legal frameworks can unlock the full potential of IPRs in reducing poverty and promoting sustainable development. The paper underscores the necessity of balancing innovation incentives with equitable access to knowledge and technology for marginalized communities.

Keywords: Intellectual Property Rights, Innovation, Sustainable Development, Poverty Alleviation, Legal Framework

[1] *PhD Scholar (Law) Aligarh Muslim University, India*
Email: miqmaaz@gmail.com

Introduction

Intellectual Property Rights (IPRs) are fundamental tools that foster innovation and economic development in the modern world. These rights, including patents, copyrights, trademarks, and trade secrets, grant creators exclusive control over their inventions and creative works for a designated period. This exclusivity serves as an incentive, encouraging individuals and organizations to invest time, resources, and effort into developing new technologies, artistic expressions, and brands. The patent system and IP rights can stimulate local innovation that directly addresses poverty. By protecting these investments, IPRs ensure that innovators can reap the rewards of their labour, thus promoting a cycle of continuous improvement and advancement across various sectors.[2] The relationship between IPRs and sustainable development is particularly critical, especially in poverty-stricken regions where innovation can be a powerful catalyst for change. Strategic use of IP rights can accelerate progress in sustainable development, fostering social and economic growth.

The concept of sustainable development, as defined by the United Nations' Sustainable Development Goals (SDGs), encompasses economic growth, social inclusion, and environmental protection. In the context of poverty alleviation, IPRs can play a pivotal role in achieving these goals by incentivizing the development and dissemination of technologies and solutions tailored to the specific needs of underserved communities.[3] For instance, innovations in agriculture, healthcare, and clean energy, protected by IPRs, can enhance productivity, improve health outcomes, and promote environmental sustainability in developing countries.[4] Patent laws need to be relaxed and adapted to help developing countries fight poverty and gain access to technology, medicines, and research.[5] IPRs can facilitate technology transfer from developed to developing countries, enabling local industries to adopt and adapt existing technologies to their unique circumstances. This process can lead to the creation of new jobs, the improvement of existing products and services, and the overall enhancement of economic

[2] *Overview,* IPRCOMMISSION, *http://www.iprcommission.org/papers/text/final_report/overviewhtmfinal.htm (last visited Feb 12, 2025).*
[3] *Clara Fong & Diana Roy, What Are the UN Sustainable Development Goals? | Council on Foreign Relations,* COUNCIL ON FOREIGN RELATIONS, *https://www.cfr.org/backgrounder/what-are-un-sustainable-development-goals (last visited Feb 14, 2025).*
[4] *Overview, supra note 1.*
[5] *Zosia Kmietowicz, Patent Laws Are Keeping Poor Countries in Poverty, 325 BMJ 562 (2002).*

competitiveness.[6] In Brazil, Companhia Vale do Rio Doce acknowledges and rewards intellectual property contributions by their employees. Protecting their IP has increased export revenue, contributing to Brazil's sustainable development.[7] However, it is crucial to recognize that the effective utilization of IPRs for sustainable development requires a balanced approach that takes into account the specific needs and challenges of developing countries.

Developing a robust legal framework that promotes IPRs is of paramount importance for fostering social and economic growth, particularly in regions grappling with poverty.[8] Such a framework should strike a delicate balance between protecting the rights of innovators and ensuring access to essential goods and services for the poor. An intellectual property system, if not used carefully, can introduce distortions that are detrimental to the interests of developing countries. This involves tailoring IPR laws and regulations to the unique circumstances of each country, taking into consideration its level of development, technological capabilities, and social priorities. Developed countries should balance their commercial interests with the need to reduce poverty. For instance, developing countries should develop laws that give them easier access to cut-price drugs and generic versions of drugs that are still patented. They should also aim to ensure that diagnostic and surgical methods are excluded from patents.[9]

The legal framework should promote transparency, accountability, and inclusivity, ensuring that all stakeholders, including local communities, small businesses, and civil society organizations, have a voice in the development and implementation of IPR policies. Local governments and international bodies must work together to ensure that IP laws facilitate the dissemination of life-changing technologies, rather than hinder them. This can be achieved through capacity-building initiatives, awareness-raising campaigns, and the establishment of accessible and affordable mechanisms for IPR enforcement and dispute resolution. Millions of rural poor and the urban poor living in informal settlements lack access to land. But even when they have access to land, their rights, however understood, to

[6] *Overview, supra note 1.*
[7] *How IP benefits developing countries, ICC - INTERNATIONAL CHAMBER OF COMMERCE (2005), https://iccwbo.org/news-publications/news/how-ip-benefits-developing-countries/ (last visited Feb 10, 2025).*
[8] *Judy Winegar Goans, Intellectual Property and Developing Countries An Overview, (2003), https://www.hsdl.org/c/view?docid=446296.*
[9] *Kmietowicz, supra note 4.*

the land may not be formally or legally recognized.[10]

International cooperation is essential to create a fairer and more equitable global IPR system. This includes strengthening the role of international organizations such as the World Intellectual Property Organization (WIPO) in providing technical assistance and support to developing countries, as well as promoting the harmonization of IPR laws and standards across different jurisdictions. The broad aim is to improve the understanding of intellectual property rights-related issues among developing countries and to assist them in building their policies and frameworks.[11] Developed countries should pay more attention to reconciling their commercial self-interest with the need to reduce poverty in developing countries, which is in everyone's interest. Moreover, international agreements such as the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement should be interpreted and implemented in a manner that takes into account the specific needs and concerns of developing countries, allowing them to utilize flexibilities and exceptions to promote access to essential medicines, technologies, and knowledge.[12] The incorporation of intellectual property rights into the multilateral trading system and their relationship with several key public policy issues has. It is intended to contribute to a better understanding of the key policy issues raised by intellectual property rights (IPRs) and their impact on economic development, poverty alleviation and sustainable human environment.

The importance of IPRs in achieving the United Nations' Sustainable Development Goals (SDGs) cannot be overstated. Innovations protected by IP can act as critical catalysts in achieving the Sustainable Development Goals. For instance, patents on agricultural technologies can help farmers increase crop yields and enhance food security, directly contributing to SDG 1 No Poverty. Similarly, IPRs can incentivize the development of new medicines and diagnostic tools to combat diseases such as HIV/AIDS, tuberculosis, and malaria, contributing to SDG 3 Good Health and Well-being. Medicines can only be developed if pharmaceutical companies are

[10] *Ruth Meinzen-Dick, Property Rights for Poverty Reduction?, UNDESA 1 (2009).*

[11] *International Cooperation in association with the World Intellectual Property Organization (WIPO) and the Japan International Cooperation Agency (JICA), JAPAN PATENT OFFICE, https://www.jpo.go.jp/e/news/kokusai/developing/experts_workshops_e.html (last visited Feb 13, 2025).*

[12] *THE TRIPS AGREEMENT AND DEVELOPING COUNTRIES, (United Nations Conference on Trade and Development ed., 1996), https://unctad.org/system/files/official-document/ite1_en.pdf.*

part of the R&D team, and they will only play their role if intellectual property rights are protected and proper contractual terms established. Furthermore, IPRs can promote the adoption of clean energy technologies and sustainable resource management practices, contributing to SDG 7 Affordable and Clean Energy and SDG 15 Life on Land.[13] IPRs have never been more economically and politically important or controversial than they are today. Patents, copyrights, trademarks, industrial designs, integrated circuits and geographical indications are frequently mentioned in discussions and debates on such diverse topics as public health, food security, education, trade, industrial policy, traditional knowledge, biodiversity, biotechnology, the Internet, and the entertainment and media industries. The implementation of a robust and inclusive legal framework will ensure equitable access to IPRs for all and that requires action for policymakers, international bodies, and stakeholders to create a fairer global IPR system.

Theoretical and Legal Foundations of Intellectual Property Rights

Intellectual Property Rights (IPRs) are essential legal mechanisms that protect the creations of the mind, providing exclusive rights to inventors and creators over their innovations for a specified period. These rights encompass various categories, including patents, copyrights, trademarks, and trade secrets. Patents protect new inventions or processes, granting the inventor exclusive rights to exploit their creation commercially for a limited time, typically 20 years from the filing date. Copyrights safeguard original works of authorship, such as literature, music, and art, allowing creators to control the reproduction and distribution of their works. Trademarks protect symbols, names, and slogans used to identify goods or services, ensuring that consumers can distinguish between different providers in the marketplace. Trade secrets refer to confidential business information that provides a competitive edge, such as formulas or practices that are not publicly known. Together, these forms of IPR serve as critical tools for fostering innovation and

[13] *World IP Day 2024: Sustainable Development Goals and Intellectual Property – The role of Intellectual Property rights in the innovation world,* EUROPEAN COMMISSION *(2024), https://intellectual-property-helpdesk.ec.europa.eu/news-events/news/world-ip-day-2024-sustainable-development-goals-and-intellectual-property-role-intellectual-property-2024-04-26_en (last visited Feb 17, 2025).*

creativity in various sectors of the economy.[14]

The international legal framework governing IPRs is primarily shaped by agreements established under the auspices of the World Intellectual Property Organization (WIPO) and the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement. WIPO is a specialized agency of the United Nations dedicated to promoting intellectual property protection worldwide. It provides a forum for member states to negotiate international treaties and develop policies that harmonize IPR laws across jurisdictions. The TRIPS Agreement, which came into force in 1995 as part of the World Trade Organization (WTO) framework, sets minimum standards for IPR protection and enforcement among its member countries. It mandates that countries provide protection for patents, copyrights, trademarks, and other forms of intellectual property while allowing for certain flexibilities to accommodate public health needs and access to essential medicines.[15] This international legal framework aims to balance the interests of innovators with those of society at large by promoting innovation while ensuring that knowledge and technology are accessible.

National legal systems play a crucial role in shaping the development and enforcement of IPRs within individual countries. Each nation has its own set of laws and regulations governing intellectual property, which can vary significantly in terms of scope, duration, and enforcement mechanisms. For instance, some countries may offer stronger protections for certain types of intellectual property than others, influencing how effectively creators can safeguard their innovations. Additionally, national laws must comply with international treaties like TRIPS while considering local economic conditions and cultural contexts. This interplay between national and international frameworks can create challenges for developing countries seeking to enhance their IPR systems. Many developing nations face difficulties in establishing effective enforcement mechanisms due to limited resources and capacity.[16] Consequently, disparities in IPR

[14] *Chapter-2 Intellectual Property Right,* SOUTHCALCUTTALAWCOLLEGE, *https://www.southcalcuttalawcollege.ac.in/Notice/50327GENERAL%20CONCEPT%20OF%20INTELLECTUAL%20PROPERTY%20RIGHTS.pdf (last visited Feb 15, 2025).*

[15] *Uruguay Round Agreement: TRIPS Trade-Related Aspects of Intellectual Property Rights, WIPO, https://www.wipo.int/wipolex/en/text/305907 (last visited Feb 10, 2025).*

[16] *Chandra Nath Saha & Sanjib Bhattacharya, Intellectual Property Rights: An Overview and Implications in Pharmaceutical Industry, 2 J ADV PHARM TECHNOL RES 88 (2011).*

protection can lead to inequities in innovation and economic growth.

The relationship between IPRs and innovation is well-documented in economic literature. Strong intellectual property protection incentivizes investment in research and development (R&D) by ensuring that innovators can reap financial rewards from their inventions. This is particularly important in industries where R&D costs are high, such as pharmaceuticals and technology. By safeguarding inventions through patents or copyrights, companies are more likely to invest in innovative projects that could lead to groundbreaking products or services.[17] Furthermore, IPRs can stimulate competition by encouraging new entrants into the market who seek to innovate around existing patents or create alternative solutions. This dynamic fosters an environment conducive to technological advancement and economic growth.

IPRs play a significant role in poverty reduction efforts globally. Access to protected technologies can empower communities by enabling them to improve agricultural practices, enhance healthcare delivery systems, and promote sustainable development initiatives. For example, patents on agricultural innovations can help farmers increase crop yields and improve food security in developing regions. Similarly, access to patented medical technologies can enhance healthcare outcomes by facilitating the development of affordable treatments for diseases prevalent in low-income populations. However, it is crucial that IPR systems are designed inclusively so that marginalized communities can benefit from these advancements without facing prohibitive costs.[18] The effective use of IPRs for poverty alleviation requires careful consideration of how intellectual property laws intersect with broader social policies. For instance, while strong patent protections may incentivize pharmaceutical companies to invest in R&D for new drugs, they can also lead to high prices that limit access for low-income patients.[19] Therefore, policymakers must strike a balance between protecting innovators'

---

[17] *Jakob Edler, Hugh Cameron & Mohammad Hajhashem, The Intersection of Intellectual Property Rights And Innovation Policy Making – A Literature Review, MANCHESTER INSTITUTE OF INNOVATION RESEARCH, UNIVERSITY OF MANCHESTER, UNITED KINGDOM FOR THE INNOVATION POLICY SECTION, DEPARTMENT FOR TRANSITION AND DEVELOPED COUNTRIES OF THE WORLD INTELLECTUAL PROPERTY ORGANIZATION 81 (2015).*

[18] *Diogo Antunes, World IP Day 2024: Intellectual Property as a Catalyst for Achieving Sustainable Development Goals in Africa, INVENTA (2024), https://inventa.com/en/news/article/986/world-ip-day-2024-intellectual-property-as-a-catalyst-for-achieving-sustainable-development-goals-in-africa (last visited Feb 16, 2025).*

[19] *KATRIONA MCGLADE ET AL., Intellectual Property Rights on Genetic Resources and the Fight Against Poverty, (2011), https://www.ecologic.eu/11982 (last visited Feb 12, 2025).*

rights and ensuring that essential goods remain accessible to those who need them most. This may involve implementing measures such as compulsory licensing or parallel importing to facilitate access to life-saving medications while still encouraging innovation.

Thus, understanding the theoretical and legal foundations of intellectual property rights is essential for recognizing their potential as catalysts for innovation and poverty alleviation. The various forms of IPR—patents, copyrights, trademarks, and trade secrets—provide critical protections for creators while fostering an environment conducive to economic growth. International frameworks like WIPO and TRIPS play a vital role in harmonizing IPR laws across borders; however, national legal systems must adapt these frameworks to local contexts effectively. The relationship between IPRs and innovation is complex but underscores the importance of robust protections in driving research and development efforts. Ultimately, leveraging IPRs effectively requires a nuanced approach that considers both economic incentives for innovators and equitable access for communities striving for sustainable development.

IPRs and Sustainable Development: A Global Perspective

Intellectual Property Rights (IPRs) are foundational to the success of the Sustainable Development Goals (SDGs), serving as vital enablers of innovation and technology transfer. The SDGs, set by the United Nations, represent a collective global effort to address various challenges, ranging from poverty and hunger to health, education, clean water, and environmental sustainability, by 2030.[20] Intellectual property is so important for the achievement of the SDGs that WIPO considers it an essential incentive for innovation and.[21] The SDGs, a global call to action to end poverty, protect the planet, and ensure prosperity for all, find a powerful ally in the realm of intellectual property. IPRs act as a catalyst for innovation, protecting the rights of inventors while also encouraging a competitive environment. This system fosters economic growth and addresses critical challenges outlined in the SDGs, such as clean energy, healthcare accessibility, and environmental

[20] *Ákos Cserkuti, How Intellectual Property Helps Achieve the SDGs,* PATENTRENEWAL *(2024), https://www.patentrenewal.com/post/the-power-of-intellectual-property-in-achieving-the-sustainable-development-goals (last visited Feb 17, 2025).*

[21] *Intellectual property is an undisputed support for Sustainable Development Goals, PONS IP (May 13, 2024), https://ponsip.com/en/ip-news/news/intellectual-property-is-an-undisputed-support-for-sustainable-development-goals/ (last visited Feb 17, 2025).*

sustainability.[22] In essence, intellectual property rights act as a catalyst for innovation and technological development, which leads to greater infrastructure investment.

The link between IPRs and the SDGs is evident in several key areas. IPRs support innovation and sustainable practices by encouraging inventors and creators to develop solutions aligned with the SDGs. Patents, utility models, and registered designs protect inventions and contribute to innovation in fields connected to the SDGs, including agriculture, renewable energy, and healthcare. Copyrights safeguard educational resources, facilitating advancements in providing quality education globally. By providing exclusive rights, the intellectual property system encourages technological advancements that nurture the SDGs.[23] Access to knowledge is a cornerstone for achieving various SDGs, including Quality Education (SDG 4), Industry, Innovation, and Infrastructure (SDG 9), and Partnerships for the Goals (SDG 17).

Examining specific SDGs reveals the profound impact of IPRs. Regarding climate action (SDG 13), the IP sector actively champions environmental sustainability by promoting the development of green technologies and fostering environmentally friendly innovations. Robust IP protections facilitate the transfer and adoption of sustainable practices, contributing significantly to combating climate change. The legal safeguards provided by intellectual property frameworks incentivize the creation of eco-friendly solutions and accelerate their dissemination globally. In the realm of renewable energy and clean technology (SDG 7), the link between intellectual property and innovations is growing stronger. Patents play a crucial role in driving advancements in solar energy, wind energy, and other sustainable technologies like grid integration and tidal energy. Protecting these innovations and their patents is crucial for achieving affordable, reliable, sustainable, and modern energy for all. For clean water and sanitation (SDG 6), innovative technologies related to water management systems, such as waterless sanitation systems and eco-friendly sewage treatment, contribute to sustainable sanitation practices. Smart water metering and greywater recycling systems can promote water conservation. Regarding healthcare and well-being (SDG 3), intellectual property emerges as a key driver of progress. Patents and IP rights support the

[22] *Ákos Cserkuti, supra note 19.*

[23] *Id.*

development of medical technologies and pharmaceuticals, bringing transformative benefits to global health. These protections encourage research and development in the medical field and facilitate the widespread dissemination of life-saving innovations. In agriculture and sustainable food production (SDG 2 and 12), intellectual property takes centre stage in addressing hunger and responsible consumption. Patents and IP rights encourage researchers and innovators to find better ways to grow crops, invent new farming tools, and practice sustainable farming. Safeguarding these innovations ensures that we can meet the growing demand for food while minimizing environmental impact, fostering a more sustainable and resilient food system.[24]

Several case studies demonstrate how IPRs have contributed to innovation, wealth creation, and poverty alleviation. Proper management of intellectual property, such as open access initiatives and licensing agreements, ensures that knowledge is shared widely, facilitating collaborative efforts and creating a more inclusive environment for progress. IP plays a pivotal role in technology transfer, a key component of SDG 9. Licensing agreements and collaborations facilitated by intellectual property rights contribute to the dissemination of technology across borders, aligning with SDG 17, which emphasizes the importance of partnerships in achieving sustainable development goals. The protection of intellectual property, particularly through copyright, supports the growth of cultural and creative industries. These industries contribute significantly to economic growth (SDG 8) and play a role in fostering sustainable communities and cities (SDG 11). In the realm of healthcare, intellectual property, especially in the form of patents, is instrumental in encouraging innovation. It drives the development of new medicines and healthcare solutions, aligning with the objectives of Good Health and Well-being (SDG 3) and Industry, Innovation, and Infrastructure (SDG 9). Intellectual property, such as Plant Breeder's Rights, contributes to advancements in agriculture. By incentivizing the development of new crop varieties, IP supports the objectives of Zero Hunger (SDG 2) and Life on Land (SDG 15), ensuring sustainable and diverse ecosystems. Green technology patents, a subset of intellectual property, play a crucial role in addressing climate change. These patents incentivize the development and adoption of clean and sustainable technologies, supporting Affordable and Clean Energy (SDG 7) and Climate Action (SDG 13).

[24] *Id.*

IPRs incentivize sustainable development in developing countries by rewarding innovation and creativity. By protecting the rights of innovators, IPRs encourage them to invest in research and development, leading to new technologies and solutions that can address pressing challenges in developing countries. Promoting intellectual property education is integral to building capacity in understanding and leveraging IP rights. This education contributes to Quality Education (SDG 4) and strengthens the foundation for Industry, Innovation, and Infrastructure (SDG 9). Furthermore, IPRs can facilitate technology transfer from developed to developing countries, enabling local industries to adopt and adapt existing technologies to their unique circumstances. This fosters economic growth, job creation, and the development of sustainable solutions tailored to local needs.[25]

The potential of IPRs to address issues like healthcare, education, and technology transfer in marginalized communities is significant. In healthcare, patents on new medicines and medical technologies can lead to the development of affordable treatments for diseases prevalent in marginalized communities. IPRs can also incentivize the development of educational resources and technologies that can improve access to quality education in underserved areas.[26] Additionally, IPRs can facilitate technology transfer to marginalized communities, enabling them to adopt and adapt existing technologies to their specific needs and circumstances.

However, challenges remain in ensuring accessibility and equitable distribution of innovations. Striking a balance between protecting intellectual property rights and ensuring that advancements reach those who need them most remains a complex challenge on the path to sustainable development. Businesses and innovators can leverage IP for sustainable development by committing to SDG 17, forming global partnerships, making licensing agreements, and working together on projects. When businesses focus on responsible and sustainable practices, they not only help achieve the Sustainable Development Goals but also become leaders in their industries.[27] In summary, intellectual property rights act as a catalyst for innovation and technological development, which leads to greater infrastructure investment.[28] Intellectual property emerges as a linchpin, fostering

[25] *Divya Samriti, Role of IPR in Sustainable Development in India, SSRN JOURNAL (2023), https://www.ssrn.com/abstract=4397580 (last visited Feb 17, 2025).*

[26] *Ákos Cserkuti, supra note 19.*

[27] *Id.*

[28] *World IP Day 2024, supra note 12.*

innovation and creativity across various domains outlined in the SDGs. Striking the right balance between protection and accessibility, IP lays the groundwork for a collaborative and innovative global community working towards common goals. As we navigate the challenges of the 21st century, the synergy between IP and the SDGs holds the key to unlocking a future where prosperity is shared, innovation thrives, and creativity knows no bounds.

Legal Challenges and Barriers to Effective Use of IPRs in Developing Countries

Developing countries face significant legal challenges and barriers in effectively harnessing Intellectual Property Rights (IPRs) for poverty alleviation. One of the primary challenges is the lack of awareness and understanding of IPRs among local entrepreneurs, businesses, and policymakers. Many individuals in these regions are unaware of the potential benefits that IPRs can offer in terms of protecting their innovations and fostering economic growth. This lack of awareness often leads to underutilization of available IP protections, which can stifle innovation and limit opportunities for wealth creation. Furthermore, the complexities of intellectual property law can be daunting for small businesses and entrepreneurs who may not have access to legal expertise or resources needed to navigate the system effectively. As a result, innovative ideas may remain unprotected, leaving them vulnerable to exploitation by competitors or larger corporations.[29]

Enforcement issues also pose significant barriers to the effective use of IPRs in developing countries. Many nations struggle with inadequate legal frameworks and insufficient resources to enforce existing IP laws. This lack of enforcement can lead to widespread piracy and counterfeiting, undermining the value of intellectual property protections. For instance, in countries where enforcement mechanisms are weak, businesses may be reluctant to invest in research and development due to fears that their innovations will be copied without recourse. Moreover, the judicial systems in many developing countries often lack the capacity to handle IP-related disputes efficiently, resulting in lengthy legal processes that discourage innovators from

[29] *DR. LISA BORGATTI & DR. NEIL BALCHIN, Harnessing Intellectual Property Rights for Innovation, Development and Economic Transformation in Least Developed Countries, 1 (2024), https://production-new-commonwealth-files.s3.eu-west-2.amazonaws.com/s3fs-public/2024-01/D19530%20V9%20COM%20Harnessing%20IPRs%20in%20LDCs%20UNCTAD%20C%20Lawson_LR.pdf (last visited Feb 17, 2025).*

seeking protection for their creations.[30] Access to technology is another critical challenge faced by developing countries in harnessing IPRs for poverty alleviation. Many innovations are protected by patents that may not be accessible or affordable for local communities. This situation creates a significant barrier to entry for small businesses and entrepreneurs who wish to leverage technology for economic development. For example, patented agricultural technologies that could improve crop yields may be out of reach for smallholder farmers who cannot afford licensing fees or royalties. As a result, these farmers may miss out on opportunities to enhance their productivity and contribute to food security in their communities.[31] Additionally, the high costs associated with obtaining patents can deter local innovators from pursuing IP protection altogether.

The role of international organizations and governments is crucial in improving IPR infrastructure and enforcement in developing countries. Organizations such as the World Intellectual Property Organization (WIPO) and the United Nations Conference on Trade and Development (UNCTAD) provide technical assistance and capacity-building programs aimed at strengthening national IP systems. These organizations work with governments to develop policies that promote innovation while ensuring that IP protections are accessible to all stakeholders, including marginalized communities.[32] Furthermore, international agreements like the Trade-Related Aspects of Intellectual Property Rights (TRIPS) set minimum standards for IP protection that member countries must adhere to, but they also provide flexibilities that developing nations can leverage to address their specific needs. Governments in developing countries must take proactive steps to reform their national IP systems to create an enabling environment for innovation. This includes investing in educational programs that raise awareness about IPRs among entrepreneurs and businesses while also providing training on how to navigate the IP system effectively. Additionally, governments should focus on strengthening enforcement mechanisms by allocating resources toward IP law enforcement

[30] *Gabriel Garcia, Intellectual Property Rights in South East Asian Least Developed Countries: The Cases of Cambodia, the Lao Peoples Democratic Republic, and Myanmar, in* INTELLECTUAL PROPERTY LAW IN SOUTH EAST ASIA *157 (Christoph Antons & Michael Blakeney eds., 2023), https://www.elgaronline.com/view/book/9781035308392/book-part-9781035308392-11.xml (last visited Feb 17, 2025).*

[31] EMMANUEL HASSAN, OHID YAQUB & STEPHANIE DIEPEVEEN, *Intellectual Property and Developing Countries: A Review of the Literature, 1 (2010).*

[32] *Intellectual property: A potential game-changer for least developed countries,* UN TRADE AND DEVELOPMENT *(2024), https://unctad.org/news/intellectual-property-potential-game-changer-least-developed-countries (last visited Feb 15, 2025).*

agencies and establishing specialized IP courts capable of handling disputes efficiently.[33] By building robust legal frameworks that align with local needs and conditions, developing countries can better harness the potential of IPRs for economic growth and poverty alleviation.

Balancing IPR protection with access to affordable medicines, education, and technology for the poor is a complex challenge that requires careful consideration. While strong IP protections are essential for incentivizing innovation, they can also create barriers to access for vulnerable populations. For instance, patent protections on life-saving medications can result in exorbitant prices that make them unaffordable for low-income individuals.[34] This situation has led to calls for more flexible approaches to IP protection that prioritize public health needs without undermining incentives for pharmaceutical innovation. Compulsory licensing is one such mechanism that allows governments to authorize the production of generic versions of patented drugs under specific circumstances, thereby increasing access to essential medicines while still respecting the rights of patent holders.[35]

In education, copyright protections can sometimes hinder access to learning materials for low-income students. The high costs associated with purchasing textbooks or educational resources protected by copyright can limit educational opportunities for marginalized communities. To address these concerns, policymakers must explore alternative models that balance copyright protections with open access initiatives that promote wider dissemination of knowledge while still rewarding creators.[36] Concerns about the misuse of IPRs also need to be addressed as they can exacerbate inequality within developing countries. In some cases, powerful corporations may exploit existing IP laws to stifle competition or limit access to essential goods and services. For example, large multinational companies may use aggressive patent strategies to maintain monopolies over certain technologies or products, making it difficult for local businesses or entrepreneurs to compete effectively. This dynamic can perpetuate cycles of poverty by restricting

[33] *Dr. Galal Wafaa Mohamedien, Recent Developments and Challenges in the Protection of Intellectual Property Rights (IPRs) Under the Trips Agreement: Concerns and Strategies for Developing Countries (2001).*

[34] *Intellectual property and access to medicine, https://www.oxfamamerica.org/explore/issues/economic-well-being/intellectual-property-and-access-to-medicine/ (last visited Feb 17, 2025).*

[35] *Aditya Pratap Singh, Impact of IPR on Pharmaceutical Industry - S&A Law Offices, S&A LAW OFFICES (Jan. 6, 2024), https://sandalawoffices.com/impact-of-ipr-on-pharmaceutical-industry/, https://sandalawoffices.com/impact-of-ipr-on-pharmaceutical-industry/ (last visited Feb 17, 2025).*

[36] *Noha Abdel Meguid El Labban, Copyright: A Roadblock to Education in Developing Countries?, 2013.*

economic opportunities for smaller players in the market.[37]

To mitigate these risks, it is essential for developing countries to adopt inclusive IP policies that prioritize equitable access while still protecting the rights of creators. Engaging stakeholders from various sectors—including civil society organizations, local businesses, and academia—in the policymaking process can help ensure that diverse perspectives are considered when shaping IP laws and regulations. Additionally, fostering collaboration between public and private sectors can promote innovation while addressing social challenges effectively. Developing countries face numerous legal challenges and barriers in harnessing IPRs for poverty alleviation. Lack of awareness, enforcement issues, access to technology, and concerns about inequality all contribute to a complex landscape where intellectual property rights have yet to reach their full potential as tools for economic development. However, through targeted interventions by international organizations and governments aimed at strengthening national IP systems and balancing protections with accessibility considerations, there is an opportunity for these nations to leverage IPRs as catalysts for innovation and sustainable growth. Addressing these challenges will require a concerted effort from all stakeholders involved—ensuring that intellectual property becomes a powerful ally in the fight against poverty rather than an obstacle hindering progress.

Proposals for Strengthening Legal Frameworks to Promote IPRs for Innovation and Poverty Alleviation

Strengthening legal frameworks to promote Intellectual Property Rights (IPRs) for innovation and poverty alleviation requires a multi-faceted approach encompassing reforms at both national and international levels. To begin, legal reforms at the national level should prioritize the creation of an ecosystem conducive to innovation and creativity. This entails streamlining the process for obtaining IPRs, reducing bureaucratic hurdles, and ensuring that the legal system is accessible and affordable for all stakeholders, especially small businesses and individual innovators. Furthermore, governments should invest in building public awareness about the economic, social, and cultural benefits of IPRs among all sections of society. A nationwide program should aim to improve awareness about the benefits of IPRs and their value to the rights-holders and the

[37] *Chakravarthi Raghavan, IPRs Costly for Third World, Don't Help Reduce Poverty, https://twn.my/title/twe289a.htm (last visited Feb 17, 2025).*

public. Such a program will build an atmosphere where creativity and innovation are encouraged in public and private sectors, R&D centers, industry and academia, leading to the generation of protectable IP that can be commercialized.[38] India's national IP strategy needs to be specifically tailored to her development priorities and objectives while ensuring conformity with her international obligations.[39]

At the international level, reforms should focus on ensuring that the global IPR regime supports the development goals of developing countries. This includes advocating for flexibilities within international agreements like the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement, allowing developing countries to tailor their IPR laws to their specific needs and circumstances. Developed countries should pay more attention to reconciling their commercial self-interest with the need to reduce poverty in developing countries, which is in everyone's interest.[40] Additionally, international cooperation is needed to combat counterfeiting and piracy, which disproportionately harm businesses and innovators in developing countries.[41] This can be achieved through greater information sharing, joint enforcement efforts, and capacity-building initiatives.

Developing inclusive IPR policies that benefit marginalized groups and encourage innovation is essential for poverty alleviation. Such policies should prioritize access to knowledge and technology for marginalized communities, ensuring that they can participate in the innovation economy. This may involve implementing measures such as open licensing, technology transfer programs, and support for traditional knowledge and cultural expressions. The Policy creates a framework conducive to unlock the potential of IP as a tool towards poverty eradication.[42] It is important to formulate a customized policy initiative for poverty alleviation. Understanding the changes in the institutional structure is a prerequisite of such policy formulation. Mere formulation of a large number of innovative schemes and programmes for the poor may not be adequate; a strong political commitment and a sustainable and healthy development

[38] *National Intellectual Property Rights Policy, (2016), https://www.meity.gov.in/writereaddata/files/National_IPR_Policy.pdf (last visited Feb 17, 2025).*

[39] *National IPR Strategy, https://www.cgihamburg.gov.in/pdf/national_IPR_Strategy_21July2014.pdf (last visited Feb 17, 2025).*

[40] KEITH E. MASKUS, *Integrating Intellectual Property Rights and Development Policy, 178 (2002), https://linkinghub.elsevier.com/retrieve/pii/S0022199603000849 (last visited Feb 17, 2025).*

[41] *National Intellectual Property Rights Policy, supra note 37.*

[42] *National Intellectual Property Policy and Strategy 2019-2024, (2019), https://wipolex-res.wipo.int/edocs/lexdocs/laws/en/na/na031en.pdf.*

of the State economy are equally important. Vision and sensitization, flexibility and capability to adapt and indigenise, responsiveness, continuity and sustainability are the fundamental key-structures of efficacious governance.[43] Furthermore, inclusive IPR policies should promote the participation of women and other underrepresented groups in the innovation ecosystem. This can be achieved through targeted support programs, mentorship initiatives, and policies that address gender biases in the IPR system. The Constitution commands justice, liberty, equality and fraternity as supreme values to usher in the egalitarian, social, economic and political democracy. In a developing society like ours, law is a catalyst and rubicon to the poor to reach the ladder of social justice.[44]

Technology transfer, licensing, and public-private partnerships (PPPs) play a crucial role in fostering innovation and promoting sustainable development. Technology transfer enables developing countries to access and adapt existing technologies to their specific needs and circumstances, accelerating economic growth and improving living standards. This requires creating an enabling environment for technology transfer, including incentives for companies and research institutions to share their technologies with developing countries. Vision 2030 envisages a prosperous and industrialized Namibia, developed by her human resources, enjoying peace, harmony and political stability by 2030. In order to realize the grand development vision, a number of development policies, strategies and plans have been developed and are being implemented. The objectives and strategies of each of the above policy instruments can be effectively supported with intellectual property.[45]

Licensing is another important mechanism for promoting innovation and access to technology. By granting licenses to local companies, foreign firms can enable them to manufacture and distribute patented products in developing countries, creating jobs and stimulating economic activity. However, licensing agreements should be structured in a way that ensures fair terms and conditions for local companies, avoiding exploitative practices. PPPs can also play a critical role in fostering innovation and addressing social challenges. By bringing together the resources and expertise of the public and private sectors, PPPs can develop and implement innovative solutions to

[43] *Vikrant Narayan Vasudeva, Legal Intervention in Poverty Alleviation: Enriching the Poor through Law, 3 NUJSLR 447 (2010).*

[44] *Id.*

[45] *National Intellectual Property Policy and Strategy 2019-2024, supra note 41.*

problems such as healthcare, education, and environmental sustainability.[46]

Tailored legal frameworks are necessary to balance economic incentives with social welfare. These frameworks should recognize that IPRs are not an end in themselves but rather a means to promote innovation and development. Therefore, they should be designed to maximize social welfare, ensuring that the benefits of IPRs are shared broadly across society. Policies required in countries with a relatively advanced technological capability where most poor people happen to live, for instance India or China, may well differ from those in other countries with a weak capability, such as many countries in sub-Saharan Africa.[47] The impact of IP policies on poor people will also vary according to socio-economic circumstances. What works in India, will not necessarily work in Brazil or Botswana. This may involve implementing measures such as compulsory licensing to ensure access to essential medicines, promoting open educational resources to improve access to education, and supporting community-based innovation initiatives to address local challenges. focus on enhancing access to healthcare, food security and environmental protection, among other sectors of vital social, economic and technological importance.[48] In addition, social protection programmes in India have helped reduce poverty significantly. The Prime Minister Jan Dhan Yojana and biometric identity cards under Aadhar have also transformed the anti-poverty programmes by replacing the current cumbersome and leaky distribution of benefits under various schemes using the Direct Benefit Transfers (DBT) programme.[49]

Therefore, strengthening legal frameworks to promote IPRs for innovation and poverty alleviation requires a comprehensive approach that addresses challenges at both national and international levels. By implementing legal reforms, developing inclusive IPR policies, promoting technology transfer and licensing, and tailoring legal frameworks to balance economic incentives with social welfare, developing countries can harness the power

[46] *Workshop on Innovation in, and Access to, COVID-19 Technologies, (2021), https://www.wto.org/english/tratop_e/trips_e/trilateral_workshop_summary.pdf (last visited Feb 17, 2025).*

[47] *RICARDO H. CAVAZOS CEPEDA, DOUGLAS C. LIPPOLDT, & JONATHAN SENFT, Policy Complements to the Strengthening of IPRS in Developing Countries, 104 71 (2010), https://www.oecd.org/en/publications/policy-complements-to-the-strengthening-of-iprs-in-developing-countries_5km7fmwz85d4-en.html (last visited Feb 11, 2025).*

[48] *National Intellectual Property Rights Policy, supra note 37.*

[49] *Kumar Das & Bijeta Mohanty, Poverty Eradication in India: Successes and Shortcomings of Social Protection, INTERNATIONAL GROWTH CENTRE (Oct. 15, 2020), https://www.theigc.org/blogs/progress-poverty-eradication/poverty-eradication-india-successes-and-shortcomings-social (last visited Feb 17, 2025).*

of IPRs to drive sustainable development and improve the lives of their citizens.

Conclusion

As we conclude this exploration of Intellectual Property Rights (IPRs) and their potential role in alleviating poverty, it is essential to summarize key findings and reflect on their implications for sustainable development. IPRs can serve as powerful tools for fostering innovation, driving economic growth, and ultimately contributing to poverty alleviation. However, the effective utilization of these rights requires a robust legal framework that is inclusive and accessible to all stakeholders, particularly in developing countries where the need for innovative solutions is most pressing. The relationship between IPRs and the United Nations' Sustainable Development Goals (SDGs) highlights the potential of intellectual property to contribute to a range of critical issues, including health, education, and environmental sustainability. By protecting innovations that address these challenges, IPRs can facilitate the development of technologies that improve living conditions for underserved populations.

The future of IPRs in fostering innovation and reducing poverty hinges on the ability of governments, international organizations, and stakeholders to create an environment where intellectual property can thrive while also ensuring equitable access. As demonstrated in various case studies, successful implementation of IPRs has led to significant advancements in sectors such as agriculture, healthcare, and renewable energy. For instance, innovations in agricultural technologies have empowered smallholder farmers to increase crop yields and improve food security, while advancements in healthcare have facilitated access to life-saving medicines for marginalized communities. However, these successes are often accompanied by challenges related to enforcement, access to technology, and the need for inclusive policies that prioritize the needs of the most vulnerable populations.

To chart a path forward for IPRs in the fight against poverty, it is crucial to emphasize the importance of developing a robust and inclusive legal framework. Such a framework should not only protect the rights of innovators but also ensure that these protections do not come at the expense of access to essential goods and services for low-income individuals. Policymakers must strike a balance between incentivizing innovation through strong IP protections while also addressing concerns about affordability and accessibility. This may involve implementing measures such as

compulsory licensing for essential medicines or promoting open-access initiatives in education to ensure that knowledge is widely disseminated. Fostering collaboration between public and private sectors can enhance the effectiveness of IPR systems in promoting innovation and addressing social challenges. Public-private partnerships (PPPs) can facilitate technology transfer and create opportunities for local businesses to engage with global markets. By leveraging the expertise and resources of both sectors, PPPs can develop innovative solutions tailored to local needs while also promoting sustainable development goals. For example, partnerships between pharmaceutical companies and local governments can lead to the development of affordable healthcare solutions that benefit underserved communities.

A call to action is necessary for all stakeholders involved in shaping the future of IPRs. Policymakers must prioritize the creation of inclusive IPR policies that consider the unique challenges faced by developing countries while also aligning with international standards. International organizations should continue to provide technical assistance and capacity-building programs aimed at strengthening national IP systems and promoting awareness about the benefits of intellectual property among local communities. Additionally, civil society organizations play a vital role in advocating for equitable access to IPRs and ensuring that marginalized voices are heard in policy discussions. Harnessing the potential of IPRs as catalysts for innovation and poverty alleviation requires a concerted effort from all stakeholders involved. By developing robust legal frameworks that balance economic incentives with social welfare considerations, we can create an environment where intellectual property serves as a powerful tool for sustainable development. The path forward necessitates collaboration among governments, international bodies, private sector actors, and civil society organizations to create a fairer global IPR system that empowers individuals and communities while addressing pressing social challenges. As we move toward achieving the SDGs by 2030, it is imperative that we recognize the vital role of IPRs in fostering innovation and reducing poverty, ensuring that no one is left behind in this endeavour.

***

DEPARTMENT OF STUDIES IN LAW

The Department of Studies in Law, established in 1973 under the aegis of the University of Mysore, stands as a preeminent institution of legal education and research in Southern India. The University of Mysore, the sixth oldest in India and the first in Karnataka, holds a distinguished place in the annals of higher education, being the first to be established beyond the confines of British India. In this venerable academic tradition, the Department has consistently exemplified scholarly rigor, intellectual excellence, and a profound commitment to advancing the study of law. At the core of the Department's academic offerings is its esteemed two-year Master of Laws (LL.M.) program, which is structured to provide an intensive and comprehensive legal education over the course of four semesters. The program is distinguished by its wide-ranging specializations, including Constitutional Law, International Law, and various other critical domains, thus affording students a rich array of options to tailor their academic pursuits to their professional ambitions and intellectual interests. Further reinforcing the Department's reputation as a leading center of legal scholarship is its robust Ph.D. program in Law, which nurtures high-level research and fosters a stimulating academic environment for scholars engaged in the exploration of complex legal issues. The LL.M. program is particularly notable for its emphasis on research, wherein students are required to undertake rigorous dissertation work that is designed to hone their skills in advanced legal analysis and scholarly inquiry. This focus on research ensures that graduates are not only well-versed in legal doctrine but are also proficient in the methodologies of academic investigation, positioning them to contribute meaningfully to the evolution of legal thought. The Department's commitment to scholarly excellence is further manifested in the publication of select student dissertations, which serve as a testament to the intellectual vitality that permeates its academic community.

The Department's pedagogical approach is complemented by its state-of-the-art facilities, including a well-curated library, advanced technological infrastructure, and a host of other resources that together create an intellectually enriching environment. These facilities, combined with the Department's exceptional faculty, attract students from across India and around the globe, including countries as diverse as Afghanistan, Kenya, Tanzania, and Tibet. The Department's reach, both in terms of its student body and its academic impact, underscores its position as a distinguished center of legal education that is committed to the advancement of legal knowledge and the preparation of future leaders in the field.

Mysore University Law Journal

The Mysore University Law Journal (MULJ) is a prestigious biannual, peer-reviewed publication under the auspices of the Department of Studies in Law, University of Mysore. It plays a pivotal role in enhancing both the academic and practical aspects of legal education. This esteemed journal provides an essential platform for scholars, students, and legal practitioners to disseminate their research and insights, fostering rigorous academic debate and contributing significantly to the advancement of legal knowledge. Moreover, it provides invaluable experiential learning opportunities for law students, allowing them to develop critical thinking, writing, and analytical skills essential for their future careers. Through networking and collaboration opportunities, the journal fosters connections among individuals from diverse legal backgrounds, facilitating the exchange of ideas and the building of professional relationships. Additionally, by publishing high-quality legal scholarship, the journal enhances the visibility and prestige of the university within the legal community, nationally and internationally, while contributing to the development of jurisprudence and legal theory. Furthermore, the journal's role in community engagement cannot be overstated, as it serves as a bridge between the academic community and society at large, promoting informed debate on pressing legal issues and contributing to the development of sound legal policies.