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"CONTEMPORARY TRENDS IN GREEN PATENTING IN INDIA: A CRITICAL ANALYSIS."

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I. ABSTRACT:

"In the past few decades, environmental degradation has exhibited an exponential growth which has certainly become an issue of global concern. Many developed and developing countries are striving to combat the menace of climate change through various means. In current times, the level of carbon dioxide emissions has increased exponentially due to the heavy increase in energy demand and carbon dependency of industries. It is an issue of major concern that India has become the world's fastest-growing polluter. According to British Petroleum's comprehensive Statistical Review of World Energy, India's carbon dioxide emission level was shown to have increased by 8.1% in 2014 and accounted for the largest share in the global emissions scale.

India, being a developing economy and a signatory to many international environmental instruments has been playing an active role in the domain of environmental protection and sustainable development.

The policy-makers have been trying to make India a hub for green growth and innovation. This paper is an attempt to conduct a critical study of the areas where India has shown growth and attempts to analyze the emerging trends of climate change mitigation technologies and green patenting particularly in India. This paper also tries to examine the current patent policy and possible solutions to tune up the diffusion of green technology through IPR policy instruments. It also attempts to find possible future paths in the area of green development."

II. INTRODUCTION:

Lately, India has become a huge tech market for both domestic and foreign players. Consequently, the Indian patenting scene has taken a giant leap as numerous companies are filing for patents for their technologies. The "Make in India" movement under the NDA government has initiated a neo-development regime. The prime objective of this movement is to achieve infrastructural expansion and calibration of investment regulations. Due to rapid industrial growth, energy consumption of our country has been clocking at the rate of 4.6% which reveals a 100% increase in the past 15 years. The demand and supply chain of energy has received a major boost which has resulted in a carbon-intensive ecosystem. India has seen unprecedented growth in the utilization of coal and diesel for electricity generation and transport.

One more objective of the global community is to reduce the concentration of Green House Gases (GHG). There have been certain agreements such as the Kyoto Protocol and the European Union Emission Trading System (EU – ETS) which have focused on reducing GHG concentrations and bring it between 450 and 750 parts per million (ppm). This would certainly warrant the innovation and adoption of such technologies which aid the reduction of GHG level throughout the globe. India, in this scenario, has also emerged as a key player.

II.I ENVIRONMENTAL DETERIORATION AND TECHNOLOGY:

The continuously increasing emissions of hazardous gases especially carbon dioxide have driven big technology players to develop environment-friendly technology and seek protection by way of patenting. Data have shown that protection of more than 70% of such technologies is being sought by developed countries.

II.II COOPERATIVE PATENT CLASSIFICATION AND CLIMATE CHANGE MITIGATION TECHNOLOGIES:

The technological area covered by the patents relating to environmental sustainability and climate change mitigation is quite vast. There is a rapid evolution of various kinds of climate-friendly technologies which makes their section-wise classification cumbersome. Therefore,

restructuring of the scheme of Cooperative Patent Classification (CPC) is required to accommodate patents relating to climate change mitigation technologies. The need for such structural overhaul led to the YO2 classification scheme that focuses on those technologies which are designed to reduce GHG emission levels and achieve objectives set forth by the Kyoto Protocol.

III. GREEN TECHNOLOGY IN INDIA:

As an economy, India may well be categorized as a nation in its post-development stage. However, innovation and dissemination of environmental-friendly technology is still a pretty new development. India's proactive approach in contributing to the global aim of reducing carbon emissions and climate change mitigation has raised the bar for the policy-makers to devise a well-tuned framework to ensure access and diffusion of climate change mitigation technologies.

Consequently, the policy-makers have come up with a game-plan to enhance the growth of the green technology sector.

III.I TRANSFER OF TECHNOLOGY:

Technology transfer is the prime mechanism for an economy like India to interact with the developed nations which are infusing substantial capital in the R&D of green technology. Primarily, India, alongside China, has adopted two methods to promote technology transfer, particularly green technology. They are: (1) Conventional; and (2) Unconventional. Both these mechanisms differ in their way of operation and impact on the sector.

III.I.I CONVENTIONAL TECHNOLOGY TRANSFERS:

The mechanisms involved in conventional technology transfer offer a comparatively lower cross-border interaction. Thus, the investment and other efforts of the recipient get minimized. The prime example of conventional transfer is equipment and blueprints which are available off-the-shelf. The basic structure of such kind of transfer consists of two factors

i.e. local production backed by foreign technology. Here, investments by the recipient and foreign direct investors, both come into play. The magnitude of local production is increased by licensing of technology and local joint ventures which are centrally governed by the headquarters of the concerned MNC.

While working under a conventional mechanism, it is very important to facilitate the flow of technology, expertise and experience to achieve a sustainable development pattern.

III.I.II. UNCONVENTIONAL TECHNOLOGY TRANSFER

Unlike conventional mechanisms, unconventional technology transfer requires substantial efforts and investment of the recipient. This is achieved by overseas collaboration in R&D, foreign acquisitions and high magnitude of sustained capital infusion in the sector.

Unconventional mechanisms are typically difficult to manage. For example, it is not easy to internalise knowledge embodied in people and organisational routines in an acquired firm. It has been observed that large developing nations are leaning towards unconventional mechanisms of technology transfer. Also, in the green technology area, where substantial research and investment is required, the unconventional mode of technology transfer is preferred across the globe.[1]

III.II SECTORS OF GROWTH:

As far as green technology is concerned, India, along with China, has shown tremendous growth in the following sectors:

(i) Wind Power;

(ii) Solar PV; and

(iii) Electric and Hybrid cars.

[1] Lema, Rasmus and Lema, Adrian, TECHNOLOGY TRANSFER? THE RISE OF CHINA AND INDIA IN GREEN TECHNOLOGY SECTORS, Routledge (Taylor and Francis Group), Innovation and Development, Vol.2, No.1, April 2012, 23-44.

III.II.I WIND POWER SECTOR:

The Indian wind power industry has entered into a phase of rapid development owing to the conventional and unconventional modes of transfer of technology. In due course of time from the 80s, India has become the fifth largest wind power market in the world. Foreign manufacturers have taken a keen interest in the Indian market in both ways i.e. joint ventures and wholly owned subsidiaries. There are more than thirty wind turbine manufacturers in the Indian market but as per a report published by the Centre for Wind Energy Technology (C-WET), Suzlon contributes almost half of the installed capacity in India and has emerged as a wind energy champion. Suzlon has been engaged in licensing agreements with various off-shore suppliers.

Later on, Suzlon acquired AE-Rotor (blades), Hansen Transmissions (gearboxes) and REpower (offshore turbines and R&D).[2] It also established a joint venture with Austrian Elin to co-design wind turbine generators. Suzlon now has state-of-the-art technology and R&D facilities in Germany and has become the world's fifth largest turbine manufacturer. It has also invested heavily in local R&D within India.

III.II.II SOLAR PV SECTOR:

The transformation of India's Solar PV sector took place from the 1970s to late 1980s wherein public supply and demand underwent a transition to private technology and India's solar PV sector has transformed from mainly public supply and demand in the 1970s to private technology. After the downward trend in the demand for solar energy by the state-owned enterprises, the producers captured the export market. The recent market-cap is 75% of the entire PV output.

One of the major players that adopted unconventional technology transfer strategies with foreign solar tech companies in addition to conventional licensing was Moser Baer. It has also undertaken various overseas R&D.

[2] Ibid

Moser Baer has also established links with various prominent research institutions in India including the National Chemical Lab, the National Physical Laboratory and IIT, Kanpur.

When we talk about technology transfer mechanism, Indian companies have used quite a few of them like joint ventures, cooperation in R&D, foreign acquisitions and also in-house R&D. Indian manufacturers have majorly licensed crystalline silicon cells. The internal links of Indian with notable research institutions have proved crucial in the refinement of technology which is produced at a significantly low cost and also enables own patenting.

III.II.III OTHER POSSIBLE SECTORS:

Apart from wind power and solar power, Indian companies have made efforts to propagate the idea of green technology in various sectors[3]:

- ***Agriculture:*** Modern agricultural processes leave a considerable impact on the environment. The objective of agriculture-related green technologies is to mitigate the impact of such processes.

- ***Automobiles:*** Major contribution to carbon emission in the world is made by automobiles. Using green technology in automobiles is aimed at minimum or zero emission. Renewable energies and other forms of sustainable energy are also used in automobiles.

- ***Construction:*** This involves the construction of environmental-friendly buildings which are called green buildings.

- ***Health & Medicine:*** Promotion of the use of recyclable and biodegradable products in health services.

- ***Water Purification:*** This involves green processes for large scale filtering of sea water and used water.

[3] Aithal, P.S Dr. & Aithal, Shubhrajyotsna, OPPORTUNITIES & CHALLENGES FOR GREEN TECHNOLOGIES IN 21ST CENTURY available at https://mpra.ub.uni-muenchen.de/73661/

- ***Industry:*** To convert industrial processes into green processes to minimize carbon emission and ensure utilization of sustainable energy.

- ***Food Processing:*** All processes related to packaging of food cause emission of poisonous gases. Green processes of food processing should be adopted which minimize the harmful impact of food packaging.

- ***Aircrafts:*** With the advancement of science and technology, space travel has become a crucial human endeavour. Thus, the use of green technology and renewable fuel in aircrafts should be ensured.

III.III INDIA'S GLOBAL POSITION:

Persistent degradation of environmental conditions worldwide has warranted the need for cleaner forms of growth. In recent times, pollution is not just a by-product of industrial activities rather it has become a fundamental threat to humanity. This situation has motivated the policy-makers across the globe to think green and act green. The global focus has shifted to green innovation as the adverse consequences of the conflict between growth and climate goals have been slowly realized. The demand for climate-friendly technologies is on the rise and those countries which invest in green innovation and development have high prospects of market access and power. When it comes to combating environmental degradation and development of environmental-friendly technologies there are several countries that are making their marks such as the US, Japan and China. On the other hand, nations which are largely dependent on fossil fuel will surely lose their market in the phase of green transition.

Thus, it is clear the countries taking swift initial steps to compete in this 'green race' is surely going into profits in the goods and service market that is rapidly shifting to the environment-friendly regime.

Countries which have taken a head-start in investing in inculcating green-skills in their population have a great advantage in global business that is gradually going green. There are

certain ways to measure the position of a country on the green scale, green competitiveness and innovation. It largely depends on the adaptability of a nation pertaining to green technologies. Trade data can reveal a country's global competitive position. In terms of scale, India is in a favourable position. It has a sizable industry in low-carbon environmental goods and services (LCEGS) and the third-highest LCEGS sales in Asia (second highest in terms of the proportion of GDP).

India is continuously developing in terms of green innovation but there is still room for improvement. If we narrow our focus to high-value, patented inventions, India is in a neutral position. About 13% of the country's high-value patents are related to green tech in line with the world average, the patent basket has a higher share of certain green tech when compared to the world average (see accompanying graphic), reflecting an innovation specialisation. These technologies include green buildings, carbon capture and storage, climate change mitigation technologies related to production and processing goods, and water-related adaptation technologies. India's share of patents in water-related adaptation technologies is four times higher than the world average, indicating a distinct advantage, as also a grave need.

According to recent data, water in the country's 91 reservoirs is at just 27% of total capacity. India is facing a severe water shortage, and capitalising on the know-how we have created and complementary support policies are critical. Overall, India is not a leading inventor, although it performs significantly better than other low- to middle-income nations. In 2013, India successfully filed 1,140 high-value green patents while Brazil filed 300 and South Africa 150. However, China filed 16,000. The vast majority of green patents are concentrated across a few nations.[4]

It is a fact that almost 60% of the world's green patents are attributed to ace innovators such as the US, South Korea and Japan. But, other prominent Asian players like China and India have shown significant growth in the past 15 years in the area of green innovation. Evidence

[4] Srivastav, Sugandha & Kathuria, Rajat, GREEN TECHNOLOGY: CAN INDIA WIN THE RACE?, available at https://www.financialexpress.com/opinion/green-technology-can-india-win-the-race/1126192/

shows that pricing carbon or eliminating fossil fuel subsidies can boost green innovation, making India more competitive in the future. In trade, India specialises in smart grids, wind energy, hydel and bio-fuels. In India's export basket, the share of wind energy is 1.7 times the world average and the share of smart grid technologies is over double the world average. While India enjoys a comparative advantage in these sectors, it is still not a large exporter. In 2013, India accounted for only 2% of global exports in contrast to China's 13%.[5]

Nevertheless, there is much room for progress. India's low-carbon exports have tripled in the period between 2001 and 2013. With these remarkable growth rates, India can build on existing advantages to prepare for the green economy transition. In particular, as discussed earlier, wind energy is a strategic opportunity. India enjoys 10 GW of wind turbine manufacturing capacity, which is three times higher than domestic demand, providing an export-growth window. India's competitors in this space include Europe, although the former's wind turbines are tailored to slower wind speeds—a unique niche in the market.

In this race of green innovation and green growth, low labour costs certainly give an edge to India. The smart-grid technologies present in India certainly provide a competitive advantage in exports. It can also harness innovation in smart grids to address its own efficiency problems. Currently, transmission and distribution losses are very high: over 20% is lost in distribution across the map while some states report losses in excess of 40%. Smart grid technologies can help address this problem, saving India from costly black-outs and power shortages. Intense efforts towards the adoption of green development would certainly attract FDI from global players. India's stance in the domain of green growth and green technology is certainly praiseworthy.

IV. GREEN PATENTING: EMERGING TRENDS IN INDIA:

India has become an active player in the area of green technology and green innovation. However, the majority of technology is acquired through international technology transfer, licensing, etc. Local innovation and patent applications pertaining to environment-friendly

[5] Ibid.

technologies are still matters of concern. Sometimes, the rigid patent regime of India acts as an impedance in the way of foreign players in tapping the Indian market with their clean technologies. The clash between the Indian government's commitment towards green growth and sustainable development and its patenting regime is certainly a point of deliberation.

It is a fact that confidence of investors is boosted in a market where innovations are protected and the same is the case in a growing economy like India which, by the way, is also a major contributor to the world's carbon gas emissions. Thus, it is imperative that the policy-makers fine-tune the patent regime to make leeway for emerging green technological trends.

IV.I ACCESS TO GREEN TECHNOLOGY:

India's rapid growth in terms of infrastructure has raised the concerns of many sections of society regarding the adverse effect on the ecosystem. A global partnership between the private and public technological players has been the chief mandate of the UN's sustainable development program.

Since the 'Make in India' movement in 2015, It has been observed by the policy-makers that providing wide and easy access to climate-friendly technologies is the only way to reduce carbon gas emissions as the focus has shifted on manufacturing industries.[6]

The transfer of environmental-friendly technologies takes place in India through various modes which have been discussed earlier. It becomes imperative for the government to synchronize with the rapidly growing industries in order to provide access to such technology. It must be reiterated that fine-tuned enforcement of IPR is a prerequisite for any innovator to give out their invention to the receiving nation. Green technologies and patents hold somewhat a paradoxical position. Thus, it is important for us to understand whether the Indian patent climate is friendly for ensuring access to such technology.

[6]https://www.orfonline.org/research/access-to-green-technology-only-way-to-reduce-to-carbon-emissions-minister/

In India, there is a prevalent contention that patents restrict access to green technology. Due to this, Indian stakeholders have pitched for limiting patent protection for environment-friendly technologies. The concept of weakening intellectual property (IP) rights in green technologies has garnered strength after India, partly on account of international pressure, opened the door for phasing out hydro-fluoro-carbons (HFCs) in 2015 under the provisions of the Montreal Protocol, an international treaty for phasing out substances that deplete the ozone layer.[7]

It was extremely important to smoothen out the transition towards green technologies and mitigate the impact on the domestic industry. Therefore, Indian policy-makers made sure to incorporate flexibilities as far as choice of alternative technologies were concerned. The smooth shift from HFCs to safe, technically sound, energy-efficient, climate-friendly and commercially viable technologies was the main target. Still, a section of stakeholders have raised the question on the available flexibilities and have rooted in support of a more stringent regime in order to protect and encourage domestic players.

IV.II COMPULSORY LICENSING AND GREEN TECHNOLOGY:

Inventors, innovators and patent litigators have shown an adverse response to the above proposal of the stakeholders. Compulsory licence regime in relation to green patents has been considered a deterrent which may potentially decrease the level of investments towards research and innovation of such technologies.

Enhanced research in the field of green technology is essential to boost the endeavour towards achieving a cleaner environment for the present and future generations. Simultaneously, strong IP rights are essential in order to create economic initiatives and incentives. It is the assurance of protection of IP rights and guarantee of exclusivity that attract investments and converts ideas into innovations and further into commercial products.

[7] Kumar, Swarup & Kumar, Jitesh, EASING THE PATH FOR GREEN TECH IN INDIA, Life Sciences Intellectual Property Review (LSIPR), 11-08-2016.

This also applies to green technology firms which include various sectors such as wind energy, solar energy and biofuels as discussed earlier in this paper.

Section of industrial players that are against compulsory licensing of green technology also contends that strong protection of IP rights may not act as a barrier because a variety of technologies is already there in the market to reduce emissions. Further, the contention that patent-protected technologies are more expensive than the unprotected ones also does not hold. The argument is further supported by the fact that to cure a disease a specific drug is needed but to reduce emissions and make the industrial processes environment-friendly there are many technologies.

Making a case against their introduction of compulsory licensing in green technology the stakeholders have pointed out various socio-economic impacts. They have contended that the cost incurred in allowing the filing for such a license would be much more than the cost involved in the issuance of the same. Additionally, stakeholders point out that the economic and social repercussions of allowing compulsory licences in green technologies may far outweigh the costs saved by the issuance of the licence itself. For example, granting compulsory licences for green technology would also invite international backlash and India may suffer unilateral trade sanctions.[8]

Further, it would also discourage foreign investors and patent owners as they would be considering India as a patent-unfriendly zone.

IV.III DIFFUSION OF GREEN TECHNOLOGY

The reason behind adopting any new technology is the contemporary need for it in a given region. India is no different in this regard. Being a signatory to the Kyoto Protocol and other international environmental instruments, India has started transforming its industrial sector into an energy-efficient and climate-friendly one. The issue of diffusion of green technology

[8] Ibid.

throughout the Indian industrial landscape is a pertinent one. There may be certain policy actions to enhance the same:

- ***Facilitating adoption through economic tools:*** Majority of Indian firms are not in a position to spend the amount of money to acquire environment-friendly technologies. Thus, it is needed that such technology be diffused by catalyzing its acquisition by slashing the price through subsidies. Simultaneously, more capital should be infused in green innovation to motivate domestic innovators and attract foreign players.

- ***Stringent regime towards carbon emissions*:** Introducing strict regulations towards industries causing carbon emission will force them to adopt technology which helps in reducing carbon levels and other by-products. This will also facilitate the innovators to foster a higher level of green innovation to various industries.

- ***Enhanced compliance of international environmental instruments:*** India is a signatory to various international agreements relating to environmental protection and sustainable development. The government should issue directions to various stakeholders regarding strict compliance of those agreements. The technological ecosystem should be redesigned so as to maintain the highest standards of environment protection.

- ***Creating awareness about green technology*:** As our generation is advancing towards modernization, rapid industrialization and greater dependency on fuels, the issue of environmental deterioration is also touching alarming heights. The government should create awareness about the positive impact of climate change mitigation technology, Clean Development Mechanism (CDM), green skills, green jobs, green consumerism, green marketing, etc. to combat climate change.

- ***Efficient patent strategies*:** The traditional outlook of patent law has to be changed in order to ensure the diffusion of green technology. Although an empirical relationship between the level of patent protection and diffusion of green technology has not been established clearly but, however, positive patent strategies may certainly boost the

innovators to invest their time and energy into developing clean technologies. Financial incentives coupled with monopoly motivate the patent-holder to innovate more efficiently. But, it is also important to regulate the use of the monopoly in green technology so that its access does not get concentrated.[9]

IV.IV TRANSFER OF TECHNOLOGY AND SECTION 3(D) OF THE INDIAN PATENTS ACT, 1970:

It has been a judicially established fact that ever-greening of the patent is not allowed in India. Section 3(d) works along the same lines. However, the section has majorly been applied to pharmaceutical inventions. The section, in its implementation, may also rope in other crucial innovations which may include green technologies.

The issue is that the Patent Office may raise objections against inventions pertaining to green technology even in genuine cases only because the interpretive history has been along those lines. Even after being amended in 2005, the scope and implementation criterion of section 3(d) are unclear which works against the interests of new innovators in the field of clean technologies.

Amid heavy demands for removing patent-blocks on climate-friendly technologies, the fresh strategy is important to protect the interests of innovators and inventors who invest a lot of time, energy and money into research and development.

One solution may be the adoption of a tiered pricing system wherein the patent-owners sell green technology at a substantially low price in India. In contrast to pharmaceutical products, the large size of most energy-efficient products significantly reduces the risk of their re-importation to countries where they are more expensive.[10]

[9] Chu, Jonathan M.W.W., DEVELOPING AND DIFFUSING GREENTECHNOLOGIES: THE IMPACT OF INTELLECTUAL PROPERTY RIGHTS AND THEIR JUSTIFICATION, available at http://law2.wlu.edu/deptimages/Journal%20of%20Energy,%20Climate,%20and%20the%20Environment/7-Chu.pdf.
[10] Supra Note 7.

One more alternative remedy is to calibrate the licensing system pertaining to essential green technologies similar to the telecom sector. Furnishing license of standard-essential patents to interested parties under fair, reasonable and non-discriminatory terms may be adopted as a rule.

We may also think of setting up centres for the development and transfer of environment-friendly technologies, the creation of patent pools and use of public-private partnership in the area of patenting of green technology.

Today, the ultimate aim of Indian policy-makers in the field of green technology is the peaceful coexistence of pro-patent and pro-environment lobbies.

V. CONCLUSION:

It is well established that in Asia, India is taking giant leaps in the domain of green technology and sustainable development. Many environment-friendly policies have been introduced in the past two decades to mitigate the negative impact of industrial development. Systematic regulation of fuel-based industries, commitment towards lowering carbon levels, motivating clean energy technologies, etc. are some prominent steps in the direction of India fulfilling its international climatic goals.

As far as patenting relating to green technology is concerned, India is at a pretty nascent stage. India being a growing economy has to tune its IP policy in order to strike a balance between consumers who are aware of their responsibilities towards the environment and firms which are engaged in green innovation and development. Clearly, India's existing patent mechanism is creating hurdles in the area of diffusion of green technology due to many factors. Either the green patent-holders are not satisfied with the rights provided to them or the patent monopoly is resulting in high prices of environment-friendly technologies.

The policy-makers have to diligently devise efficient licensing standards and perhaps a dedicated patenting plan for climate change mitigation technologies. It is important to invest

capital into the development of such technologies and it would not be possible if innovators are not satisfied by the patent ecosystem as every innovator expects rewards for their skill usage and hard work.

The Indian technology market is getting inspired by the global trend in green technology and remarkable activity in the field has been observed after 2008. However, it is important for the government to properly assess the current trends in the economy to plan the roadmap for the coming decade wherein green growth will be the global focus.