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WORLD INTELLECTUAL PROPERTY ORGANIZATION

GENEVA

CLIMATE CHANGE AND THE INTELLECTUAL PROPERTY SYSTEM: WHAT CHALLENGES, WHAT OPTIONS, WHAT SOLUTIONS?

AN OUTLINE OF THE ISSUES:

INFORMAL CONSULTATION DRAFT ONLY

This paper does not present an official view. It is a draft prepared for informal consultations, with a view to clarifying the intellectual property issues arising from the global challenge of climate change. It does not attempt to advocate or advance any position, but aims only to capture some current issues in an accessible format.

Contents

I. SOME THEMES

Technology: cause, and remedy, of climate change?

Debate continues over how far climate change is caused by human activity. But one point is entirely clear: whatever its scale, humanity's impact on the climate – anthropogenic climate change, as the jargon has it – has essentially been caused by our technologies: the remarkable development and dissemination of the energy technologies that catalyzed the industrial revolution; the technological muscle that cleared much of the world's forests; the new industrial chemicals we synthesized and released into the atmosphere, unaware they would intensify the greenhouse effect.

It follows that reversing the human impact on the atmosphere – climate change mitigation – also boils down to deploying the right technologies. And adapting to the inevitability of a transformed climate will also need new technologies, widely disseminated, such as crops that will still feed those living in hotter, drier, more saline conditions. So technology was the root of the problem; and technology will be at the core of the solution.

What role for intellectual property?

The same applies for intellectual property (IP) and climate change: it's seen as a two-edged sword. The IP system, especially the patent system, is closely interrelated with many technologies that could help mitigate and some scenarios would cast IP as a problem – as a barrier to technology diffusion. This is a widespread assumption in the climate change policy community. IP is something you have to get around. Other scenarios would cast the IP system in a positive right, as contributing to the crafting of solutions – the many, diverse solutions we will need to address the impact of climate change.

So is IP as a problem or solution? It is up to us. It will depend on whether we take an informed, strategic view or a reactive view. It will hinge on whether we take up the system in a positive spirit and ensure that it works as it is intended to, ensure that it delivers on its undoubted potential. For the IP system was certainly not devised as a means of blocking access to technologies or denying the public the benefits of new technologies. It was created not only to stimulate the creation of new technologies, but

also to provide an efficient means of widely disseminating this new technological information, and to build structures to transfer the technology and to put it to work.

Building an information base for policy choices

Patent information systems allow us to track developments in key areas of climate change mitigation and adaptation technology. They show a welcome surge of investment, and an equally welcome diversification of inventive effort – including emerging players from developing countries. Whether these many patents flow into socially beneficial outcomes is ultimately a matter of informed choices, and effective management of this knowledge. This is the challenge for policymakers – what are the key technologies now, and what will be the key technologies in the future; and how can rights over those technologies be managed and structured most effectively to deliver them to the public, to disseminate the technologies needed to tackle the climate change challenge.

There are no simple answers to these questions: finding the solutions will be a matter of continuing dialogue and cooperation, both within the international community on the policy plane, and at a practical level on the part of individual enterprises. The task of assessing the complex factual situation, and of sifting through a welter of policy options, is an immense one, necessitating widespread collaboration and the pooling of diverse expertise. The IP system undoubtedly has the potential, in principle, to deliver the outcomes society demands of it; the challenge now is to realize those principles in practice.

II. IP & CLIMATE CHANGE: SNAPSHOT OF THE ISSUES

This section provides a brief review of the range of issues discussed more extensively in this paper.

Technology lies at the centre of the climate change debate – the impact of technology on the climate, how to stimulate green innovation, promoting technology transfer and the diffusion of technological knowledge – these are pressing questions for policymakers. International legal instruments and global policy initiatives place high emphasis on the role of technology in addressing the challenge of climate change. It is therefore natural that when climate change policymakers consider the intellectual property (IP) system, they focused almost exclusively on patents. The patent system is closely interwoven with the whole process of creating, refining, developing and delivering the kind of technologies that will be essential to mitigate and adapt to climate change. When the patent system works according to plan, it stimulates the creation of new technologies and creates pathways for their dissemination and uptake. But the patent system needs constant attention and careful management to ensure that it does deliver in practice what it offers in principle.

Transparency is a key principle of the patent system; and here the system undoubtedly delivers, thanks to advances in information technology and the increasing availability of free information from many countries worldwide. Patent information provides an invaluable window on technology development. Patent landscapes give policymakers an overview of emerging technologies in key areas of interest – from wind turbine technologies to reversing desertification. Landscapes illustrate trends over time and the changing geographical profile of innovation, disclose the most active players and new entrants on the scene, and show the split between public and private, developed and developing, multinationals and small firms in those technologies of most interest to policymakers. Patent information can be used to chart the trend of the major energy companies to invest increasingly in renewable energy technologies, and can track what new carbon sequestration methods are under development.

Patent policy: in the balance

The essential logic of the patent system is often portrayed as a 'balance': an optimal balance that respects the private interests of those investing resources in the development of new technologies, and that promotes the broader public interest in

seeing these new technologies emerge not only as abstract scientific publications, but as effective, proven technologies that are actually disseminated to the broader public, for overall welfare outcomes. Achieving this idea of 'balance' is a complex matter, in turns both technical and controversial; but, broadly speaking, the idea of balance can be broken down into two clusters of issues:

- pre-grant questions (what kind of technologies should patent offices grant patents for, and what claimed inventions should be denied protection), and
- post-grant questions (what forms of licensing and other access to technology should be encourages; what steps should be taken to monitor and to regulate, as necessary, the actual use of patent rights in the marketplace, and what forms of intervention are required, if any)

Pre-grant phase: patent pending

The essential question in the **pre-grant phase** is to ensure that the patents that are granted conform most closely to the public interest, as expressed in the so-called 'patentability' criteria – patents are intended only for technologies

- that are genuine additions to existing technological knowledge ('novel'),
- that involve a substantial step forward in their technical field ('inventive' or 'non-obvious'), and
- that are practically useful ('utility' or 'industrial applicability').

The patent application must describe the invention (its 'teaching' function) sufficient for a skilled reader to carry out the new technology in practice – this is what makes patent information systems valuable as a source of technology diffusion and dissemination; and the scope of the patent rights claimed cannot extend beyond the new technology actually disclosed in the patent: patent offices frequently narrow claims during the application phase to restrict patent rights to their legitimate scope.

These criteria are well established and widely accepted at the level of broad principle, but ensuring that, in actual practice, issued patents do conform with these criteria (the question of 'patent quality') is key to an effective patent system. Many national laws also give patent offices the power to exclude technologies that would cause damage to the environment if commercially exploited, a substantial area of overlap between patent law and practice and environmental policy.

Post-grant phase: the patent in the marketplace

Once a patent is approved and issued on a given technology, **post-grant considerations** apply, as the patented technology moves into a broader legal and regulatory environment**:** questions concern how to encourage, or indeed legally require, a patent owner to exercise the exclusive patent rights appropriately; and what other remedies may be needed to serve the public interest. After the patent enters into force, the focus is therefore more on how the rights granted under the patent are to be exercised, and the broader public impact of the exercise of the patent rights. Even so, whether the patent was validly granted may still be reviewed, as there is no guarantee that the original decision to grant a patent took account of all relevant background information and correctly applied the patentability criteria.

Rarely does a new patented technology stand entirely on its own, and technologies typically have to be packaged together from several sources, through a range of licensing arrangements and other technology transfer structures; this applies especially to platform technologies, such as a new solar cell technology, but also to the many improvement and refinements of existing technologies that will see, for example, efficiency gains in sustainable energy production. The manner in which a patent holder licenses technology may attract the attention of regulators, including competition authorities. For patented technologies that are developed by public sector institutions or through public funding, there may be additional expectations that the technology should be made available for the public benefit.

In general, post-grant questions include:

- Determining what licensing structures and IP management strategies are appropriate to promote the uptake and dissemination of technologies needed to address climate change; distinguishing the special responsibilities of those publicly funded or public sector institutions which increasingly hold key patents on valuable technologies with a strong public interest flavour.

- Shaping and exercising exceptions and limitations to patent law, to safeguard the public interest, such as exceptions for pre-commercial or non-commercial research, and for steps required to comply with regulatory processes.

- Establishing the rationale for other interventions which override exclusive patent rights, such as remedies for anticompetitive practices and other abuses of patent rights, including compulsory licensing, and government use authorizations for non-commercial public use.

Patents and technology transfer

The role of patents in the transfer of technology, particularly for technologies needed for sustainable development, has been the subject of a longstanding international debate. Current concerns about climate change, health and food security have given this debate renewed intensity and focus, given the crucial role of access to new technologies in crafting effective responses to these global challenges. The debate is a complex, multifaceted one, blending international law with the economics and policy context of innovation, competition policy, and ethical considerations. But some broad observations can be made:

- The simple existence of a patent on a particular technology is not a barrier in itself to transfer of technology; nor does it guarantee that the technology will be fully exploited in all possibly beneficial ways. Much depends on how the exclusive rights that come with a patent are deployed; where they are in force and where they are not; and how they can be used as components in constructing suitable vehicles for technology transfer.

- Equally, the absence of an enforceable patent right in a certain country does not in itself provide any guarantee of technology transfer. Most patented technologies are already free of enforceable patent rights in the majority of developing countries, and this absence of patent protection doesn't necessarily spur technology transfer. At best, it leaves open the prospect of using the technology disclosed in the patent document, but often without the partnership or involvement of the technology originator, and the transfer of valuable knowhow and other background technology that may be useful for the effective exploitation of the technology.

- The transparency of the patent system, if effectively exploited, can in itself serve as a major boost to technology transfer. In principle, it can help:

    - Track significant technological developments and trends, including monitoring new players, geographical shifts and the relative participation of public and private sector actors, established firms and new entrants
    - Avoid duplicative research and development, and enable technological leapfrogging and other forms of cumulative development, such that innovations disclosed and published through the patent system fuel further innovation

  - Organize and structure technology transfer arrangements, as well as providing an effective incentive not only to enter into such arrangements but also to include within them improvements, knowhow and other related technologies

- Taking out a patent is not a stand-alone technology transfer mechanism, any more than foregoing the option of a patent is a single form of knowledge management. Rather, patents are used in a host of different ways to transfer technology, depending on whether effective transfer of the technology concerned requires
  - a market-based incentive for a core new technology to be developed and disseminated,
  - a means of leveraging access to other related technologies to form a package of technologies from different sources
  - public institutions to maintain an interest and a degree of leverage over technology developed through public investment
  - the creation of new enterprises as tailor-made vehicles for development of a new technology
  - a broad-based open licensing structure to promote dissemination of a platform or enabling technology
  - cross-licensing structures or pool arrangements that allow diverse technology players to build on the benefits of each others' technologies
  - packaging the patented technology with other non-patented material, such as manufacturing knowhow, other commercial information, or regulatory approval dossiers

Intellectual property beyond patents

Given the essential focus on the innovation and dissemination of new technologies in the climate change debate, the patent system has borne much more scrutiny than other aspects of intellectual property law and policy. But IP is broader field, and should not be conflated with patents alone. Several other aspects of IP law and policy may be relevant to addressing the challenge of climate change, for instance:

- The protection of undisclosed information or trade secrets for key areas of knowhow relevant to mitigation and adaptation;

- The use of certification and collective marks, geographical indications and other distinctive signs used to identify products that are particularly relevant to climate change mitigation;
- Protection of undisclosed information and regulatory data from the field testing of genetically modified crops relevant to climate change adaptation;
- The protection of traditional knowledge through conventional or sui generis mechanisms, including environmental and agricultural knowledge;
- The suppression of unfair competition, including such acts as greenwashing and misleading claims about carbon offsets.

III. Climate Change and Intellectual Property

Situating intellectual property in the climate change debate

Climate change presents a vast, multifaceted challenge for the international community, a challenge that will require a comprehensive and inclusive response. An informed, judicious approach to the intellectual property (IP) issues is likely to be one ingredient in an effective response – but it will only ever be one element, to be considered in a much broader context. Rarely will IP issues be decisive, one way or the other, in determining whether the challenge of climate change can be met.

Nonetheless, it is overdue to take a close and systematic look at how the IP system, as an instrument of public policy, can contribute to the mitigation of anthropogenic climate change, and adaptation to the reality of climate change; and how the IP system may present an obstacle to these pressing policy demands. This paper seeks to outline the relationship between the IP system and the challenge of climate change. The main focus of debate about IP and climate change has been patenting on relevant technology, and this paper will concentrate on the patent system. But other forms of intellectual property should also be considered; for instance:

- The protection of undisclosed information or trade secrets for key areas of knowhow relevant to mitigation and adaptation;
- The use of certification and collective marks, geographical indications and other distinctive signs used to identify products that are particularly relevant to climate change mitigation;
- Protection of undisclosed information and regulatory data from the field testing of genetically modified crops relevant to climate change adaptation;
- The protection of traditional knowledge through conventional or *sui generis* mechanisms, including environmental and agricultural knowledge;
- The suppression of unfair competition, including such acts as greenwashing and misleading claims about carbon offsets.

These are outlined briefly below, following the general discussion of the patent system.

IV. PATENTS AND CLIMATE CHANGE TECHNOLOGY

In effect, the patent system is relevant to climate change to the extent that creation and dissemination of technology is relevant. It is especially relevant inasmuch as both new and existing technologies will be required to deal with both mitigation of climate change and adaptation. The role of technology is recognized in all major multilateral instruments on climate change. The UNFCCC[1] itself and the Kyoto Protocol[2] both explicitly provide for development, application and diffusion of environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries. Most recently, the Bali Plan of Action[3] calls for

> "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) Cooperation on research and development of current, new and innovative technology, including win-win solutions;
>
> (iv) The effectiveness of mechanisms and tools for technology

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1 Article 4.1(c) requires parties to "promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors."

2 Article 10 (c) requires Parties to "cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries, including the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector, to promote and enhance the transfer of, and access to, environmentally sound technologies."

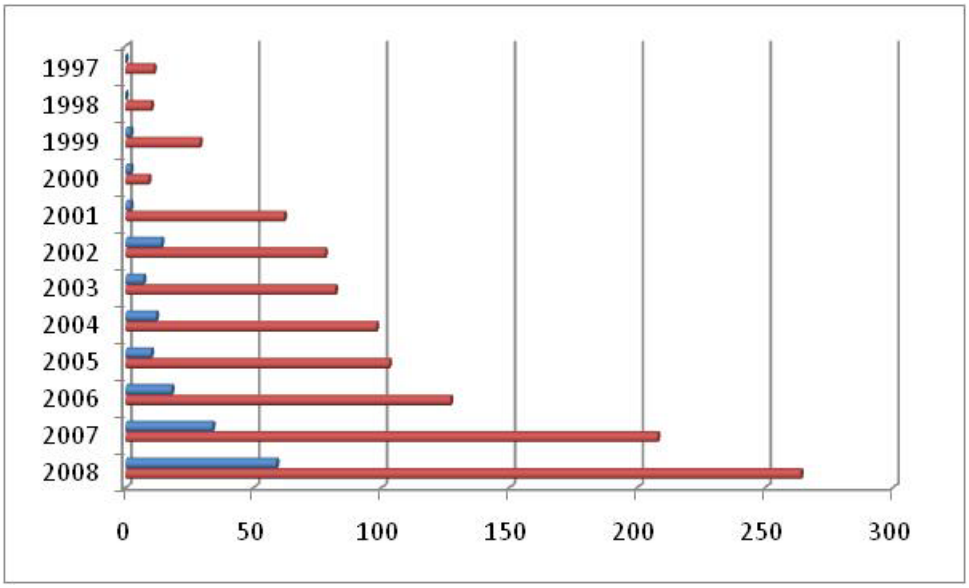
3 Agenda item 4: Report of the co-facilitators of the dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention, Conference of the Parties, Thirteenth session, Bali, 3–14 December 2007

cooperation in specific sectors

Intellectual property mechanisms – and patents in particular – will doubtless come under scrutiny for their effectiveness and utility in addressing these goals. And policy debate is indeed intensifying about how to make more effective use of the patent system. This debate concerns, in part, the specific subject matter covered by patents – to what extent, and where, patent claims include mitigation and adaptation technologies.

But the debate also increasingly considers not just the content of patents, but how patents should be used, and how patents should be regulated: for instance, should patent rights over key climate change technologies be exercised in a special way, through humanitarian licensing, patent pools or licensing clearing houses, rather than exclusively exploited; and what is the role of regulatory interventions such as government use orders and compulsory licensing? What forms of licensing practices and other ways of exercising of patent rights should be encouraged as good policy or as good business practice, and what kinds of behaviour should be legally excluded as an abuse?

Greater private investment in the creation, development and effective diffusion of suitable new technologies is unquestionably an essential ingredient for effective action towards climate change mitigation and adaptation. As an admittedly very rough measure of the increased investment of private resources into tackling this challenge, a survey of all international patent activity relating to the Kyoto Protocol as such, or referring specifically to the Protocol, to climate change or greenhouse gases, illustrates this trend in concrete, if very approximate terms:



PCT APPLICATIONS REFERRING TO THE KYOTO PROTOCOL (SERIES 1) OR IN MORE GENERAL TERMS TO THE PROTOCOL, TO CLIMATE CHANGE OR TO GREENHOUSE CASES (BY YEAR OF PUBLICATION)
(2008 TO END SEPTEMBER ONLY)

Patents in principle and in practice

The patent system does not exist, in principle, to impede or obstruct access to technologies in tension with the public's interests and expectations. Patent laws are passed to promote the development and dissemination of new and useful technologies. The patent information system discloses immense quantities of technological knowledge in accessible form, much of it falling directly into the public domain in many countries. Yet an active debate continues over whether, and to what extent, the actual operation of the patent system lives up to its principles, especially in areas of great public interests such as public health, agriculture and the environment – thus including many areas of technology that will be critical to adaptation. In principle and to a significant extent in practice, the patent system offers a balanced public policy tool to encourage the investment of resources into addressing practical needs, to help structure and leverage the kind of deals and partnerships that are necessary to deliver complex new technologies to the public, to deliver technological information to the public in accessible form, and to promote its implementation and dissemination.

The specific debate over patents and climate change therefore touches on many of the broader questions that arise in relation to patents and the public interest, and highlights the beneficial opportunities provided by the patent system and potential problems. These include:

- Use of patent information to promote transparency, to support policymakers, to predict technology trends, to identify emerging technologies, to monitor the activities of particular firms and institutions, and to locate and track specific technologies of interest;

- The incentive effect of the patent system, intended to promote the investment of resources into the research and practical development of potentially risky or uncertain technologies;

- Appropriate licensing and management strategies to promote the uptake and dissemination of technologies required to address climate change, including cross-licensing, humanitarian licensing, pooling of patents, and other structures for collaboration and blending of intangible assets in innovation processes;

- The exercise of exceptions to patent law to permit such activities as research and regulatory approval procedures; and

- The exercise of regulatory interventions such as compulsory licensing and government use authorizations to safeguard the competitive environment and the public interest more generally.

Technology landscaping through patent information.

Just as the rise in greenhouse gas emissions has been the product of old technologies – from coalfired power stations to internal combustion engines – so the reduction in emissions will rely on the deployment of new and more efficient technologies that could form the basis of economies that are less carbon-intensive. Most of this development will necessarily take place in developed countries, but developing countries should also be able

to benefit through technology transfer.[4]

One essential function of the patent system is the full public disclosure of technological information: patent information systems yield a steadily growing body of technological knowledge which enters an international public domain of accessible information soon after the inception of the technology. The Patent Cooperation Treaty (PCT) system provides a public resource of state of the art information, international in character, through its PatentScope search tool.[5] This information is published within 18 months of the first application for a patent. It is therefore a timely and accessible means for:

- tracking new technological developments in a field of particular interest (e.g. tracking new developments in fuel cells or hydrogen technologies);
- monitoring the activities of particular actors, such as firms, inventors or institutes of interest (e.g. maintaining a watch on an oil company's research activities in alternative energy technologies);
- locating and negotiating partnerships with developers of complementary technologies to (e.g. matching alternative power generation technologies with new electrical storage technologies)

The international patent applications filed under the PCT can mature into into patents, depending on the operation of national and regional patent laws, and depending on an applicant's choice to pursue protection in some jurisdictions and to forego it elsewhere. In practice, the technological knowledge in patent documentation fully enters the public domain in many jurisdictions worldwide, given that international patent applications typically mature into in-force national patents in only a minority of countries, typically developed economies and significant emerging economies. The debate often distinguishes between technology in the public domain and patented technology – but the territorial limitation on any patent right means that much 'patented technology' is in the public domain in many countries.

Accordingly, patent information systems provide a potential source of applicable technological information concerning technologies applicable to climate change

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4 The promise of technology, in United Nations Framework Convention on Climate Change, The First Ten Years, UNFCCC (2004).

5 http://www.wipo.int/patentscope/en/

mitigation and adaptation. Annexed to this paper are a number of sample searches, together with a summary of technology transfer provisions under the UNFCCC. The following boxes set out illustrative examples of new technologies disclosed in recent patent publications.[6]

Climate change mitigation technologies

- method of converting green house gases from fossil fuels into non-toxic base elements[7]
- a method for increasing the dry biomass of a plant through increasing its carbon assimilation[8]
- methods for sequestering carbon dioxide from a carbon dioxide-generating source[9]
- a photo-bioreactor with pulsing light emitting diodes for the cost-effective photo-fixation of carbon dioxide [10]
- a method for the enhanced production of algal biomass with accompanying improved sequestration of carbon dioxide through photosynthesis,[11]
- a process for converting green house gases emitted from burning fossil fuels, to their base components of elemental carbon, sulfur, nitrogen and oxygen, while eliminating emissions of harmful green house gases into the atmosphere.[12]
- a method of storing and releasing hydrogen using a hydrogen storage material comprises the addition or removal of electrons to or from the hydrogen storage material to initiate hydrogen uptake or release.
- power systems utilizing hydrolytically generated hydrogen[13]

Climate change adaptation technologies

- floating plant cultivation platform and method for growing terrestrial plants in saline

6 These are international patent applications only, included here to illusrate technical disclosure – no assessment is made as to their patentability.

7 WO/2005/072466)

8 WO 2008/059054, Method for Increasing the Dry Biomass of Plants

9 WO/2007/106883, Processes And Systems For The Sequestration Of Carbon Dioxide Utilizing Effluent Streams

10 WO/2007/047805, CARBON NEUTRALIZATION SYSTEM (CNS) FOR CO2 SEQUESTERING

11 WO/2006/100667) A METHOD FOR THE ENHANCED PRODUCTION OF ALGAL BIOMASS

12

13 WO/2005/097491

water of various salinities for multiple purposes[14]

- process of planting trees in a desert and arid regions[15]
- method and apparatus for high altitude environmental data collection[16]
- method and system for automated location dependent probabilistic tropical cyclone forecast
- a statistical-deterministic approach to natural disaster prediction[17]
- a process for the re-vegetation of an area of land for reversing or arresting desertification[18]
- a method and apparatus for predicting extreme, storm-driven events and their potential effect in respect of coastal structures and areas[19]
- an inorganic, static electric binder composition for use as a texture stabilising element in masses of organic and/or inorganic particles and also as a filtering mass, its uses including to reclaim arid and hyper-arid deserts and to prevent desertification and the movement and advancement of sand dunes, in other words stopping wind erosion efficiently.[20]

Monitoring key actors and technology trends

The international patent system also produces extensive metadata concerning defined fields of technology – such as information about patterns of technological activity and ownership, about directions in technological development, about the activities of individual inventors and firms, about other documents relevant to the claim of novelty and inventiveness, and about preliminary assessments of the validity of that asserted status.

Public and private patenting activity

Patterns of ownership are of interest, for instance, in determining where key technologies are developed and patented not by private firms but by government

[14] WO/2005/102030)
[15] (WO 2008/062928)
[16] WO 2007/008570)
[17] (WO 2007/084315)
[18] WO 2005/070194
[19] WO 2006/021746
[20] WO 2007/081219

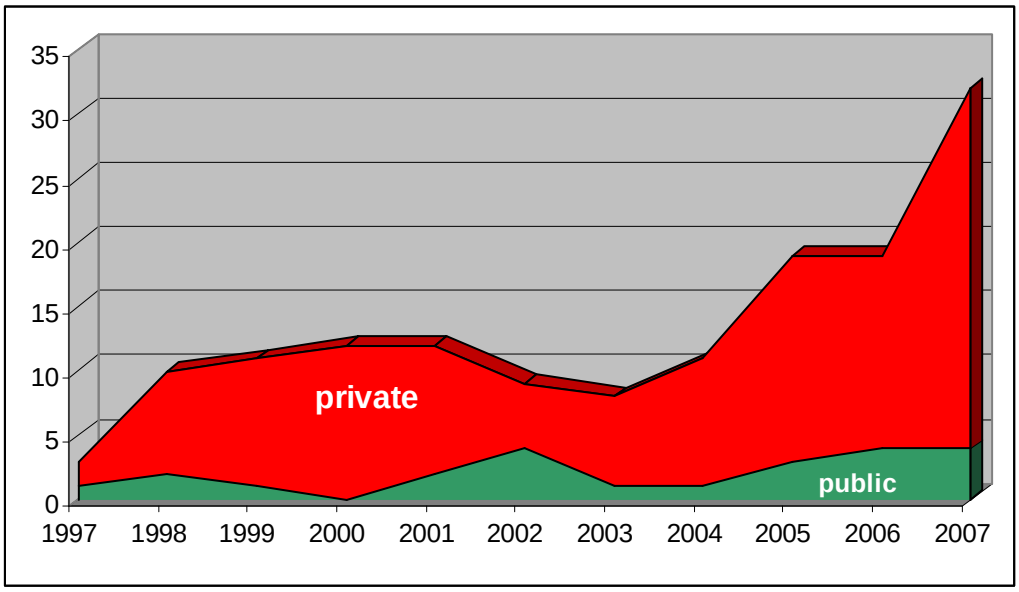
agencies, public funded initiatives or public research or educational institutions, when it has been argued that these patent holders have a special responsibility to make technology readily available to promote environmental goals. Accordingly, Agenda 21, a comprehensive United Nations programme on sustainable developed concluded at the Rio summit, included undertakings on 'support of and promotion of access to transfer of technology' that distinguish between:

- Formulation of policies and programmes for the effective transfer of environmentally sound technologies that are *publicly owned* or in the public domain;[21]

- And a range of measures regarding *privately owned* technologies, including incentive measures, 'enhancement of the access to and transfer of patent protected environmentally sound technologies, in particular to developing countries … purchase of patents and licences on commercial terms for their transfer to developing countries on non-commercial terms as part of development cooperation for sustainable development, taking into account the need to protect intellectual property rights'

In other words, Agenda 21 recognized that expectations and technology transfer mechanisms may need to differ depending on whether technologies are publicly or privately owned. In general, climate change policymakers may need to know where technology is concentrated in the private sector, and when the public sector holds key technologies. Patent information will provide the most efficient means of tracking trends on public and private ownership of technology relevant to climate change. For example, in the general field of meteorology and technologies for monitoring and predicting weather conditions, the technologies patented over the past decade have predominantly been held by private sector players and a relatively small number of public research institutions, as the following graphic illustrates:

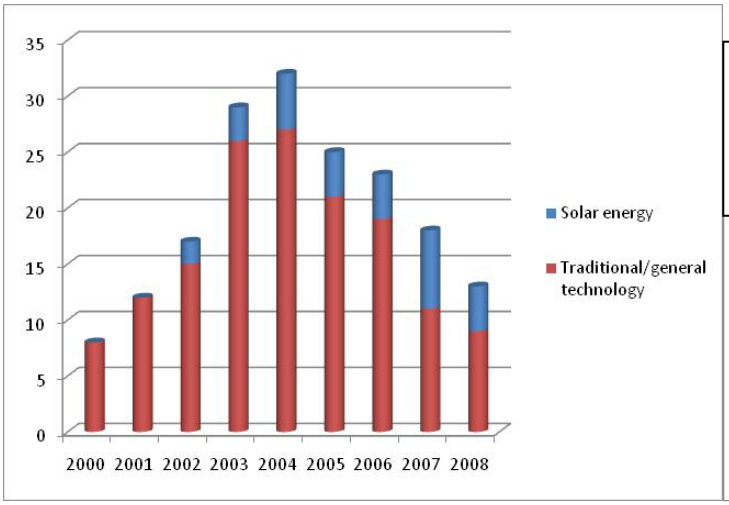
21 34.18 (a)



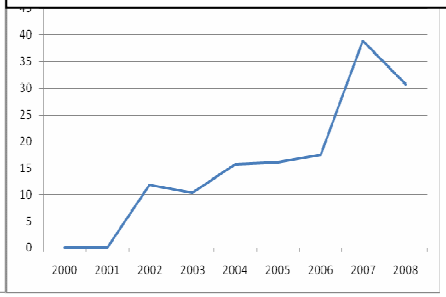
International applications in class G01W (Meteorology), by year of publication

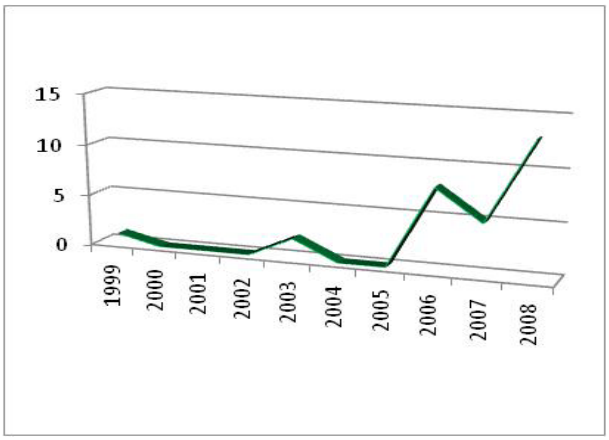
Activities of key players

Policymakers may also have an interest in tracking the future plans of major private sector players, including to determine what resources are going into research on alternative energy technologies, which new players are emerging, and to what extent the research effort of established energy companies, such as the oil majors, is moving towards environmentally friendly and alternative energy technologies. Again, patent information provides a timely and comprehensive overview of the emerging trends, for example:



PCT APPLICATIONS (YEAR OF PUBLICATION): BP CORPORATION OF NORTH AMERICA; TOTAL PUBLISHED BY SUBJECT SOLAR ENERGY RELATED

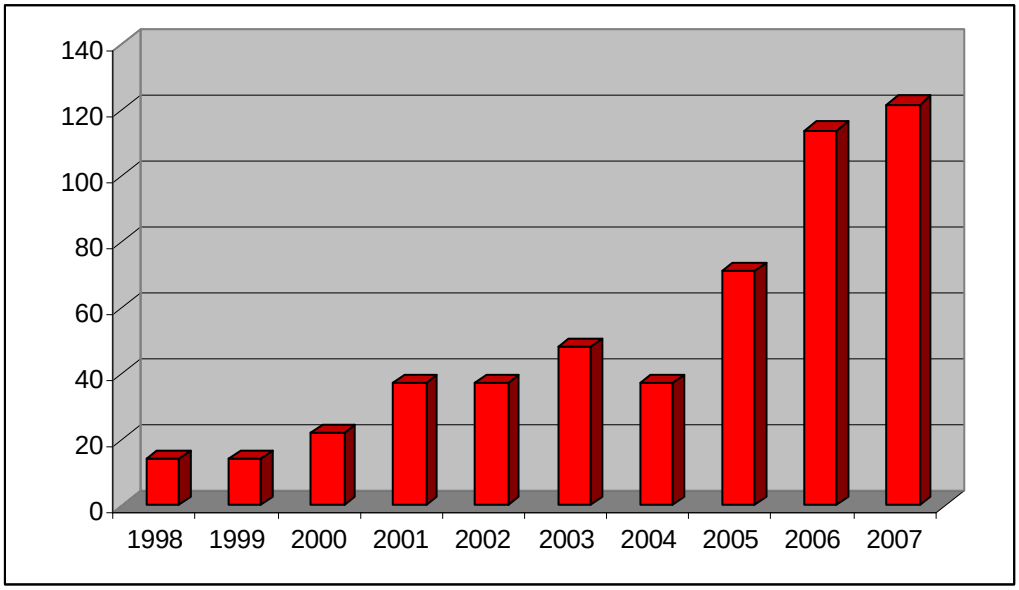




SHELL GROUP: INTERNATIONAL PATENT FILINGS ON SOLAR TECHNOLOGY (BY YEAR OF PUBLICATION)

North-South dynamics

A central concern in debate over the role of technology in climate change adaptation and mitigation has been the north-south dimension – to what extent are the necessary technologies produced in developed countries, and held by private and public entities there, raising questions over how the technologies can be effectively transferred to countries in the developing world where the challenges of adaptation and mitigation will be acute; and to what extent are countries in the developing world actively innovating and adapting technologies and exerting leverage over them through the patent system. Once again, patent information provides a window – necessarily incomplete, but nonetheless broad in scope – on the relevant trends, and the degree to which technology followers are emerging as technology producers in these areas of technology.



International applications by year of publication – conversion of chemical energy into electrical energy (including fuel cells) - IC/H01M

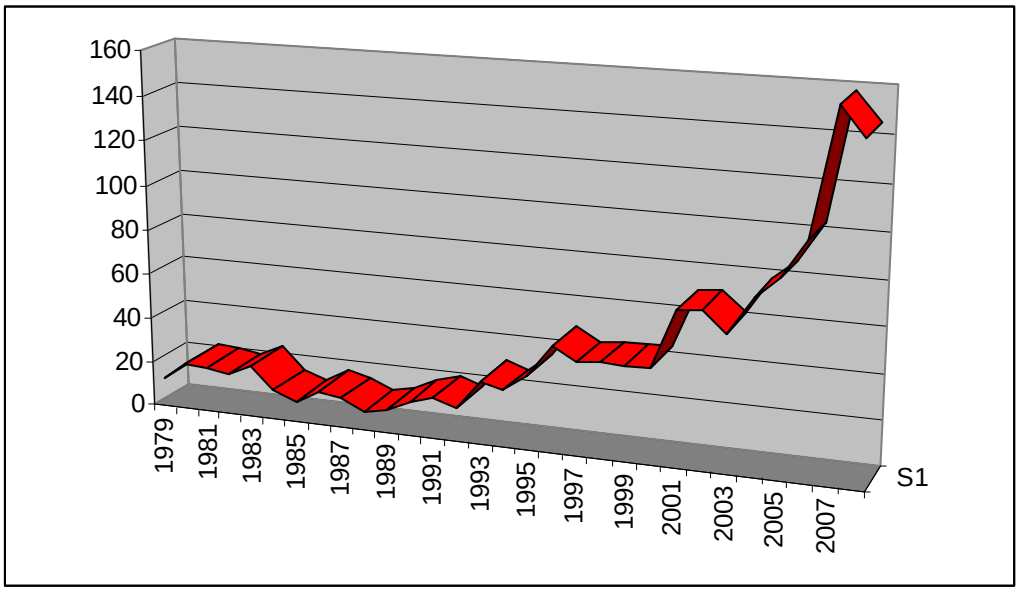
Some leading applicants from China (number of published international applications):

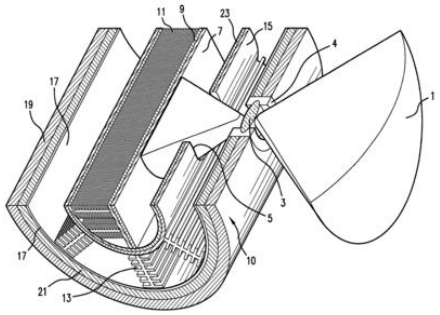
BYD Company Limited	43
Shenzhen Bak Battery Co, Ltd	17
Citic Guoan Mengguli New Energy Technology Co., Ltd.	6
Chung Pak Battery Works Ltd	4
Xu, Gang	3
Ju, Yongming	3
Institute of Physics, Chinese Academy of Sciences	3
Golden Energy Fuel Cell Co, Ltd	3
FENG, Yuesheng	3
CHUNG, Hingka	3
TIAN, Binglun	2

SHANGHAI SHANSHAN TECH CO., LTD.	2
REN, Xiaoping	2
LEXEL BATTERY (SHENZHEN) CO., LTD.	2
HORIZON FUEL CELLS TECHNOLOGIES (SHANGHAI) CO., LTD.	2
FUDAN UNIVERSITY	2
FU, Liping	2
CHUNG, Hai	2
CHEN, Yuanhong	2
BTR ENERGY MATERIALS CO., LTD.	2
BEIJING UNIVERSITY OF CHEMICAL TECHNOLOGY	2
BEIJING CHANGLI UNION ENERGY	2

TECHNOLOGY COMPANY	

Selected solar power technologies (IC/F24J-2/**)





Details from a recent publication, WO/2008/081209, Solar Chimney - Pitaya Yangpichit, Thailand

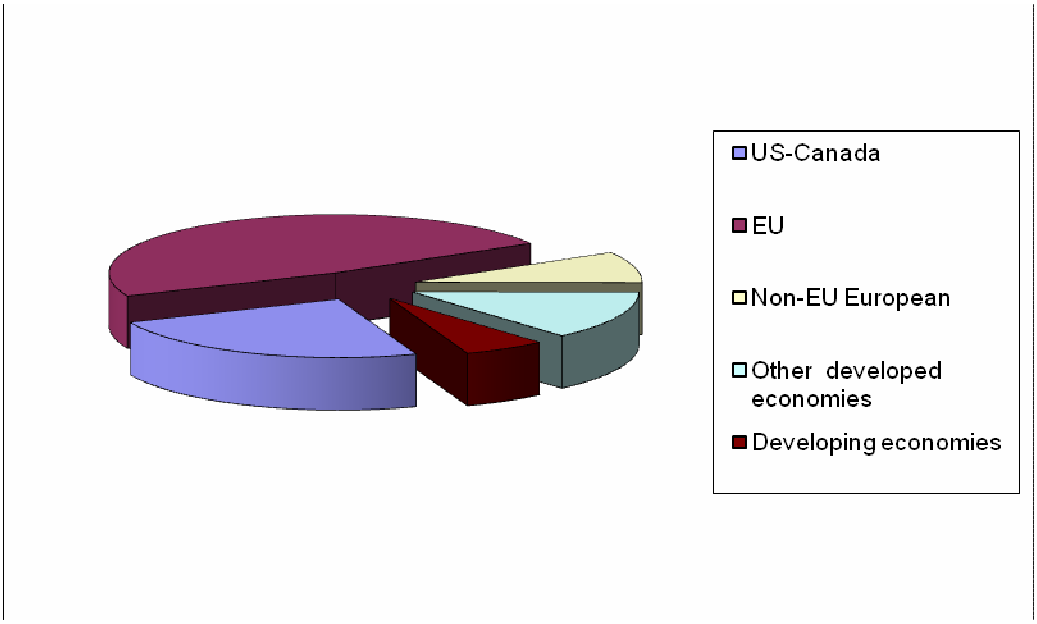


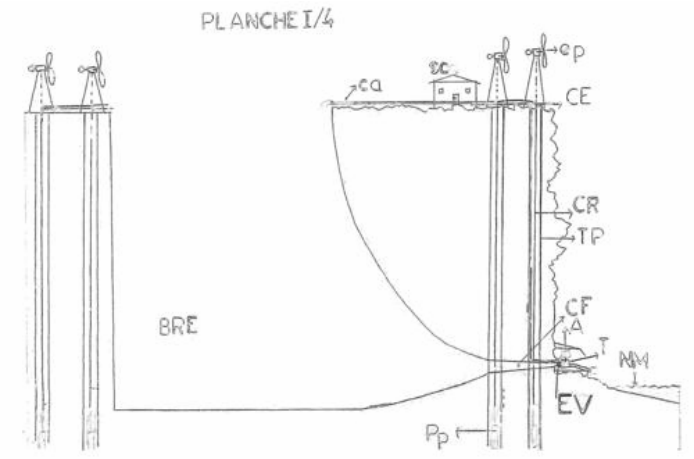
Figure 1 Selected solar power technologies: geographic distribution

Selected technologies for generating energy from sustainable sources

- B60L 8/00
  Electric propulsion for vehicles with power supply from force of nature, e.g. sun, wind
- B60K 16/00
  Arrangements in connection with power supply from force of nature, e.g. sun, wind (electric propulsion with power supply from force of nature, e.g. sun, wind
- F03D
  Wind motors (mechanisms for converting the energy of natural wind into useful mechanical power, and the transmission of such power to its point of use)

In these three related clusters of technology – which are illustrative, but not exhaustive – over 27% of all relevant activity has been published since January 2007, demonstrating the dramatic increase in technological advancement in this domain.

This activity includes filings from the following developing countries: Argentina, Bahamas, Belize, Brazil, Burundi, China, Ghana, India, Lebanon, Morocco, OAPI (the regional patent office for Francophone Africa), Peru, Philippines, Republic of Korea, Singapore, South Africa, United Arab Emirates, Yemen and Zimbabwe. In activity published since January 2007, China represents the fifth most active economy, after Denmark, the United States, Germany and Spain; the Republic of Korea lies eighth, after the UK and Japan.



Extract from international publication WO/2008/114072 (Mohammed Abid, Morocco): Network of hydroelectric plants supplied with sea water by renewable energies for storing same

Patent law and policy and the challenges of climate change

Patent law and policy in the early years of the current decade were dominated by concerns about public health – the impact of patenting activity on access to medicines, and the scope and focus of the innovation and product development effort. Internationally, these concerns were epitomized, firstly, in the Doha Declaration on TRIPS and Public Health, which initiated an important process leading to a revision of the TRIPS Agreement to promote access to medicines, and secondly in the work of the World Health Organization, in the form of the CIPIH and the IGWG, which considered at length the possible means of aligning research activities with the health burden, and considered a range of measures to promote necessary innovating, leading to the recent adoption

The parallel has been drawn explicitly by some policymakers between public health and climate change – the suggestion has been that similar steps may need to be taken to address climate change, including an environmental equivalent of the Doha Declaration on TRIPS and Public Health. Indeed, these two policy domains overlap to some extent, given the expectation that climate change adaptation will likely put immense stress on public health systems and change the pattern of the disease burden, creating new demands for innovation and access in the medical domain.

In general, these policy-level proposals concerning patents and climate change have centred on two broad operational aspects of the patent system:

- pre-grant questions (what kind of technologies should patent offices grant patents for, and what technologies should be refused patent protection), and
- post-grant questions (what steps should be taken to monitor and to regulate, as necessary, the actual use of patent rights in the marketplace, and what forms of intervention are required, if any)

Pre-grant questions

For example, as a pre-grant question, the proposal has been made that in view of the urgency of the response to climate change, it may be appropriate to deny patents to certain climate-friendly technologies, so as to ensure there are no legal constraints on their access and diffusion. This kind of proposal goes to the heart of the patent system as an incentive mechanism and an instrument of public policy. Hence, while likely to provoke diverse responses and possibly difficult to put into practice, such proposals helpfully focus on some key questions about the policy function of the patent system, such as:

- What incentives are required to promote the investment of resources into the research and practical development of potentially risky or uncertain technologies that may be socially beneficial, and what pathways can be constructed to maximize the investment of resources and effort to bring promising new technologies to the public, in the diverse and ultimately unpredictable field of technologies relevant to climate change mitigation

and adaptation?

- What are the policy and practical implications of singling out environmentally-friendly technologies at the time patent applications are reviewed and examined for possible allowance as patents? Can the ultimate environmental impact of technologies be fully or effectively assessed at the stage of patent examination? What are the systemic implications of singling out environmentally beneficial technologies for either negative or positive discrimination in the patent system? Are there legal issues, too, to be considered?

Broadly, the pre-grant questions have focused especially on how to improve *patent quality*, which may be considered as a measure of the degree to which patents as actually granted conform in fact with the broad principles of the patent system in reserving patent rights solely for those inventions that are genuinely new, involve true inventiveness, and are useful for society, while not intruding in areas of public policy concern, such as technologies that would run contrary to morality and the public interest if they were commercialized (generally, such exclusions from patent law have included technologies that would damage the environment, rather than making a positive contribution to it).

Apart from major legislative reform and treaty renegotiation, what kind of initiatives may be necessary to ensure patent quality especially in key areas that are relevant to climate change? These may include:

- greater cooperation between patent offices on search and examination to ensure that patent claims, once granted, are as close as possible to the ideal set out in the principles of patent law
- 'wiki' style open review processes for members of the public to notify relevant prior art to facilitate the search and examination process, again in areas of technology of particular concern and public interest
- Specific prior art databases and other technical support for search and examination in these key technology areas

Post-grant questions

And turning to the post-grant environment – considering how patents, once granted, should be exercised and regulated, the issues break down into three general clusters

(i) Strategies and mechanisms for voluntary licensing and management of technologies relevant to mitigation and adaptation\

- What licensing structures and IP management strategies are appropriate to promote the uptake and dissemination of technologies required to address climate change?
    - cross-licensing,
    - humanitarian licensing,
    - pooling of patents,
    - other structures for collaboration and blending of intangible assets in innovation processes;
- How should these structures and strategies be developed and applied differently for:
    - Public institutions and government agencies
    - Entities, including educational and research institutes, that are substantially publicly funded
    - Institutes and enterprises in countries at different stages of development

(ii) The exercise of exceptions to patent law to provide for public interest safeguards; in particular, what exceptions should exist and how should they be implemented to allow for:

- Pre-commercial or non-commercial research (for example, independently testing the utility of a patented fuel-cell technology)
- Steps necessary to undertake regulatory approval procedures (for example, to seek approval for the use of a patented trait in field trials of food crops engineered to thrive in relatively saline soils)

(iii) Regulatory interventions that limit the exclusive effect of patent rights,

such as

- The issuance of compulsory licenses to safeguard the competitive environment and
- Government use authorizations and other compulsory licenses as safeguards of the public interest more generally.
- These questions, while controversial when applied to climate change technologies – unsurprisingly so, as they have been controversial for many years in other fields, can be resolved down to two broad clusters:
    - Legal and formal: what are the legal options under international law, and what legal tests and safeguards are appropriate under national law?
    - Practical and prudential: when is it systemically desirable and in the public interest for such measures to be taken; what thresholds can be discerned, what assessments may need to be considered when such interventions are considered.

It is notable that Agenda 21, at the time of the Rio Summit, noted that "in compliance with and under the specific circumstances recognized by the relevant international conventions adhered to by States, the undertaking of measures to prevent the abuse of intellectual property rights, including rules with respect to their acquisition through compulsory licensing, with the provision of equitable and adequate compensation." Since that time, controversy continues as to whether compulsory licensing and government use authorizations should be considered highly exceptional regulatory interventions to remedy egregious behavior or failings in the system, or a default means of access to patented technology. Given the vast spread of technologies relevant to climate change mitigation and adaptation, it may be difficult to resolve this question without considerable further debate and examination of the state of play and scope of patenting of relevant technologies.

Patents and technology transfer

The role of patents in the transfer of technology, particularly for technologies needed for sustainable development, has been the subject of a diverse, lively and

vital debate since the 1970s and the attempts then to forge a new international economic order. The widespread expectation that new technologies will be critical to the effective response to the challenge of climate change brings a new urgency to this debate. This briefing paper does not attempt to summarize this longstanding debate nor to advocate a position in the debate. However, drawing on the general discussion above, some broad observations are offered:

- The simple existence of a patent on a particular technology is not a barrier in itself to the transfer of that technology, and indeed the patent is in principle in place in order to facilitate dissemination and use of the technology, not to block it; equally, however, the existence of a patent alone does not guarantee that the technology will be fully exploited in all possibly beneficial ways. Much depends on how the exclusive rights that come with a patent are deployed; where they are in force and where they are not; and how they can be used as components in constructing suitable vehicles for technology transfer.

- Equally, the absence of an enforceable patent right in a certain country does not in itself provide any guarantee of technology transfer. At best, it leaves open the prospect of using the technology disclosed in the patent document, but often without the partnership or involvement of the technology originator, and the transfer of valuable knowhow and other background technology that may be useful for the effective exploitation of the technology.

- The transparency of the patent system, if effectively exploited, can in itself serve as a major boost to technology transfer. In principle, it can help

    - Track significant technological developments and trends, including monitoring new players, geographical shifts and the relative participation of public and private sector actors, established firms and new entrants

    - Avoid duplicative research and development, and enable technological leapfrogging and other forms of cumulative development, such that innovations disclosed and published

through the patent system fuel further innovation

- Organize and structure technology transfer arrangements, as well as providing an effective incentive not only to enter into such arrangements but also to include within them improvements, knowhow and other related technologies

- Taking out a patent is not a stand-alone technology transfer mechanism, any more than foregoing the option of a patent is a single form of knowledge management. Rather, patents are used in a host of different ways to transfer technology, depending on whether effective transfer of the technology concerned requires

  - a market-based incentive for a core new technology to be developed and disseminated,
  - a means of leveraging access to other related technologies to form a package of technologies from different sources
  - public institutions to maintain an interest and a degree of leverage over technology developed through public investment
  - the creation of new enterprises as tailor-made vehicles for development of a new technology
  - a broad-based open licensing structure to promote dissemination of a platform or enabling technology
  - cross-licensing structures or pool arrangements that allow diverse technology players to build on the benefits of each others' technologies
  - packaging the patented technology with other non-patented material, such as manufacturing knowhow, other commercial information, or regulatory approval dossiers.

V. MARKS AND DISTINCTIVE INDICATIONS

The law of intellectual property covers the use of certification and collective marks, geographical indications and other distinctive signs. Such signs are increasingly used to identify products that are particularly relevant to climate change mitigation, and represent a means of ensuring the public can play an active role in climate change policy through their daily purchasing choices. The public seeks credible guarantees that the products and services they buy – ranging from climate friendly products, to carbon offsets – properly conform with their expectations.

Certification marks are applied when a good or a service conforms with the standards set by a certifying organization, which may be an NGO, an international organization, a commercial body or a government agency. For example, the Carbon Label Company Limited was established by the Carbon Trust, a UK Government initiative, to manage a system for labeling products with their carbon footprint, as a guide to the consumer. It has already yobtained trademark protection for a number of certification marks and is seeking protection for additional marks

UK trademark 2449540, registered by The Carbon Label Company Limited in respect of "certifying as to energy consumption, energy savings, energy efficiency, carbon emissions and reduction of carbon emissions"

Certification mark 2488986, recently applied for by the Carbon Label Company Limited in the United Kingdom, for possible use in certifying the carbon footprint of a wide range of goods and services, potentially ranging from industrial chemicals to sporting services. The certifier stipulates that "to qualify for a label, products will have to go through [a] rigorous, agreed methodology and be

independently verified. They will also have to sign up to a 'reduce or lose' clause whereby if they fail to reduce the carbon footprint of the labelled product over a two year period the label will be withdrawn by the Carbon Trust."

The international trademark system

The 'Madrid system' – so called because it is based on two key international treaties, the Madrid Agreement and the Madrid Protocol – provides for the international registration of trademarks. It enables a trademark owner to pursue trademark protection in several countries through one international registration. An increasing number of certification marks relevant to climate change mitigation are being registered in the Madrid system, offering a window onto the increasing commercial significance of such certification schemes.

One example, among many, is the CLIMATE SAVERS mark, which was registered in 1999 by the WWF-World Wide Fund For Nature (Formerly World Wildlife Fund) (as international registration number 717982), in respect of

- Printed matter; publishing printed periodicals, books, magazines and newspapers; stationery; writing ustensils; photographs; teaching and instructional material (apparatus excluded); artists' supplies, paper and office supplies (excluding furniture).
- Clothing, footwear and headgear.
- Business management services; business and management know-how; business information management services; commercial development services; information and advice relating to the above services; expertise services relating to the above services.
- Training, educational and entertainment services, teaching, entertainment and training services; organisation of lectures and seminars; production, rental and screening of films; publishing and production of books, newspapers, magazines and news and educational material.
- Organising and conducting projects for the conservation, study and protection of nature and the environment; advice, reports and research related to these services.

Details of the Climate Savers program, and examples of the leading private corporations that work with this program can be viewed at

www.worldwildlife.org/climate/projects/climatesavers/companies.cfm. Here it is reported that "leading corporations are partnering with WWF to establish ambitious targets to voluntarily reduce their greenhouse gas (GHG) emissions. By 2010, the Climate Savers companies will collectively cut carbon emissions by some 14 million tons annually – the equivalent of taking more than 3 million cars off the road every year. By increasing efficiency, Climate Savers companies are saving hundreds of millions of dollars, proving again that protecting the environment makes good business sense."

Trademarks are also used by commercial enterprises and other entities to distinguish their services relating to managing the impact of climate change. The recent growth in emissions trading systems has seen a concomitant growth in applications and registrations for trademarks in this area. Such trademark registrations reflect the development of a emission trading economy, and illustrate the mainstreaming of climate change mitigation business models. Trademark records illustrate that they are increasingly taken out by firms such as insurance companies, business consultants and financial organizations.

A recent example is Madrid registration 936597 for the mark:

which is registered by the Global Carbon Solutions Pty Ltd in respect of "insurance and financial consultancy services relating to the impact of climate change on organizations, including abatement verification, triple bottom line reporting and corporate sustainability reporting; commodity exchange services, namely carbon dioxide and other emissions exchange services that facilitate the trading or sale of carbon dioxide and other emissions allowances and offsets between business and other market participants."

Climate change mitigation initiatives have also seen increasing attention to the origins of consumer products, particularly agricultural products. Geographical indications are distinctive signs that identify a good as originating from a particular geographical location, where a certain characteristic of the good can be attributed to its geographical origin. While not directly relevant to climate

change mitigation, the protection of geographical indications helps reinforce awareness of and accurate indication of the origin of products, especially agricultural products and foodstuffs, but also other traditional products such as handicrafts that are associated with sustainable use of genetic resources. In turn, such geographical indications may help to promote sustainable local arrangements for the maintenance of biological diversity, with a potential link to avoiding deforestation and other environmental disruption with an adverse impact upon climate change.

VI. UNFAIR COMPETITION

A core element of intellectual property law is the suppression of unfair competition. This term has diverse usages in different national systems; however, some clear principles can be distilled from the international law in this area, principally the Paris Convention. One core idea is that the public should not be deceived as to the quality and the source of the goods they purchase. These broad principles would naturally extend to claims that goods were environmentally friendly, carbon neutral, developed or endorsed by local communities or by environmental authorities, or otherwise consistent with sound management of the environment. The Paris Convention, which is incorporated in the WTO TRIPS Agreement, provides for the prohibition of "indications or allegations the use of which in the course of trade is liable to mislead the public as to the nature, the manufacturing process, the characteristics, the suitability for their purpose, or the quantity, of the goods."

Recent reports, for instance, have raised concerns over so-called 'greenwashing', or a form of green marketing or ecological marketing that makes environmental claims that are unfounded or inaccurate. The development of the carbon offset economy, and increasing attention by consumers to the carbon footprint of the goods and services they purchase, highlight the need for vigilance against false or misleading statements that may seek to capitalize on consumer concern for the environment while failing to make a positive contribution to climate change reduction.

One consumer protection authority, the US Federal Trade Commission, has issued Guides for the Use of Environmental Marketing Claims, which include the provision that " it is deceptive to misrepresent, directly or by implication, that a product, package or service offers a general environmental benefit. Unqualified general claims of environmental benefit are difficult to interpret, and depending on their context, may convey a wide range of meanings to consumers… every express and material implied claim that the general assertion conveys to reasonable consumers about an objective quality, feature or attribute of a product or service must be substantiated. Unless this substantiation duty can be met, broad environmental claims should either be avoided or qualified, as necessary, to prevent deception about the specific nature of the

environmental benefit being asserted." Examples given include:

- A product label contains an environmental seal, either in the form of a globe icon, or a globe icon with only the text "Earth Smart" around it. Either label is likely to convey to consumers that the product is environmentally superior to other products. If the manufacturer cannot substantiate this broad claim, the claim would be deceptive. The claims would not be deceptive if they were accompanied by clear and prominent qualifying language limiting the environmental superiority representation to the particular product attribute or attributes for which they could be substantiated, provided that no other deceptive implications were created by the context.

- A product is advertised as "environmentally preferable." This claim is likely to convey to consumers that this product is environmentally superior to other products. If the manufacturer cannot substantiate this broad claim, the claim would be deceptive. The claim would not be deceptive if it were accompanied by clear and prominent qualifying language limiting the environmental superiority representation to the particular product attribute or attributes for which it could be substantiated, provided that no other deceptive implications were created by the context.

Example of claims being made	Nature of ACCC Concerns
Claims of Carbon-neutrality based on an accurate carbon footprint but inappropriately 'offset'	• Offsets achieved via the purchase of carbon credits that have not been accurately calculated • Offsets that are forward credited or non-additional • Companies taking advantage of offset activity from which they have already benefited or 'double-dipping' (where an individual purchases carbon credits to offset their emissions, but the carbon credits purchased have already been previously sold or retired) • Instances of participants in carbon offset schemes buying worthless credits that do not yield reductions in carbon emissions (e.g. planting shrubs and grasses that contain far less carbon than assumed)
Claims of Carbon-neutrality based on an inaccurate carbon footprint	• Carbon footprint calculated to include only some emission sources (e.g. emissions generated during a car's manufacture but not including the emissions generated by driving the car) • Carbon footprints calculated in good faith but using an inaccurate 'calculator' or a calculator that provides no substantiation with regard to its calculations
Claims of Carbon-neutrality made without substantiation	• Blatant disregard for the TPA
Claims of a transition to a position of carbon neutrality (representations about future matters)	• Places organisations at risk of engaging in misleading and deceptive conduct if claims are made with the expectation of offsetting emissions, but without sufficient rigour in the explanation of timeframes and implementation models • The overall impression generated may be that more is being done than actual outcomes would reflect
Claims of 'low carbon' in particular products and services	• Breadth of claim may be too great - it could mean 'lower carbon' than other products or services or could be understood by consumers as low in emissions or even 'virtually' carbon-neutral

EXAMPLE OF A RECENT REPORT ON THE CONCERNS OF A NATIONAL COMPETITION AUTHORITY REGARDING MISLEADING OR DECEPTIVE COMMERCIAL CLAIMS CONCERNING CARBON OFFSETS FOR PRODUCTS AND SERVICES (SOURCE: AUSTRALIAN COMPETITION AND CONSUMER COMMISSION, ISSUES PAPER, JANUARY 2008)

Competition watchdogs, typically the authorities responsible for monitoring and policing unfair competition, have been anxious to suppress unfair competition involving false and misleading claims relating to goods and services that ostensibly contribute to climate change mitigation. One illustrative example is provided in the box below.

Fair competition and carbon offsets

One recent guideline issued for businesses concerning carbon offset claims[22] included the following guidance

- Sponsorship—businesses should not give the impression they have the backing
of another party when they do not. The unauthorised use of a trademark or logo may breach this provision.
- Approval—businesses should not claim to have approval from a government agency or licensing board when no such approval has been given; where such approval has lapsed; or where the approval relates to other matters.
- Performance characteristics—businesses should not falsely claim that their product or service has certain capabilities or effects they do not have. For example, overstating the impact in relation to a product or service of any particular offset program in place.
- Benefits—businesses should not claim that a product or service has carbonrelated environmental benefits if these claims cannot be substantiated.

The guidelines further state that "some images may suggest carbon-related benefits to consumers. For example, the use of a symbol or official-looking logo might give consumers the impression of certification from an independent third party. If this is not the case, the use of the image risks misleading people. As good practice, when using the logo of a scheme that not many consumers will be familiar with, provide opportunity for consumers to easily find further details and information on the scheme identified with the logo to help alleviate potential confusion.

[22] Carbon claims and the Trade Practices Act, Australian Competition and Consumer Commission, June 2008

Labelling and certification systems are also widely used to ensure more accurate information is made available to the consumer, recalling the linkage between the trademark system and the suppression of some forms of unfair competition.

The EU Ecolabel aims to stimulate both supply and demand of products with reduced environmental impact. Criteria for its use are set by the EU Ecolabeling Board.

The Thai Green Label Scheme was launched in 1994 by the Ministries of Environment and Industry. The symbol signifies hope and environmental harmony.

As the WIPO Magazine has reported, such labels need to be carefully managed to ensure that the consumer interest is served.

> The greenwash backlash: Jacob Malthouse, a co-founder of the Vancouver-based consumer advice site ecolabelling.org, says eco-labels can, however, be something of a mixed blessing for consumers. "The sheer number of labels available can be enough to make your shopping trolley spin," he says. In Britain alone, there are at least four labels to tell consumers about a product's carbon footprint. To help consumers navigate through the eco-label maze, the ecolabelling.org website, launched this year, details more than 300 eco-labels and sets out who runs them and what they mean. A further 150 will be added soon.
>
> The potential for confusion is risky, explains Jacob Malthouse. "People see ecolabels and think 'perfect, this is green.' Then they start to hear about greenwashing and they question the credibility of what's being done." Greenwashing, the term used to describe companies trumping up their green credentials without any real basis, can backfire on a brand.[23]

[23] Jo Bowman, Climate Change: Green Branding - Cashing in on the Eco-Market, WIPO Magazine, April 2008

VII. TRADITIONAL KNOWLEDGE

> Although indigenous peoples regard themselves as the mercury in the world's climate change barometer, they are rarely considered in public discourses on climate change.[24]

International policy debate over traditional knowledge systems, and their appropriate recognition and protection, has highlighted the inherent rights and entitlements of TK holders in the due respect, recognition and protection of misuse and misappropriation of their TK. A number of initiatives are under way, at the community, national, regional and international levels, to bolster the legal recognition and protection of traditional knowledge, including environmental and agricultural knowledge, through conventional or *sui generis* mechanisms,.

But the increasing policy focus on TK protection has also drawn broader attention to the common global interest in TK and traditional knowledge systems from a broader point of view, in such areas as conservation of biodiversity, food security, public health and the protection of the environment. International legal instruments, and policy processes, directly recognize and reinforce this linkage.

One key area where TK has an important role to play is in monitoring climate change, and in finding appropriate sustainable responses to the impact of climate change. TK is typically shaped by and is responsive to the physical environment. Traditional knowledge systems are typically finely attuned to the changes and rhythms of the natural environment, including disruptions or shifts in climatic patterns. These knowledge systems therefore offer an early warning system for the guidance of international policymakers, but also offer prospects for guidance on developing a coordinated, fully informed response to the challenges of varying weather patterns and their impact on the natural environment and on human civilizations. Traditional knowledge is key to monitoring climate change and its direct impact on the environment, on ecosystems and on biodiversity; but

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24 United Nations University Institute of Advanced Studies, Meeting Report, International Expert Group Meeting on Indigenous Peoples and Climate Change held April 2-4 in Darwin, Australia.

it is also an invaluable resource in dealing with the challenges of adaptation and mitigation in a sustainable and culturally appropriate way.

Climate change therefore emerges as a key and urgent area for bridging between policymaking in the broad field of TK and indigenous knowledge systems, on the one hand, and in the field of climate change and related environmental policy and programs, on the other. General experience has shown that TK must be dealt with inclusively, giving a central voice to the holders of TK themselves, and must be dealt with holistically, ensuring that the full policy, cultural and social context is borne in mind as well as the domain of grass roots capacity building and the implementation of practical tools.

Policymakers and indigenous peoples need to bridge between the broader policy context, and the development of needed practical tools, so as to reinforce the positive linkages between international policy and legal discourse, and practical initiatives to bolster the capacity of indigenous communities and other TK holders to identify and safeguard their interests as their TK is increasingly documented, disseminated and used by others well beyond its original community context.

A comprehensive review of policy issues and practical options relating to TK and climate change could include the following:

- A review of linkages between monitoring and responding to climate change, and traditional knowledge systems?

- Capacity building tools and options for the documentation, safeguarding and appropriate legal protection of TK in relation to monitoring and responding to climate change

    - national, regional and international capacity building tools and initiatives

    - the community focus: needs assessments and appropriate capacity building measures at the community level

- Prospects and possibilities for practical cooperation and initiatives on:

  - Sharing of information and policy perspectives on TK and climate change
  - Monitoring developments and case studies in relation to TK and climate change
  - Community-level capacity building and community-centred needs assessments

- The use of patent information systems in tracking the use of TK relating to climate change and related fields

- The legal, policy and practical options for communities in seeking to preserve their traditional knowledge systems at a time of environmental, social and cultural change, and the linkage with appropriate protection measures to ensure TK, especially when documented and disseminated beyond the community in the context of climate change responses, is used respectfully and appropriately, and is not misappropriated or misused,

- The IP implications of the use of TK and traditional knowledge systems in regulatory processes concerning the environment and climate change in particular.

Protection of traditional knowledge against misappropriation and misuse

As traditional knowledge is used and disseminated more widely, in recognition of its value in regulatory systems, its importance in monitoring and responding to climate change, and its technological and potential commercial significance, greater attention is paid to protecting traditional knowledge. Above all, this concern grows from a recognition that TK holders merit recognition and respect, that their customary forms of holding and transmitting knowledge should be respected and strengthened, rather than overridden, and that no assumption can be made that TK is in the public domain, free to be used regardless of any liability or responsibility to the holders of TK.

TK can be 'protected' in several, complementary ways. A range of international policy processes and several international legal instruments address various aspects of protection, amidst calls for an holistic approach to protection of TK.

Protection may include safeguarding against loss, including, among other ways, documenting and recording, building capacity to support traditional knowledge systems, the custodians of TK and TK systems, and the social structures that sustain and express them, acknowledging the broader range of collective and individual rights that are linked to TK and its physical, cultural and legal environment, and protecting the TK against illegitimate use or misappropriation by third parties, including commercial misappropriation and misuse that is derogatory or offensive.

WIPO's work on TK includes protection against the kinds of illicit uses and misappropriations that IP protection usually addresses, while taking into account the particular nature and characteristics of traditional knowledge systems, including their communal quality, and the preference many TK holders have expressed to avoid distinct new property rights. This approach concerns how to determine which forms of use of protected TK by third parties are permissible, what uses of protected TK require the consent or authorization of the holders of TK, and what conditions or constraints may apply to use by third parties. This is consistent with the preservation of TK and the safeguarding of customary use and transmission of TK, while clarifying the specific issues relating to the IP facet of protection identified above.

The specific characteristics of protection under consideration in WIPO discussion include the following:[25]

(a) The concept of 'misappropriation' is clarified as including a range of acts typically prohibited under diverse laws and norms: this includes acquisition or appropriation of TK by unfair or illicit means, as well as misuse of TK and the concept of unjust enrichment or reaping unfair commercial benefit from TK

(b) Five specific aspects of misappropriation are set out, again corresponding to the acts that are most frequently identified in debate about TK protection and are addressed in many laws: (i) direct acts of deliberate misappropriation, (ii) misappropriation through the breach of legal arrangements for prior informed consent and benefit sharing, (iii) misappropriation through attempts to obtain illegitimate IP rights over TK, (iv) misappropriation in the form of unfair

25 See document WIPO/GRTKF/IC/11/5(c)

competition or unjust enrichment, deriving commercial benefit when this is manifestly inequitable, and (v) certain forms of willful misuse and offensive behaviour regarding TK.

(c) Consistent with existing international standards, the principles identify other relevant forms of unfair competition, such as misuse of the reputation of TK holders and acts creating confusion with traditional products.

(d) The principles suggest that customary practices, norms, laws and understandings should guide the protection against misappropriation of TK, including determination of equitable sharing and distribution of benefits.

(e) TK is defined in general, indicative terms as the content or substance of knowledge resulting from intellectual activity in a traditional context, and is not limited to any specific field, extending to agricultural, environmental and medicinal knowledge, and knowledge associated with genetic resources.

(f) For specific protection against misuse or misappropriation, TK should (i) exist in a traditional and intergenerational context; (ii) be distinctively associated with a traditional or indigenous community or people which preserves and transmits it between generations; and (iii) be integral to the cultural identity of an indigenous or traditional community or people which is recognized as holding the knowledge through a form of custodianship, guardianship, collective ownership or cultural responsibility. This relationship may be expressed formally or informally by customary or traditional practices, protocols or laws.

(g) Beneficiaries of protection would also be defined to be the communities who generate, preserve and transmit the knowledge in a traditional and intergenerational context, who are distinctively associated with it, and who culturally identify with it. Benefits may flow to communities as such, or recognized individuals within communities. Again, customary protocols, understandings, laws and practices should guide or determine entitlement to the benefits of protection.

(h) Exceptions and limitations also draw on existing experience and respond to policy concerns, and safeguard the customary practice, exchange, use and

transmission of traditional knowledge by traditional knowledge holders; uses such as traditional household use and public health ; and fair use of TK that is already readily available to the general public, subject to equitable compensation for industrial and commercial usage.

VIII. UNDISCLOSED INFORMATION, TRADE SECRETS AND REGULATORY DATA

Within the broad area of undisclosed or confidential information, two specific forms of intellectual property protection may be relevant to the development, diffusion and effective adoption of technologies for climate change. These are discussed briefly here for the sake of completeness, but no detailed account is offered.

- The protection of undisclosed information or trade secrets for key areas of knowhow relevant to mitigation and adaptation;

  - Contrasting in principle with the protection of patented invention – for which effective disclosure of the invention to the public is essential for a valid patent – protection of undisclosed information or trade secrets entails keeping the information from public disclosure. This form of protection is not inconsistent with technology transfer, and may indeed actively promote it; equally it can be consistent with responsible use of the patent system – such as when the economically efficient implementation of a patented technology requires additional knowhow concerning the fine tuning of production techniques, even when this is not technically required to carry out the invention.

  - In practice, technology transfer packages therefore often include arrangements for licenses to patented invention as well as the transfer of related knowhow and confidential information or trade secrets.

- Protection of trial data

While controversial in many countries, from a range of environmental and ethical dimensions, genetically modified crops are finding increasing usage in a number of countries. Some plant traits under investigation for resistance to abiotic stress – such as drought and high soil salinity – may be considered relevant to climate change adaptation. Field trials of such crops generate

valuable data concerning their safety, efficacy and environmental impact, data which are required by the regulatory authorities who must consider whether or not such new crops should be released for wider cultivation.

One aspect of the intellectual property system is the protection of the field trial data associated with the testing of genetically modified plants expressing such traits. The area of protection of such regulatory data is controversial and sensitive, both in terms of concerns about the technology itself and about the appropriate level of protection provided for such data, but it is an area of critical importance, with the balance between public interest and private incentives being particularly significant. It should therefore at least figure in any comprehensive survey of intellectual property issues relating to climate change.