TECHNOLOGY TRANSFER AND DISSEMINATION UNDER THE UNFCCC: ACHIEVEMENTS AND NEW PERSPECTIVES

by
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EXECUTIVE SUMMARY

Response to climate change will critically depend on the cost, performance, and availability of technologies that can lower emissions, mitigate, and adapt to climate change. Technological innovation can furthermore lower the cost of achieving environmental objectives. However, data from the United Nations Framework Convention on Climate Change (UNFCCC) Subsidiary Body for Scientific and Technological Advice flag that although issues of technology transfer have been central to the UNFCCC since the negotiation of the Convention, there is still an urgent need for effective environmental technology diffusion. Building upon lessons learned from technology transfer activities under the Clean Development Mechanism and the Global Environment Facility, the white paper suggests three possible solutions for enhanced environmental technology diffusion within the UNFCCC regime. First, I advocate in favor of a simplification of the transfer scheme within the Convention's bodies, in order to save resources and better allocate responsibilities. Second, I make some recommendations with respect to technology transfer through the Green Climate Fund. Third, I suggest that the creation of an environmental patents' pool would help to ensure access to key environmental technologies. To this respect, I conclude that in order to ensure the full participation of the private sector, right holders should be paid a fair royalty. Therefore, I recommend a model where rights would be bought out and then made available to Parties through a patent pool.

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INTRODUCTION

Climate change and environmental degradation are certainly the overriding issues of the 21st century and one of the most complex challenges humanity has ever faced. Climate change is a global issue, requiring international cooperation both at the level of policy and at the level of innovation.[1] The 2007 IPCC Report very interestingly highlighted that

"[t]he widespread diffusion of low-carbon technologies may take many decades, even if early investments in these technologies are made attractive. Initial estimates show that returning global energy-related CO2 emissions to 2005 levels by 2030 would require a large shift in the pattern of investment, although the net additional investment required ranges from negligible to 5-10%".[2]

The challenge is hence accessible but response to climate change will critically depend on the cost, performance, and availability of technologies that can lower emissions, mitigate, and adapt to climate change. The 2007 IPCC Report clearly stated that

"[t]he range of stabilization levels assessed can be achieved by deployment of a portfolio of technologies that are currently available and those that are expected to be commercialized in coming decades. This assumes that appropriate and effective incentives are in place for development, acquisition, deployment and diffusion of technologies and for addressing related barriers".[3]

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[1] *See, e.g.*, Ian Hascic *et al.*, *Climate Policy and Technological Innovation and Transfer: An Overview of Trends and Recent Empirical Results*, OECD Environment Working Papers, No. 30, OECD Publishing, ENV/WKP(2010)16, 2010, at 31.

[2] IPCC, *Climate Change 2007 – Mitigation of Climate Change*, Contribution of Working Group III to the Fourth Assessment Report of the IPCC, Cambridge University Press, January 2008, Summary for Policymakers, at 13. See also Chapters 4.1, 4.4 and 11.6 of the Report.

[3] *Id*., p. 16. *See, also*, D. HUNTER *et al.*, International Environmental Law and Policy 660 (Thomson Reuters/Foundation Press, 2011).

Technological innovation will hence play a decisive role in the fight against climate change and environmental degradation. It can furthermore lower the cost of achieving environmental objectives.[4]

The United Nations Framework Convention on Climate Change (UNFCCC) Subsidiary Body for Scientific and Technological Advice (SBSTA) second synthesis report on technology needs identified by non-Annex I Parties presents relevant facts on technology needs for mitigation and adaptation to climate change.[5] The findings stem from 70 technology needs assessments (TNAs) and 39 national communications from Parties not included in Annex I. The SBSTA report underlines that barriers to the transfer of prioritized technologies appeared as an issue in 80% of the assessments.[6] The report states that "[e]conomic and market barriers were the most frequently identified barriers […] followed by barriers relating to human capacity".[7] The TNAs equally identified other barriers such as information and awareness barriers, institutional barriers, regulatory barriers, policy-related and technical barriers, lack of transport infrastructure and poor soil quality.[8] In general, lack of financial resources was identified by 73% of the Parties.[9] Regarding priority technological needs identified by the TNAs, the SBSTA report states that "[m]itigation technologies were prioritized by many Parties"[10] and that "[m]ost of the Parties indicated great potential for the transfer of ESTs, as the majority of

[4] *See, e.g.*, Ian Hascic *et al.*, Climate Policy and Technological Innovation and Transfer: An Overview of Trends and Recent Empirical Results, OECD Environment Working Papers, No. 30, OECD Publishing, ENV/WKP(2010)16, 2010, at 9.
[5] *See* UNFCCC, Subsidiary Body for Scientific and Technological Advice, *Second synthesis report on technology needs identified by Parties not included in Annex I to the Convention*, UN Doc. FCCC/SBSTA/2009/INF.1, 29 May 2009.
[6] *Id.*, § 125.
[7] *Id.*, § 126.
[8] *Id*.
[9] *Id.*, § 128.
[10] *Id.*, § 86.

the mitigation technologies they currently use are obsolete and inefficient".[11] To this respect, the report further highlights that "[t]he most commonly identified technology needs were for energy generation, dominated by renewable energy technologies".[12] Many non-Annex I Parties indicated that they lacked "capacity to adequately exploit the available renewable energy options"[13], an element which advocates for extensive technology dissemination. These stunning data from the SBSTA report confirm that there is an urgent need for effective environmental technology diffusion.

With respect to the competitiveness of environmental technologies on international markets, the International Energy Agency (IEA) underlined that "[m]any of the most promising low-carbon technologies currently have higher costs than the fossil-fuel incumbents".[14] This weakness severely impedes their broad diffusion in both developed and developing countries.

It stems out of these illustrations that diffusion of environmental technology should be optimum in order to relevantly address the climate change challenges the international community is facing. Nevertheless, acknowledged studies reveal that the current picture is far from meeting with this requirement.[15]

[11] *Id.*, § 88.
[12] *Id.*, § 88.
[13] *Id.*, § 91.
[14] International Energy Agency, *Energy Perspectives 2010 – Scenarios & Strategies to 2050*, OECD-IEA, 2010, p. 50. For relevant comments on the matter *see* D. HUNTER *et al.*, International Environmental Law and Policy 660-61 (Thomson Reuters/Foundation Press, 2011).
[15] *See, e.g.*, UNFCCC, Subsidiary Body for Scientific and Technological Advice, *Second synthesis report on technology needs identified by Parties not included in Annex I to the Convention*, UN Doc. FCCC/SBSTA/2009/INF.1, 29 May 2009.

Issues of technology transfer have been central to the UNFCCC since the negotiation of the Convention.[16] A legal argument that has been recurrent in this respect is that intellectual property rights prevent the diffusion of environmental technologies.[17] Interestingly, we experimented a marked increase in the rate of patenting of environmental technologies after the signing of the Kyoto Protocol in 1997.[18] This is particularly true for technologies that were the closest to being competitive, *i.e.* wind power, some solar power, biofuels, geothermal and hydro innovation.[19] This said, intellectual property rights are not the sole barrier to the effective dissemination of environmental technology. Absorptive capacity and technological capabilities of the recipient country are indeed equally highly important.[20] But these components are only relevant once the recipient has had access to the necessary technology, namely once the intellectual property issue has been solved.

Environmental technologies are currently developed, for the most part, in OECD countries.[21] However, we can no longer consider technology diffusion as an issue limited

[16] *See, e.g.*, Daniel Bodansky, *The United Nations Convention on Climate Change: A Commentary*, 18 YALE J. OF INT'L L. 451, 529-530 (1993); MATTHEW RIMMER, INTELLECTUAL PROPERTY AND CLIMATE CHANGE: INVENTING CLEAN TECHNOLOGIES 39-82 (Edward Elgar, 2011).

[17] *See, e.g.*, MATTHEW RIMMER, INTELLECTUAL PROPERTY AND CLIMATE CHANGE: INVENTING CLEAN TECHNOLOGIES 39-82 (Edward Elgar, 2011).

[18] UNEP, EPO and ICTSD, *Patents and clean energy: bridging the gap between evidence and policy – Final report*, UNEP, EPO and ICTSD, 2011, at 9 and 37. Ian Hascic *et al.*, *Climate Policy and Technological Innovation and Transfer: An Overview of Trends and Recent Empirical Results*, OECD Environment Working Papers, No. 30, OECD Publishing, ENV/WKP(2010)16, 2010, at 24. At the same time, the rate of patenting in fossil fuels for example has remained stagnant and has even been decreasing since 2001. *See* UNEP, EPO and ICTSD, *Patents and clean energy: bridging the gap between evidence and policy – Final report*, UNEP, EPO and ICTSD, 2011, at 30.

[19] Ian Hascic *et al.*, *Climate Policy and Technological Innovation and Transfer: An Overview of Trends and Recent Empirical Results*, OECD Environment Working Papers, No. 30, OECD Publishing, ENV/WKP(2010)16, 2010, at 24 and 44.

[20] *See, e.g.*, D. Popp, *Policies for the Development and Transfer of Eco-Innovations: Lessons from the Literature*, OECD Environmental Working Papers, No. 10, OECD Publishing, ENV/WKP (2009)5, 2009, at 16.

[21] Keith Maskus, *Differentiated Intellectual Property Regimes for Environmental and Climate Technologies*, OECD Environmental Working Papers, No. 17, OECD Publishing, ENV/WKP (2010)3,

to relations between developing and developed countries. China, India and Brazil are indeed very important producers of environmental technologies.[22] Furthermore, enhanced diffusion is also needed among developed countries because fossil energies and other non-environmentally friendly technologies are still easier and cheaper to access than environmentally friendly ones.[23] Nevertheless, technology transfer to developing countries remains a priority. As underlined by the IPCC, "many developing countries are in a phase of massive infrastructure build up. Delays in technology transfer could therefore lead to a lock-in in high-emissions systems for decades to come".[24] Moreover, "certain technologies that are specific to the needs of developing countries are not being developed at all, because the developing countries lack the innovation capacity to do so, while the developed countries lack incentive to develop such 'neglected' technologies".[25] In order to efficiently mitigate climate change, it is therefore a priority that developing countries are not only given relevant access to environmental technologies, but equally benefit from major capacity building operations. Furthermore, it is important to adopt strategies to support environmental technologies that do not currently fund themselves because they are not yet needed or saleable, notably in the field of geoenginering.

2010, at 44; U.N. Department of Economic and Social Affairs, 2009 World Economic and Social Survey: Promoting Development, Saving the Planet, U.N. Doc. E/2009/50/Rev.1, ST/ESA/319, at 128.

[22] *See, e.g.*, Joel B. Eisen, *The New Energy Geopolitics?: China, Renewable Energy, and the Greentech Race*, 86 CHICAGO-KENT L. REV. 9 (2011); UNEP, EPO and ICTSD, *Patents and clean energy: bridging the gap between evidence and policy – Final report*, UNEP, EPO and ICTSD, 2011, at 9, 31, 33 and 34. D. Ockwell *et al.*, *Enhancing Developing Country Access to Eco-Innovation: The Case of Technology Transfer and Climate Change in a Post-2012 Policy Framework*, OECD Environmental Working Papers, No. 12, OECD Publishing, 2010, at 17.

[23] International Energy Agency, *Energy Perspectives 2010 – Scenarios & Strategies to 2050*, OECD-IEA, 2010, at 50.

[24] IPCC, *Climate Change 2007 – Mitigation of Climate Change*, Contribution of Working Group III to the Fourth Assessment Report of the IPCC, Cambridge University Press, January 2008, Chapter 2.7, at 158.

[25] Ian Hascic *et al.*, *Climate Policy and Technological Innovation and Transfer: An Overview of Trends and Recent Empirical Results*, OECD Environment Working Papers, No. 30, OECD Publishing, ENV/WKP(2010)16, 2010, at 44. *See, also*, D. Popp, *Policies for the Development and Transfer of Eco-Innovations: Lessons from the Literature*, OECD Environmental Working Papers, No. 10, OECD Publishing, ENV/WKP(2009)5, 2009, at 11.

Interestingly, the recent success of the adoption of the international Minamata Convention on Mercury was in part reached through the addition of a supplementary article detailing technology transfer and capacity building mechanisms.[26] If the UNFCCC regime is to have any future, it thus seems quite unequivocal that concrete steps towards technology transfer will have to be taken and that better outcomes will have to be rapidly reached. In the light of these tremendous legal and technical challenges, this short paper has only a limited purpose, *i.e.* to analyze what lessons can be drawn from results reached so far under the UNFCCC regime and suggest a few strategies that could be relevant in enhancing technology transfer for climate mitigation and adaptation. The first section of the paper will briefly go over the definition of 'environmental technology' (I). I will then present how the issue of technology has been legally tackled under the UNFCCC regime (II). Moreover, the results reached through the Clean Development Mechanism (CDM) and the Global Environment Facility (GEF) will be analyzed (III). Finally, I will suggest three strategies that could be efficient in enhancing technology transfer under the UNFCCC regime (IV).

I ENVIRONMENTAL TECHNOLOGY AS A LEGAL OBJECT

Defining such a complex notion as 'environmental technology' is particularly difficult because by defining the legal object 'environmental technology' more or less

[26] In addition to Article 15 already agreed upon, Parties added a second article (Article 16) equally dedicated to technology transfer. The text of the Convention has not been officially published on the United Nations Treaty Series but a summary of the negotiations is available through the Earth Negotiations Bulletin. *See* http://www.iisd.ca/vol28/enb2822e.html (last visited Apr. 30, 2013).

broadly, States and policy-makers make strategic decisions.[27] At the center of these negotiation strategies stand issues of competitiveness, each country defending its industries' interests on the international markets.

The Vienna Convention for the Protection of the Ozone Layer is one of the rare Multilateral Environmental Agreement (MEA) that provides a definition of what 'environmental technology' refers to. Article 1(3) of the Vienna Convention defines 'alternative technologies or equipment' as "technologies or equipment the use of which makes it possible to reduce or effectively eliminate emissions of substances which have or are likely to have adverse effects on the ozone layer".[28] The definition is rather open with respect to the technological aspect of the problem but the consideration is nevertheless limited to the purpose of the Convention, *i.e.* effects on the ozone layer.

Turning to the IPCC, the 2000 Special Report states that "[t]echnology for mitigating and adapting to climate change should be environmentally sound technology and should support sustainable development".[29] Environmental technologies are defined as those

> "[t]echnologies that protect the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they were substitutes and are compatible with nationally determined socio-economic, cultural and environmental priorities".[30]

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[27] *See, e.g.*, WTO, CTESS, *Report by the Chairman, Ambassador Manuel A.J. Teehankee, to the Trade Negotiations Committee*, TN/TE/20, 21 April 2011, Annex II.A.

[28] Vienna Convention for the Protection of the Ozone Layer, 22 March 1985, 1513 U.N.T.S. 293, Article 1(3).

[29] IPCC, *Methodological and Technological Issues in Technology Transfer – Summary for Policy Makers*, Special Report of Working Group III of the Intergovernmental Panel on Climate Change, Cambridge, Cambridge University Press , 2000, at 3.

[30] IPCC, *Methodological and Technological Issues in Technology Transfer*, Special Report of Working Group III of the Intergovernmental Panel on Climate Change, Cambridge University Press, 2000.

The IPCC equally refers to "software and hardware challenges"[31], a terminology that certainly covers embodied technologies but also disembodied ones such as know-how. The report finally acknowledges that there is "no simple definition" of environmental technologies and that "[t]echnologies that may be suitable in each of such contexts may differ considerably"[32], opening the door to case by case assessments. The IPCC definition is hence as inclusive as possible. It is equally centered on an individual assessment of each technology.

Interestingly, current World Trade Organization (WTO) negotiations on Environmental Goods and Services (EGS) distinguish between two kinds of environmental goods and services, *i.e.* traditional environmental goods and services (or established environmental technologies, EET) and environmentally preferable products (EPP) and services. The distinction, introduced by UNCTAD in 1995 already[33], focuses on the product's purposes and aims at tackling the so-called 'dual use controversy'.[34] Traditional environmental goods and services are thus a narrower category encompassing goods and services whose end-use, or main purpose, is environmental *per se*. EPPs on the other hand, are a broader category encompassing goods and services whose rationale is not environmental but who prove more environmentally friendly than alternative products.

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[31] IPCC, *Methodological and Technological Issues in Technology Transfer – Summary for Policy Makers*, Special Report of Working Group III of the Intergovernmental Panel on Climate Change, Cambridge University Press, 2000, at 3.

[32] *Id*.

[33] S*ee* UNCTAD, *Environmentally Preferable Products (EPPs) as a Trade Opportunity for Developing Countries*, Doc. UNCTAD/COM/70, 19 December 1995.

[34] On the concerns about 'dual' or 'multiple' uses *see, e.g.*, WTO, Committee on Trade and Environment, *An Alternative Approach for Negotiations under Paragraph 31(III) – Submission by India*, Doc. TN(TE/W/51, 3 June 2005 and WTO, Committee on Trade and Environment*, Communication from the Republic of Cuba*, Doc. TN/TE/W/55, 5 July 2005.

As suggested by these three illustrations, definitions for environmental technologies are quite heterogeneous. Except for the WTO's distinction between traditional environmental goods and EPPs, the definitions nevertheless converge in that they follow an inclusive approach, *i.e.* they tend to be open to as many technologies as possible. Considering the complexity of the fight against climate change, inclusive approaches appear particularly relevant. Indeed, no unique technology is able to address current environmental challenges and EPP represent frequently the best available technologies. Environmental technologies should furthermore be able to adapt to the specificities of each State and each population. It is hence necessary to concentrate on the best available techniques and best environmental practices available in each specific situation and assess the value of a technology on a case-by-case basis.

In light of the limited purpose of this paper, it is not necessary to hold a single definition of environmental technology. Rather, it is important to keep in mind that different definitions protect different interests and that these political and economic interests lead the negotiations on the matter. Nevertheless, the illustrations we have examined show that the current approach followed by international law fairly goes towards a broad acceptation of environmental technologies.[35]

[35] *See, e.g.*, Agenda 21, IPCC and OECD's approaches. United Nations, Economic and Social Development, Division for Sustainable Development, 1992 Rio Earth Summit, *Agenda 21*, Reproduced in U.N. Doc. A/CONF.151/26/Rev.1 (Vol.1), Section IV, § 34.1; IPCC, *Methodological and Technological Issues in Technology Transfer*, Special Report of Working Group III of the Intergovernmental Panel on Climate Change, Cambridge University Press, 2000 and OECD, Policy Brief, Opening Markets for Environmental Goods and Services, September 2005, at 2.

II TECHNOLOGY TRANSFER FROM STOCKHOLM TO DOHA

The passage of a technology from the originator to a secondary user has frequently been referred to as 'technology transfer'. Nevertheless, the current most widely used meaning of the terms 'technology transfer' refers principally to a transaction from developed to developing countries[36], rather than to the spreading of environmental technologies. As flagged in the introduction of this paper, we can no longer consider technology dissemination as an issue limited to North-South relationships. China, India, and Brazil notably, are indeed very important environmental technology producers.[37] Moreover, diffusion of environmental technology must equally be enhanced between developed countries. While the activities undertaken within the UNFCCC framework focus mainly on technology transfer, we will when relevant refer to 'technology diffusion' rather than 'technology transfer' in order to adopt a comprehensive and neutral approach to the issue. This terminology notably stands in line with that adopted by Principle 9 of the United Nations Global Compact.[38]

[36] For example, the Oxford English Dictionary's entry for 'technology transfer' reads: "the transfer of new technology from the originator to a secondary user, especially from developed to developing countries in an attempt to boost their economies". OXFORD ENGLISH DICTIONARY (Oxford University Press, 2011).

[37] *See, e.g.*, UNEP, EPO and ICTSD*, Patents and clean energy: bridging the gap between evidence and policy – Final report*, UNEP, EPO and ICTSD, 2011, at 9, 31, 33 and 34. *See, also*, D. Ockwell *et al*., *Enhancing Developing Country Access to Eco-Innovation: The Case of Technology Transfer and Climate Change in a Post-2012 Policy Framework*, OECD Environmental Working Papers, No. 12, OECD Publishing, 2010, at 17; and Joel B. Eisen, *The New Energy Geopolitics?: China, Renewable Energy, and the Greentech Race*, 86 CHICAGO-KENT L. REV. 9 (2011).

[38] Principle 9 reads: "Businesses should encourage the development and diffusion of environmentally friendly technologies". United Nations Global Compact's Ten Principles, available at http://www.unglobalcompact.org/AboutTheGC/TheTenPrinciples/index.html (25 October 2011). Interestingly, this choice of words had already been adopted by United Nations Secretary General Kofi Annan in his address to the World Economic Forum in Davos on 31 January 1999 proposing Global Compact on human rights, labour and environment. *See* U.N. Doc. SG/SM/6881 (Press Release), 1 February 1999.

The 1972 Stockholm Declaration of the United Nations Conference on the Human Environment (Stockholm Declaration) already highlighted the importance of technology in the context of the fight against environmental degradation. It called for stronger cooperation between States in the field of environmental technologies, providing specifically for technology transfer in favor of developing countries "on terms which would encourage their wide dissemination without constituting an economic burden".[39]

Nowadays, the most commonly referred to definition is the one from the IPCC Working Group III's 2000 Special Report on Methodological and Technological Issues in Technology Transfer. The Special Report states that technology transfer comprises a

"broad set of processes covering the flows of know-how, experience and equipment for mitigating and adaptation to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organizations (NGOs) and research/education institutions".[40]

As acknowledged within the Special Report, the quoted definition goes further than the UNFCCC's provisions on technology transfer[41] which are essentially limited to an obligation of developed countries in favor of developing ones.[42] The Special Report moreover reads:

"[t]he broad and inclusive term 'transfer' encompasses diffusion of technologies and technology cooperation across and within countries. It covers technology transfer processes between developed countries, developing countries and countries with economies in transition, amongst developed countries, amongst developing countries and amongst countries with economies in transition. It comprises the process

[39] Declaration of the United Nations Conference on the Human Environment (Stockholm Declaration), 5-16 June 1972, Reprinted in 11 I.L.M. 1416. Principle 20 (see also Principle 12).
[40] IPCC Working Group III, *Methodological and Technological Issues in Technology Transfer – Summary for Policy Makers*, 2000, at 3.
[41] *Id*.
[42] *See, e.g.*, United Nations Framework Convention on Climate Change, 9 May 1992, 1771 U.N.T.S. 107, Articles 4(5), 4(7) and 4(9).

of learning to understand, utilize and replicate the technology, including the capacity to choose it and adapt it to local conditions and integrate it with indigenous technologies".[43]

The IPCC hence acknowledges the global nature of the issue of environmental technology diffusion. As members of the international community, *all* States therefore have a responsibility regarding the efficient diffusion of environmental technologies. According to this definition, technology diffusion equally covers both transfer of hardware material and transfer of software goods, *e.g.* training and other capacity building activities.[44]

Regarding the quality of technology diffusion, the Special Report stresses that capacity building "is required at all stages in the process of technology transfer"[45], encompassing human capacity, organizational capacities, as well as information assessment and monitoring capacity.[46] The IPCC's approach to technology diffusion stands in line with Chapter 34 of Agenda 21 which encourages all types of environmental technology diffusion and reads:

"Environmentally sound technologies are not just individual technologies, but *total systems which include know-how, procedures, goods and services, and equipment as well as organizational and managerial procedures*. This implies that when discussing transfer of technologies, the human resource development and local capacity-building aspects of technology choices, including gender-relevant aspects, should also

[43] IPCC Working Group III, *Methodological and Technological Issues in Technology Transfer – Summary for Policy Makers*, 2000, at 3.
[44] The IPCC Report defines software elements as "education, training and other capacity building activities". IPCC Working Group III, *Methodological and Technological Issues in Technology Transfer – Summary for Policy Makers*, 2000, at 4.
[45] IPCC Working Group III, *Methodological and Technological Issues in Technology Transfer – Summary for Policy Makers*, 2000, at 4.
[46] *Id*., at 5.

be addressed. Environmentally sound technologies should be compatible with nationally determined socio-economic, cultural and environmental priorities".[47]

Interestingly, the Special Report finally states that "although there are numerous frameworks and models put forth to cover different aspects of technology transfer, there are no corresponding overarching theories".[48] According to the IPCC, there is thus no unique framework able to contain the entire problematic of technology diffusion. Channels for technology transfer may indeed vary depending on the sector, the technology type and the country circumstances.

Within the UNFCCC's framework, Article 4(5) of the UNFCCC states:

"The developed country Parties and other developed Parties included in Annex II shall take all practicable steps to *promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties*, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies".[49]

As noted by Professor Bodansky, the Convention adopts a broad language with respect to technology transfer.[50] In the drafting of the Kyoto Protocol, technology transfer appeared again as a central issue.[51] As a result, article 10(c) states that all Parties "taking into account their common but differentiated responsibilities" shall:

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[47] United Nations, Economic and Social Development, Division for Sustainable Development, 1992 Rio Earth Summit, *Agenda 21*, Reproduced in U.N. Doc. A/CONF.151/26/Rev.1 (Vol.1), Section IV, § 34.3 (emphasis added).

[48] IPCC Working Group III, *Methodological and Technological Issues in Technology Transfer*, 2000, at 17.

[49] United Nations Convention on Climate Change (emphasis added).

[50] Daniel Bodansky, *The United Nations Convention on Climate Change: A Commentary*, 18 YALE J. OF INT'L L. 451, 529-530 (1993).

[51] For more on the Kyoto Protocol and the Kyoto negotiations *see, e.g.*, SEBASTIAN OBERTHÜR & HERMANN E. OTT, THE KYOTO PROTOCOL: INTERNATIONAL CLIMATE POLICY FOR THE 21ST CENTURY (Springer, 1999).

"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."[52]

At the seventh session of the UNFCCC's Conference of the Parties (COP) in 2001, Parties agreed on the implementation of a technology transfer framework comprising technology needs and needs assessment, technology information, enabling environments, capacity building, and mechanisms for technology transfer.[53] The Expert Group on Technology Transfer (EGTT) was subsequently established in order to enhance the implementation of the technology transfer framework and to advance the technology transfer activities under the UNFCCC.[54]

In Bali, the issue of technology transfer moved center stage and the Bali Action Plan recognized that:

there is a crucial need to accelerate innovation in the development, deployment, adoption, *diffusion and transfer of environmentally sound technologies* among all Parties, and particularly from developed countries to developing countries, for both mitigation and adaptation.[55]

In particular, the Bali Action Plan requested the GEF to elaborate a strategic program to scale up the level of investment for technology transfer[56], to develop a scale of

[52] Kyoto Protocol to the United Nations Convention on Climate Change, 11 December 1997, 2303 U.N.T.S. 148 (entered into force 16 February 2005) (emphasis added).
[53] Conference of the Parties on its seventh session, held at Marrakesh from 29 October to 10 November 2001, U.N. Doc. FCCC/CP/2001/13/Add.1, 21 January 2002 (decision 4/CP.7, annex).
[54] For an assessment of the EGTT's first five year of work *see* http://unfccc.int/ resource/docs/publications/egtt_eng.pdf (last visited Apr. 30, 2013).
[55] Bali Action Plan, Decisions 4/CP.13, 15 December 2007 (emphasis added).
[56] *Id*., § 3.

performance indicators to monitor and evaluate the implementation of Article 4(5) of the UNFCCC [57], and to provide financial support to developing countries for the implementation of technology transfer.[58]

Before the COP in Copenhagen, Brazil, India, China, and South Africa, as well as the Group of 77 representing developing countries, emphasized the necessity for enhanced technology transfer and particularly the necessity to address the issue presented by intellectual property rights to this respect.[59] In order to prepare for the negotiation in Copenhagen, the Ad Hoc Working Group on Long-term Cooperative Action had identified five options to address intellectual property issues with respect to climate change: enhanced measures to promote the transfer of clean technologies (1), measures to address barriers to technology transfer (2), exclusion and revocation of patents relating to environmentally sound technologies (3), compulsory licensing of environmentally sound technologies (4), and creation of a technology mechanism (5).[60] In the end, the creation of a Technology Mechanism with a Technology Executive Committee and a network of climate innovation centers prevailed in the Copenhagen Accord.[61] In addition, the Green Climate Fund (GCF) was established "to support projects, program, policies and other activities in developing countries related to mitigation including REDD-plus, adaptation,

[57] *Id*., § 4.
[58] *Id*., § 10.
[59] *See e.g.*, Submission of India (May 19, 2009), *available at* http://unfccc.int/resource/docs/2009/awglca6/eng/misc04p01.pdf#page=114 (last visited Apr. 30, 2013); Submission of China (Mar. 19, 2009), *available at* http://unfccc.int/resource/docs/2009/awglca5/eng/misc01.pdf#page=19 (last visited Apr. 30, 2013); and Submission of the Group 77 and China (Oct. 27, 2008), *available at* http://unfccc.int/resource/docs/2008/awglca4/eng/misc05.pdf#page=6 (last visited Apr. 30, 2013).
[60] Ad Hoc Working Group on Long-term Cooperative Action under the UNFCCC, *Report*, Seventh Session held in Bangkok from 28 September to 9 October 2009 and Barcelona from 2 to 6 November 2009, U.N. Doc. FCCC/AWGLCA/2009/14, 20 November 2009.
[61] Copenhagen Accord, U.N. Doc. FCCC/CP/2009/11/Add.1, Decision 2/CP.15, 30 March 2010, § 11. *See, also*, http://unfccc.int/ttclear/templates/render_cms_page?TEM_home (last visited Apr. 30, 2013) (Technology Mechanism webpage).

capacity-building, *technology development and transfer*".[62] With the adoption of the GCF, developed countries pledged $100 billion annually to developing countries by 2020 to finance climate mitigation and adaptation.[63] However, the Accord does not address intellectual property issues expressly.

Despite extensive work by the Ad Hoc Working Group on Long-term Cooperative Action, issues of technology transfer and intellectual property rights remained a major contention bone during the COPs in Cancun and Durban.[64] Both agreements therefore underline the importance of technology transfer but none contain any substantial decision on the matter and neither expressly mentions intellectual property.[65]

At the COP in Doha, technology transfer was once again a central issue in the negotiations.[66] Before the Conference, the Technology Executive Committee of the Convention issued a report, which included key messages on enabling environments for and barriers to technology development and transfer. These key messages included the promotion of collaborative research (a), the strengthening of national systems of innovation (b), the enhancement of developing countries' capacity to assess, absorb and develop technologies (c), finance of technology activities (d), the engaging of the financial and business community (e), the implementation of the Technology Mechanism (f), and further assessment on the role of intellectual property rights in the development

[62] *Id.*, § 10 (emphasis added).
[63] *Id.*, § 8.
[64] See http://unfccc.int/meetings/cancun_nov_2010/meeting/6266.php; http://unfccc.int/meetings/Durban_nov_2011/meeting/6245.php (last visited Apr. 30, 2013).
[65] Cancun Agreements, UN Doc. FCCC/CP/2010/7/Add, 15 March 2011. Durban Outcomes, UN Doc. FCCC/KP/CMP/2011/10/Add.1, 15 March 2012.
[66] *See* http://unfccc.int/meetings/doha_nov_2012/session/7049/php/view/documents.php (last visited Apr. 30, 2013).

and transfer of technologies (g).[67] Despite these efforts, Doha's Agreed Outcome pursuant to the Bali Action Plan contained no substantial obligation with respect to technology transfer.[68] The reason for this absence of agreement on technology transfer was a strong opposition between developing countries who wanted an explicit reference to the need to consider intellectual property rights and developed countries who wanted either a reference to the need to protect intellectual property rights or no reference to the issue at all.[69]

III ACHIEVEMENTS UNDER THE UNFCCC

In this section I will present and assess the achievements of the two main UNFCCC's technology transfer channels: the CDM (A) and the GEF (B).

A THE CLEAN DEVELOPMENT MECHANISM

In order to foster investments in developing countries, the Kyoto Protocol established the CDM.[70] Although the CDM does not have an explicit technology transfer mandate and is not identified as a mean of fulfilling the technology transfer objectives of the Kyoto Protocol, it was expected that because foreign direct investment (FDI)

[67] Technology Executive Committee (TEC), Report on activities and performance of the TEC, U.N. Doc. FCCC/SB/2012/2, 18 October 2012, § 35.

[68] Report of the Conference of the Parties on its eighteenth session, held in Doha from 26 November to 8 December 2012, Agreed Outcome Pursuant to the Bali Action Plan, Decision 1.CP/18, U.N. Doc. FCCC/CP/2012/8/Add.1, 28 February 2013.

[69] Technology Executive Committee (TEC), Report on activities and performance of the TEC, U.N. Doc. FCCC/SB/2012/2, 18 October 2012.

[70] Kyoto Protocol, Article 12. Allows Annex B Parties to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tone of CO2, which can be counted towards meeting Kyoto targets.

generally promotes technology transfer, the CDM would be an effective channel for technology transfer.[71] More than fifteen years after the creation of the mechanism, the assessment is reserved. A survey undertook by Stephan Seres for the UNFCCC Registration and Issuance Unit showed that around 36% of the CDM projects analyzed (and accounting for 59% of the annual emission reductions) referred to some form of technology transfer (equipment and/or know-how). [72] The study demonstrated that technology transfer is more likely to occur in big scale projects and in projects involving foreign participants.[73] In addition, it was shown that the probability that a CDM project leads to technology transfer is higher in developing countries with a good investment climate, an open economy and a strong GDP growth.[74] Interestingly, agriculture, HFC, landfill gas, nitrous oxide and wind projects appeared more likely to involve technology transfer regardless of the project characteristics.[75] The data from the Seres analysis prove that the CDM can be useful in triggering technology transfer but they equally prove that there is great space for improvements. For sure, the CDM has contributed to accelerate the transfer and diffusion of environmental technologies and has been successful in enhancing financial and technical assistance. However, and as underlined by a specialized commentator, "it has been incapable of encouraging policy changes, let alone the setting up of the institutional and technical capacities necessary to foster

[71] On the CDM *see, generally*, Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. REV. 1759 (2007-2008).
[72] Stephan Seres, *Analysis of Technology Transfer in CDM Projects*, Prepared for UNFCCC Registration and Issuance Unit, 2008, at 7, 10. *Available at* http://cdm.unfccc.int/Reference/Reports/TTreport/TTrep08.pdf (last visited Apr. 30, 2013).
[73] *Id*.
[74] Joelle de Sepibus, *Reforming the Clean Development Mechanism to accelerate Technology Transfer, NCCR Trade Regulation*, Working paper No 2009/42, November 2009, at 9.
[75] Stephan Seres, *Analysis of Technology Transfer in CDM Projects*, Prepared for UNFCCC Registration and Issuance Unit, 2008, at 10. *Available at* http://cdm.unfccc.int/Reference/Reports/TTreport/TTrep08.pdf (last visited Apr. 30, 2013).

innovation".[76] Moreover, a study conducted by Professor Michael Wara in 2008 found, after examining the nature of CDM projects, that a substantial percentage of them were not focused on core sustainable energy technologies.[77] Therefore, the CDM cannot be identified as a successful tool in creating technology transfer and diffusion. As put forward by the U.N. Department of Economic and Social Affairs' 2009 World Economic and Social Survey, "the operation of the [CDM] has been on much too limited scale and has been too heavily concentrated in a few developing countries to allow it to initiate and sustain the kind of pig push towards cleaner technologies".[78] In order to foster more important technology transfer, the CDM should be reformed. Notably, commentators suggest that a technology mandate should be added to the CDM Rules and that an internal database should be established.[79] After the Doha COP, it seems nevertheless that an amendment of the CDM is not likely.

B THE GLOBAL ENVIRONMENT FACILITY

The GEF serves as the financial mechanism for four important MEAs: the Convention on Biological Diversity, the UNFCCC, the Convention on Persistent Organic Pollutants, and the UN Convention to Combat Desertification. Created in 1991 as a pilot program in the World Bank, the GEF has achieved a strong track record with developing

[76] Joelle de Sepibus, *Reforming the Clean Development Mechanism to accelerate Technology Transfer, NCCR Trade Regulation*, Working paper No 2009/42, November 2009, at 9.
[77] Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. REV. 1759, 1774s, 1778-1781 (2007-2008). Wara's study showed indeed that renewable energy projects account for only 28% of the emissions reductions produced.
[78] U.N., Department of Economic and Social Affairs, *World Economic and Social Survey: Promoting Development, Saving the Planet*, U.N. Doc. E/2009/50/Rev.1, ST/ESA/319 (2009), at 138.
[79] *Id*., at 11. For more on the CDM and technology transfer *see, e.g.*, Antoine Dechezlepretre *et al.*, *The Clean Development Mechanism and the International Diffusion of Technologies: An Empirical Study*, Fondazione Eni Enrico Mattei, Paper 164, 2008.

countries and countries with economies in transition, providing $11.5 billion in grants and leveraging $57 billion in co-financing for over 3,200 projects in over 160 countries.[80]

The GEF has a mandate from the COP to the UNFCCC to finance the transfer of environmental technologies and has evolved into the largest public-sector funding source for these technologies.[81] Technology transfer became increasingly important within the GEF framework during phases GEF-2 (1998-2002) and GEF-3 (2002-2007).[82] Following the UNFCCC's 13th COP, the GEF developed the Poznan Strategic Program on Technology Transfer establishing three channels in support of technology transfer: conduct of TNAs, pilot of technology projects linked to the TNAs, as well as dissemination of GEF experience and of successfully demonstrated ESTs.[83] Under the GEF-5 phase (2010-2014), funding pledge for climate change mitigation programs has expanded to $1.4 billion, with a strategy finally embracing technology transfer as a priority.[84] At the present, the GEF is supporting technology transfer activities in almost 100 developing countries.[85] Moreover, capacity building and technology transfer have been important components of many projects, notably in the GEF's adaptation portfolio.[86]

One interesting case study is the one of the GEF's support for Concentrating Solar Power (CSP) in Egypt (with the World Bank (WB)), Mexico (with the WB), Morocco

[80] *See* http://www.thegef.org/gef/whatisgef (last visited Apr. 30, 2013). *See generally*, Laurence Boisson de Chazournes, *The Global Environment Facility (GEF): A Unique and Crucial Institution*, 18 RECIEL 193 (2005); Sophie Smyth, *A Practical Guide to Creating a Collective Financing Effort to Save the World: the Global Environment Facility Experience*, 22 GEO. INT'L ENVTL. L. REV. 29 (2009).
[81] *See* http://www.thegef.org/gef/Technology_Transfer (last visited Apr. 30, 2013).
[82] Global Environment Facility (GEF), *Transfer of Environmentally Sound Technologies: Case Studies from the GEF Climate Change Portfolio*, GEF, November 2010 (revised November 2012), at 3.
[83] *Id.*, at 5.
[84] *Id.*,at. 6. *See also*, http://www.thegef.org/gef/Technology_Transfer (last visited Apr. 30, 2013).
[85] *Id*.
[86] Global Environment Facility (GEF), *Transfer of Environmentally Sound Technologies: Case Studies from the GEF Climate Change Portfolio*, GEF, November 2010 (revised November 2012), at 36.

(with the WB), and Namibia (with the United Nations Development Programme (UNDP)) because the technology transfer aspect of these projects was very important.[87] The GEF invested about $144 million in these projects involving around $314 million in co-financing. As explained by the GEF, the CSP projects were complex from a technology diffusion perspective as

"technology transfer challenge for integrated solar combined cycle systems depends on a variety of factors, including suitable locations with access to water and natural gas, favorable government policies, proper project finance, and cost effective access to electric transmission for delivering the power to market".[88]

Indeed, CSP technologies are complex environmental technologies that cannot be transferred without appropriate know-how and capacity building allowing the recipient to work and repair the technology on the long term. Even if the CSP projects are still ongoing, they have so far been a success from a technology transfer perspective with the four sites running effectively. In these four countries that were facing important growth in electricity demand, CSP has therefore proved particularly relevant in adding new power supply with low GHG emissions.[89]

Nevertheless, the GEF is far from being a perfect mechanism and there are still opportunities for improvement. As put forth by experts in the field of technology transfer, the "key weaknesses identified in the GEF's climate-related work are its complex project cycle (particularly the lengthy approval periods), its slow response to new opportunities,

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[87] *See* Global Environment Facility (GEF), *Transfer of Environmentally Sound Technologies: Case Studies from the GEF Climate Change Portfolio*, GEF, November 2010 (revised November 2012), at 8-12. *See also*,http://www.thegef.org/gef/project_list?keyword=technology+transfer&countryCode=&focalAreaCode=all&agencyCode=all&projectType=all&fundingSource=all&approvalFYFrom=all&approvalFYTo=all&ltgt=lt&ltgtAmt=&op=Search&form_build_id=forme4dd9b451bffb9b17b728371b056a90f&form_id=prjsearch_searchfrm (last visited Apr. 17, 2013).

[88] Global Environment Facility (GEF), *Transfer of Environmentally Sound Technologies: Case Studies from the GEF Climate Change Portfolio*, GEF, November 2010 (revised November 2012), at 10.

[89] Global Environment Facility (GEF), *Transfer of Environmentally Sound Technologies: Case Studies from the GEF Climate Change Portfolio*, GEF, November 2010 (revised November 2012), at 12.

and its need for additional funding".[90] These weaknesses are important barriers to technology transfer and often discourage private actors in participating to GEF projects.

C BRIEF ASSESSMENT

Through different legal and technical approaches, both the CDM and the GEF have achieved some transfer of environmental technologies to developing countries. Although it does not have a transfer mandate, the CDM met some transfer objectives thanks to flows of FDI. The GEF has proved more relevant in promoting technology transfer and capacity building, notably through the implementation of the Poznan Strategic Program on Technology Transfer. Nevertheless, we saw that both mechanisms have faced great difficulties in ensuring effective transfer of environmental technologies. Building upon the weaknesses that were identified, I will offer three suggestions for the future of environmental technology transfer under the UNFCCC.

IV MOVING FORWARD: THREE SUGGESTIONS FOR ENHANCED TECHNOLOGY TRANSFER UNDER THE UNFCCC REGIME

In the present section I would like to briefly suggest and present three possible solutions in order to enhance technology transfer and diffusion within the UNFCCC regime. I first advocate in favor of a simplification of the transfer scheme within the Convention's bodies (A). Second I will introduce some recommendations for technology

[90] Christiane Gerstetter, *Technology Transfer in the International Climate Negotiations - The State of Play and Suggestions for the Way Forward*, 3 CLIMATE AND CARBON L. REV. 3 (2010).

transfer and diffusion through the GCF (B). Finally, I will assess the possibility of creating a patent pool within the UNFCCC regime (C).

A A PLEA FOR SIMPLIFICATION

As flagged by Section II of this paper, the technology transfer scheme under the UNFCCC is quite complex. Indeed, numerous bodies, mechanisms and expert groups are involved with the issue. I suggest that a simpler technology transfer scheme under the UNFCCC would be beneficial, as it would save resources, time and money. I also suggest that such a simplification is desirable from a legal point of view, as a clearer scheme would allow a more efficient allocation of responsibilities. Indeed, the more bodies that are involved, the less clear it becomes to identify who is in charge of assisting Annex I countries in meeting their technology transfer obligation. Notably, the technology transfer mandate of the Technology Executive Committee, the Climate Technology Centre and Network, the Ad-Hoc Working Group on Long-Term Cooperative Action[91] and the Expert Group on Technology Transfer should be clarified. I suggest that if all four are to play a role in ensuring technology transfer, the Technology Executive Committee should bare the primary responsibility for assisting the Parties and coordinating actions.

[91] The Ad-Hoc Working Group on Long-Term Cooperative Action's mandate should have ended with the Doha Agreed Outcome but there is yet no official record of the Working Group being terminated (Apr. 30, 2013).

B OPPORTUNITIES UNDER THE GREEN CLIMATE FUND

At the UNFCCC COP 16, the Parties established the GCF as an operating entity of the financial mechanism created by Article 11 of the Convention.[92] The CGF aims at supporting projects, programs and policies in developing country Parties[93], and it was decided that the GCF will collaborate with the Technology Executive Committee.[94] In this early stage of the GCF's existence, it is difficult to assess what the Fund will be able to undertake in term of technology transfer. Nevertheless, I would like to suggest a few directions the GCF could follow in order to support technology transfer within the UNFCCC framework.

First, the weaknesses flagged earlier with respect to the GEF should be kept in mind when developing the GCF's actions. Complex project cycles and lengthy approval periods should be avoided as much as possible. Moreover, in order to foster efficient technology transfer, the GCF should be flexible and responsive to new opportunities. The funding should equally be sufficient, stable and predictable, so that effective mitigation and adaptation projects can be undertaken.[95]

Second, strong attention should be paid to subnational entities when designing projects and programs under the GCF. As recently underlined by Professor Osofski, "[w]hile [the] treatment of nation-states as core units comports with international law, which views nation-states as its primary subjects and object, it potentially misses critical

[92] UNFCCC, Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010, U.N. Doc. FCCC/CP/2010/7/Add.1, 15 March 2011 (Decision 1/CP.16).
[93] For more information on the GCF *see* http://gcfund.net/home.html (last visited Apr., 30, 2013).
[94] *Id*.
[95] *See, e.g.*, U.N. Department of Economic and Social Affairs, World Economic Survey 2012, U.N. Doc. E/2012/50/Rev.1, ST/ESA/341, at 94.

interconnections.. [t]hese potential gaps pose issues for the most efficient and effective technology transfer". [96] Indeed, subnational entities may have different needs than national ones. For example, EPPs and environmental technology needs may vary at the subnational level. Moreover, subnational entities could cooperate, building upon their synergies and experiences.

Third, efforts should be made in order to ensure relevant involvement of the private sector entities as they have proved, notably under the GEF, to be key actors in ensuring efficient and long-term technology transfer. Without the private sector's expertise, it is indeed very difficult to disseminate know-how and other necessary capacity building knowledge.

Finally, the GCF presents a great opportunity to further development of technologies that do not currently fund themselves but may be of critical importance for climate adaptation in the future. This is for example the case with regard to certain geoenginering techniques.

C INVOLVING THE PRIVATE SECTOR: PATENT POOLS

Intellectual property rights play an ambiguous role in the scheme of diffusion of environmental technologies.[97] Strong intellectual property regimes indeed appear as an incentive to innovation and diffusion as they protect applicants from illegitimate

[96] Hari M. Osofsky, *Technology Transfer and Climate Change*, *in* SUSTAINABLE TECHNOLOGY TRANSFER: A GUIDE TO GLOBAL AID AND TRADE DEVELOPMENT, Chapter 8 (Hans H. Lidgard et al. eds., 2011).

[97] On the ambiguous role of intellectual property rights' diffusion scheme, *see, e.g.*, WIPO, Climate Change and the Intellectual Property System: What Challenges, What Options, What Solutions?, Draft 5.0 14.xi.08, 2008, at 2. *Available at* http://www.wipo.int/export/sites/www/globalchallenges/en/climate/pdf/summary_ip_climate.pdf (last visited Apr. 30, 2013).

appropriation of technologies. One of the central arguments put forward by proponents of strong intellectual property rights regimes, and underlying the adoption of the Agreement on Trade-Related Aspects Intellectual Property Rights (TRIPS Agreement), is that such approaches not only increase innovation by firms, but also promote diffusion of technologies.[98] On the other hand, intellectual property rights can present two types of barrier to the diffusion of environmental technology.[99] Intellectual property rights can indeed create a financial barrier to the diffusion of technologies because proprietary products undoubtedly cost more than generic ones. Moreover, intellectual property rights can represent a barrier in accessing technologies as right holders may simply refuse to license a technology to a certain manufacturer or to those in certain countries. Developing countries are especially vulnerable to risks posed by the implementation of intellectual property rights as they often appear unable to deal with the legal complexity of patent licensing or to bear the financial cost of the process.[100] But these barriers equally concern corporations in developed countries as environmental technologies remain uncompetitive in certain markets.[101] Hence these hurdles affect the international community as a whole, even though developing countries are particularly affected.

A famous case study illustrates how intellectual property rights can hinder technology diffusion as well as the implementation of international climate obligations.

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[98] *See, e.g.*, UNEP, EPO and ICTSD*, Patents and clean energy: bridging the gap between evidence and policy – Final report*, UNEP, EPO and ICTSD, 2011, at 18; and L. Branstetter, *Do stronger patents induce more local innovation?*, in INTERNATIONAL PUBLIC GOODS AND TRANSFER OF TECHNOLOGY UNDER A GLOBALIZED INTELLECTUAL PROPERTY REGIME 316 (Cambridge University Press, 2005).

[99] On the ambiguous role of intellectual property rights see notably DAVID POPP, "Policies for the Development and Transfer of Eco-Innovations: Lessons from the Literature", *OECD Environmental Working Papers*, No. 10, OECD Publishing, ENV/WKP (2009)5, 2009, pp. 16-17.

[100] *See, e.g.*, Ad Hoc Working Group on Long-Term Cooperative Action Under the UNFCCC, Seventh Session, Bangkok, 28 September to 9 October 2009, and Barcelona, 2-6 November 2009, *Reordering and consolidation of text in the revised negotiating text, Note by the Secretariat*, U.N. Doc. FCCC/AWGLCA/2009/INF.2, 15 September 2009, Annex V.

[101] *See, e.g.*, International Energy Agency, *Energy Perspectives 2010 – Scenarios & Strategies to 2050*, OECD-IEA, 2010, p. 50.

With the entry into force of the Montreal Protocol, ozone-depleting substance (ODS), generic for the most part, were phased out and industries had to use ODS free technologies.[102] Nevertheless, many Parties had significant difficulties in gaining access to ODS free technologies and, after its ratification of the Montreal Protocol, India complained vigorously against the practical and financial difficulties it encountered in trying to access ODS free technologies.[103] Indeed, the agrochemical manufacturer DuPont had refused to enter into commercial licensing agreements for chlorofluocarbon substitutes with Indian and Korean agrochemical manufacturers, fearing illegal appropriation of the technology by potential national and international competitors.[104] These difficulties encountered by India and Korea were acknowledged by the 2001 Human Development Report which stated that "[c]ommitments to technology transfer are central to many international agreements. But once the negotiations are over, many of these provisions are ignored or implemented only superficially".[105]

At the Bangkok Climate Change Talks in 2008, several developing countries expressed their concerns with respect to intellectual property rights acting as a barrier to technology transfer.[106] These concerns were repeated during the COP negotiations in

[102] Montreal Protocol on Substances that Deplete the Ozone Layer, 16 September 1987, 1522 U.N.T.S 3 (entry into force 1 January 1989).

[103] See for example JHA, V. and HOFFMANN, U. (eds.), *Achieving Objectives of Multilateral Environmental Agreements: A Package of Trade Measures and Positive Measures*, UNCTAD, UNCTAD/ITCD/TED/6, pp. 45-55.

[104] *See, e.g.*, UNDP, *Human Development Report 2001 – Making New Technologies Work for Human Development*, Oxford, Oxford University Press, 2001, at 109; and N. Nanda, *Diffusion of Climate Friendly Technologies: Can Compulsory Licensing Help?*, 14 J. OF INTELL. PROP. RTS. 241 (May 2009).

[105] UNDP, *Human Development Report 2001- Making New Technologies Work for Human Development*, Oxford, Oxford University Press, 2001, at 109.

[106] Ad Hoc Working Group on Long-Term Cooperative Action Under the UNFCCC, Seventh Session, Bangkok, 28 September to 9 October 2009, and Barcelona, 2-6 November 2009, *Reordering and consolidation of text in the revised negotiating text, Note by the Secretariat*, U.N. Doc. FCCC/AWGLCA/2009/INF.2, 15 September 2009, Annex V.

Copenhagen.[107] In line with these concerns, there was a call for "joint technological or patent pools to disseminate technologies to developing countries at low cost". [108] More drastic intellectual property measures, such as compulsory licensing of environmental technologies[109] or reduction of the duration of patents[110], were also suggested. The UNFCCC appears to be the wrong forum to discuss patent duration, an issue that should be rather addressed at the World Intellectual Property Organization (WIPO) or under the TRIPS Agreement. It is also doubtful that the UNFCCC would be the right forum to discuss compulsory licensing of environmental technologies. In any case, as environmental technologies are complex technologies, the relevance of compulsory licensing is questionable. Indeed, it is almost impossible to force a private entity to disclose essential know-how, a component that is vital to efficient technology transfer. For this reason, the often referred to parallel between compulsory licensing of pharmaceutical products and compulsory licensing of environmental technologies may be a distraction from the real issue. The pooling solution appears to be a more realistic and effective option in the current state of negotiation.[111] I would thus like to briefly discuss that option.

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[107] For a detailed discussion regarding negotiation over intellectual property right at Copenhagen *see, e.g.*, MATTHEW RIMMER, INTELLECTUAL PROPERTY AND CLIMATE CHANGE: INVENTING CLEAN TECHNOLOGIES 45-61 (Edward Elgar, 2011).

[108] UNFCCC, Ad-Hoc Working Group on Long-Term Cooperative Action under the Convention, Fourth Session, Poznan, 1-10 December 2008, *Ideas and proposals on paragraph 1 of the Bali Action Plan, Revised Note by the Chair*, U.N. Doc. FCCC/AWGLCA/2008/16/Rev.1, 15 January 2009, § 129(b). *See also*, § 13(g).

[109] *Id.*, § 129(b) and 134(c). Under a compulsory license, the right to use another's intellectual property is given in the absence of the right holder's consent in exchange of a set fee for the license. For a commentary on compulsory licensing under the TRIPS Agreement *see, e.g.*, PING XIONG, AN INTERNATIONAL LAW PERSPECTIVE ON THE PROTECTION OF HUMAN RIGHTS IN THE TRIPS AGREEMENT: AN INTERPRETATION OF THE TRIPS AGREEMENT IN RELATION TO THE RIGHT TO HEALTH 191-221 (Martinus Nijhoff Publishers, 2012).

[110] *Id.*, § 129(b).

[111] For an introduction to patent pools *see, e.g.*, Robert P. Merges, *Institutions for Intellectual Property Transactions: The Case of Patent Pools*, *in* EXPENDING THE BOUNDARIES OF INTELLECTUAL PROPERTY: INNOVATION POLICY FOR THE KNOWLEDGE SOCIETY 123-66 (Oxford University Press, 2001).

After the Bangkok Climate Change Talks and the Copenhagen negotiations, the question of patent pools was developed further in Cancun. In order to remove barriers to the development and transfer of technologies arising from intellectual property rights protection, it was notably suggested that "a Global Technology Intellectual Property Rights Pool for Climate Change that promotes and ensures access to intellectual property protected technologies and the associated know-how to developing countries on non-exclusive royalty-free terms" be created.[112]

There are two main possibilities for patent pooling under the UNFCCC: (1) a patent pool to streamline licensing of environmental technologies and (2) a patent common for environmental technologies. The patent pool has the advantage of ensuring that access to environmental technologies is guaranteed and avoids the necessity to deal with multiple patent dealers. Going back to our case study under the Montreal Protocol, the patent pool would have allowed India and South Korea to enter into agreement with DuPont through the patent pool and to hence have access to ODS free technologies. However, patent pools do not necessarily ensure a preferable licensing price and could therefore not be a relevant solution for the least developed countries, unless they received funding from the GEF or the GCF to participate in the pool. A patent common for environmental technologies on the other hand provides free access to patented technologies.

An illustration of an environmental patent pool is the GreenXchange. GreenXchange is a nonprofit web-based marketplace launched in Davos, Switzerland, during the World Economic Forum in January, 2010, by Nike, Creative Commons and

[112] UNFCCC, Work undertaken by the Conference of the Parties at its fifteenth session on the basis of the report of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, U.N. Doc. FCCC/CP2010/2, 11 February 2010, § 11bis(a).

Best Buy. It provides a standardized license structure whereby intellectual property holders can control the level at which and to whom their intellectual assets are available.[113] Intellectual property holders can thus retain the rights they believe to be critical to maintaining their competitive advantage, and licensing agreements are especially designed to allow the necessary flexibility. Three years after its launch, more than 400 patents are available through the GreenXchange licensing platform[114], including Nike's environmentally preferred rubber.[115] In addition to the standardized patent-licensing platform, GreenXchange provides partners with collaborations that offer technical assistance to companies licensing technologies through the GreenXchange.[116] As noted by Eric Lane, intellectual property lawyer and patent attorney specialized in green patents, "the GreenXchange platform enables the patent owner to make its proprietary green technologies available for transfer without compromising competitiveness".[117] This feature should encourage the contribution of more valuable patents.[118]

A patent common for environmental technologies – the Eco-Patent Commons- has already been established by the World Business Council for Sustainable Development (WBCSD), a CEO-led organization. Under the Eco-Patent Commons,

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[113] *See* http://greenxchange.cc/info/about (last visited Apr. 30, 2013).

[114] 237 apparel patents, 167 devices patents, 17 materials patents and 17 method patents. *See* http://greenxchange.cc/info/release/1-23-2011 (last visited Apr. 30, 2013).

[115] *See* http://greenxchange.cc/info/release/1-23-2011 (last visited Apr. 30, 2013).

[116] For example, on January 11, 2011 the GreenXchange held an in-person Collaboratory that included attendance by Brooks, Nike, New Balance, Oregon based non-profits, the University of Oregon and University of Washington, and the U.S. Environmental Protection Agency. The focus of the meeting was on providing technical assistance to footwear companies licensing the environmentally preferred rubber (EPR) patent offered through the GreenXchange. *See* http://greenxchange.cc/info/release/1-23-2011 (last visited Apr. 30, 2013).

[117] ERIC LANE, CLEAN TECH INTELLECTUAL PROPERTY: ECO-MARKS, GREEN PATENTS, AND GREEN INNOVATION 212 (Oxford University Press, 2011).

[118] For more on the GreenXchange *see, e.g.*, MATTHEW RIMMER, INTELLECTUAL PROPERTY AND CLIMATE CHANGE: INVENTING CLEAN TECHNOLOGIES 327-32 (Edward Elgar, 2011).

patents providing environmental benefits are available without royalty.[119] In terms of technology transfer, the free availability of environmental patents is undoubtedly valuable. However, the issue with this model is the question of incentive, quantity and value of the patents offered. One indeed wonders what is the incentive for the private sector to offer valuable intellectual property assets for free. The WBCSD itself acknowledges that the Eco-Patent Commons targets patents "that provide environmental benefit and do not represent an essential source of business advantage" for the patent holder.[120] In this light, it is likely that cutting edge, high quality environmental technologies may not be made available through an open source patent common approach.

In order to ensure the full participation of the private sector in the pooling of environmental technologies, it seems therefore that a fair royalty should be paid to right holders. One approach in this respect could be for a UNFCCC Fund to buy out key environmental technologies and then make them available to the Parties through a special pool. This option has notably been put forward by the WIPO.[121] One could therefore imagine that the pool could be hosted by the WIPO, an organization that may be more efficient in dealing with a patent pool than the UNFCCC regime. In terms of funding, it seems that the GCF would be most relevant in order to finance the operation.

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[119] *See* http://www.wbcsd.org/work-program/capacity-building/eco-patent-commons/overview.aspx (last visited Apr. 30, 2013). For more on the Eco-Patent Commons *see, e.g.*, MATTHEW RIMMER, INTELLECTUAL PROPERTY AND CLIMATE CHANGE: INVENTING CLEAN TECHNOLOGIES 318-26 (Edward Elgar, 2011).

[120] *Id*.

[121] WIPO, Climate Change and the Intellectual Property System: What Challenges, What Options, What Solutions?, Draft 5.0 14.xi.08, 2008, p. 2. *Available at* http://www.wipo.int/export/sites/www/globalchallenges/en/climate/pdf/summary_ip_climate.pdf (last visited Apr. 30, 2013).

CONCLUSION

While diffusion of environmental technology should be optimum in order to effectively address current climate change challenges, currently developing countries lack access to environmental technologies and that environmental technologies remain uncompetitive compared to non-environmental ones. It is therefore necessary to develop mechanisms in order to enhance environmental technology diffusion and transfer.

Technology transfer has been central to the UNFCCC since the negotiation of the Convention. As the Convention's legal framework establishes a technology transfer obligation in favor of developing countries, concrete steps must be taken in order to ensure more efficient results. Building upon lessons learned from technology transfer activities under the CDM and the GEF, this paper has suggested three possible solutions for enhanced environmental technology diffusion within the UNFCCC regime. First, I advocated in favor of a simplification of the transfer scheme within the Convention's bodies, in order to save resources and better allocate responsibilities. Second, I made some recommendations with respect to technology transfer through the GCF, *i.e.* to avoid complex and lengthy approval periods, to make the fund responsive to new opportunities, to provide sufficient, stable and predictable funding, to pay attention to subnational entities, as well as to involve the private sector more. Third, I suggested that the creation of an environmental patents' pool would help to ensure access to key environmental technologies. After assessing different possibilities, I concluded that in order to ensure the full participation of the private sector, right holders should be paid a fair royalty.

Therefore, I recommended a model where rights would be bought out and then made available to Parties through a pool that could be hosted by the WIPO.

The suggestions I made are undoubtedly not exhaustive of the possible options and simply represent three of the solutions open to the UNFCCC's COP. Nevertheless, I believe that they are viable and effective options that build upon existing consensus within the international community.

As a conclusion to this paper I would like to stress that as climate-related innovative finance has concentrated on the global public good of mitigation rather than adaptation, so too has technology diffusion.[122] It is therefore important that adaptation technologies are increasingly considered in technology transfer activities. Finally, and from a long-term technology transfer perspective, thought should also be given to the support of adaptation technologies that do not yet fund themselves because they are not useful or saleable at the moment, but that may become essential in the near future.

[122] *See, e.g.*, U.N. Department of Economic and Social Affairs, World Economic Survey 2012, U.N. Doc. E/2012/50/Rev.1, ST/ESA/341, at 88.

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