

## Grasping Climate Technology Transfer: A Brief Discussion on Indian Practice

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Technological solutions are imperative for curbing the menaces of climate change. Thus, development of technology and its transfer have become a crucial component in climate negotiations. Within this grandiose set up, intellectual property rights add a new dimension. It is the constant demand of ‘not so rich nations’ that IPRs should not become a hurdle for transfer and allocation of climate technology. Being the third-largest emitter of greenhouse gases, India has been proactive in climate talks and now is ready move ahead with clean energy development. However, for India the obvious conundrum is about framing proper policies and legal rules that would enlarge technology transfer scenario. Simultaneously, poverty alleviation and sustainable development have been a long-standing challenge for India. An effective implementation of the Paris Agreement and climate change action plans would certainly strengthen India’s position in international arena in years to come.

**Keywords:** UN Intergovernmental Panel on Climate Change (IPCC), Framework Convention on Climate Change (FCCC), Kyoto Protocol, Climate Technology Centre & Network (CTCN), climate change, technology transfer, Intellectual property rights, sustainable development

Aldo Leopold, the erstwhile American author, philosopher, scientist and environmentalist, once famously said that “Civilization has so cluttered this elemental man-earth relationship with gadgets and middlemen that awareness of it is growing dim. We fancy that industry supports us, forgetting what supports industry.”<sup>1</sup> Perhaps, this ornate observation stemmed from a deep and profound ecological concern that shaped Leopold’s remarkable contributions towards conservation of nature. Today, our predicament stands on much simplistic assumption – we have gone too far with our machines and technology and now they are our only hope for a greener and cleaner future.<sup>2</sup>

Barring a debate here and there,<sup>3</sup> our obsessive dependency on technologies has made us to believe that modern and ever growing technologies have remarkable healing power and solutions for all environmental problems. Apparently, technological solutions are imperative for curbing the menaces of climate change.<sup>4</sup> Thus, development of technology and its transfer has become a crucial component in climate dialogs.<sup>5</sup> Within this grandiose set up, intellectual property rights (IPRs) add a new dimension.

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India, the third-largest emitter of greenhouse gases, has been proactive in climate talks and now is ready to move ahead with clean energy development. While, the United States under the Trump administration showing disinclination towards the Paris Agreement,<sup>6</sup> India sensibly feel the urge to keep its commitments going under the Paris Climate Agreement.<sup>7</sup>

However, for India the obvious conundrum is about framing proper policies and legal rules. Also, implementation of such policies and rules in the ‘right’ framework is particularly crucial, both in securing socio-economic rights of suffering (Mostly poor and marginalized) classes and selecting ‘right’ option (presumably decisions based on scientific and technological understanding). India does not have a very heartening history when it comes to implementing environmental policies and laws. The conflicts between judiciary and executives or legislature on environmental issues have been a recurrent theme over the last few decades. Whereas, such conflicts are fairly common in many parts of the world, in India, the disagreements ravine deep in sociopolitical differences. Climate change and its mitigation encompass multitude of complex set-ups within which institutions of this country have to react and react in time. Assumptions as mystifying as technological perils and its benefits must be measured with caution. Thus, any telling shake-hands between IPRs and technological development, leading to a

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‘more’<sup>8</sup> greener future depends on how we can define the undefined.

Although, there is a common consensus now that IPRs are the essential drivers for innovation, how the environment can be benefitted from it is unclear. In India, IP regime is shrouded by a ‘classic paradox’. In one hand, they aim to inspire innovation and originality and on the other, ‘they have themselves been shielded from innovation experimentation’.<sup>9</sup> No wonder, Francis Gurry, the WIPO Director General, said that ‘for intellectual property to be an empowering mechanism, it has to provide business and industry with the tools to enable them to convert the fabled intellectual and cultural richness of India into economic wealth’.<sup>10</sup>

Also, poverty alleviation and sustainable development have been long-standing challenges for India. An effective implementation of the Paris Agreement and climate change action plans, visualized sufficiently in the Nationally Determined Contributions (NDCs), involve enormous financial resource requirements.<sup>11</sup> Therefore, it is important for India now to allocate its resources judiciously, not giving undue priority to any particular sector.

This paper aims to evaluate India’s desires, determination and enigma in mitigating climate change problem. As the country with its growing population is slowly but surely moving towards the point of no return, robust decision-making in terms of developing and disseminating climate-friendly technology is vital. It is certainly a big challenge for India to strike a right balance between its IPR regime, domestic and foreign trade policies for enhancing green technology transfer process.

### **Climate Change as We Cognize**

Climate change is a ‘contestable reality’. Being a complex phenomenon, a normative conceptualization of climate change may take us to a turbulent ground where believers and skeptics vigorously collide with each other. Those who put forward argument to prove imprecision in climate change, however, do not make it contingent anymore. Climate change as a reality is too entrenched now that it cannot be overthrown by any superfluous side-wind of disbelief. Simply speaking, climate change has become a term that provides a ‘generally accepted certainty’ without compelling us to think much into intricate scientific understanding. The contest perhaps ensues in another level where political argument over the framing or

implementation of policy, rules, and regulations relating to climate change takes place. Here, at this level the search for semantic solution often lead us to a stalemate situation because most political scuffles are self-motivated.

Quite rightly, hence, in its Fifth Assessment Report, the UN Intergovernmental Panel on Climate Change (IPCC) concluded that climate change is real and human activities are the main cause.<sup>12</sup> The Report gives us a grim reality. As per the Report, from 1880 to 2012, the average global temperature had increased by 0.85 °C. From 1901 to 2010, the global average sea level rose by 19 cm as oceans expanded because of warming and more ice melted. The sea ice extent in the Arctic has disappeared in every successive decade since 1979, with  $1.07 \times 10^6$  km<sup>2</sup> of ice loss per decade. The world’s oceans will continue to be warm and ice will melt constantly. Therefore, average sea level rise is predicted to be 24–30 cm by 2065 and 40–63 cm by 2100 relative to the reference period of 1986–2005. What is more worrisome is that most of these aspects of climate change will persist for many centuries, even if emissions are stopped.<sup>13</sup>

The list can go on and the physical effects of climate change on society may be measured by the experts world over. From legal standpoint also climate change creates many intricate problems worldwide. Uncertainty prevails in terms of predicting how society will respond to rising level of pollution in villages and cities. Economic losses resulting from abrupt and devastating climate events are difficult to mitigate. Political responses to larger public demand ideally should be balanced against the interests of the small group of short-sighted industrialists. Hence, the solutions for climate change amidst these complex set up are bound to be intricate and exploratory in nature.<sup>14</sup>

For India, the climate change has already become a spectacle. From students to scholars, NGOs to government organization and small business entities to large corporate giants, all embrace it in both hands. Many of these efforts, perhaps, again self-motivated but at least it is encouraging in a sense that now we are ready to talk about it (and for environment) expressively. But it is important to remember that in India environmental tussles overwhelmingly originate from resource-distribution conflicts. For India, it may not be prudent to say, what Jurgen Habermas has claimed of the European green movement, namely, that it is ignited not ‘by problems of distribution, but by concern for the grammar of forms of life.’<sup>15</sup>

In India, they are certainly not post-materialistic<sup>16</sup> and knowingly, connected with intense livelihood issues and basic human rights.<sup>17</sup>

Problem of climate change is indeed no different and the method of domestically tackling it by a state must be according to the social conditions prevailing in that country. This depends again on that state's external manifestation to comply with its international commitments. In other words, it is entirely up to the state to rationalize its preferential treatment given to one particular group. In the absence of proper justification, amidst stark inequality, the poor communities are always the sufferers. Then they desperately rely on direct actions to resist the state and other exploiters, giving birth to a different kind of conflicts.<sup>18</sup>

### **Outlining Technology Transfer**

Defining technology transfer ought to be simple. It should happen (at least ideally) when a holder of a technology decides to allocate it on agreed terms to someone who values or in need of such technology. However, away from this informal understanding, the technology transfer involves sophisticated layers.

Further, the development of technology and its transfer to the highest valued purchaser has received sporadic attention worldwide. Solving climate change problem entails an incredible sophistication in the field innovation and distribution of energy efficient technologies. But what are climate-friendly technologies? In common parlance, technologies that help in lessening of greenhouse gas emissions and escalate the energy efficiency may be called as climate-friendly technologies.<sup>19</sup> These technologies can include equipment used in cleaner and more efficient resource use and power generation, waste water recycling and cleaning units, green computing, solar technology etc. Technology transfer means disseminating these environment-friendly technologies, with essential knowhow to create them, from one entity to another (predominantly from technology-rich to technology-poor nations).

This idea for the first time gained prominence in the international scenario under the Framework Convention on Climate Change (FCCC).<sup>20</sup> Article 4 of FCCC provides that all parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall give full consideration to what actions are necessary under the

Convention, including actions related to funding, insurance and the transfer of technology, to meet the specific needs and concerns of developing country parties arising from the adverse effects of climate change and/or the impact of the implementation of response measures. Also, the parties shall take full account of the specific needs and special situations of the least developed countries in their actions with regard to funding and transfer of technology.<sup>21</sup> This commitment is reverberated in like manner under Article 10(c) of the Kyoto Protocol.<sup>22</sup> At COP 7, as part of the Marrakesh Accords, parties further agreed to work together on a set of technology transfer activities, grouped under a framework for meaningful and effective actions to enhance the implementation of Article 4.5 of the FCCC. Through the Poznan Strategic Program on Technology Transfer, the Global Environment Facility (GEF) provides funding to climate technology development and transfer activities. The programme encompassed three windows: (a) Technology Needs Assessments (TNAs), (b) Piloting priority technology projects linked to TNAs and (c) Dissemination of GEF experience and successfully demonstrated environmentally sound technologies.<sup>23</sup>

Progressively, a trend has emerged in terms of linking sustainable development with the technology transfer. To get rid of poverty and unsustainable developmental pattern in years to come technological solutions are imperative and Post-2015 Development Agenda and the Addis Ababa Action Agenda may be useful in that regard.<sup>24</sup>

Paris Agreement in fact establishes a technology framework to provide overarching guidance to the technology mechanism. Article 10, Paragraph 4 of the Paris Agreement provides the technology framework. In order to fulfil cherished dream on technology development and transfer, the framework provides central guidance to the technology mechanism in promoting and facilitating enhanced action on technology development and transfer.<sup>25</sup>

However, what remains contentious how and on what terms a nation may acquire these technologies. One of the ways for acquiring technology is Foreign Direct Investment (FDI) by Global Multinational Enterprises (MNEs). Though, conventionally treated as a lucrative option, how does FDI intermingle with commercial development in host countries remain a touchy issue.

The markets of developing countries' are constantly on the move to explore the myriad promises that FDI

may breed for them. Researches have shown that this may have both tapering and widening influence in the market.<sup>26</sup> Pol Antr`as, Mihir Desai and C. Fritz Foley in their paper develops and examines a model of the operational and financial decisions taken by the firms as they exploit their technologies in countries having differing levels of investor protections. Their model shows that MNC activity and FDI arise from within in situations marred by financial chafing.<sup>27</sup> Apart from these risk allocation paradigm, there exist other important criteria. For example, the Cost effectiveness of technology transfer. It is necessary that average and marginal costs must be assessed and compared to alternate options. The benefits arising out of technology transfer must surpass its costs involved. Private sector enterprises, particularly when they act as buyers, essentially look at it from profit maximizing perspectives. Before making decision they try to identify all the risks associated with technology transfer. The cardinal rule for them shall be the benefits of a technology must beat its procurement costs.<sup>28</sup> On the other side, the suppliers of technology will only be keen to sell their technology, assuming that the price received for it surpasses the costs of supply. IP, especially patent, plays a determining factor here. The lack of patent protection may discourage the sellers as uncertainties are not only difficult to measure but also problematic to allocate.<sup>29</sup> From macroeconomic perspective, there are some more factors that may affect the technology transfer. Some of these factors are GDP change, jobs created or lost, effects on inflation or interest rates, implications for long-term development, foreign exchange and trade, other economic benefits or drawbacks, differential impacts on countries and income groups or future generations.<sup>30</sup>

Nonetheless, climate technology transfer with IP issues involved, give birth several delicate concerns. IP is potentially both an incentive and an obstacle to the transfer of technology. IPs like patents, trademarks or trade secrets often are crucial. Though, patent is the most important IP when climate-friendly technologies are being transferred. Here, TRIPS Agreement plays a very important role.

TRIPS provide the overall standards for the protection of IPs. Section 5 and & 7 of the TRIPS Agreement are the most pertinent provisions for the protection of IP involved in green innovations.<sup>31</sup>

Under the TRIPS, incentivisation of the domestic players by the developed nations is the key. This may

help them to decide on delicate economic as well as front and back-end cost allocation issues at the earliest which in turn facilitate the technology transfer to the buyer countries. It is also to be seen that IP protection should have contributing effect in the field of innovation and transfer of technology.

Largely, in TRIPS there is nothing to restrain a member state from reviewing their IP laws. They are free to take actions to endorse the varied diffusion of technologies relevant to climate change adaptation and mitigation, including those covered by IP rights. All they have to do is to remain TRIPS compatible, including on the payment of remuneration for non-voluntary licences. Though, a state can very well use those technologies that are in the public domain.<sup>32</sup>

In addition of TRIPS, Article 10 of the Paris Agreement also establishes a technology framework for indorsing enhanced action on technology development and transfer. The idea envisaged in Article 10 is complementary to Article 2 of the Agreement in which the importance of the development and its transfer is considered as key element to mitigate climate change. Accordingly, Parties are required to undertake technology needs assessments (TNAs) to decide their climate technology priorities.<sup>33</sup>

There is no doubt that a foremost adjustment in our lifestyle and market mechanism all over the world is required to realize the desired effects of these initiatives. Not that the change is not taking place. During Kyoto Protocol regime under the garb of Clean Development Mechanism (CDM) the process was markedly promoted and appreciated. On 16 November 2016, the developed countries decided to pledge US\$23 million cumulatively to the Climate Technology Centre & Network (CTCN) to support technology transfer to developing countries. This is a significant initiative to provide request-oriented and tailored assistance for capacity building and technology in developing countries.<sup>34</sup> It is, though, to be noted that the pledges do not visualise that there should be a transfer of intellectual properties to developing countries. They are rather only the means to get expert opinion and aid in identifying and setting up relevant technologies. Even this distinctive initiative is not enough. Now, when Kyoto is dead, Paris is still a baby and the world is still debating over acceptable terms and conditions for transfer of green technologies, more urgency is required as the magnitude of the problem is too overwhelming.

### Understanding Obstructions in a Nutshell

Over the decades in climate talks, India has not altered its position much except in last few years it has begun to take more active role in shaping the global climate scenario. What helps India is its vast diversified market and human resources. But on the contrary In India there is lack of insight and efforts to curb domestic pollution. The government is constantly diluting the environmental norms that come in opposition to economic and industrial development. It is time for India to understand 'meaningfully' that climate change is an "aggregate efforts global public good", which basically means everyone needs to pull together to be successful. Professor Dave Frame and H. Damon Matthews are of the opinion that this is difficult. The problem with climate diplomacy and the reason it took so long to negotiate a global agreement, is that the motivations for countries to deal with climate change are collectively strong but individually weak.<sup>35</sup>

Further, there seems to be a clear contradiction in international understanding. For a long time, one of the major focus of international community has been to ensure sustainable development. Even with dissimilar ideology, it is well understood that conservation is the precondition for all forms of development. Jeffrey A. McNeely of the International Union for the Conservation of Nature (IUCN) once interestingly observed:

*..... future consumptions depend to a considerable extent on the stock of natural capital. Therefore, conservation may well be a precondition for economic growth. Conservation is certainly a precondition for 'sustainable development', which unites the ecological concepts of carrying capacity with the economic concepts of growth and development.*<sup>37</sup>

However, the development of climate technology which ideally should take place in real quick time, includes lucrative commercial opportunities for nation as well for MNCs. Such technology, when put in use, may give green benefit to the society. But neither of the stakeholders are ready to ponder over any timeline.<sup>37</sup> This gets more complicated when we consider socio-economic dimension of the problem. Evidently, sustainable development includes socio-economic aspects. But how far such aspects can be counter-balanced by business strategies is unclear. This is particularly important for India as the protection of such rights historically had given by the judiciary in the presence of considerable legislative ignorance and

executive indifference. Then, climate technologies are nothing but green resources. IPRs that interact with such technology are inevitably become the part of the green resources. Definitely, the self-driven motivation of IPR regime coupled with legitimate business interests stand in direct conflict with more equitable paradigm of green resource allocation.

Let us consider a practical scenario. India cannot afford to embark on a juvenile approach for its industries by protecting renewable and other related industries. Global exports of the identified environmental goods as in 2015 stood at \$492 billion. In that India's share is only \$3 billion. The import of environmental goods by India on the other hand was three times more, at \$9 billion, displaying significant differences. This shortage can be plugged in by allowing investments in products that are triggering this trade deficit. There is an enormous electricity demand in India as industries and communities grow and get connected to grids. Today, only a small number of homegrown companies are capable of developing the necessary in-house technologies and components for a finished environmental product. International alignment is, thus, necessary for creating strong regional and global environmental goods supply chains. India has by far opposed the Environmental Goods Agreement,<sup>38</sup> dreading that this may be used by the developed countries as a new trade-restrictive measure.<sup>39</sup>

This conundrum is amply reflected in WTO Solar Dispute Case between India and US, where WTO eventually ruled in favour of US. US made a complaint against India's decision to enforce certain domestic content requirements (DCRs) on solar power developers. It was particularly made clear that the developers were required to produce designated categories of solar cells and modules only in India.<sup>40</sup> WTO found that India's measure was trade restrictive and discretionary.<sup>41</sup> The decision is certainly a questionable one. If we consider that India has a binding obligation as per Paris Agreement to put forward NDCs, then it should have some flexibility in terms of determining its own strategies. So far so good, when we further contemplate article XX (b) and (g) of the General Agreement on Tariffs and Trade<sup>42</sup> - India should develop its domestic market indigenously to protect its own environment and contribute to global cause. However, any 'ought' norm should be scrutinized carefully in the context of specific treaty obligation. Paris Agreement leaves no uncertainty regarding the legal character of NDCs as its Parties can only submit NDCs in relation to mitigation of climate

change<sup>43</sup> and mitigation process is certainly clothed with ‘collective action flavor’. Thus, any measure for developing domestic market to produce clean energy has to be seen as an integral part of international initiatives which makes it amenable to TRIPS compliance. Certainly, WTO was technically correct. Still, hind side it becomes somewhat hard to fall in line with WTO’s rational, especially when we consider the ethical dimension of climate change problem.

Thus, the reality can be thornier than the theories. Patents may produce doles both in terms of investment and commercialization of resources. But they are problematic to calculate at present. So what should be the way forward?

### Conclusion

India is standing in the midst of transition. Apart from policy measures, its IP regime has grown considerably over the period of times. In 2010 a study, led by the United Nations Environment Program (UNEP), revealed that 80 percent of patent applications for clean energy technologies, for example wind and solar energy systems, were filed in just six countries. Japan had the largest number of patent filings, followed by the U.S. and then Germany, Korea, the U.K., and France. The study also revealed that less than half, approximately 42 percent, had got into licensing agreements with players in developing countries in the previous three years. Just 5 percent of those surveyed indicated that they often enter into licensing agreements with developing countries, while 17 percent said they occasionally do and 25 percent said they rarely do.<sup>44</sup> It is noteworthy that some of the countries that are identified in the study filling the patents are also involved in Environmental Goods Agreement in Geneva.<sup>45</sup> Therefore, it is important for India to participate meaningfully in the Environmental Goods Agreement. Tariff liberalization in environmental goods will certainly facilitate production of energy efficiency technologies in India by lowering costs.

India should also think earnestly how to integrate innovation with sustainable development. As it is correctly articulated that understanding is a necessary precondition for the development of carefully targeted interventions to counteract the power imbalances that inhibit realizing the full potential of innovation. Actors with convening power should facilitate sharing across disparate communities of practice.<sup>46</sup>

It is not too dark for India at present, though. It has taken some significant domestic measures already to

expedite climate change mitigation. It has already established the National Designated Entity for Reducing Emissions from Deforestation and Forest Degradation. The key functions of it include: (i) identification of possible needs and gaps in coordination support; (ii) improvement for the effectiveness of finance (result-based finance, technology and capacity building); (iii) sharing of information on knowledge, experience and good practices; (iv) exchange of information as per the FCCC requirements and (v) approval of national level REDD+ proposal for submission to FCCC. India has also established the National Designated Entity for Climate Technology Centre and Network and Technology Executive Committee. The important functions of these entities include: (i) leading and coordinating the formulation, selection and submission of requests for the implementation of Climate Technology Centre and Network response assistance; (ii) foster collaboration and access to information and knowledge to accelerate climate technology transfer in the country and (iv) strengthen network, partnership and capacity building for climate technology transfer.<sup>47</sup> All India needs to do is to put them in practice as its age of innocence is over and it must take the lead role in marking and defining the new frontier of IP innovation, technology transfer and solving climate change problem.

### References

- 1 Leopold A, *A Sand County Almanac and Sketches Here and There*, (Oxford University Press, USA), 1968, first published in 1949, p. 178.
- 2 Cleaner not necessarily mean greener – not at least when we realize that global space for living is shrinking.
- 3 Critics like Barry Commoner, Paul R Ehrlich & John Holdren while developing controversial I=PAT equation raised doubt about the influence of technology in solving environmental problems. Similarly, Paul Ekins also voiced different opinion about utility of technology inn ecological matters. Ekins Paul, *Economic Growth and Environmental Sustainability: The Prospects for Green Growth*, (Routledge, UK), 1999.
- 4 In this paper, I assume (somewhat arbitrarily) that climate change demands technological solution in terms of its development and transfer. The lack of theoretical justification and mathematical uncertainty are the reasons and such debate far exceeds the scope of current discussion thread. Even though we mostly admit that technology can help in mitigating climate change, it is just a part of the overall solution. We are also required to change our consumption patterns. Improved efficiency of resource should not lead to blatant increase in consumption. Otherwise, as per the classic rebound effect, efficient technology will only take us to the age of oblivion.

- 5 For example, the Bali Action Plan is divided into five main categories: shared vision, mitigation, adaptation, technology and financing. The shared vision refers to a long-term vision for action on climate change, including a long-term goal for emission reductions. The AWG-LCA subsequently split the work streams into components under those five parts. For discussion refer, *Now, up to and beyond 2012: The Bali Road Map*, [http://unfccc.int/key\\_steps/bali\\_road\\_map/items/6072.php](http://unfccc.int/key_steps/bali_road_map/items/6072.php) (accessed on 26 September 2017).
- 6 Nevertheless, general consensus in US is towards the support for strong climate action.
- 7 Speaking with reporters at a joint press conference with German Chancellor Angela Merkel in May 2017, Indian Prime Minister Mr. Narendra Modi underscored the need to act against climate change: “Playing with the well-being of future generations would be an immoral and criminal act”, <https://www.nrdc.org/experts/india-leads-climate-action-trump-withdraws-paris> (accessed on 26 September, 2017).
- 8 This depends on understanding based on quantification of where we are now and where do we want to be and when.
- 9 Basheer S, An IP policy with no innovation, *The Hindu*, 17 May 2016.
- 10 DG Gurry Welcomes India Workshop on Enforcement of Intellectual Property Rights; [http://www.wipo.int/about-wipo/en/dgo/news/2017/news\\_0050.html](http://www.wipo.int/about-wipo/en/dgo/news/2017/news_0050.html) (accessed on 17 August 2017).
- 11 *Economic Survey 2016-17*, Ministry of Finance, Department of Economic Affairs Economic Division, Government of India.
- 12 The expression ‘anthropocene’, coined first time by Eugene Stoermer and popularized by Nobel Laureate Paul Crutzen, is good enough to reveal the risks – we live in an era that threatens our survival possibility.
- 13 IPCC Fifth Assessment Report, taken by the members of the IPCC at its 28th Session (09-10 April 2008, Budapest, Hungary), <https://www.ipcc.ch/report/ar5/> (accessed on 21 September 2017).
- 14 For example, climate change litigations to quench the anti-environmental industrial hunger have become common in many countries. But its use to combat climate change problem is unique in nature as it re-states the viability of an old common law doctrine in addressing today’s one of the difficult and defused environmental problems. Thus, how an old tried and tested legal structure will fit into quick problem-solving approach is seemingly uncertain. At the international level this becomes even more acute because of lack of forum and standing.
- 15 Guha R & Alier-Juan Martinez, *Varieties of Environmentalism: Essays North and South*, (Earthscan, UK), 1997, Reprinted in 2006, p. 21.
- 16 In sociology, post-materialism is the transformation of individual values from materialist, physical, and economic to new individual values of autonomy and self-expression. The term was first coined by Ronald Inglehart in 1970.
- 17 Some of the landmark decisions of Indian judiciary include, *Rural Litigation & Entitlement Kendra v State of Uttar Pradesh*, AIR 1985 SC 359; *Olga Tellis v Bombay Municipal Corporation*, AIR 1986 SC 180; *Samatha v State of Andhra Pradesh*, AIR 1997 SC 3297 etc.
- 18 Some of the cases where Green Tribunal in India already have addressed climate change are *Court on its own Motion v State of Himachal Pradesh &Ors.*, Application No. 237 (THC)/2013; *Gaurav Kumar Bansal v Union of India &Ors.*, Original Application No. 498 of 2014; *Ratandeep Rangari v State of Maharashtra &Ors.*, Application No.19/2014 (WZ); and *Indian Council for Enviro-legal Action v MoEFCCand Ors.*, Original Application No. 170 OF 2014. But the most notable is *Ridhima Pandey v Union of India*, 2017, pending with NGT. This is India’s first climate change litigation drawing inspiration from *Juliana v United States*, 2017.
- 19 Srinivas K Ravi, Climate change, technology transfer and intellectual property rights, *Research and Information System for Developing Countries*, 2009, p. 2.
- 20 Adopted on 9 May 1992, entered into force on 21 March 1994.
- 21 The United Nations Framework Convention on Climate Change is an international environmental treaty adopted on May 9, 1992 and opened for signature at the Earth Summit in *Rio de Janeiro* from 3 to 14 June 1992.
- 22 Article 10(c) of Kyoto Protocol provides: *All parties..... shall cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries, including the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector, to promote and enhance the transfer of, and access to, environmentally sound technologies.*
- 23 Countries created the PSP in 2007, when the Conference of the Parties (COP) requested the GEF to elaborate a strategic programme for scaling up the level of investment for technology transfer. This was undertaken with the aim of helping developing countries to address their needs for environmentally sound technologies. In 2008, the GEF Council approved a strategic programme on technology. COP 14 renamed this programme the Poznan strategic programme on technology transfer. In 2010, the GEF submitted to the COP a plan for the PSP’s long-term implementation. This plan contained five elements: support for climate technology centres and a climate technology network; piloting priority technology projects to foster innovation and investments; public-private partnership for technology transfer; TNAs; and GEF as a catalytic supporting institution for technology transfer. *Poznan Strategic Program on Technology Transfer*, Available at <http://unfccc.int/ttclear/support/poznan-strategic-programme.html> (accessed on 23 September 2017).
- 24 In 2012, the UN Conference on Sustainable Development (“Rio+20”) called for identifying technology facilitation mechanism. The Addis Ababa Action Agenda, in its paragraph 123, decided to establish a technology facilitation mechanism. The mechanism will be launched at the United Nations summit for the adoption of the post-2015 development agenda in order to support the sustainable development goals. Sustainable Development Knowledge Platform; <https://sustainabledevelopment.un.org/topics/technology> (accessed on 23 September 2017).
- 25 UNFCCC eHandbook, Available at <http://bigpicture.unfccc.int/> (accessed on 20 September 2017).

- 26 On the one side, declining transportation costs, significant differences in factor prices, and slowing growth rates in developed countries drove an increasing number of firms to establish operations abroad. On the other side, many governments, seeing FDI as key to bringing the capital, technology, and know-how needed to move their economies from traditional activities to higher-end manufacturing and services, not only liberalized flows but actively competed for FDI with a variety of preferential incentives and policies. Alfaro Laura & Chauvin Jasmina, *Foreign Direct Investment, Finance, and Economic Development*, Chapter for *Encyclopedia of International Economics and Global Trade*, (2016), p. 2; Calvo, Leiderman G A L & Reinhart C M, Inflows of capital to developing countries in the 1990s, *Journal of Economic Perspectives*, 10 (1996)123-139.
- 27 The model considers the problem of a firm that has developed a proprietary technology and is seeking to deploy this technology abroad with the help of a local entrepreneur. A variety of alternative arrangements, including an arm's length technology transfer or directly owning and financing the entity that uses it, are considered. Antr'as Pol, Desai Mihir & Fritz C, *Multinational firms, FDI flows, and imperfect capital markets*, *The Quarterly Journal of Economics*, MIT Press, 124 (3) (2009), 1172.
- 28 For example, companies usually employ risk weighting to adjust the discount rate that they use for calculating costs and benefits associated with specific projects. *Methodological and Technological Issues in Technology Transfer*, <http://www.ipcc.ch/ipccreports/sres/tectran/index.php?idp=15> (accessed on 20 September 2017).
- 29 The suppliers of technology may also become apprehensive about the risk of their technology being copied without any payment, resulting in an inability of the supplier to recover the costs sustained in research, development and commercialization. *Methodological and Technological Issues in Technology Transfer*, <http://www.ipcc.ch/ipccreports/sres/tectran/index.php?idp=15> (accessed on 20 September 2017).
- 30 *Methodological and Technological Issues in Technology Transfer*, <http://www.ipcc.ch/ipccreports/sres/tectran/index.php?idp=15> (accessed on 20 September 2017).
- 31 Section 5 of TRIPS deals with patents and Section 7 deals with protection of undisclosed information.
- 32 As a patent has not been applied for and granted in that territory (as is often the case in developing and least developed countries), or the patent has expired. Taubman Antony & Watal Jayashree, *The WTO TRIPS Agreement – A Practical Overview for Climate Change Policymakers*, Documentation used in technical cooperation activities of the WTO's Intellectual Property Division, (2010), p. 19 [https://www.wto.org/english/tratop\\_e/trips\\_e/ta\\_docs\\_e/8\\_3\\_overviewclimatechange\\_e.pdf](https://www.wto.org/english/tratop_e/trips_e/ta_docs_e/8_3_overviewclimatechange_e.pdf), (accessed on 26 September 2017).
- 33 Since 2001, more than 85 developing countries have undertaken TNAs to identify their technology needs for mitigation and adaptation. Since 2010, as part of their TNAs, developing countries have also developed technology action plans (TAPs), which are concrete action plans for the implementation of their prioritized technology needs. The GEF provides support for developing countries to undertake TNAs through its Poznan Strategic Program on Technology Transfer. UNFCCC eHandbook, Available at <http://bigpicture.unfccc.int/> (accessed on 20 September 2017).
- 34 As a UN institution and the implementation arm of the Technology Mechanism, the CTCN helps countries to realise their commitments under the Paris Agreement. In effect, the CTCN operates as an expeditor in binding expertise from a network of over 230 technology institutions from several sectors around the world for usage in developing countries as per their requests. Apparently, the CTCN has received 160 requests for support from different countries to tackle climate change.
- 35 Frame Dave and Matthews H. Damon, *Keeping Global Warming to 1.5 Degrees: Really Hard, but Not Impossible*.
- 36 Jeffrey A. McNeely, *Economics and Biological Diversity: Developing and Using Economic Incentives to Conserve Biological Resources* (Gland: IUCN, 1988), p. 2.
- 37 The standard economic theory says that efficient resource allocation should have the effect of maximizing utility from consumption. If we accept the use of time discounting as a method of comparing the economic values of consumption in different time periods, then sustainability appears to mean nothing more than efficient resource allocation, a concept already well-established in economics. This theory is known as the time preference theory which is particularly important in microeconomics. With time preference comes time discounting. For the purposes negating the future risks involved, future costs and benefits are converted into present value in order to make them comparable with each other. This is known as time discounting. In other words, the discount rate is a rate used to convert future economic value into present economic value. For instance, if Rahim offers Ram to pay Rs. 105 a year from now, the present value is Rs. 100 if Ram would earn interest of Rs. 5 on a deposit of Rs. 100.
- 38 Eighteen participants representing 46 WTO members are engaged in negotiations seeking to eliminate tariffs on a number of important environment-related products. These include products that can help achieve environmental and climate protection goals, such as generating clean and renewable energy, improving energy and resource efficiency, controlling air pollution, managing waste, treating waste water, monitoring the quality of the environment, and combating noise pollution. [https://www.wto.org/english/tratop\\_e/envir\\_e/ega\\_e.htm](https://www.wto.org/english/tratop_e/envir_e/ega_e.htm) (accessed on 26 September 2017).
- 39 Mazumder R, India's role in green tech transfer talks, *The Business Line, The Hindu*, (accessed on 17 April 2017).
- 40 Pursuant to India's ambitious policy, *i.e.* Jawaharlal Nehru National Solar Mission (JNNSM), these developers were providing electricity to government and its various wings. This was tied up closely with National Solar Mission of the country.
- 41 [https://www.wto.org/english/tratop\\_e/dispu\\_e/cases\\_e/ds456\\_e.htm](https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds456_e.htm) (accessed on 4 April 2018).
- 42 Article XX: General Exceptions: Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures: ..... (b) necessary to protect human, animal or plant life or health; .....(g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption.



- 43 Article 4.2: Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.
- 44 Patents and clean energy: bridging the gap between evidence and policy, Summary of the report prepared by UNEP, Full report is available at [www.epo.org/clean-energy](http://www.epo.org/clean-energy); <http://blogs.ei.columbia.edu/2016/10/19/protecting-intellectual-property-while-mitigating-climate-change-can-we-do-both/> (accessed on 26 September 2017).
- 45 For example, Japan, U.S., Germany, Korea, the U.K. and France.
- 46 Anadon Laura Diaz *et al.*, Making Technological Innovation Work for Sustainable Development, Faculty Research Working Paper Series, Harvard Kennedy School, (December, 2015), *RWP15-079*, 16.
- 47 *Indian 2017*, Additional Director General, Publications Division, Ministry of Information and Broadcasting, Govt. of India, (2017).