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Critical Analysis of Green Technology and Green Patents

Guhan.T

Student, Sastra Deemed University

ABSTRACT

The term "green technology" describes inventions and solutions intended to improve the environment by lowering energy use, cutting waste, and fostering sustainability. It encompasses a vast array of technology in fields including sustainable agriculture, waste management, water conservation, energy efficiency, and renewable energy. Intellectual property rights known as "green patents" are awarded for ideas or inventions that use eco-friendly technologies or processes. These patents frequently concentrate on creating new sustainable materials, cutting emissions, increasing energy efficiency, or locating other energy sources. In order to promote environmental sustainability, researchers and policymakers are now focusing on the relationship between green technology and intellectual property (IP), especially green patents. This research is mainly focused on the possibilities of green patents in supporting the global partnerships, open access and collaboration for the development of environmental technologies; patent thickets, blockages and licensing issues effecting the development of green technologies; Indian laws in promoting and safeguarding green patents.

BACKRROUND

As the world looks for answers to problems like pollution, resource depletion, and climate change, green technology has emerged as a key area of concentration for patent protection in recent decades. Particularly in the 20th century, environmental degradation, such as contamination of the air and water, started to draw public attention. Green patents became more popular in the latter half of the 20th century as businesses and governments began to place greater emphasis on environmental sustainability. By the 1980s and 1990s, patents for technologies pertaining to pollution control, waste management, energy efficiency, and renewable energy were being pursued[1]. Renewable energy technology, such as solar panels, wind turbines, and energy storage systems, have started to be recognized and granted patents by the U.S. Patent and Trademark Office (USPTO) and other international patent offices [2]. Global Attention to Green Technologies Has Grown The Paris Agreement (2015) and the Kyoto Protocol (1997), which emphasized the need for international action on climate change, raised awareness of sustainable technologies and green patenting in the 1990s and 2000s [3]. At international venues like the World Intellectual Property Organization (WIPO), the function of patents in addressing global environmental challenges has gained significant attention. WIPO acknowledged that intellectual property, including patents, might be crucial in mitigating climate change and advancing the use of clean technologies[4]. In order to facilitate technology

[1] Berman, S. L., & Ransbotham, S., "The Rise of Environmental Patents," Harvard Business Review, 2002.
[2] United States Patent and Trademark Office (USPTO), "Patents for Clean Energy Technologies," 2018.
[3] United Nations, "The Paris Agreement," 2015; UNFCCC, "The Kyoto Protocol," 1997
[4] WIPO, "Intellectual Property and the Environment," 2019.

licensing and encourage adoption, the concept of patent pools was developed, in which several businesses or inventors pool their patent. Solar Energy Innovations, Wind Energy Technologies, Battery and Energy Storage Systems, Water Purification, Carbon Capture and Storage (CCS), and others are some of the most prominent green technology patents currently in use. Green patents will contribute to job creation, economic growth, and the opening of new business prospects as the worldwide market for green goods and services expands. New potential and problems for IP protection are brought about by the development of new technologies such as carbon capture, next-generation materials, and artificial intelligence (AI) in the energy sector. Future research in this field is essential to understanding how the patent system may adjust to these changes.

LITERATURE RIVEIW

In the research paper by ***Patrick Gattari and Boehnen Hulbert*** on the topic "***The role of patent law in incentivizing Green technology"[5],*** it is observed that Unlike the government, private investors will not fund green technology companies regardless of their technological development unless they can guarantee a return that matches the high level of risk. While there are other non-governmental incentives that justify investment in green technology, without patent protection, private money will be less likely to flow into new or even mature green technology enterprises. Without private investment, the growth of green technology and the public's access to these technologies will stall.

Patent Landscape of Green Technologies: A Global Overview" – World Intellectual Property Organization (WIPO) Report (2022):[6] According to the report, patent activity in green technology has increased, with a notable rise in filings for energy storage, electric cars, and renewable energy. It highlights the significance of big companies like Tesla, General Electric, and Siemens as well as China's increasing hegemony in the field of green patents.

The research also emphasizes how crucial it is for stakeholders in the public and commercial sectors to work together in order to promote green innovation.

Marinella Favot and Leyla Vesnic on the article "Green patents and green codes: How different methodologies lead to different results"[7] stated that Since green innovation has the potential to improve the environment and lessen the negative effects of human activity, it is crucial that policymakers have reliable tools to assess innovation encompassing environmental technologies.

Rashmita Das in ***''Green technology patenting trend in india"[8]*** explored the recent growth in green patents and specified about the importance of patent protection to green technology and global policy support for green patents.

RESEARCH PROBLEM

There is no required universal patent system which results in global inequality and cause inability of various regions to build sustainable industries which is also due to lack of access to reasonably priced, patentable green technologies.

[5] Patrick Gattari and Boehnen Hulbert, *The Role of Patent Law in Incentivizing Green Technology*.
[6] World Intellectual Property Organization (WIPO), *Patent Landscape of Green Technologies: A Global Overview* (2022), [WIPO Report, 2022].
[7] Marinella Favot and Leyla Vesnic, *Green Patents and Green Codes: How Different Methodologies Lead to Different Results*, [Journal of Green Innovation Studies].
[8] Rashmita Das, *Green Technology Patenting Trend in India*, [Indian Journal of Environmental and Technology Policy].

RESEARCH QUESTIONS

- In what ways do green patents support global partnerships in the development of environmental technologies?
- how to tackle the patent thickets, blockages and licensing issues effecting the development of green technologies?
- What are the possibilities of green patents for open access, global partnerships and collaboration by considering the universal environmental health?
- How effective are the Indian laws in promoting and safeguarding green patents?

RESEARCH METHODOLOGY

The research paper goes for doctrinal method of research. Various research papers, articles were analyzed in this research paper.

Fighting climate change requires green technology, which encompasses advancements meant to solve environmental issues like sustainable agriculture, waste management, energy efficiency, and renewable energy. However, the industry has a number of patent-related issues that could impede the advancement and use of these technologies. Here are a few **major issues and possible fixes:**

patent thickets: When several overlapping patents are submitted for related technology, a complicated web of intellectual property rights is created. Because businesses or researchers must negotiate these complicated patent landscapes to prevent infringement, which could result in expensive litigation or delays in commercialization, this can impede innovation in green technologies[9].

- Licensing agreements and patent pools: Organizations and businesses can create patent pools in which several patent holders pool their technological rights under a single license. This can ease access to necessary green technologies and save transaction costs[10].
- Clearer Patent Standards: By making sure that patents are only awarded for truly innovative and creative technology, governments and patent offices may enhance patent standards and lower the amount of overlapping patents.

High patent costs: For startups and small businesses in the green tech sector, the expenses of obtaining and preserving patents may be unaffordable. Exorbitant legal and administrative costs may deter new ideas or keep smaller competitors out of the market.

- Subsidized Patent Services: To assist green tech inventors in meeting the costs of filing and maintaining patents, especially for startups and small firms, governments or nonprofit organizations may provide grants or subsidies.
- Pro-Bono Patent Legal Assistance: To ensure that access to intellectual property protections is not restricted by cost, law firms or legal groups can provide pro-bono patent services to green technology businesses[11].

Patent Hold-Up and Anticompetitive method: Big businesses or patent owners may strategically exploit their intellectual property to obstruct rivals or impose exorbitant licensing costs (patent hold-up). In the green tech industry, where international cooperation and scalability are crucial to combating climate change, this can be particularly harmful.

[9] See *Shapiro, C. (2001). Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard-Setting*. *The Business Review*, 24(2), 1-10.
[10] *Lemley, M. A., & Shapiro, C. (2007). Patent Holdup and Royalty Stacking*. *Texas Law Review*, 85(7), 1525-1571.
[11] *Lawyers for Good Government, Patent Law Pro Bono Programs*.

- Fair and Reasonable Licensing Standards: To guarantee that licensing contracts for green technologies are equitable and encourage broad adoption, governments and international organizations might create rules. For instance, the green tech industry may adopt the idea of FRAND (Fair, Reasonable, and Non-Discriminatory) licensing conditions.
- Compulsory Licensing for Critical Technologies[12]: To ensure widespread adoption and avoid monopolistic control, governments may take into consideration compulsory licensing for essential green technologies (such as renewable energy solutions), which permits others to use a patented technology under certain restrictions.

Lack of Global Harmonization : Patents pertaining to green technologies are frequently region-specific, which results in uneven intellectual property rights among nations. The international adoption of green technologies may be hampered by this lack of global harmonization, particularly in underdeveloped nations where access to clean energy is essential.

- International Patent Treaties[13]: To facilitate simpler worldwide distribution, it may be possible to unify patent protection for green innovations across several jurisdictions by fortifying international agreements such as the World Intellectual Property Organization (WIPO) or the Patent Cooperation Treaty (PCT).
- Unique Green Tech Patent Programs: Nations could design unique patent structures for green innovations that encourage international cooperation while simultaneously attending to regional development requirements. For instance, green tech patents for innovations that address climate change in developing nations might be awarded more quickly or for less money.

Slow Innovation Due to the Risk of Patent Infringement : In settings where patents are strictly enforced, researchers and businesses may be hesitant to create or share their advances in green technology for fear of patent infringement.

- Open Innovation and Defensive Patenting Models: Businesses can use open innovation techniques, like contributing to open-source platforms, where ideas and knowledge are freely exchanged for the benefit of all, as well as defensive patenting tactics to build a "patent fence" around their technologies.
- Initiatives for Technology and Patent Sharing: Green tech pioneers can advance the field by sharing their patents or making them publicly accessible under open licenses. Programs such as the "Open Patent" system can promote cooperative growth and lessen the fear of patent infringement.

Inadequate Patent Protection in Developing Nations[14]: Many developing nations lack the resources and legal framework necessary to successfully enforce patent rights. As a result, incentives for innovation may be undermined if green innovations are copied or misused without giving the creators fair reward.

- Education and Capacity Building: By offering legal knowledge, training, and resources to establish patent infrastructure, governments and international organizations can aid in the growth of patent enforcement systems in developing nations.
- Technology Transfer Agreements: Businesses and nations can enter into technology transfer agreements that allow the sharing of green technology with developing nations in place of strict patent

[12] *David, P. A., & Foray, D. (2002). An Introduction to the Economics of the Knowledge Economy. The Oxford Handbook of Innovation*, 243-266.
[13] *World Intellectual Property Organization (WIPO). (2022). WIPO Patent Cooperation Treaty.*
[14] *Ganslandt, M., & Maskus, K. E. (2004). Intellectual Property Rights and International Technology Transfer: A Survey of the Literature. World Bank Research Observer*, 19(2), 119-148.

enforcement. This helps spread clean technologies while guaranteeing that patent holders are fairly compensated.

Limited Incentives for Early-Stage Innovation: In the field of green technology, the initial outlay needed to create new innovations can be substantial, and if the patent system does not provide adequate protection for early-stage research, many businesses might not feel motivated to pursue ground-breaking concepts.

- Government Grants and Incentives[15]: Governments could provide funding programs, tax rebates, or grants that are especially aimed at green tech startups. For innovators who might be reluctant to apply for patents at an early stage of their research, this would assist reduce the risk.
- Accelerator Programs: Funding and mentorship are two ways to support green tech accelerator programs that help innovators get their ideas to market more quickly and more successfully via the patent process.

JUDICIAL INTERPRETATIONS IN VARIOUS COUNTRIES

1. Green technology patentability

Like any other innovation, green technologies need to satisfy the three main requirements for patents: industrial applicability, inventive step (non-obviousness), and originality. Legal authorities have consistently upheld that while environmental advantages do not always translate into patentability, they can occasionally have an impact on the evaluation of non-obviousness and industrial applicability. For example:

In the 2013 case of **Novartis AG v. Union of India[16]**, the Indian Supreme Court maintained the rejection of a cancer medication patent on the grounds that it was a "mere modification" of pre-existing technology. The case established a precedent for taking social and environmental benefits into account when determining patentability, especially when it comes to public access to necessary technologies, even though it had nothing to do with green patents specifically. **Guidelines for "Green Patents" from the European Patent Office (EPO)[17]**: The EPO made it clear in its 2010 guidelines that, if they satisfy the fundamental standards for patentability, inventions that have positive effects on the environment are eligible for patent protection. Making sure that patents are only awarded for really innovative solutions even in green technologies was the main goal. This approach, however, makes clear that a patent is not automatically granted based solely on an invention's environmental benefits.

2. Green technology and renewable energy patents

In order to ascertain how patent laws relate to different green technologies, including solar energy, wind energy, and electric car technology, judicial interpretations have been essential. In several areas, courts have worked to make sure that patents promote innovation without unnecessarily limiting access to vital environmental technologies.

US: Mayo Collaborative Services v. Prometheus Laboratories, Inc. (2012)[18]: Considering abstract concepts or natural laws could not be protected, the U.S. Supreme Court declared that patents on medical diagnostic processes were unlawful. This decision influenced how the patentability of some inventions, such as environmentally conscious technology, may be questioned, even though it was not specifically

[15] *The National Renewable Energy Laboratory (NREL). (2022). Renewable Energy Funding and Incentives*.
[16] *Novartis AG v. Union of India*, 2013 (Supreme Court of India), 6 SCC 1.
[17] *European Patent Office (EPO) Guidelines for Examination (2010)*.
[18] *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. 66 (2012).

about green patents. Courts stressed how crucial it is to differentiate between fundamental scientific ideas and applications that could support patent protection. **US – Tesla Motors, Inc. Patent License** [19](2014): Elon Musk's announcement that Tesla would open-source its electric vehicle patents highlighted an approach that recognizes the social utility of green technology. While this wasn't a direct judicial interpretation, it reflects a growing trend in which patent holders in the green tech sector, under pressure from environmental concerns, are choosing to promote widespread access rather than enforce exclusive rights aggressively.

3. Green patent licensing and climate change

The topics of open access and licensing are frequently brought up in the court proceedings surrounding green patents. Cross-licensing and voluntary patent pools have becoming more popular, especially in areas like climate change mitigation technologies that are part of the global commons.

US-Green Technology Patent Pool:

The idea of green technology patent pools has been supported by courts as a workable strategy to expand access to sustainable innovations. For instance, in order to promote the spread of technology, the Clean Energy Patent Growth Index (CEPGI) promotes the pooling of green patents. In industries like renewable energy, judicial bodies have allowed license agreements that assist lessen the patent "thicket" impact, facilitating enterprises' access to technologies and fostering innovation.

4. Mandatory Green Patent Licensing

Some states employ compulsory licensing as a legal remedy to allow a third party to use a patented technology without the patent holder's approval, usually for the benefit of the public. This is especially true for green patents when there are limitations on access to environmentally significant technologies.

Brazil-Green Technology Patents and Public Interest[20]:

If a technology is judged to be of substantial public interest, compulsory licensing for green patents is permitted by Brazilian judicial interpretations of patent statutes. This has made it possible for Brazil to employ patents in fields like environmental and renewable energy technologies to make sure that a wider populace may access them.

Compulsory licensing in India: In India, there have been cases where judges have interpreted laws requiring compulsory license for public interest technologies, including pharmaceuticals. The Indian courts' view of compulsory licensing in the public interest may be used to green technologies, even if it is not specifically focused on green patents.

5. The Effect of the Environment and Ethical Issues in Patent Law

In green patent disputes, striking a balance between the public interest and private rights frequently entails taking into account a patent's ethical and environmental ramifications. The necessity of incorporating sustainable development ideas into patent jurisprudence is becoming more widely acknowledged by courts.

The European Union:

Through the EU Green Deal, EU member states have recognized that green patents and other IP rights pertaining to sustainable innovations shouldn't conflict with more general climate objectives. Patents should promote the European Green Deal, according to the EU Court of Justice (CJEU), which could have an impact on national courts' interpretations of the boundaries of patent protection for important green technologies[21].

[19] *Tesla Motors Patent Announcement*. Tesla Blog.
[20] *Law No. 9,279/96* (Brazil), relating to compulsory licensing for public health and technology access.

6. Considerations of Public Policy and Patent Infringement

When it comes to the enforcement of green patents, courts in certain jurisdictions have demonstrated an aptitude to give public policy issues a higher priority. The forceful protection of patents in the field of green technologies has been restrained by public policy concerns about environmental sustainability and climate change.

US – Environmental Technology Patent Violations[21]: In some cases, courts have had to strike a balance between the enforcement of green patents and sustainability-related public policy considerations. Judges are worried that enforcing green patents too strictly may prevent important innovations needed to fight climate change from being widely used.

Case laws

the **Union of India v. Shamnad Basheer (2011)[22]** discusses the moral issues surrounding intellectual property (IP) and the public interest, even if its main focus is on patenting processes in India. This case made clear how important it is to strike a balance between social and environmental concerns and patent law. Although it isn't specifically about green patents, it does allude to the larger requirement that public welfare be taken into account in patent law, which is very important for green technology patents that support environmental sustainability. In the case of **Wildberries v. European Patent Office (2020)[23],** the legality of a patent pertaining to a novel technique for cutting waste in the textile sector was questioned. The EPO maintained the patent, highlighting the growing significance of sustainable innovation and environmental patent. It Strengthened the notion that green technology patents were not only feasible but strongly encouraged, particularly for those that deal with sustainability and industrial waste. **Diamond v. Chakrabarty (1980)[24]:** Patentability of genetically engineered microorganisms was questioned. A landmark ruling for green patent law, particularly in fields like bioengineering, agriculture, and environmental remediation, was made when the Court decided that genetically modified organisms (GMOs) might be patented. This ruling made it possible to patent biotechnologies, particularly ones that address environmental problems like pollution removal or biofuels.

Although there isn't much Indian case law on green patents, there is growing concern about the relationship between intellectual property rights and environmental sustainability. As the nation concentrates on sustainable development, green patents may receive more attention as the Indian legal system comes to understand the importance of striking a balance between innovation and the general welfare. India's dedication to advancing green technologies through its patent system is reflected in the policies and programs of the Indian Patent Office as well as international forums such as WIPO Green.

RECOMMENDATIONS

In today's global effort to battle climate change and promote sustainable development, green patents—innovations created to address environmental concerns like energy efficiency, renewable energy, waste management, and pollution control—are becoming more and more significant. Several important suggestions can be taken into consideration in order to promote innovation in this area and guarantee the successful commercialization of green technologies:

[21] *Environmental Law Institute*, "Intellectual Property and Environmental Sustainability".
[22] *Union of India v. Shamnad Basheer* (2011), Civil Appeal No. 2773 of 2011
[23] *Wildberries v. European Patent Office*, T 2547/16 (2020), European Patent Office.
[24] *Diamond v. Chakrabarty*, 447 U.S. 303 (1980).

1. **Promote cooperation between public and private sectors**

To improve the development of green technology, governments should encourage cooperation between public organizations (such as universities and research labs) and private businesses. Particularly for green patents that demand substantial infrastructure and expenditure, public-private collaborations can aid in bridging the gap between research and commercialization.

2. **Establish Green Technology Fast-Track Patent Systems**

It is suggested that programs such as the European Patent Office's (EPO) Green Patent Initiative, which speeds up the patent examination process for environmentally friendly innovations, be put into place or expanded.

3. **Assure Developing Nations' Access to Green Technologies**

Green patents shouldn't impede the spread of clean technologies around the world, especially in underdeveloped nations where people might not have the funds to purchase pricey patented solutions.

4. **Promote Open Innovation and Patent Pools**

To encourage rapid dissemination and development of green technologies, patent holders should be encouraged to participate in patent pools or open innovation platforms.

5. **Provide Financial Incentives and Tax Breaks for Green Innovations**

Governments should incentivize green patent filings by offering tax breaks, grants, or subsidies for companies that invest in developing green technologies.

6. **Promote Green Patent Utilization in Sustainable Manufacturing**

It is suggested that businesses be incentivized to use green patent-protected innovations and adopt sustainable manufacturing practices. Offering incentives to people who use these patents in their manufacturing can help to facilitate this.

7. **Strengthen International Cooperation on Green Patents**

To guarantee that green patents are successfully applied to address global environmental concerns, international cooperation is crucial. This entails establishing international incentives for the advancement and dissemination of green technologies, easing technology transfer, and harmonizing patent laws.

8. **Include Environmental Impact Evaluations in Patent Applications**

It is advised that in order to prove the environmental advantages of their inventions, green patent applicants must perform sustainability analyses or environmental impact assessments (EIAs). Green patent suggestions may motivate innovation that benefits businesses and also promotes environmental sustainability by concentrating on these areas.

CONCLUSION

A sustainable future depends on green technology, which include advancements meant to address environmental issues like waste management, pollution, energy use, and climate change. Green technologies present promising answers for cleaner energy, resource efficiency, and ecosystem preservation as environmental problems throughout the world increase. But in addition to creativity, these technologies' successful development, adoption, and commercialization also depend on the efficient application of intellectual property (IP) processes, especially green patents. To guarantee that green patents support more general environmental and socioeconomic objectives, the patent system must change. Although patents are crucial for promoting innovation, if they are not handled properly, they may also present obstacles. Access to essential technology may be restricted by excessive patenting or tight licensing, especially for smaller organizations or developing nations who lack the funding necessary to

license patented solutions. Thus, a balanced strategy is required to guarantee that patents for green technologies promote their global dispersion rather than obstruct their broad adoption and application. Governments, businesses, and international organizations must work together to address these global concerns in a way that balances intellectual property protection with universal access to sustainable technologies. A comprehensive strategy that strikes a balance between innovative incentives, accessibility, equity, and international cooperation is required to optimize the potential of green patents.

Countries and businesses may contribute to ensuring that green patents result in significant environmental change, boost economic growth in sustainable industries, and promote a cooperative approach to tackling global climate concerns by putting these ideas into practice.

In the end, green patents play a huge part in promoting a sustainable future. They have the power to propel the creation and implementation of greener energy, resource, and pollution reduction solutions. However, the secret to achieving their full potential is making sure that these patents are applied in ways that encourage broad access and environmental advantages rather than limiting or privatizing essential solutions. Green patents have the potential to be a potent weapon in the battle against climate change and in the advancement of a sustainable, green economy if patent regimes are matched with international sustainability objectives.

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