FACILITATING TECHNOLOGY TRANSFER FOR CLIMATE CHANGE: THE NEED TO ADDRESS IPR ISSUES

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Climate change is now recognized as a major, if not the most important, environmental problem. Now that the scientific battle to have this problem recognized seems to have been won (with a few exceptions), attention is turning on solutions.

A major area in the search for solutions is the design and spread of more energy-efficient technologies that reduce or eliminate climate change inducing emissions. In the next few years, it can be expected that these technologies will be increasingly introduced.

However, intellectual property rights (IPR) over such technologies may pose a hindrance to their dissemination and use. In particular, developing countries may be expected to face such obstacles to the transfer of technology that is aimed at reducing the sources of climate change.

The issue of technology transfer is one of the bone of contention at most climate change negotiations, including the recent Conference of the Parties 13 (COP 13) to the United Nations Framework Convention for Climate Change (UNFCCC) and the third Meeting of the Parties to the Kyoto Protocol (MOP 3). This paper looks at the state of negotiations, some of the issues relating to IPRs and the transfer of environmentally sound technologies and suggestions for facilitating transfer of technology particularly in terms of addressing constraints posed by IPR regimes.

Technology Transfer in UNFCCC and KP

Articles 4.5 and 4.7 of the UNFCCC spell out the provisions for technology transfer. Article 4.5 obliges developed countries to take all practicable steps to promote, facilitate and finance the transfer to or access to environmentally sound technologies and know-how so as to enable developing countries to implement the provisions of the Convention. It also obliges developed countries to support development and enhancement of endogenous capacities and technologies of developing countries. Article 4 (7) of UNFCCC says that the extent to which developing countries implement their commitments under the Convention will depend on the effective implementation by developed countries of their commitments related to financial resources and technology transfer, and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of developing countries.

Article 10 (c) of the Kyoto Protocol (KP) says: all parties, taking into account their common but differentiated responsibilities …., without making any new commitments for Parties not included in Annex 1, shall: " *cooperate in the promotion of effective modalities for the development, application and diffusion, 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 formulation of policies and programmes for effective transfer of technologies that are publicly owned or in the public domain …..…etc." . Article 11 of Kyoto says developed countries shall provide new and additional financial resources to meet the agreed full costs of developing countries in implementing commitments (for data) and provide financial resources (including technology transfer) to meet the agreed full incremental costs needed by developing countries to implement their commitments (which include formulating and implementing national/regional programmes for mitigation and adaptation.

These provisions clearly indicate that developing countries can only their implement commitments if developed countries also implement their commitment on financial resources and technology transfer. Technology transfer (and access) has also been spelt out to include know-how, practices etc, and policies for transfer of publicly owned technology. There is of course the unresolved issue of transfer of privately owned technology.

These commitments of developed countries have yet to be implemented in any significant manner, as the following section will indicate. The IPCC report says that it is difficult to quantify how much climate-relevant hardware is successfully transferred annually. When software elements are included, the quantification is further complicated. It further describes the existing mechanism for technology transfer such as ODA and FDI which have not been proven to have progressed much in technology transfer. Thus there is a large "development deficit" in terms of unfulfilled finance and technology obligations.

State of Negotiations

The slow progress in implementation in technology transfer is indicated by the fact that it was only at COP 7 that a meaningful decision was taken (Decision 4/C.P 7) to establish an expert group on technology transfer, with the objective of enhancing the implementation of Article 4.5 of the convention, including inter alia, by analyzing and identifying ways to facilitate and advance technology transfer activities and making recommendations to the Subsidiary Body for Scientific and Technological Advice (SBSTA). An Expert Group on Technology Transfer (EGTT) was then established to analyse and identify ways to advance technology transfer activities, within a framework covering five areas, i.e. (1) technology needs and needs assessments to identify, among other things, adaptive technology priorities and to engage stakeholders in a consultative process; (2) technology information to include a web-based technology clearinghouse i.e. the TT: CLEAR web technology, a portal dedicated to all climate change technology transfer with linkages to all relevant websites; (3) enabling environments (4) capacity building; (5) mechanisms for technology transfer. The work of the EGTT was to be reviewed at COP 12.

In subsequent negotiations, a fundamental disagreement began to emerge between developing countries who demand real results brought about by public funding, and the developed countries, who emphasize the role of private sector investments.

The G77 and China proposed three concrete actions to facilitate technology transfer. The first is to upgrade the EGTT into a Technology Development and Transfer Board (TDTB) to report directly to the COP. The proposed mandate for the TDTB would be more action-oriented, with responsibilities for the development, deployment, diffusion and transfer of environmentally-sound technologies. Second was the Multilateral Technology Acquisition Fund (MTAF) to fund the development, deployment, diffusion and transfer of technologies to developing countries, through, *inter alia*, the buying out of intellectual property rights. Third they expressed a strong desire to put in place a provision for assessing and monitoring the progress of technology transfer activities. These proposals are in line with the findings of the EGTT in 2007 after five years of work which concluded that "while the EGTT has promoted an 'understanding of transfer of technology at a conceptual level," there is now need to move to 'a more practical and results oriented level by providing actions on specific sectors and programs'".

The developed countries showed flexibility only to the proposal for monitoring the progress of technology transfer activities. They rejected the proposal to form the TDTB and instead wanted the EGTT to remain and to report only to SBSTA, which is not an implementing nor a decision making body. On the MTAF they proposed the strengthening and better use of current ODA and stronger engagement of private sector. In other words no new resources to help developing countries acquire climate friendly technology.

The reluctance on the part of developed countries to move forward in technology transfer was again shown during the Bali Climate Change Conference (COP13/MOP3). Developing countries tried once again to move the technology transfer agenda forward by asking that the issue also be discussed at the Subsidiary Body for Implementation (SBI); this was a compromise for the proposal of establishing the TDTB, and by submitting a paper a fairly comprehensive and strong (barring the absence of the IPR provisions) paper on technology transfer, especially on the proposal to form a multilateral technology cooperation fund. It took the COP 13 almost a full day to come to a decision that technology transfer also be discussed at SBI, due to the strong opposition of developed countries. Developed countries also rejected most of the components of the G 77 and China proposal. The negotiation collapsed on the eve of the High Level segment and was salvaged at the end of the conference.

When the final Bali decisions came, developing countries had given up a lot on their fundamental positions. No board, no multilateral fund were agreed. Instead the SBSTA decision, in its annex, merely reinforced the five themes for meaningful and effective actions to enhance implementation of article 4.5 of the Convention: technology needs and assessments, technology information, enabling environments for technology transfer; capacity building for technology transfer; mechanism for technology transfer.

Instead of a multilateral fund for technology transfer, the SBI decision merely requests the GEF to elaborate a strategic programme to scale up investment for technology transfer. A little progress is made by requesting the EGTT to develop a set of performance indicators to be used by SBI to regularly monitor and evaluate the effectiveness of the implementation of the meaningful and effective actions to enhance implementation of Article 4.5.

Technology transfer is also one of the important four building blocks in the Bali Action Plan on long-term cooperative action (LCA), that links mitigation of developing countries to technology provision and finance. How this will play out remains to be seen in the next two years. Meanwhile, two issues are important if we are to advance on technology transfer. First is that developing countries need to identify internal factors that would facilitate and/or constraint technology transfer and address those factors accordingly. Second is the need to look at external factors that would also facilitate and/or constraint technology factor. One such factor identified by the authors, that may also be the reason for developed countries to refuse to commit to more concrete action in this area is the IPR regime.

IPRs and Technology Transfer

The need for transfer of environmentally sound technology (EST) to developing countries has for a long time been seen as one of the major aspects of the process of sustainable development. During the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro and the process leading to it, technology transfer and financial resources were the two major cross-cutting issues, and constituted the two main demands of the developing countries.

In the UNCED negotiating process, the key issue in technology transfer was IPRs. The Group of 77 countries argued that IPRs had to be relaxed in the case of EST, for otherwise IPRs would hinder the developing countries' access to such technology.

The developed countries' delegations were very sensitive on this point and refused to concede. Whilst agreeing that concessional terms should be encouraged for the transfer of ESTs, they insisted that IPRs (such as patents) be applied and that an exception should not be made in IPRs regimes on such technologies.

Finally, the chapter on technology in Agenda 21 (a programme of action for sustainable development adopted at UNCED) called for action to promote and finance the access to and transfer of ESTs to developing countries on favourable (including concessional and preferential) terms. But it also says these terms must be "mutually agreed" upon and also take into account the need to protect IPRs.

Since Rio, there has also been little or no progress on facilitating the transfer of EST to the South. At the United Nations Commission on Sustainable Development, a working group on technology transfer was set up in 1993, but after a few years the group was closed down, signifying the erosion and loss of importance the subject has suffered. Instead of the concessions asked for by developing countries, the reverse trend towards

much stricter IPRs regimes (including for EST) prevailed, when the TRIPS Agreement came into force together with the WTO in 1995.

Proponents of a strict IPRs regime have argued that it would encourage innovation and contribute to technology transfer. Opponents point out that granting exclusive rights to IPRs holders would enable them to monopolise the technology, hinder research by other parties and prevent the use by and spread to other parties.

At international policy fora, developed countries have been taking the pro-IPRs position whilst developing countries have generally raised concerns about the negative effects of a strict IPRs regime on technology transfer.

In relation to the environment, some technologies can have a negative impact whilst others may have a positive impact. It would be rational for policy frameworks (whether at national or international levels) to recognise the need to discourage the former whilst encouraging the latter.

In so far as the granting of IPRs provides an incentive for developing technologies, then the ability to prohibit IPRs for environmentally-damaging technologies should be part of the policy armoury of a government. The TRIPS Agreement recognises this point.

In relation to EST, there is a strong case that IPRs hinder the ability of developing countries to attain EST as well as new technologies in general. To begin with, the great majority of patents are held by companies based in North America, Western Europe or Japan. A 2007 report by the European Patent Office and OECD illustrates this point very well. About 28 percent of Patent Cooperation Treaty (PCT) filings related to the wind energy were invented in Germany, followed by Denmark with 11 percent. The EU has the largest share of patent filings for environmental related technologies of importance to climate change management i.e. solid waste management, renewable energy and motor vehicle abatement. Annex 1 shows the patent development and share of countries in patent filings for climate change and environmental related technologies. Such patents would have an adverse impact on technology transfer to developing countries.

By strengthening IPRs in developing countries, the TRIPS Agreement can also encourage foreign firms to import technology at higher prices rather than produce it in the host country, and also enable technology suppliers to raise their prices. These two factors raise the cost and reduce the flow of technology to developing countries.

There are several ways in which a strong IPRs regime can hinder access of developing countries to technology, and transfer to developing countries of technology (including EST).

Firstly, a strict IPRs regime can discourage research and innovation by locals in a developing country. Where most patents in the country are held by foreign inventors or corporations, local R&D can be stifled since the monopoly rights conferred by patents

could restrict the research by local researchers. Strict IPRs protection, by its apparent bias, may actually slow the pace of innovation in developing countries, and increase the knowledge gap between industrial and developing countries. In such situations, the IPRs system favours those who are producers of proprietary knowledge, vesting them with greater bargaining powers over the users (Oh 2000a).

Secondly, a strict IPRs regime makes it difficult for local firms or individual researchers to develop or make use of patented technology, as this could be prohibited or expensive.

Thirdly, should a local firm wish to "legally" make use of patented technology, it would usually have to pay significant amounts in royalty or licence fees. As pointed out earlier, TRIPS increases the leverage of technology suppliers to charge a higher price for their technology. Many firms in developing countries may not be able to afford the cost. Even if they could, the additional high cost could make their products unviable. Moreover, there could be a large drain on a developing country's foreign exchange as a result of having to pay foreign IPRs holders for the use of their technology. Many developing countries with serious debt problems will be unable to afford the cost of using the technologies.

Fourthly, even if a local firm is willing to pay the commercial rate for the use of patented technology, the patent holder can withhold permission to the firm or impose onerous conditions, thus making it impossible or extremely difficult for the technology to be used by the firm.

This can hinder progress of developing countries towards the use of EST. Holders of the patents to such technologies, which are usually Northern-centred transnational companies, can refuse to grant permission to companies in the South to use the technologies, even if they are willing to pay market prices; or onerous conditions are imposed; or else the technologies may be made available only at high prices (due to the monopoly enjoyed by the patent holders). Companies in the South may not be able to meet the conditions or afford to pay such prices, and if they do their competitiveness could be affected. As a result, developing countries may find difficulties in meeting their commitments to phase out the use of polluting substances under international environment agreements, such as the Montreal Protocol. A popular example of this is the well known case of India in the context of the Montreal Protocol as documented by Watal (1998) and summarized here in Annex 2.

This example show how much the developing countries have been put on the spot. They join international environmental agreements and commit themselves to taking painful steps to change their economic policies or production methods. Financial aid and technology transfer on fair and most favourable terms are promised during the hard negotiations, to persuade the South countries to sign on. Then, when the agreements come into force, the funds fall far short of the promised level, and technology transfer fails to materialise.

Meanwhile, in another forum like the WTO, other treaties such as TRIPS(Trade Related Intellectual Property Rights) are negotiated which produce or contribute to an opposite effect, increasing the obstacles to developing countries' access to EST[1]. Yet, when the time comes, the developing countries can be expected to be pressured to meet their full obligations, such as phasing out the use of CFCs (in the Montreal Protocol) or reducing emissions of greenhouse gases (in the Climate Change Convention). There is thus an unfair imbalance. The North does not (or does not adequately) meet its obligation to assist the South, and the South (when meeting its commitments), because of the lack of aid and technology, will face economic dislocation.

One remedy being proposed by some public interest groups and developing countries is to revise international laws on patents so that the full weight of IPRs is not applied to EST.

TRIPS, Technology and the Environment

(a) Major Concerns about Effects of TRIPS on the Environment

In the WTO's Committee on Trade and Environment, the topic "TRIPS and environment" is being discussed under two issues: the relationship of the TRIPS Agreement with access to and transfer of technology and the development of environmentally sound technology; and the relationship between the TRIPS Agreement and multilateral environmental agreements which contain IPRs-related obligations.

There are several concerns in relation to the potential effects of TRIPS on the environment, including the following:

(i) Will TRIPS encourage the spread of environmentally harmful technologies?

(ii) Will TRIPS discourage or even prevent the spread and transfer of environmentally sound technologies?

A framework of discussing the issues relating to TRIPS, technology and environment from the perspective of developing countries was interestingly provided at the Committee on Trade and Environment meeting in March 1996 in a paper presented by India (India 1996). The paper stated that the types of intellectual protection (IP) covered in TRIPS are relevant in this context: patents, plant variety protection, layout designs of integrated circuits and undisclosed information. Two types of technologies incorporating IP are distinguished: those that harm and those that benefit the environment. The use of the first should be discouraged, and the second encouraged, by the international community.

The Indian paper's section on patents stated that for technologies harmful to the environment, measures needed to discourage their global use may include exclusion from patentability (so that incentives are not given to generate such technologies) and ban of their use or commercial exploitation. The TRIPS Agreement recognises this

[1] A similar situation is faced in the health sector. Countries that are issuing compulsory license for essential medicines are being pressured not to do so, although it is consistent with the provisions in TRIPS.

reasoning in Article 27.2. For environmentally beneficial technologies, to encourage their global use, the paper proposes that some amendments or clarifications be made to the TRIPS Agreement. (These two points are elaborated on below.)

It suggests that amendments to the TRIPS Agreement in Section 5 (Articles 27, 31, 32, 33), Section 6 (Articles 36, 37, 38) and Section 7 (Article 39), and an understanding on plant variety protection (Article 27), dispute settlement (Article 64) and undisclosed information (Article 39), may be required.

The Indian paper was an early submission to the work of the Committee on Trade and Environment on TRIPS and the environment and set a useful framework for discussions on the issue.

(b) Excluding the Patenting of Environmentally Harmful Technologies and Products

The need for countries to be able to prevent the granting of patents for environmentally harmful products or technologies is recognised in the TRIPS Agreement. Its Article 27.2 allows members to exclude from patentability "inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect *ordre public* or morality, including to protect human, animal or plant life or health or to avoid prejudice to the environment, provided that such exclusion is not made merely because the exploitation is prohibited by their law."

However, WTO members that wish to make use of this provision to prevent the patenting of environmentally harmful technologies may face the disapproval of some other members that could contest whether the prohibited technologies constitute "prejudice to the environment" or whether the exclusion is needed to protect life and health. In other words, there can be a clash of interpretations as to whether a particular technology (for example, genetic engineering) or its products are harmful to the environment or to human, plant and animal life and health. The fear of a dispute and of being hauled up before a WTO dispute panel may to some extent discourage a WTO member from making use of this provision. Thus, whilst TRIPS does afford leeway for countries to exclude harmful technologies from patentability, the test of the usefulness of this flexibility will come when some members make use of this provision to exclude the patenting of certain technologies and are then challenged by other members.

(c) Relaxing IPRs Standards for Environmentally Sound Technologies

For environmentally beneficial technologies, to encourage their global use, and in cases where other measures for technology transfer are not possible, India proposed three points:

(i) To allow free production and use of such technologies as are essential to safeguard or improve the environment, members may have to exclude these

technologies from patentability. Such an exclusion is not incompatible with TRIPS and may have to be incorporated through a suitable amendment.

(ii) For currently patented technologies, members may revoke patents already granted, if this is done in consonance with the Paris Convention and is subject to judicial review;

(iii) To encourage the use of environmentally beneficial technology, members should be allowed to reduce the term of patent protection from the present minimum of 20 years to, say, 10 years, "so as to allow free access to environmentally-beneficial technologies within a shorter period."

Provisions in TRIPS for Technology Transfer

The TRIPS Agreement has several references and provisions that deal with technology transfer.

Article 7, which contains the objectives of the agreement, states: "The protection and enforcement of intellectual property rights should 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, and to a balance of rights and obligations."

Article 8 is on principles. One of the two principles (Article 8.2) is as follows: "Appropriate measures, provided that they are consistent with the provisions of this Agreement, may be needed to prevent the abuse of intellectual property rights by right holders or the resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology."

Article 66.2 on least developed countries states: "Developed country Members shall 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."

Despite these and other provisions in TRIPS that seek to promote technology transfer, in reality little or nothing has been done by developed countries to either provide concessions to developing countries or provide incentives to (or impose obligations on) their enterprises and institutions to disseminate or transfer technology to developing countries. This has led to an erosion of confidence in the seriousness or sincerity of the developed countries to fulfill the technology-transfer obligations of TRIPS. For example, in a paper to the WTO's General Council and to the TRIPS Council, the Indian delegation stated: "There has been little effort to implement this provision (Article 66.2), raising doubts about the effectiveness of the Agreement to facilitate technology transfers" (India 2000a).

In the same paper, India recounted an earlier proposal it had made to the Committee on Trade and Environment, "that owners of environmentally sound technology and products shall sell such technologies and products at fair and most favourable terms and

conditions upon demand to any interested party which has an obligation to adopt these under national law of another country or under international law." Developing countries access technologies usually through licences and technology transfer agreements. The paper points out that technology seekers in developing countries face serious difficulties in their commercial dealings with technology holders in developed countries. These difficulties include: (i) those arising from imperfections of the market for technology; (ii) those arising from lack of experience and skill of enterprises and institutions in developing countries in concluding legal arrangements for technology acquisition; (iii) government practices (legislative and administrative) in developed and developing countries which influence the implementation of national policies and procedures designed to encourage the flow of technology to, and its acquisition by, developing countries.

For the TRIPS provisions on technology transfer to be implemented, these difficulties have to be addressed. To overcome some of the difficulties, developing countries would need to build suitable safeguards in their domestic IPRs laws. Also, commercially viable mechanisms need to be established to address the problems and needs of enterprises or institutions in developing countries that want to acquire technology but find its cost prohibitive due to economies of scale and other reasons. Moreover, the high cost of technology makes it difficult for smaller and poorer developing countries to acquire technology on commercial terms. They can only acquire the needed technology through government-to-government negotiations and with financial aid provided either by developed countries' governments and other institutions, or by inter-governmental organisations. Another problem is the denial of dual-use technologies, even on a commercial basis, to developing countries; under this guise, a variety of technologies and products required for their growth process is being denied to developing countries. (India 2000a: pp 2-3).

In order that the TRIPS objectives, principles and provisions on technology transfer are made effective, a review of how to operationalise the relevant provisions of the TRIPS Agreement should be carried out. The obligations on developed countries to provide incentives to or oblige the enterprises or other institutions in their countries to transfer technology to developing countries could be made stronger, with regular reviews of the implementation. Relaxation of the standards of protection for environmentally sound technology should also be done, including through amendments to the agreement. Progress towards the goal of technology transfer is essential in order for there not to be a further loss of confidence in the TRIPS Agreement's purported objective of technology dissemination and transfer.

Conclusion and Recommendations

1. Developing countries need to identify the type of technology they need now or might need in the future, by sector, the technologies that are available and at what cost to developing countries.

2. Technologies that are in the public domain, should be made available to developing countries as quickly and as easily as possible. But many key technologies are patented. And many technologies of the future will also be patented.

3. Technology transfer is not the mere purchase of machines etc. at commercial rates. Technology transfer is the building of local capacity so that local people, farmers, firms and governments can design and make technologies which can be diffused in the domestic economy.

4. For the technologies required for mitigation and adaptation, there must be an understanding that patents should not be an obstacle for developing countries to have access to them at affordable prices. According to the TRIPS agreement, if there is a patent on a product, a process or a technology, a firm or agency in a country in which the patent is operating can request for a voluntary license from the patent holder, in order for the firm to make or import generic versions of the patented product or technology. The patent holder will normally charge a price (royalty or license fee) for granting the license. If the patent holder refuses to give a license, or if the price charged is too high, the firm or agency can apply to the government to grant it a "compulsory license". Alternatively, a government that wants to have access to generic versions of a product or technology can itself take the initiative to issue a compulsory license.

5. The firm or agency granted a compulsory license would normally have to pay a royalty or remuneration to the patent holder. In the case of pharmaceutical drugs, the royalty rate offered in recent compulsory licenses by developing countries such as Malaysia, Indonesia, Thailand, ranges from 0.5 to 4 per cent of the price of the generic drug.

6. Under the TRIPS agreement, there is considerable flexibility provided to WTO members states on grounds for issuing compulsory licenses. These grounds are not restricted, as confirmed by the WTO Ministerial Declaration on TRIPS and Public Health (Doha 2001). It is not necessary to declare a state of emergency, for example. Certainly the fact that a country requires a product or technology in order to meet its objectives or responsibilities to mitigate climate change or to adapt to climate change is a most valid ground for compulsory licensing.

7. Compulsory licensing is not a unique or exceptional policy. In developed countries like the US and the UK, there have been many compulsory licenses granted by the government to facilitate cheaper products and technology in the industrial sector. In many developing countries, compulsory licenses have been issued for the import or local production of generic drugs. There is a type of compulsory license known as "government use" which many developing countries have made use of. This is when the product to be imported or produced in a generic version is to be for public, non-commercial use, for example for medicines distributed by the government in clinics and hospitals. In such cases, prior negotiation with the patent holder is not necessary although remuneration or royalty to the patent holder is required.

8. Thus compulsory licensing is an option that developing countries must now seriously consider for climate friendly technology. The Brazilian Foreign Minister Mr Celso Amorim in his speech at the plenary of the Bali climate conference in 2007 said that inspiration should be drawn from the case of TRIPS and medicines, and that a similar statement regarding TRIPS and climate friendly technologies should be considered. Strictly spaking, it is not necessary for such a statement to be made by Ministers before a country exercises rights that it now has to issue compulsory licenses for climate technologies. The rights already exists in TRIPS. However when countries exercise these rights they may be penalised by countries such as the USA. Therefore developing countries find it useful that an international declaration is made, so that when they exercise their rights they are to some extent more protected politically, which adds to their confidence of exercising what is already their rights under international law (ie TRIPS). However there is no guarantee that the political declaration will protect a country that exercises its rights – Thailand today faces political pressure from the USA for issuing compulsory licenses on some drugs.

9. It is also possible to raise the level of ambition for sustainable development, by proposing that environmentally friendly technology should not be patented in the first place (so that the process of compulsory licensing etc is not even required). There is a strong rationale for this, at least for climate friendly technology and products. If climate change is truly the serious crisis threatening human survival, and there is only a few years left to start very strong action, then the situation is similar to war-like conditions. During war (eg the Second World War) individual commercial interests such as patents are suspended so that there can be concerted national action in the most effective way, to face the enemy. Developing countries require technologies at the cheapest possible prices. If they obtain the needed technology at one quarter the price, they can increase the rate of change to put into effect mitigation and adaptation measures four times faster and four times more effectively.

10. There can be many variations for the relaxation of IP in relation to climate friendly products and technologies. (a) A mandatory ban on patents on climate friendly technologies and products. (b) A mandatory ban on patents in developing countries only, while patents can still be granted in developed countries. (c) Developing countries are allowed to exclude patents on climate friendly technologies and products. (d) Voluntary licenses must be automatically granted on request, which will be free of royalty.

11. In conclusion, any WTO member state is already allowed by the TRIPS agreement to take measures such as compulsory licenses and parallel importation to obtain technologies or products (that are patented) at more affordable prices. But the processes of negotiating with the patent holder and of issuing compulsory licenses etc can be quite cumbersome to countries not familiar with the procedures. It is better that developing countries be allowed to exempt such technologies from patenting. There should not be resistance to this, if we are to take the climate threat seriously. Developed countries should not treat patents or IPRs as something sacred that has to be upheld at

all costs. That would send a signal that climate change is not a serious threat, as commercial profits for a few are more important on the scale of values and priorities than are the human lives that are at stake due to global warming. Technology transfer to developing countries to enable them to combat climate change should be the far higher priority. Developed countries should not treat climate technology as a new source of monopoly profits, as this would damage the ability of developing countries to phase in existing or new climate-friendly technologies for both mitigation and adaptation. The post-Bali process should therefore adopt the principle that developing countries can exempt climate-friendly technologies from patents. Such a principle would demonstrate that developed countries are serious about resolving the global climate crisis and about assisting developing countries. It would also help developing to take on mitigation and adaptation measures, which are dependent on the technologies.

12. The implementation of the above measures should not wait until the Adhoc Working group on LCA (AWG-LCA) finishes its work in 2009. Implementation of technology transfer must start now if we are to be serious about planning a sustainable and climate friendly development pathway for developing countries, in a fair and just manner, through technology access, sharing and transfer.

The time to act was yesterday, today that action must be taken, or tomorrow might never come for our children.

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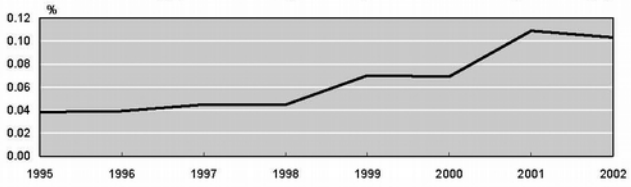
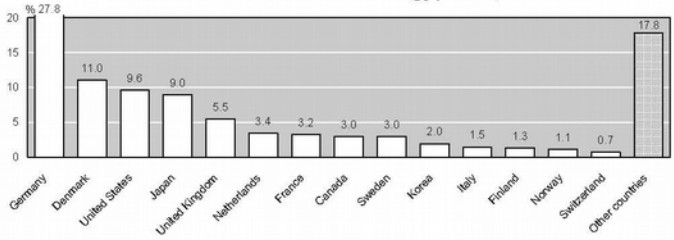
Annex 1 PATENTS ON ENVIRONMENTALLY SOUND TECHNOLOGIES, RELATED TO CLIMATE CHANGE (source: Compendium of Patent Statistics, 2007, published by EPO, OECD and Patent Office of Japan).

3.5. Patents related to wind energy technology

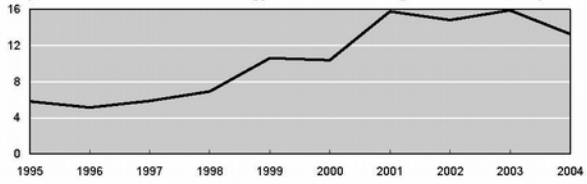
3.5.1. Wind energy patents[1] as a percentage of national total (PCT filings)



3.5.2. Share of countries in wind energy patents,[1] *1987-2002*



3.5.3. Share of wind energy patents[1] in patents related to wind energy and surrounding relevant techniques[2]



Note: Patent counts are based on the earliest priority date, the residence of the inventors and fractional counts.
1. Wind energy patents are identified using IPC code F03D (wind motors). Data refer to patent applications filed under the PCT, at international phase, designating the EPO.
2. Patents in relevant techniques surrounding wind energy are defined as H02P (control or regulation of electric motors, generators, or dynamo-electric converters), H02K (dynamo-electric machines), and H02J (circuit arrangements or systems for supplying or distributing electric powers).

Source: OECD, Patent database, June 2007.

- Since the mid-1990s, the share of wind energy patent applications in all PCT patents increased at an average growth of 25% a year (Figure 3.5.1).
- About 28% of PCT filings related to the wind energy were invented in Germany (Figure 3.5.2). Denmark is also a strong contributor to wind energy inventions (11%), ranked after Germany. The United States and Japan follow with 9% and more PCT filings in wind energy.
- Figure 3.5.3 shows that among all techniques surrounding wind energy, the share of patents related to wind motor, which is the key wind energy technique component, has increased markedly since the mid-1990s.

3.7. Patents in environment-related technologies

- Technological change plays a crucial role in reducing pollution and in coping with environmental constraints. Compared to pollution control and waste treatment technologies, which are generally imposed by law, energy-efficient innovation is the result of both stronger regulation and the need for alternative sources of energy in the face of rising fuel prices.
- Overall, there has been a modest increase in patenting in renewable energy and in motor vehicle abatement technologies (Figure 3.7.1). Technologies related to renewable energy appear as the most dynamic group. They include wind, solar, geothermal technologies, wave and tide, biomass and waste technologies. Within this group, solar, wind power and waste-to-energy have exhibited rapid growth, particularly since the mid-1990s.
- Patenting activity in motor vehicle abatement technologies is strong, although the average annual growth rate lags that of renewable energy. The rise in innovation activity in this area is positively related to changes in the regulatory framework (*i.e.* automotive emissions control) in the main producer countries. Furthermore, foreign regulatory pressures appear to influence domestic innovation. For instance, Japanese inventors played a lead role in the development of catalytic converters, even though the regulatory "shock" initially came from the United States. Japan, the United States and Germany dominate innovation activity in this field (Figure 3.7.2).

Box 3.3. Identifying patents in environment-related technologies

World Intellectual Property Organization (WIPO) descriptions of the IPC classification (8th Edition) were used to identify IPC codes that matched environmental technologies more closely. Keyword searches were also conducted to find patents embedding technology specific to a particular field (see Johnston and Hascic, 2007a, 2007b).

Renewal technologies: Based on an extensive literature on technology developments in the area of renewable energy, a set of keywords was identified. These were used to determine IPC codes which relate directly to renewable energy in the areas of wind, solar, geothermal, wave-tide, biomass and waste (see Johnston and Hascic, 2007b).

Motor vehicle abatement: Identifying IPC codes and relying on keyword searches, a set of technologies relating to emission control was identified. Automobile pollution control technologies comprise all technologies used to reduce pollutants produced and released into the atmosphere by automobiles. These automotive-generated emissions fall broadly into two categories based on the point of emission: *i)* tailpipe or exhaust emissions; and *ii)* evaporative emissions (Johnston and Hascic, 2007a). Abating pollution from vehicles must target both tailpipe and petrol tank venting. Searches conducted for these technologies are primarily based on specific regulations imposed on the automobile sector such as the US Tier standards and the European Union's Euro standards. The IPC codes identified are broadly categorised into the three major technology groups identified above: *i)* those that relate to improvements in engine (re)design and therefore generate fewer emissions; *ii)* those that treat pollutants produced before they are released into the atmosphere; and *iii)* those that reduce evaporative emissions. Unfortunately, the last category is somewhat opaque, because there is no IPC sub-classification that clearly defines improvements to nozzles and/or canisters.

For further reading

Johnston, N. and I. Hascic (2007a). *Environmental Regulation and International Innovation in automotive Emissions Control Technologies*. OECD, Paris.

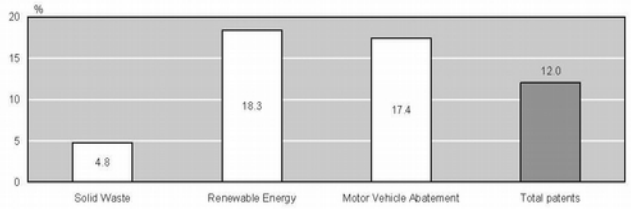
Johnston, N. and I. Hascic (2007b). *Renewable Energy Policies and Technological Innovation: Empirical Evidence based on Patent Counts*. OECD, Paris.

For further details

International patent classification (IPC, 8th edition, 2006): www.wipo.int/classifications/ipc/ipc8

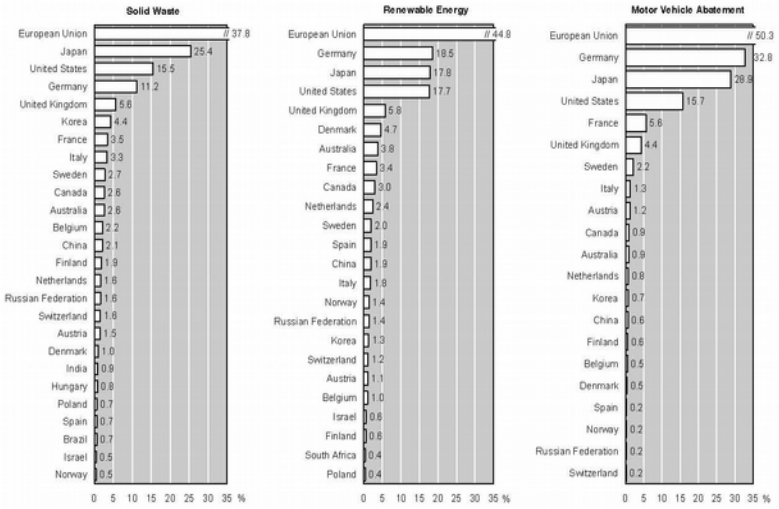
3.7.1. Trends in patents filed under PCT in selected environmental technologies[1]

Average annual growth rate, 1995-2004



3.7.2. Share of countries in EPO patent applications in environmental technologies[1]

2000-2004



Note: Patent counts are based on the priority date, the inventor's country of residence and fractional counts.
1. Patent applications filed under the PCT, at international phase, designating the EPO.

Source: OECD, Patent database, June 2007.

- Overall, the European Union has the largest share for the three technology fields. Japan leads in solid waste technologies and Germany in motor vehicle abatement technologies. For renewable energy, Japan, the United States and Germany report a similar performance. Other countries reporting a share above 5% are the United Kingdom (solid waste and renewable energy), Denmark (renewable energy), and France (motor vehicle abatement).

Annex 2. Case Study of Effect of IPRs on Implementation of the Montreal Protocol

Local firms in some developing countries are finding it difficult to have access to substitutes for chlorofluorocarbons (CFCs), chemicals used in industrial processes as a coolant, which damage the atmosphere's ozone layer. This hinders their ability to meet commitments under the Montreal Protocol, an international agreement aimed at tackling ozone-layer loss by phasing out the use of CFCs and other ozone-damaging substances by certain target dates.

Under the Montreal Protocol, developed countries originally agreed to eliminate production and use of CFCs by the year 2000, whilst developing countries are given a 10-year grace period to do the same. A fund was set up to help developing countries meet the costs of implementing their phase-out, and the protocol's Article 10 provides for technology transfer to developing countries. Each party is obliged to take every practical step to ensure that the best available and environmentally safe substitutes and related technologies are expeditiously transferred to developing countries, under fair and most favourable conditions.

A study of the effect of IPRs on technology transfer in the case of India in the context of the Montreal Protocol has been conducted by Watal (1998). She points out that technology-transfer provisions in the Montreal Protocol are particularly relevant for developing countries which are producers of ozone-depleting substances (ODS), such as India, Brazil, China, South Korea and Mexico. In India, Korea and China, such production is dominated by local-owned firms, for which the access to ozone-friendly technology on affordable terms has become a central issue of concern.

The study concludes that: "Efforts at acquiring substitute technology have not been successful as the technologies are covered by IPRs and are inaccessible either on account of the high price quoted by the technology suppliers and/or due to the conditions laid down by the suppliers. This would require domestically owned firms to give up their majority equity holding through joint ventures or to agree to export restrictions in order to gain access to the alternative technology." Moreover, financial assistance to acquire the technology was also not effective. A report of the executive committee on technology transfer of the protocol stated that the terms of freely-negotiated technology transfers, including costs such as patents, designs and royalties, may not always be accommodated by the Multilateral Fund's funding policies. "Thus, while prices of alternative technologies are unaffordable on account of IPRs, access to these is limited due to inadequate funds domestically and lack of financial assistance from the Multilateral Fund, creating a major hurdle in transiting to ozone-friendly production, especially among producer nations. For ODS producer countries with domestically owned firms, therefore, technology transfer is a distinct and crucial issue in itself requiring immediate attention" (Watal 1998: pp 1-2).

Two specific cases from Watal's study show the acute problems faced by local firms in their attempts to access technology from suppliers who hold patents over the products.

CFCs, which are ozone-depleting, have been used in refrigerators and air-conditioners that are manufactured in India. In most major sub-sectors, two alternative substitutes (HFC 134a and hydrocarbon) are available. Most Indian refrigerator manufacturers would like to convert to using HFC 134a. Indian producers of CFCs are very keen to acquire the technology for making HFC 134a for domestic and export sale. However, their efforts to access the technology were unsuccessful. Only a few companies in the developed countries control the patents and trade secrets related to HFC 134a, and thus developing countries have to either pay high royalty fees to produce them locally or lose the local and international markets for this alternative. One of the Indian companies that sought to access the technology was quoted a very high price of US$25 million by a transnational company that produces HFC 134a and that holds a patent on the technology. The supplier also proposed two alternatives to the sale, namely, that the Indian firm allow the supplier to take majority ownership in a joint venture to be set up, or that the Indian firm agree to export restrictions on HFC 134a produced in India. Both options were unacceptable to the Indian company, while the quoted price was also unrealistically high as it was estimated that the technology fee should at most have been between US$2 and $8 million.

The ozone-depleting substance halon is used in fire extinguishers and many other products. India imported all the halon it required up to 1990. Since 1991 it has manufactured halon 1211 and since 1995-96 it developed the technology for halon 1301. Producers of fire protection systems would like to convert from using halon 1301 to HFC 227ea (commercially known as FM 200). India would like to produce this alternative locally. FM 200 is covered by a methods and composition patent filed by a US company in 1995 with a life of 20 years. It was filed in several countries including China, Korea and Russia (but not in India, which, up to the time of the study, did not allow such patents). According to industry sources, China and Russia succesfully developed the process for FM 200 through indigenous R&D but will be prevented from marketing the final product due to this patent. An additional problem is that the patent owner has imposed several restrictive conditions for FM 200, such as that the components used in the fire protection systems should have the approval of the Underwriters' Laboratory (UL) or Factory Mutual (FM) of the US, and the systems' design must meet the requirement of NFPA-2000 (USA) and the approval of UL and FM (USA); and the final inspection/clearance of the system (including various tests following international standards) must meet the approval of UL and FM. The costs to India to produce the alternative to halon 1301 would include US$1.5 million for licence fees to produce alternatives just for the halon 1301 sub-sector and another US$1.4 million to convert halon portable systems to ODS-free systems. Indian firms that have tried to acquire the technology faced the problem not only of finance, but found that the owner of the patent was not interested in licensing the technology to wholly owned companies. The patent holder was interested only in joint ventures in which it would hold a majority share. The Indian firms did not want to divest their equity holding but only wanted to buy the technology. Thus, in the case of HFC 227ea as in the case of HFC 134a, the technology supplier, which also owned the patent, was unwilling to transfer the environmentally sound technology to India, not even on commercial terms. In such a situation where the alternative cannot be produced within the country, the

users of halon 1301 even in strategic sectors such as defence and power plants will have to depend entirely on imports of HFC 227ea to meet their demands.