

Technologies for Climate Change and Intellectual Property: Issues for Small Developing Countries

Development and transfer of technology has emerged as a basic building block in the crafting of a post-2012 global regime on climate change. A number of technologies needed for adaptation and mitigation (e.g. water saving, disease and pest control technology, energy efficiency and renewable energy technologies, etc.) have been identified. The role of intellectual property (IP) in promoting the transfer of technology, though generally controversial, is particularly complex in relation to Least Developed Countries (LDCs). This information note aims to provide an initial review of the links between these issues from the perspective of LDCs and outline some of the relevant measures that could be developed in support of a post-Kyoto climate regime.

Introduction

Development and transfer of technology has emerged as a basic building block in the crafting of a post-2012 global regime on climate change. A range of technologies needed for mitigation and adaptation to climate change have already been identified. These include technologies needed for observation and monitoring of climate change, technologies for mitigation (e.g. energy-efficient and renewable-energy technologies, energy efficiency transportation technology, energy- and material-saving building and construction technologies, low-greenhouse gas (GHG) emission technologies for agriculture and animal husbandry etc.) and technologies for adaptation (e.g. water-saving, water-capture and water-reuse technologies, agricultural biotechnology, disease and pest-control technology, flood, drought, sea-level rise, agricultural disasters and desertification-control technologies).

Several barriers to access to these technologies have been identified, including economic, institutional, policy and human capacity-related barriers. Smaller developing countries are confronted with many such barriers to the development and transfer of technology. Legal and policy measures have an important role in the transfer of technology, even as technology is largely transferred by the private sector. Trade liberalisation, per se, is an insufficient driver to the diffusion of the knowledge and technologies that will be required, especially in developing countries, to mitigate and adapt to climate change. A range of economic and trade-related instruments provide opportunities for multilateral action to promote climate-relevant innovation and technology transfer, providing an 'enabling environment'.



Box 1: Technology Transfer in the Bali Action Plan

The Bali Action Plan launched 'a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term co-operative action', by addressing, inter alia:

- (d) Enhanced action on technology development and transfer to support action on mitigation and adaptation, including, inter alia, consideration of:
 - (i) Effective mechanisms and enhanced means for the removal of obstacles to, and provision of financial and other incentives for, scaling up of the development and transfer of technology to developing country Parties in order to promote access to affordable environmentally sound technologies;
 - (ii) Ways to accelerate deployment, diffusion and transfer of affordable environmentally sound technologies;
 - (iii) Co-operation on research and development of current, new and innovative technology, including win-win solutions;
 - (iv) The effectiveness of mechanisms and tools for technology co-operation in specific sectors

Technological solutions are one of the imperative elements in meeting the challenges of climate change. A critical factor in greenhouse gas (GHG) emissions, technology is also fundamental to enhancing existing abilities and lowering the costs of reducing these emissions. In this context, the UN Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol already require Parties to promote and co-operate in the development and diffusion, including transfer, of technologies that control, reduce or prevent GHG emissions.¹ Enhanced action on technology development and transfer will also be central in enabling the full, effective and sustained implementation of the UNFCCC beyond 2012, as recognised in the Bali Action Plan (see box 1).

Though both the development and the transfer of technology are important aspects of the Bali Action Plan, transfer of technology is proving a particularly significant and complex issue in ongoing negotiations. Indeed, transfer of technology is taking an unprecedented place in the debate, given remaining technological disparities at the international level and the consideration of mitigation commitments for developing countries in a post-2012 climate regime. Significant divergences remain, moreover, as to the principal obstacles to the transfer of climate-related technologies, as well as to measures needed to effectively address these obstacles. Increased research and analysis will be fundamental in overcoming such differences, and in developing effective technology-related international co-operative action on climate change.

In any case, there will likely be no single answer to promoting the transfer of climate-related technologies. The UNFCCC has recognised that least developed countries, countries in the African region and small island developing states have 'specific needs and special situations' in regards to technology transfer.² Many of the tools found useful in other contexts, therefore, may be inadequate and even counterproductive for these countries, which have lower levels of development and other distinctive circumstances. For example, market-based technology transfer mechanisms such as foreign direct investment or joint ventures are ineffective in meeting the needs and demands of least developed countries.³

The role of intellectual property (IP) in promoting the transfer of technology, though generally controversial, is particularly complex in relation to least developed countries. Studies show, for instance, that the basic conditions for IP to operate as an incentive for the transfer of technology do not exist in countries at the initial stages of technological development.⁴ Moreover, unless they are selectively adapted to address the particular needs and conditions of least developed countries, IP rules may even hinder the technological development that is necessary for these countries to grow and reduce poverty, as well as address climate change mitigation and adaptation. As UNFCCC discussions address whether IP-related measures or other incentive mechanisms are necessary to ensure the transfer of the climate-related technologies, therefore, the singular situation of least developed countries should be taken into account.

¹ See, e.g., Article 4.1 (c) of the UNFCCC and Article 10 of the Kyoto Protocol.

² The UNFCCC has recognized the particular needs and circumstances of these groups of countries in Article 4.9 and other subsequent decisions, including Decision 3/CP.13 on "Development and transfer of technologies under the Subsidiary Body for Scientific and Technological Advice."

³ Foray, D. (2008). "Technology Transfer in the TRIPS Age: The Need for New Types of Partnerships between the Least Developed and Most Advanced Economies." ICTSD.

⁴ United Nations Conference on Trade and Development (UNCTAD), "The Least Developed Countries Report 2007."

Indeed, there is increasing realisation that - both within and beyond the intellectual property system - existing innovation structures and activities can and should be enhanced, and more efforts are needed to get smaller developing countries on board.

Given the complexity of the topic, the objective of this note is not to comprehensively address the topic of climate change, technology transfer and intellectual property. In the context of ongoing work on trade and climate change, however, it aims to provide an initial review of the links between these topics from the perspective of least developed countries, as well as to outline some of the relevant measures that could be developed in support of a post-Kyoto climate regime.

There is no single definition for 'transfer of technology'.

Technology Transfer: the Role and Impact of Intellectual Property Rights

On the contrary, both the term 'transfer of technology' and other related notions are understood in various ways depending on perspectives on technology and technology-related processes. In general, however, 'transfer of technology' can be defined as the transfer of systematic knowledge for the manufacture of a product, for the application of a process or for the rendering of a service.⁵ The transfer of a technology is thus not exhausted in the transmission of the hardware, but also requires facilitating access to related technical and commercial information and the human skills needed to properly understand it and effectively use it.⁶ These aspects are all recognised by the definition of 'transfer of technology' used in the UNFCCC context (see box 2).

In the complex process of transfer of technology, the role of IP protection - despite being only one of many influential factors - has proven particularly contentious. IP rights were conceived as private rights to reward innovation and promote the dissemination of knowledge in the context of broader societal goals. By offering protection against a loss of control of information in technology-related transactions, IP is thus - in part - an instrument aimed at facilitating the transfer of technology.⁸ On the other hand, the existence of IP protection does not guarantee or suffice for effective transfer of technology. IP rights need to be buttressed by appropriate infrastructures, governance, and competition systems in order to be effective.⁹ Moreover, there are circumstances in which IP rights may provide no incentives for the transfer of technology.

For the majority of least developed countries, IP protection may in fact hinder or prevent transfer of technology.¹⁰ Research shows that, in the case of least developed countries, the absorption of existing technologies and their adaptation to local conditions primarily occurs through informal mechanisms, including imitation. In most cases, these informal mechanisms for the transfer of technology require some degree of 'reverse engineering', which can be curtailed by strong IP protection. In addition, the formal mechanisms for transfer of technology, including trade in goods, foreign direct investment, and licensing, which would be supported by stronger IP rights in other contexts, do not seem to have significant effect in least developed countries. Circumstances such as limited market size, weak regulatory mechanisms and minimal technological capability of local firms, for example, all limit the potential benefits from formal mechanisms for technology transfer in small and vulnerable economies.¹¹

Box 2: Intergovernmental Panel on Climate Change (IPCC) Definition of 'Transfer of Technology'

In its Special Report prepared in response to a request by the Subsidiary Body for Scientific and Technological Advice (SBSTA) to the UNFCCC, the IPCC defines 'technology transfer' as:

'The broad set of processes covering the flows of knowledge, experience and equipment amongst different stakeholders such as governments, private sector entities, financial institutions, NGOs and research/educational institutions.

'The broad and inclusive term "transfer" encompasses diffusion of technologies and technology co-operation across and within countries. It comprises the process of learning to understand, utilise and replicate the technology, including the capacity to choose it and adapt it to local conditions'.⁷

⁵ Draft International Code of Conduct on the Transfer of Technology, 1985 version.

⁶ In this regard, a critical aspect of the technology transfer process is the development of the domestic capacities to absorb and master the received knowledge, innovate on that knowledge, and commercialize the results.

⁷ Intergovernmental Panel on Climate Change (2000). "Methodological and Technological Issues in Technology Transfer." Cambridge University Press, UK.

⁸ Studies have shown that such a positive impact does exist, including by establishing a link between stronger patent rights and productivity, trade flows, foreign direct investment, and the sophistication of the technologies transferred. See, e.g., Maskus, K. (2003). "Transfer of Technology and Technological Capacity Building". ICTSD-UNCTAD.

⁹ Maskus, K. et al (2004). "Patent Rights and International Technology Transfer through Direct Investment and Licensing." Duke University Law School, April 2003.

¹⁰ United Nations Conference on Trade and Development (UNCTAD), "The Least Developed Countries Report 2007."

¹¹ Foray, D. (2008). "Technology Transfer in the TRIPS Age: The Need for New Types of Partnerships between the Least Developed and Most Advanced Economies". ICTSD.

The exact role of IP in the transfer of climate-related technologies remains unclear. In a 2006 UNFCCC report, IP-related issues did not feature prominently within a range of economic and market barriers to the transfer of technology in developing countries.¹² No comprehensive study has been conducted on the potential impact of IP rights in the different categories of climate-related technologies, but initial research found that the impact of patents on access to solar, wind and biofuel technologies in developing countries might not be significant.¹³ On the other hand, studies by the European Patent Office (EPO) have noted the increasing number and scope of patent claims in wind energy and biofuels technologies - though the precise implications of these patent trends for the transfer of technology remain uncertain.¹⁴

Nevertheless, the general dynamics of IP and transfer of technology are likely to remain valid in the climate change context. Determining a balance between the protection of IP rights and the promotion of public objectives, such as the transfer of technology, therefore, may be an important element of the post-Kyoto climate regime or the supportive international legal framework. Indeed, there are already significant calls to address the potential adverse effects of IP on the transfer of climate-related technology. On the eve of the Bali conference, for example, the European Parliament adopted a resolution, which stated that an ambitious post-Kyoto agreement might require 'corresponding adjustments' to be made to other international agreements, including on IP.¹⁵ In discussions on the Bali Action Plan, moreover, several developing countries have stated as their position that IP is one of various obstacles that must be addressed in a systemic and cross-cutting manner to promote the transfer of technology.¹⁶

Issues for Developing Countries

As discussion on the Bali Action Plan continues, recognising the special circumstances of least developed countries and their need for specific approaches and incentives for technology transfer should be paramount. UNFCCC Parties should thus consider a number of approaches that may ensure that IP protection functions as an instrument for the transfer of technology and

other sustainable development goals in least developed countries. These approaches, which are non-mutually exclusive, include focusing on the policy space still available in international IP rules; increasing existing policy space through modifications to these rules; and developing new - and not necessarily IP-related - incentive mechanisms to promote the transfer of technology. Approaches focusing on protecting and enhancing the policy space for transfer of technology within the international IP system should also be considered.

The World Trade Organization (WTO) Agreement on Trade-related Aspects of Intellectual Property Rights (the 'TRIPS Agreement') introduced IP rights into the international trading system and remains the most comprehensive international agreement on the topic. The TRIPS Agreement states that the objective of the protection and enforcement of IP 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...'.¹⁷ It also recognises that measures 'may be needed to prevent the abuse of intellectual property rights by rights holders or the resort to practices which ... adversely affect the international transfer of technology'.¹⁸

Despite such language, it is unclear whether the TRIPS Agreement does establish a framework conducive to the transfer of technology, particularly in relation to least developed country Members. The TRIPS Agreement recognises 'the special needs and requirements of least developed country Members, their economic, financial and administrative constraints, and their need for flexibility to create a viable technological base', providing them with a special implementation period.¹⁹ During this transition period, which is currently set to expire on 1 July 2013, these countries have available a range of channels for transfer of technology, including, for example, imitation and reverse engineering.²⁰ The TRIPS Agreement also foresees particular incentives for technology transfer to least developed countries (see box 3). Nevertheless, there are concerns as to how a strong IP regime, as encouraged

¹² UNFCCC Secretariat (2006). "Synthesis report on technology needs identified by Parties not included in Annex I to the Convention." UNFCCC Subsidiary Body for Scientific and Technological Advice.

¹³ Barton, J. (2007). "Intellectual Property and Access to Clean Energy Technologies in Developing Countries, An Analysis of Solar Photovoltaic, Biofuel and Wind Technologies." ICTSD.

¹⁴ European Patent Office (EPO) (2007). "Fuelling a sustainable economy" and "The Age of Windustry?" Available at <http://www.epo.org/topics/innovation-and-economy/emerging-technologies/>.

¹⁵ European Parliament resolution of 29 November 2007 on trade and climate change (2007/2003(INI)).

¹⁶ In the first meetings of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG) and Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWGLCA), Cuba, India, Tanzania, Indonesia, China, and others stressed the need to address IP within technology discussions. Some developed countries, however including Australia and the US, affirmed their belief that IP was not a barrier, but a catalyst for technology transfer.

¹⁷ TRIPS Agreement, Article 7.

¹⁸ TRIPS Agreement, Article 8.

¹⁹ TRIPS Agreement, Article 66.1.

²⁰ These channels allow immediate and free access to some knowledge and facilitate the building of productive capacities in least developed countries. In addition, in 2002, WTO Members approved a decision extending until 2016 the transition period during which least developed countries do not have to provide IP protection for pharmaceuticals products.

Box 3: Article 66.2 of the TRIPS Agreement

Article 66.2 of the TRIPS Agreement mandates developed country Members to 'provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least developed country Members in order to enable them to create a sound and viable technological base'.

Because least developed countries considered little progress was being made under this obligation, the Doha Ministerial Declaration mandated the TRIPS Council to 'put in place a mechanism for ensuring the monitoring and full implementation of the obligations' of Article 66.2. A decision setting up this mechanism was adopted in February 2003. It requires developed country Members to present annual reports providing a range of information on the incentives regime put in place to fulfil Article 66.2 obligations.

There are growing concerns, however, that such a mechanism is inadequate to promote effective transfer of technology in least developed countries. An analysis of reports on the measures taken to date, for example, found several shortcomings, including in the types and areas of incentives chosen²¹. As a result, it is still unclear to which degree transfer of technology takes place under Article 66.2 of the TRIPS Agreement, and what specific measures might be taken to improve the implementation of the provision.

and eventually required by the TRIPS Agreement, will impact the transfer of technology and other public policy considerations in least developed countries.

This is where the issue of TRIPS flexibilities comes to the forefront of international discussions, including on the transfer of climate-related technologies. The TRIPS Agreement not only establishes minimum standards of IP protection, but also incorporates certain policy space to allow countries to position IP rights in the context of their broader objectives and priorities. For example, the TRIPS Agreement allows for certain limitations and exceptions to the protection of IP rights and for national determination of the appropriate method of implementation. These provisions are known as 'TRIPS flexibilities' and have been found to provide critical policy space in areas ranging from biodiversity and agriculture to public health and education. Though parallels with other public policy areas must be taken forth with care, previous experiences - particularly regarding patents and public health²² - have become a reference point, and some UNFCCC Parties are already calling to reaffirm or increase TRIPS flexibilities to ensure a rapid and widespread transfer of climate-related technologies.

The TRIPS Agreement includes several types of provisions that could be useful in relation to climate-related technology transfer. For example, various provisions on patents - the exclusive rights granted for an invention, which generally constitutes a product or process that offers a new technical solution to a problem - are deemed pertinent to enhancing the transfer of technology. These provisions include:

- **Exemptions to patentability:** 'Patentability' refers to the boundaries established in relation to what inventions may be patented. Prior to the TRIPS Agreement, countries could exclude inventions of certain types or in certain areas of technology - such as pharmaceutical products and agricultural methods - from patentability, based on their development priorities and strategies. Article 27.1 of the TRIPS Agreement requires WTO Members to grant patents to all types of inventions in all fields of technology, as long as these inventions meet certain basic criteria. Because the TRIPS Agreement does not define the patentability criteria (namely novelty, inventive step and industrial applicability), however, some critical policy space remains in relation to the scope of patentability in each country. The loose definition of these criteria has raised concerns given the resulting all-encompassing patents. For example, patent claims on synthetic biology products and processes among the most promising technologies for cellulosic biofuels are so broad that scientists worry it could bring the discipline to a standstill.²³ Defining the patentability criteria to adequately limit the scope of patents, on the other hand, would have a positive impact on further innovation by limiting the possibility of conflict with existing patents. In addition, in some contexts, it would also enhance the transfer of technology. For example, by limiting the scope of patentability as they implement the TRIPS Agreement, least developed countries could safeguard informal pathways to the transfer of climate-related technologies, such as reverse engineering.

²¹ Foray, D. (2008). "Technology Transfer in the TRIPS Age: The Need for New Types of Partnerships between the Least Developed and Most Advanced Economies". ICTSD.

²² Discussions on patents and public health at the WTO led to the adoption of the Doha Declaration on the TRIPS Agreement and Public Health, as well as an amendment to the Agreement to address the difficulties that WTO Members with insufficient or no manufacturing capacities in the pharmaceutical sector could face in making effective use of some of the TRIPS flexibilities.

²³ Steve Suppan. "Patent policy and sustainable cellulosic biofuels development." *Biofuels News*, May 19, 2008.

- **Exceptions to patent rights:** The TRIPS Agreement recognises that the rights of a patent owner to prevent third parties from exploiting the patented product are not absolute. Indeed, Article 30 states that WTO Members may provide 'limited exceptions' to these rights. That is, countries may - under certain circumstances - automatically allow the use of the patented invention by a third party without consent of the patent holder. The TRIPS Agreement does not define these circumstances, which will be linked to national policies and objectives. For example, a common exception addresses experimental use, allowing the use of patented inventions for research or experimental purposes by Parties other than the patent owner. This type of exception will be relevant in the climate change context, where adaptation of the technology to local needs and environments will be particularly vital. It would also allow companies in developing countries to 'invent around' patent claims to gain access to environmentally sound technologies, which has proved important in the context of the implementation of other multilateral environmental agreements.
- **Compulsory licenses:** There are also other cases in which the TRIPS Agreement allows the use of a patented product or process without authorisation of the rights holder. One of the most important - yet perhaps most controversial - is the granting of compulsory licenses. These non-voluntary licenses are granted by an administrative or judicial authority to a third party, allowing the exploitation of the patented invention without consent of the patent owner.²⁴ Developing country Members consider this possibility as essential to ensuring that they can implement the TRIPS Agreement in a way that responds to broader public policies.

Article 31 of the TRIPS Agreement, which deals with compulsory licenses, does not define the grounds on which countries may allow non-voluntary licenses, although it does require a number of conditions and procedural steps. Climate mitigation or adaptation could provide valid grounds for compulsory licensing, and could even be considered to be included in general references to 'public interest' in most patent laws. Some countries also foresee compulsory licenses in cases in which the invention is not exploited in the country, or is insufficiently

exploited. Such a measure could restrain some of the anti-competitive practices feared as potentially impeding the transfer of climate-related technologies to developing countries. It is interesting to note that the issuing of compulsory licenses in certain situations, including cases of national emergency, other circumstances of extreme urgency or public non-commercial use, is less arduous.²⁵ These compulsory licenses could thus prove an effective tool to ensure rapid access to critical climate-related technologies in developing countries.

These examples show the potential contribution of TRIPS flexibilities to climate-related technology transfer, including for least developed countries once they are required or choose to establish IP protection. Moreover, increasing public attention and concerns about the relationship between IP and the transfer of climate-related technologies have resulted in calls for modifications to the TRIPS Agreements to support the post-Kyoto climate regime.²⁶ Proponents consider that changes such as explicitly incorporating climate protection as grounds for compulsory licensing or limiting the patentability of climate-related inventions could establish and consolidate policy space, which is important for a successful technology component in a post-Kyoto climate change regime.²⁷

Nevertheless, it is important to keep in mind the difficulties and vast political cost of modifications to the TRIPS Agreement. In addition, given the ongoing promotion of an agenda of higher levels and enhanced enforcement of IP protection, the risk of 'opening' the TRIPS Agreement should not be taken lightly. These points are particularly valid for least developed countries, which are currently not obliged to implement TRIPS Agreement provisions. Finally, on an issue as complex as climate-related technologies, it is questionable whether effective solutions could be achieved in the Council for TRIPS, a forum with a specific and limited approach. As a result, it is important to define the role of the UNFCCC and the climate regime itself in addressing the relationship between IP and climate-related technologies, including by developing new - and not necessarily IP-related - incentive mechanisms to promote the transfer of technology.

²⁴ The process does have a number of safeguards under Article 31 of the TRIPS Agreement, of course, including the requirements that the proposed user should have made good faith efforts to obtain authorization from the patent holder, the use will be for domestic supply only, the patent holder shall be granted "adequate" remuneration, there be an established review process and so on.

²⁵ In these cases, the need to make efforts to obtain authorization from the right holder on reasonable commercial terms and conditions and to have such efforts have not been successful within a reasonable period of time is waived.

²⁶ In his speech to the UNFCCC Conference of the Parties in Bali, for example, the Brazilian Foreign Minister proposed that a statement similar to the Doha Declaration on the TRIPS Agreement and Public Health should be considered in the climate change context. The European Parliament, for its part, has recommended launching a study on amendments to the TRIPS Agreement required to allow for the compulsory licensing of environmentally necessary technologies.

²⁷ Third World Network. "Brief Note on Technology, IPR and Climate Change". 23 Feb 2008.

Intellectual Property and the Transfer of Technology in the Post-2012 Climate Regime

Both the UNFCCC and the Kyoto Protocol contain specific commitments on technology transfer. Article 4.5 of the UNFCCC urges developed country Parties, for example, to take all practicable steps to promote, facilitate and finance the transfer of, or access to, environmentally sound technologies and know-how, particularly to developing countries. Article 10 of the Kyoto Protocol, among others, reaffirms these commitments. Under Article 4.3 of the UNFCCC, moreover, developed country Parties are required to provide the financial resources needed by the developing country Parties to meet the agreed full incremental costs of implementing their obligations, including for the related transfer of technology. Indeed, the effective implementation by developed country Parties of their commitments on transfer of technology is inherently linked to the extent to which developing country Parties are required to implement their own commitments. As in other areas, however, realising the goals and complying with the obligations of transfer of technology have not proved simple.

The role of IP in promoting the transfer of climate-related technologies has traditionally not been at the forefront of discussions at the UNFCCC. As this debate appears to gain momentum, however, it is worth noting that UNFCCC Parties may consider a number of measures to enhance technology transfer in the context of a post-2012 climate regime - measures that may prove more feasible and effective than those sought in the context of the TRIPS Agreement. This is particularly true from the perspective of least developed countries. Some measures are already being discussed in the context of ongoing UNFCCC negotiations, including financial mechanisms to address the link between IP and the transfer of technology and guidelines on IP protection for publicly funded technologies. Other emerging topics include institutional arrangements for open or collaborative innovation, prizes as incentives to climate-related innovation and public-private partnerships.

Financial mechanisms are considered an important approach to addressing the issue of IP and transfer of technology. A 'Multilateral Technology Acquisition Fund', for example, has been proposed as a way to fund the transfer of technologies to developing countries through, inter alia, the buying-out of IP rights.²⁸ Given the relative success of the Multilateral Fund for the Implementation

of the Montreal Protocol, such a proposal is actively being considered in the negotiations. Nevertheless, it should also be noted that, under the Montreal Protocol, 'IP rights did not constitute as large a barrier to technology transfer as was feared'.²⁹ Moreover, it is unclear that the case-by-case approach used in ozone-related technologies would work in the climate change context, given the greater range of relevant technologies and potential patent challenges.³⁰ On the other hand, complementary activities taken forth under the Montreal Protocol on technical assistance and capacity building set significant examples, particularly given the importance of enhancing national capabilities to achieve effective technology transfer in least developed countries.

Implications of public financing for the IP rights available over climate-related technologies has also been raised in the UNFCCC context, albeit not in recent negotiations. Government financing of research and development (R&D) - significant in most environmentally sound technologies - particularly benefits climate-related technologies. Nevertheless, such financing currently has few implications for the mode of ownership, commercialisation or transfer of these technologies, which are usually protected by IP rights³¹. As a result, these technologies, though stemming from publicly funded R&D, are not necessarily publicly available. A series of guidelines might guide public entities to retain some influence on the use and commercialisation of publicly financed climate-related technologies, and could be considered in the post-Kyoto climate regime.

As mentioned, there are other emerging measures that - while not discussed in the framework of the Bali Action Plan to date - would merit consideration. One is the use of open source mechanisms to incentivise innovation and promote the transfer of climate-related technologies, as has been done in a variety of other fields, including software and biomedicine. Open source - which allows a broad access to the technologies developed beyond their innovators - has been called 'perhaps the most promising model' for technological development in least developed countries, given its costs advantages and the greater possibilities for learning due to the sharing of knowledge and ideas.³² Its potential for the development and transfer of climate-related technologies remains largely unexplored.

²⁸ See, e.g., the statement of the African Group in COP-12 of the UNFCCC.

²⁹ Andersen, S. et al (2007). "Technology Transfer for the Ozone Layer: Lessons for Climate Change." Earthscan.

³⁰ In addition, it should be noted that in the case of ozone depleting substances, alternative technologies to specifically and effectively address the problem had been identified and were available, which is not the case in the climate change context.

³¹ United Nations Conference on Trade and Development (UNCTAD) (1998). "The Role of Publicly Funded Research and Publicly Owned Technologies in the Transfer and Diffusion of Environmentally Sound Technologies." Background Paper No. 22, Commission on Sustainable Development, Sixth Session.

³² United Nations Conference on Trade and Development (UNCTAD), "The Least Developed Countries Report 2007."

Another possibility is the use of prizes to promote innovation while establishing a series of conditions that would allow the rapid and widespread transfer of the resulting technologies. In 2007, a number of prizes were offered by various countries and organisations to promote innovation in climate-friendly technologies, including the Earth Fund, launched in Bali to reward environmental innovation in areas such as second generation biofuels, water treatment or clean energies.³³ For these prizes to serve as an instrument of technology transfer, however, it is fundamental that related conditions are expressly considered and prioritised in their development.

Finally, another potential measure would be the introduction of public-private partnerships into the post-Kyoto climate regime. Such partnerships have been found to be particularly useful for transfer of technology to least developed countries, as they specifically aim to design and manage the various phases of the process successfully and might include specific arrangements on IP issues.³⁴ Moreover, in its Special Report on technology transfer, the IPCC noted that 'public-private partnerships are increasingly seen as an effective way in which the public sector can achieve public policy objectives by working with the private sector.'³⁵

Conclusions

Given remaining uncertainties, a unique conclusion on the relationship between IP and the transfer of climate-related technologies is far from feasible at the moment. Similarly, there is still little clarity as to the manner to best address this relationship in the various relevant international institutions and rules, particularly with relation to challenges posed by circumstances in least developed countries. Nevertheless, an overview of the potential opportunities and challenges presented by international IP rules to technology transfer under the post-2012 climate regime does present important lessons for possible next steps both in the UNFCCC and in the WTO.

First, it is clear that further research and analysis will be critical to achieve any effective solutions. An in-depth study of the various aspects of the interaction between IP and the transfer of climate-related technologies could provide the basis for more efficient and evidence-based

discussions. Specific information on the climate-related technologies most strategic for least developed countries and the manner in which IP might impact the transfer of technology in practice could assist in moving negotiations towards more concrete problems and potential solutions.

Second, the existing transition period for the implementation of the TRIPS Agreement available to least developed countries provides a flexibility that should be noted. In addition, even when required to implement IP protection, least developed countries, as well as other developing countries, will still be able to resort to a number of TRIPS flexibilities to promote the transfer of climate-related technologies. The use of these flexibilities has not proved easy in other areas, but there is no evidence of such obstacles in the climate change context. Existing possibilities, therefore, should be explored in full. Third, it is important to note the need for negotiating expertise in the area of technology and IP rights - an expertise that is not shared by many environmental negotiators.

Finally, the consideration of measures related to IP and other incentive schemes should not be limited to the discussions on the TRIPS Agreement, but should also consider opportunities within climate negotiations. Considering IP-related issues in the development of measurable, verifiable indicators of technology transfer, for example, could help in ensuring adequate consideration of any positive and negative impact of IP on the implementation of the relevant UNFCCC and Kyoto Protocol provisions. In addition, a number of mechanisms increasingly explored and used in other public policy areas - including health, education and R&D - provide interesting examples to explore in ongoing UNFCCC negotiations as ways to enhance the technology transfer component of the post-Kyoto climate regime.

Moving beyond what has often been a general and political discussion, and - above all - moving towards an effective solution to the greatest development challenge of our time, requires such informed, comprehensive and coherent debate on intellectual property and climate change. It also requires the realisation that - in the context of least developed countries - technology transfer involves specific challenges and demands distinctive solutions.

³³ *Knowledge Ecology International (2008). "Selected Innovation Prizes and Reward Programs." KEI Research Note 2008:1.*

³⁴ *Foray, D. (2008). "Technology Transfer in the TRIPS Age: The Need for New Types of Partnerships between the Least Developed and Most Advanced Economies". ICTSD.*

³⁵ *Intergovernmental Panel on Climate Change (2000). "Methodological and Technological Issues in Technology Transfer." Cambridge University Press, UK.*

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