



## Dream Green: Paradigms of Green Technology Commercialization viz-a-viz Green Patents

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A significant effort is witnessed in shifting the innovation and technologies to align them with sustainable development and particularly with the climate change mitigation efforts and so is the number of patents granted – green patents Art 27(2) TRIPS enables exclusion of patentable subject matter prejudicial to the environment but not by mere prohibition by law of a member state; Objectives of Articles 7, 8, TRIPS obliged to be consistent with ‘trade centric’ create a room on enquiry about green patent’s role in balancing the sustainability and trade centered goals Whether terms like ‘unreasonable conflicts’, ‘unreasonable prejudice’, ‘legitimate interests’ under Art 30 of TRIPS would be capable of excepting the green patents? In spite of the obligation on developed countries under Art 66 (2) TRIPS the Least Developed Countries are left to capacitate themselves to adopt the green technology transfer. These provisions and the impact of green patent in the given situations, intrigues the author on a question, whether green patents and commercialization can have any interplay to fit in these provisions. Barriers in accelerated adoption, skill sets in manufacturing and infrastructures, strengthening of supply chain dynamics<sup>1</sup> are already acknowledged. An enquiry of commercialization barriers, in paradigms of green technologies is the broader objective and the role of green patents in such paradigms is the particular objective.

The secondary sources of literature including authoritative and authentic datasets and reports, are relied upon to deduce the findings inductively.

**Keywords:** Green Patents, Sustainable Development, Climate Change Mitigation, TRIPs Commercializing Green Patents, Technology Transfer, IPC Green Inventory, WIPO

### Green Technology, Green Patents and Significance

A significant effort in shifting the innovation and technologies to align them with sustainable development and particularly with the climate change mitigation efforts. The Sustainable Development Goals 07, 11, 13 and 14 together contribute towards mitigating climate changes and sustainable development. The climate change mitigation efforts also need the relevant environment friendly technologies like renewable energy technologies, solar powered technologies, and alike all in all effectively harnessing and exploiting the resources in such a way so as to not cause the damage to environment, or make it sustainable. The technologies environmentally beneficial, related to renewable energy, pollution control, waste management, energy efficiencies are called as green technologies and patents granted to these are also called as ‘green patents. Such technologies are developed with a primary goal of their alignment with environment

sustainability and innovations without causing harm or negative impact on environment, including climate change mitigation. The importance of green technology commercialization also includes the role of grant patents in case applied for and granted. Hence in order to promote and expedite so, the patent offices have offered the specialized channels expedite the patent grant procedures in respect of inventions related to such environment friendly technologies; green technologies.

### Significance of green patents and initiatives

A significant increase in the green patents have been witnessed in past decade, for example World’s top R&D investors own 70% of global climate change mitigation or adaptation patents.<sup>2</sup>

Significance of ‘green patents’ has increased and gaining the momentum. The reported worldwide grant of patents in renewable energy from 2002 until 2019 have increased from 831 to 2,863.<sup>3</sup> The WIPO analysis of mapping patent innovations and United Nations Sustainable Development Goals(SDG) have

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reported almost doubling of the patent families related to environmental and climate related SDGs.<sup>4</sup> These reporting indicate the current investments inclined more in green energy driven innovation and infrastructures in pursuance of climate change mitigation efforts.

### **The Background**

Art 27(2) TRIPS excludes patentable subject prejudicial to the environment but not because of mere prohibition by law of a member state; whereas environment protection laws would always be inclined to prohibit the technology harming the environment and the grant of patent for it might bear the repercussions. Would the green patents be a win-win solution in such situations?

Objectives of Articles 7, 8, TRIPS are 'trade centric' provisions than environmentally sustainable, climate mitigating goals. So, whether the green technologies can really attain the trade centric level of commercialization? The dissemination of green technologies, their commercialization and translation into infrastructure, are all towards environmental sustainability and expected to be relevant to Sustainable Development Goal 7, 13 and 14 mentioned above. So, can the green patents be excepted under Art 30 of TRIPS excepted limitations?

Whether green patents would have an limited exception impact in interpreting the broader terms like 'unreasonable conflicts', 'unreasonable prejudice', 'legitimate interests of owner and third party' mentioned under Art 30 TRIPS?

The obligation under Art 66 (2) TRIPS on developed countries, have not proven effective. The criteria and specificities of technology transfers to the Least Developed Countries are unclear and thus such countries are left to capacitate themselves to adopt the technology transfer. Can green patents add any value to this state of affairs?

These provisions and the impact of green patent in the given situations, intrigues the author on a broader question, whether green patents has a role to fit in, and would become a solution to issues identified in above articles of TRIPS? This question is being explored particularly from a commercialization perspective of green patents

The acceleration in adoption of green technologies is barriered by deficit skills in manufacturing, infrastructures, and need of strengthening of supply

chain dynamics<sup>5</sup> which prompts exploring of the domain additionally.

An enquiry of commercialization barriers, in commercialization paradigms of green technologies is the broader objective and whether the TRIPS articles mentioned above, have any interplaying role for green patents in such context, is the particular objective of this study.

The scope for green technology dissemination and commercialization is more through technology transfers and or harnessing of green technology through self-development in developing and least developed countries. Hence the state of affairs on green patents and technology commercialization is explored in developing and under developed or least developed countries, by relying on the secondary sources of literature including authoritative data and authentic reports, to deduce the findings inductively.

### **Green Patents: Initiatives in Grant Procedures**

The 9<sup>th</sup> Class in International Patent Classification system titled as 'IPC Green Inventory' – a World Intellectual Property Rights Organization (WIPO) initiative - the Eco-Patent Commons taken by four companies in collaboration with WBCSD<sup>6</sup>- the Y02 class relevant to climate change mitigation technologies<sup>7</sup>, the 'green channel' for expediting the green patent applications typically around environment friendly technologies; green technologies, countries announcing 'Green Channel Patent Applications' way back since 2009; UK IP Office<sup>8</sup>, USPTO - Green Technology Pilot Program (now closed), USPTO Climate Change Mitigation Pilot Program – 2021<sup>9</sup>, initiatives for grant of green patents by Korean Patent Office, Japan Patent Office, Australian IP Office, Canadian IP office, Brazilian National Institute of Industrial Property – 2012<sup>10</sup>, are some of the initiative taken across the countries to expedite the green patent grant, and effectively promote the green technology innovation, dissemination and commercialization in market as early as possible. A large number of green patents have been availed globally in last three years<sup>11</sup>; OECD has tracked the number of green patents from 2000 to 2019.<sup>12</sup> The WIPO green patent database reports around 12000 green patents from 2019 to 2022.<sup>13</sup> Further green patent grants and initiatives are aligned towards achieving the Sustainable Development Goals; Goal 13 - while linked to all 16

of other Goals of the 2030 Agenda for Sustainable Development.<sup>14</sup>

The dissemination of green technology however, on one side pose challenges for developing countries in reaping the benefits due to the costs and capacity issues<sup>15</sup>, while on the other, requiring the support by ‘strong / robust IP patent protection’.<sup>16</sup> having high stakes and investments.

### **Harnessing the Green Patents**

WIPO compares the green tech patent to pharma patents and differentiates them as relatively more of conducive as to climate change mitigation efforts than to access to medicine contradiction.<sup>17</sup>

This highlights the need and potential of green technology harnessing and access to it.

European regions have varying capabilities to capture the innovative features, the utilities of the green technologies, patenting them, and the green technology developed so far even in the cumulative proportion in such regions is limited.<sup>18</sup> The contribution of the green patents, in technology transfer, has been found to be real and positive in actual GDP growth but again varies regionally.<sup>19</sup> Interestingly it is also observed that the importance of harnessing the patented green technologies is independent of the corporate power in ‘*efforts to reverse the climate change*’<sup>20</sup> in terms of capabilities..

The role of green patents in general may have been debated as ‘imperfect incentive’ but has been acknowledged to be crucial for research and development.<sup>21</sup> Green patents have been acknowledged as a valid instrument to measure eco-innovation which essentially is about ‘green technologies’.<sup>22</sup> The number of patents granted in India since 2016 to 2021, is 61,186,<sup>23</sup> predominantly on waste management and alternate energy production, energy conservation. Industry emphasizes not only the role of green patents in disseminating green technologies but also in the partnerships in the sectors.<sup>24</sup>

The insights on ownership of green technologies, the organizational dominance in sectors and economies, is scattered geographically between developed and developing countries.<sup>25</sup> However we do see some examples of green technology transfer in such countries.

### **Green Technology Transfer**

Interestingly in spite of such green patent grant trends and initiatives, the external factors and

dynamics have a significant impact on commercialization of green patents and green technology harnessing or transfer. Below are some of the examples and discussion.

### **Least Developing Countries**

Collaborative efforts by World Bank with United Kingdom to minimize the climate changing risks in Tanzania, involved a technology transfer in the areas of drones and survey mapping instruments, during ‘digital terrain modelling’ in the project<sup>26</sup> ‘Building Urban Resilience to Climate Change in Tanzania’. Providing training and technical assistance by United States Government Ambassador’s Water Expert Program (AWEP) is also another example of technology transfer in Uganda, Azerbaijan.<sup>27</sup> Technical assistance in climate change resilient technologies and sustainable wheat production by International Cooperation Agency (JICA) through its programme in Sudan<sup>28</sup>, is yet another instance of technology transfer.

### **Developing Countries**

Green Technology Managers, practitioners, business managers, technology specialists - point out another dimension around green technology dissemination as concerns about, lack of knowledge – technology transfer due to technical risks; technical risks due to lack of ‘operational tests’, lack of prescribed environmental standards leading to lack of specific regulations on Green Technologies.<sup>29</sup>

The ‘readiness index’ reveal, a divide amongst developing countries in capabilities to harness the frontier and green technologies. Least ready countries face incapacity to harness the benefits of basic green technologies even. Whereas the ‘most-ready’ countries harness the frontier technologies including green technologies.<sup>30</sup> Though the efforts and initiatives are undertaken by USPTO partnering with ‘WIPO Green’,<sup>31</sup> in identifying the climate aligned technologies and investing in them even, the ‘access to green technology barriers in climate change action plans’<sup>32</sup> is doubtfully realizable. The ‘*obligation*’ - under Art 66(2) TRIPS, on developed countries to create ‘*sound and viable technological base*’ is relative, undefined. ‘Nationally Determined Contributions’ per se, have not proven to be effective in the recent past; the green technology diffusion ranging across the sectors, ranging through polluted regions, through energy related technology challenges, and in the ways and patterns, reaching to

absorbers and beginners vary, and do not reach even in some cases.<sup>32</sup>

Though the possible way outs like complete exclusion of the green technologies from patentability, through restricted term of 10 years of green patents, up to licensing conditions;<sup>33</sup> have been suggested but only to be rejected.

### Green Patents Commercialization Barriers

Commercializing green innovations depend upon evolution of green markets, consistent adaptation of such green technologies, green ventures, industrial partnership and so on.<sup>34</sup> Approaches like, the strategic collaborative intellectual property sharing, licensing of green patents<sup>35</sup> contribute as well. For example 'Hydrogen Production Technology' is hurdled by competitive pricing, cost effective methods of productions, despite its maturity strength, and competitiveness, and being the most suitable and potential energy source to reduce greenhouse emission'.<sup>36</sup> The strategic sharing in such situations – licensing of patents around it can provide some solutions to such hurdles.

Another instance of a barrier could be about the large consumption, for instance '*the large consumption of natural gas by Dutch households inhibiting the scale-ups of new technologies*'.<sup>37</sup>

The reliance of developing countries on fossil fuel considering the industrial - technology, and infrastructure, is the fundamental aspect for their increased carbon footprints in recent past decades, and without an industrial infrastructure the economic growth is practically impossible.<sup>38</sup> Licensing of Green Patents without royalty, 'Patent Pledges' as in case of Tesla announcement, in the larger goal of development, IBM led 'Eco-Patents Common' in 2006 and closed way back in 2016 didn't result in any increase in diffusion of green technologies in pledged patents.<sup>39</sup> Whereas in certain countries like China, in spite of regional disparity in the green patent transactions, green technology trade transfers are high in demand for green technologies.<sup>40</sup>

Such regional disparities are always attributed to multiple external factors.

While correlating the environment or climate technologies related number of patents implemented and the economic benefits reaped thereby –

Interestingly the latest WIPO report illustrating the mapping between innovation and sustainable development goals have revealed the state of technology development across the SDGs and

highlights growth trends in SDG-related patent. The mapping of patents to the SDG 13 climate action is limited to only AIST Japan, CEA, and ITRI.<sup>41</sup>

The small, medium and large green innovative and non-green innovative firms, varied in their results of economic benefits reaped by implementing the patents owned; the green innovative firms took time varying within the range of three years for corresponding granted green patents based on the size of firm.<sup>42</sup>

### Findings and Conclusion

The green patents secure a win-win place in situations posed by Art 27(2) TRIPS - regarding the restriction of exclusion from patentability of inventions 'prejudicial to environment'- since green patents essentially are aimed towards climate mitigating efforts under SDG 7, 13 and 14.

Green patents as such cannot be accepted under Art 30 TRIPS, since the possibility of bringing the green technologies as exceptions to patent rights would discourage the corporations from investing and commercializing the green technologies undermining the goal of Sustainable Development Goal 7, 11 and 13.

Art 31 TRIPS however may arguably serve as a vital tool in the spirit of environment protection and pose yet another contrast in between the predominant trade perspective and public interest perspective. However, the commercial interests in any case prevails to balance the interest with Sustainable Development Goal 9 with environment friendly context.

The terms like 'sound and viable technology base' under Art 66(2) TRIPS are broad and need to be articulated to understand in terms of, collaborative training programs by developed countries, transfer of technical skills, operations tests, know-how, technology launching and market adaptability techniques accelerating the adoption of such green technologies, and further, all such tailored to address the region specific or market specific green technology commercialization and or transfer hurdles.

### Significant Divide in Developed, Developing and Least Developed Countries

- (i) A significant divide is observed between developing and underdeveloped countries in green technology diffusion<sup>43</sup>; between developing and developed countries as well and is scattered with organizational dominance in the markets.<sup>44</sup>

- (ii) The green patents filed across the countries has been notably increasing since 2009 through 2011, though a decline in 2016 and 2017<sup>45</sup>, but again, from 2017 to 2020.<sup>46</sup>
- (iii) The green technologies export by developed countries for the period of 2018 to 2021 exceeds in proportion as compared to the developing countries, however countries like India, Philippines, Vietnam interestingly are identified amongst ‘over performers’ by exceeding their projected performances in capabilities and investments in harnessing frontier green technologies.<sup>47</sup>
- (iv) An expectation, to identify the green technology transfer, access barriers, and stipulate them in climate change action plans<sup>48</sup> and goals in ‘Nationally Determined Contributions’<sup>49</sup> from developing and least developed countries, has proven not effective.
- (v) Deductions in tax for companies adopting green technologies, licensing deals with developing countries, access to ‘Green Climate Fund’ for remunerating to licensor, have been claimed to seek balancing a strong patent regime and access to technology transfer.<sup>50</sup> The success rate of projects under ‘Green Climate Fund’ is well acclaimed however much is needed

Indian scenario reveals, the lack of IPR awareness, patent enforcement mechanisms, notions like green patents only incentivize higher cost complex technologies, critics on green patent enforcements, legal framework and local bureaucratic dynamics as hurdles for setting up a foreign investment and thus difficulties for green technology dissemination<sup>51</sup>

Nonetheless, a significant green patent trend in India can be found as below:

- (vi) The Intellectual Property Help Desk of European Commission has acknowledged the green patent trends in India.<sup>52</sup>
- (vii) The environmental biotechnology seems to find no place in the 9<sup>th</sup> Class of International Patent Classification system - ‘IPC Green Inventory’. More initiatives addressing it would effectively complement climate change mitigation actions

The willingness of industry is clear, in the investment and efforts undertaken in green technology.<sup>53</sup> For example, of the Indian context in its ‘out-performing’ efforts, to invest in frontier green technologies, the government schemes to boost and

accelerate the solar energy infrastructure, justifies a requirement of a robust, enforceable patent regime in place.<sup>54</sup> The present times are of green technology development, adoption and most importantly the mobilization of green patent resources across regions and amongst the stakeholder.

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