Facilitating Technology Transfer for Climate Change Mitigation and Adaptation

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Introduction

It is now well recognized that technology can play an important role in climate change mitigation and adaptation. While some existing technologies if diffused properly can bring down emission of greenhouse gases, there is potential for development of new technologies that can help further. It has been estimated that using currently available technologies if 20% of energy is conserved in developing countries, the increase in CO_2 emissions from developing countries from 2000 to 2020 would decline to almost half (METI 2004). Effective and timely development, deployment and transfer of technology in developing countries are crucial for a concerted global action towards tackling the challenges posed by climate change. The UNFCCC text recognized parties' commitment to promote and cooperate in technology development, application and diffusion, including transfer. The Bali Action Plan recognized technology development and transfer to support action and mitigation as a specific action point.

Effective and timely development, deployment, and transfer of technology in developing countries are crucial for a concerted global action towards tackling the challenges posed by climate change.

Development and diffusion of technologies are quite complex processes with several factors contributing to it. There have been various reasons cited for the lack of technology development as well as transfer in developing countries. The reasons cited by developed and developing countries are often divergent. IPRs remain one of the most contentious issues in this regard in the climate change negotiations. While developing countries have stressed that IPRs need to be addressed as a barrier within the technology transfer discussion, developed countries continue to maintain that IPRs are indispensable to ensure innovation for technology development and deployment. The primary contention of developed countries has been that weak IPRs in developing countries constitute the biggest barrier to technology transfer, though evidence bears out that developing countries have TRIPS compliant regimes and some have even adopted TRIPS Plus provisions, owing to pressure from developed countries through FTAs. Also the contention that IPR enforcement is slack in developing countries does not carry much weight. According to Nanda and Srivastava (2009), in the particular context of clean technology transfer, companies in developing countries are not infringing patents either because they are respecting the patent rights or are not capable of using the patented knowledge.

Though climate change mitigation is something that needs to be taken as a global challenge and acted upon decisively, it is now also recognized that some degree of climate change is going to take place irrespective of the actions taken by global community now. Moreover, such climate change is going to affect developing countries disproportionately. Thus, adaptation

to climate change is essential, particularly for developing countries. Like mitigation, technology can play an important role in adaptation as well. Needless to say, intellectual property rights can have implications for adaptation technologies as well.

Possibility of IPR acting as barrier

There is no definite manner in which intellectual property rights and technology transfer impact each other. The impact can be varied from country to country, technology to technology and the stage of development or maturity of the technology. Whether IPRs act as a barrier or not has been a subject of debate in literature as well as negotiations in different fora. The barriers could operate at different levels.

The most obvious and direct barrier that IPRs pose for technology transfer and uptake is in the form of high license costs. While the license costs alone may be trivial in several technologies, they are high in leading edge energy technologies with climate mitigation potential. There is no doubt that IPRs are a premium that the developing countries have to pay in order to acquire the ESTs. But the serious issue is how big is the premium and also the time horizon over which the technology will have its impact, i.e basically the expected time between investment in development of a new technology and the payoff. If the technology is expected to yield good results over the long-term, it makes economic sense to acquire the technology even by paying a high premium and in that case the real IPR cost will be less as calculated by the net present discounted value. On the other hand if the technology is expected to yield returns only in the short run, but a country has to meet stringent environmental regulations, for which the technology has to be acquired, in those cases the real IPR cost is high. But again such an assumption is true only in the perfect information scenario.

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However, the importance of technology transfer in terms of actions aimed at mitigating climate change is widely accepted now. The differences lie in (i) who/what is responsible for the lack of it (ii) the role that IPRs can play in restricting or facilitating it, and (iii) what measures should be taken to promote transfer of climate relevant technologies.

At the climate negotiations, technology transfer came to the fore at seventh Conference of parties, when an expert group on technology transfer (EGTT) was proposed. At the Bali negotiations in 2007 there was considerable disagreement between the United States and G77/ China over IPRs and clean technology transfer. While the G 77 group argued that IPRs need to be addressed as a barrier within the technology transfer discussion; Australia and the US maintained that IPRs serve as catalysts, rather than barriers to technology transfer (South Centre and CIEL 2008). This divergence among Member States over IPRs in clean technology transfer became even more pronounced at the COP held in Poznan in December 2008. Developing countries argued for a fundamental paradigm shift in the treatment of IPRs in addressing the climate change emergency, as done in the case of access to affordable medicines. On the other hand, developed countries continued to maintain that IPRs are indispensable

to ensure innovation for technology development and deployment (Third World Network 2008).

At the CoP held at Copenhagen in 2009, IPRs were expected to be a sticky issue but was carefully avoided and the Copenhagen Accord while sets out to establish a Technology mechanism, does not mention IPRs at all. This was reflective of the polarization of debate on the IPRs and climate change linkage (Latif 2010). Even at Cancun, the final agreed text did not mention IPRs.

Gradually the reluctance of discussing IPRs at the climate forum has been increasing. This was evident from the fact that IPRs were not a part of the Durban Agenda, until the Indian submission sought amendment of agenda and inclusion of IPRs as an issue to be discussed (Government of India 2011).

The central premise of the developing country position is that a strong IPR regime can hinder access of developing countries to technology, and transfer to developing countries of ESTs or clean technologies in a number of ways (Khor 2007). First, where most patents in a developing country are held by foreign inventors or corporations, monopoly rights conferred by patents could stifle R&D by local researchers. Secondly, a strict IPR regime makes it difficult for local firms or individual researchers to develop and make use of the patented technology, as this could be prohibited or expensive. Also, should a local firm wish to 'legally' make use of patented technology; it would usually have to pay significant amounts in royalty or license fees. Again, even if a local firm is willing to pay the commercial rate for the use of a patented technology, the patent holder can withhold permission to the firm or impose onerous conditions, thus making it extremely difficult for the firm to use the technology.

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There have been studies pointing out evidence of IPRs as a barrier to clean technology transfer. Much of this impact varies from sector to sector and from country to country with different levels of economic development. A study brings out, albeit indirectly, how developing country firms are likely to encounter barriers to international technology, owing to the 'unlikeliness' of leading companies in the industry to license information to companies that could become competitors (Lewis 2008). Lewis' study examines the technology development strategies that have been pursued by the companies Suzlon and Goldwind, India and China's leading wind turbine manufacturer, both of which have used technology licensing agreements to enhance their technological base. The study highlights Suzlon's control over sufficient intellectual property rights as an important way in which it has attained a significant share of 8% of the global wind turbine sales. Suzlon's licensing arrangements and collaborations with subsidiaries have typically focused on second-tier companies as a matter of business strategy. Developing country manufacturers often obtain technology from smaller wind power companies that have less to lose in terms of international competition, and more to gain in license fees.

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In the case of meeting commitments under the Montreal Protocol,[1] developing countries have faced a similar problem. Phasing out ozone depleting substances (ODS) requires sophisticated technologies, most of them patent protected, making it a heavy financial outflow for developing countries. Hence, transfer of technology becomes a crucial issue therein. Technology switchovers and phase out have been difficult in sectors where the required technology or processes are under IPRs and dominated by a few owners. High costs, export restrictions, demands of high shares in joint ventures were some of the problems associated with the latter.

Barton has examined some of the linkages between IPRs and transfer of technology in the area of renewable energy, and his main findings were that it is unlikely for developing nations to face IP barriers in accessing EST (Barton and Osborne 2007). However, a UNIDO study relying on country-specific evidence conceded that strong IPRs at initial stages of development hamper rather than facilitate transfer and adoption of technology (UNIDO 2006). Thus, there is insufficient and mixed evidence on the actual impact of IPRs on transfer of climate relevant technologies. One of the reasons, as mentioned earlier, is that most IPR costs are disguised and may not be easy to account for when assessing the barriers.

IPR flexibilities and facilitating technology transfer

The main binding regime for protection of IPRs is the Agreement on Trade related Aspects of Intellectual Property Rights (TRIPS) of the WTO. Often, the TRIPs regime, including its implementation, is cited as a factor determining technology transfer amongst countries. However, there are some mechanisms within the WTO–TRIPS regime that can be made use of to promote technology transfer to advance actions on climate change mitigation. Within TRIPS, although there is not much in the text of the agreement directly with respect to technology transfer, there are indeed some principles and provisions that can be used to transfer climate relevant technologies to developing countries.

Article 27.1 of the TRIPS Agreement, for instance, requires WTO Members to grant patents for all types of inventions in all fields of technology, as long as these inventions meet certain basic criteria. Article 7 of the Agreement states that the objective of the protection and enforcement of IPRs should be to contribute "to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare..." Article 8 also recognizes that measures "may be needed to prevent the abuse of intellectual property rights by right holders or the resort to practices which … adversely affect the international transfer of technology."

One of the tools used by countries to access patented technologies is through an old concept of compulsory licensing. Compulsory Licence (CL) refers to a statutorily created licence that allows certain entities to pay a royalty and use an invention without the patentee's authorization

[1] Montreal Protocol on Substances that Deplete the Ozone Layer, in force since 1989

or permission. The term does not appear in the TRIPs text, but can be read into its clauses on other use (of the patented subject matter) without authorization of the right-holder. The TRIPS Agreement allows countries to grant non-voluntary licences to a third party, allowing the exploitation of the patented invention without consent of the patent owner. Exceptions to rights of patent holders and principles on measures for preventing the abuse of intellectual property rights by right-holders or the resort to practices, which unreasonably restrain trade or adversely affect the international transfer of technology also provide reasonable flexibility for resorting to the provision of compulsory licence.

Drawing from TRIPs and Doha Development Declaration, a compulsory licence can be granted in cases such as meeting government requirements, abuse of patent rights, national emergency, public non-commercial use and technical advance of considerable economic significance over the existing patent (Keayla 2007) rights of the member countries to make use of compulsory licence in the interest of public health have been explicitly recognized in the Doha Declaration on Public health. Thus, treating health as one of the public goods, the scope of compulsory licence has been extended to health. Consequently, a few CLs have been issued by developing countries as well. Till now, most of these examples have related to health. Developing countries, including India have made submissions at the UNFCCC that demand a paradigm shift in the way climate mitigation technologies are subject to intellectual property rights protection, and have an approach similar to affordable medicines. This has included pushing for a mechanism that would ensure that privately owned technologies are available on an affordable basis, including through measures to resolve the barriers posed by IPRs and addressing compulsory licensing of patented technologies (Government of India 2008). Developed countries oppose such an approach where developing countries would allegedly free ride. However, it must be clarified that a CL is normally issued after compensating the holder of the IPR. Another concern raised against CL is that it is a difficult proposition, as most technologies are owned by private companies. However, developed countries have in the past have often taken recourse of CL to meet their government plans or objectives.

Developing countries, including India have made submissions at the UNFCCC that demand a paradigm shift in the way climate mitigation technologies are subject to intellectual property rights protection, and have an approach similar to affordable medicines.

The US has a long history of compulsory licensing which has been mostly used as an antitrust remedy in cases of patent abuses. There also exists a host of specific environmental and health legislations that provide for the targeted licensing of specific technological applications to meet public health needs and specific environmental objectives like air pollution control. 42 USC Sec 7608 provides for mandatory licensing of air pollution prevention inventions under Title 42 (Public Health and Welfare) under the Clean Air Act. Mandatory patent licenses have also been granted under Section 308 of the Clean Air Act (EPA 1994).

Although the application of CL can be made by both individuals and governments, in the past it is the governments who have initiated the action for CL. It is a part of domestic IP laws of several nations, including China, India, Indonesia, Malaysia and Thailand to meet national emergency. TRIPs recognizes its members' freedom to determine and defines national

emergency in their specific country context to issue a CL. The flexibility rests with the countries, thus giving an opportunity to treat climate change mitigation as a public good.

Although there have been some instances of use of compulsory license in developing countries, they have been limited to the pharmaceuticals sector. While a common argument put forth by developing countries has been treatment of climate change mitigation and adaptation as analogous to health, the case of climate technologies would be slightly different from health due to the fact that Doha Declaration on the TRIPS Agreement and Public Health clarified the rights of member countries with regard to the compulsory licensing system by recognizing that each member has the right to grant compulsory licences and the freedom to determine the grounds upon which such licences are granted.

No such clear declaration exists for climate change, but that makes the task of issuing CL for climate change mitigation technologies difficult, and not impossible. In order to use the CL provision to access climate change relevant technologies first and foremost, climate has to be treated as public good in domestic and international regimes. A climate technology declaration in line with TRIPS and public health this regard at the WTO as well as allowing even non-LDC developing countries to uses compulsory licensing for climate-friendly goods could also be useful in this context.

The use of compulsory licensing in respect of transfer of technology for climate change mitigation and adaptation, in the absence of access to equipment, know-how and human skills to adapt and implement the technology, would not be able to translate to effective transfer.

However, such a similar innovation in the context of climate change could have limited value for countries. This is because the central innovation of the Doha Declaration on Public Health was to obtain a deviation from the requirement of Article 31(f) of the TRIPS Agreement, which required compulsory licensing to be used only in circumstances of 'predominant supply to the domestic market'. This requirement curtailed the possibility of use of compulsory licensing solely or predominantly for the purpose of export to least developed countries with no manufacturing capacity. The Doha Declaration on Public Health provided for a waiver from this requirement provided certain procedural safeguards were complied with. In this regard, one element that can be specifically considered at the WTO is a waiver in respect of use of compulsory licensing to supply EST to export markets. In the context of EST, compulsory licensing for 'exports' has not as yet emerged as a major issue.

While there are several lessons to draw from the CL for public health model, the case of climate relevant technologies will be slightly different on account of its nature and scale of manufacture and operation. The use of compulsory licensing in respect of transfer of technology for climate change mitigation and adaptation, in the absence of access to equipment, know-how and human skills to adapt and implement the technology, would not be able to translate to effective transfer.

Lack of technology transfer is also linked to market monopoly and anti-competitive practices and can also be addressed through measures for tackling anti-competitive practices. Article 31 (c) of TRIPS provides that a country can use such a measure "to remedy a practice determined after judicial or administrative process to be anti-competitive". Hence, countries can invoke their competition law where "abuse of dominance" is included

as one of the anti-competitive practices and the source of dominance is an IPR. Similarly, refusal to give licence can also be included as an anti-competitive practice by countries in furtherance of their right under Article 40 of TRIPS to control of anti-competitive practices.

The real effectiveness of compulsory licensing to promote transfer of technology, however, will depend on the market conditions of the relevant products and technologies. It is important that there are capable and willing firms to receive a compulsory licence. This will require that there will be sufficient number of firms operating in the same or similar products. Markets for climate-friendly products and technologies are unlikely to meet such conditions as they are highly concentrated. The concentration is even higher in particular segments of the industry. If a firm remains a virtual monopoly for a sufficient long period of time, then it becomes extremely difficult for any other firm to enter that industry. If there is no firm with adequate capability to receive a compulsory licence of some technology and use it, a mere legal provision of compulsory licence is of little use (Nanda 2009).

Barriers other than IPR

There are other factors as well and the stage of development and maturity of a technology is also integral in determining the extent to which IPRs pose a barrier (Ockwell et al. 2008). The study reports that more than the IPR issue, the prime barrier of IGCC commercial plants in India is the limited amount of testing of IGCC that has been done with Indian grade coal and also the absence of large-scale demonstration and commercialization of this technology. A joint study conducted by researchers from the University of Sussex and TERI in 2006 (Ockwell et al. 2007) points out the importance of gaining ownership or access to IPRs for low- carbon technologies. At the same time, it emphasizes that this would not be a sufficient requirement for successful low carbon technology transfer, for which other aspects such as tacit knowledge and absorptive capacity are also important. It highlights that these factors differ by country, technology and sectors, and that a case-by-case approach would be required to address IPR related barriers. For instance in the case of LEDs, the study examined that wherein industry commentators felt that without improved technological capacity in India in this industry, ownership of relevant IPRs would make little difference to India's ability to manufacture white LEDs.

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As argued by William J Baumol (2004) in his recent work, large firms use innovation as a prime competitive weapon. So, an innovator will license out its technologies of it suits them strategically. Hence diffusion of technology is unlikely to be at the maximum possible level. Inter-firm collaboration in the creation and use of innovations do occur. But firms from developing countries being much less capable are not able to participate in such collaboration in equal terms. Often firms from developing countries are not keen to license technologies from large firms not just due to high costs but they also feel that they will become technologically dependent forever. Those, who are relatively more capable, prefer to work around developing alternative or parallel technologies. This definitely takes time, and in the context of climate change, seriously compromises the actions on climate

change mitigation and adaptation. Those who are less capable may be too small in size and may not have the financial or technological capability to handle these.

An important barrier in adopting climate friendly technologies in developing countries is of course financial constraints. Though in some cases these technologies could be more efficient economically and the additional investment can be recouped in due course, in a capital constrained economy with problems of poverty and underdevelopment, the natural tendency would be to invest in areas that will generate additional income rather than in areas that will improve the environmental quality. Government policies and incentive structure evolve in such a context and firms tend to respond to such a structure. Hence, without outside financial assistance, technology transfer for climate change mitigation will be difficult to ensure.

Technology diffusion and beyond: IPR measures

One of the main results of the CoP – 16 at Cancun was the establishment of a Technology Mechanism to facilitate the implementation of enhanced action on technology development and transfer to support action on climate change mitigation and adaptation. The mechanism comprising a Technology Executive Committee and a Climate Technology Centre and Network is expected to become fully operational next year. The governance structure of the two and their inter-relationship is being discussed along with the mechanism's linkage with financial mechanisms. It is interesting to note how the technology mechanism is not a technology *transfer* mechanism but just a technology mechanism, thus supporting the technology diffusion view over technology transfer. (ICTSD 2011) This avoids the polarization that comes with technology transfer debates.

Another option proposed at some fora is creation of a Technology Acquisition Fund (Srinivasan 2006). It could be managed by a multilateral organization or a trust, which serves to acquire or buy out patented technologies that are climate friendly and make them available to the intended users, often the developing countries in want of technology to reduce or mitigate the greenhouse gas emissions. The inspiration for such a fund comes from the financial mechanism under the Montreal Protocol for inter alia licensing fees of alternative technologies and which has been hailed as being fairly successful (Anderson, Sarma, and Taddonio 2007) (Sarma and Madhavan 2008).

Another option is a patent buy-out mechanism, keeping in mind the patent owners' concerns as well. It is seen as the 'most diplomatic alternative' to compulsory licence (Kim Do Hyung 2007). Outterson (2006)has outlined a detailed process for a suitable buy-out mechanism, where compensation is calculated at the net present value of expected future profits. However, this is going to be an expensive proposition and would have to be linked to a suitable financing mechanism.

Mandatory price negotiation for patented products is a common practice in some countries in pharmaceutical products. However, it could be more difficult as climate-friendly technologies are often complex in nature and involve several IPRs in a technology. Price regulation can be imposed even

Although climate change and clean technology transfer are yet to figure directly in the WIPO development agenda, there is a view that the WIPO agenda would be an appropriate forum to promote technology transfer and take advantage of the various flexibilities that exist internationally.

as a competition-remedy measure. Since countries are empowered to act under their competition regimes such a mechanism is legally possible. However, for many developing countries, it would not be easy to enforce when the companies in question could be big trans-national companies from a powerful country (Nanda and Srivastava 2009). Even though companies are paid a royalty in compulsory licensing, companies oppose any move of issuing a CL.

The thirteenth session of the WIPO Standing Committee on the Law of Patents (SCP), held in March 2009 has decided to tackle the issue of "patents and the environment, with a particular attention to climate change and alternative sources of energy" in greater detail. Although climate change and clean technology transfer are yet to figure directly in the WIPO development agenda, there is a view that the WIPO agenda would be an appropriate forum to promote technology transfer and take advantage of the various flexibilities that exist internationally (Nanda 2008). Till now WIPO has been taking a cautious approach without an attempt to advocate or advance any position.[2] However, it observes that neither the simple existence of a patent serves as a barrier in itself to the transfer of a technology nor does the absence of an enforceable patent right in a certain country provide any guarantee of technology transfer.

Besides 'direct regulatory interventions', WIPO has also been promoting voluntary arrangements for sharing of technologies by technology holders who realize that the benefits of pooling technologies from several sources outweigh any immediate advantage of closely restricting access to their technology. Some such technology diffusion models include patent pools, where patent holders agree to license their technologies to one another; Patent commons, where technology holders pledging their patented technology for widespread use for no royalty payment, subject to certain general conditions; Open innovation, open source, commons-based peer production and distributed innovation, all of which emphasize a collaborative or shared technological platform for innovation (WIPO, 2008)

Conclusion

It appears that transfer and diffusion of technology from developed to developing countries is happening at a very slow pace. This is probably slower in climate-related technologies compared to technologies in general. The intellectual property right regime can be an important factor in this. In the developed world one of the instruments that have often been used to make a technology widely available is compulsory licensing and price negotiations. However, what is legally possible is not always easy to use practically. Developing countries will find it difficult to make compulsory license work in climate-friendly products and technologies, as they do not have much production capabilities. Indeed, production capacities are limited in developing countries also because they do not have access to the technologies. These products are very different from pharmaceutical products. For example, even a least developed country like Bangladesh has

[2] WIPO Briefing paper 2008

capabilities to produce pharmaceutical products, but a relatively advanced developing country like India does not have much capability in climate change mitigation technologies.

However, compulsory licensing, though may be helpful in some cases, given the specific nature of the industry, cannot do much. Developing countries find it difficult to use the compulsory lincese provision due to political pressure even if that is allowed by TRIPS. (Wise 2006) Hence a political statement at the global level will certainly strengthen their position. But even that may not go a long way as the industry is highly concentrated even in the developed world. It would not be easy as there will be very few capable and willing firms in developing countries. Hence the global community needs to explore other alternatives as well.

Given this, it appears that a global technology acquisition fund can be an effective mechanism to spread these technologies. This is, of course, not in lieu of other available instruments but in addition to them. It would be difficult to evolve such a mechanism given the present global geo-political context. It is often heard that developed country governments cannot do much with technology transfer, as they do not own the technologies. But if the governments wish they can pay their companies adequate compensation and make the technologies available to developing countries. Joint R&D efforts to develop technologies for the future where both developed and developing country firms would be useful. But such collaboration should be on equal terms where IPRs are equally shared and developing country firms do not end up doing only contract research for developed country firms. It should however be noted that merely making the technologies available may not be enough as the use of technologies may still be expensive in developing countries compared to alternative technologies available. Thus, generous financial assistance would be required even for deployment of these technologies that are available at concessional rates.

Bibliography

Latif A A. 2010. "Technology Transfer and Intellectual Property: A Post-Copenhagen Assessment." *Bridges*:17–18.

Anderson S O, Sarma K M, and Taddonio K N. 2007. *Technology Transfer for the Ozone Layer: Lessons for Climate Change*. London: Easrthscan.

Barton J H and Osborne G E. 2007. *Intellectual Property and Access to Clean Energy Technologies in Developing Countries: An Analysis of Solar Photovoltaic, Biofuel and Wind Technologies.* ICTSD Programme on Trade and Environment, Issue paper no. 2, Geneva: ICTSD.

Baumol W. 2004.*The Free-Market Innovation Machine - Analyzing the Growth Miracle of Capitalism.* Oxford: OUP.

EPA. 1994. "Mandatory Patent Licenses Under Section 308 of the Clean Air Act." *Federal Register Environmental Documents.* december 30, 1994. http://www.epa.gov/fedrgstr/EPA-AIR/1994/December/Day-30/pr-251.html.

Government of India. 2011. "Proposals by India for inclusion of additional agenda items in the provisional agenda of the seventeenth session of the Conference of the Parties." *Letter dated 26 May 2011 from India.* UN Doc. FCCC/CP/2011/INF.2, 21 September.

Government of India. 2008."Submission to UNFCCC on Technology Transfer Mechanism for CoP14." *Submission to UNFCCC on Technology Transfer Mechanism for CoP14.*

ICTSD. 2011. "The Climate Technology Mechanism: Issues and Challenges." *Information Note Number 18.* Geneva: International Centre for Trade and Sustainable Development.

Keayla B K. 2007. "Compulsory Licensing: Suggestions For Change." *CENTAD.* http://www.centad.org/focus_40.asp.

Khor M. 2007. "IPRs, Technology Transfer and Climate Change." *Cooperation for Development to address the Climate Change Challenge, 19-20 November, 2007.* New York: UN.

Kim Do Hyung. 2007. "Research Guide on TRIPS and Compulsory Licensing." *New York University School of Law.* http://www.nyulawglobal.org/globalex/TRIPS_Compulsory_Licensing.html.

Lewis J. 2010. "Leapfrogging in China and India." *China Dialogue*. 2008. http://www.chinadialogue.net/article/show/single/en/1784. Accessed 12 December.

METI. 2004.*Sustainable Futurte Framework on Climate Change*. Special Committee on a Future Framework for Addressing Climate Change Global Environmental Sub-Committee Industrial Structure Council, Japan: Ministry of Economy, Trade and Industry.

Nanda N. 2009. "Diffusion of Climate Friendly Technologies: Can Compulsory Licensing Help?" *Journal of Intellectual Property Rights*14(3):241–246.

Nanda N. 2008. *Expanding Frontiers of Global Trade Rules.* Oxon: Routledge.

Nanda N and Srivastava N. 2009. "Clean Technology Transfer and Intellectual Property Rights." *Sustaianble Development Law and Policy* IX(3):42.

Ockwell D G, Haum R, Mallett A, and Watson J. 2008. *UK-India Collaboration To Overcome Barriers To The Transfer Of Low Carbon Energy Technology: Phase 2.* University of Sussex: IDS and TERI.

Ockwell D, Watson J, MacKerron G, and Pal P. 2007. *UK–India collaboration to identify the barriers to the transfer of low carbon energy technology.* University of Sussex: IDS, TERI.

Outterrson K. 2006. *Access to Global Disease Innovation.* Submission to WHO IGWG, www.who.int/phi/public_hearings/.../15Nov06KevinOutterson.pdf: WHO.

Sarma K and Madhavan. 2008. "Technology Transfer Mechanism for Climate Change." http://www.igsd.org/docs/SarmaTT%2024Mar08.pdf.

South Centre and CIEL. 2008. "The Technology Transfer Debate in the UNFCCC: Politics, Patents and Confusion." *Intellectual Property Quaterly Update*. http://www.ciel.org/Publications/IP_Update_4Q08.pdf.

Srinivasan A. 2006. *Asian Aspirations for Climate Regime*. Institute for Global Environmental Strategies.
Third World Network. 2008. *Divergence over IPR Issue in Technology Transfer.* TWN Info Service on Intellectual Property Issues, TWN.
UNIDO. 2006. *The Role of Intellectual Property Rights in Technology Transfer.* Working paper, Vienna: United Nations Industrial Development Organization.
Wise J. 2006. "Access to AIDS medicine stumbles on trade rules." *Bulletin of World Health organisation*: 84(5).

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