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Sustainable development
& INTELLECTUAL PROPERTY
Access to technologies in developing countries

inpi

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PREFACE

Gilles Berhault, chairman of Comité 21 and the Club France Développement Durable, organiser of Solutions COP21

"Let us innovate to save the planet and create wealth."

If we want to prevent the definitive disappearance of what constitutes a decent quality of life on this planet, we urgently need to stabilise our consumption of resources and lower our carbon emissions. This is accentuated by extremely fast world population growth, with over two billion children born since 1st January 2000.

This situation does not concern just governments, but each and every one of us. We can help by contributing to a profound transformation of human activities, especially in terms of the economy. A few years ago, energy was still cheap and easy to transport, mainly in the form of hydrocarbons. The only priority was growth - we could destroy and pollute to generate wealth and jobs. We were convinced that we had plenty of time and that technologies could repair everything, even nature.

Humanity has often undergone changes, but they have taken time. The main difficulty now is that we need to change quickly, as time is running out. The current trajectory of a 4 to 5 °C rise in the average temperature casts a cloud over our whole model of society. The issue is exacerbated by the fact that those populations likely to suffer the most are already in a precarious state. And then there is the risk of a considerable acceleration in migration due to climate change.

Let us turn to the future, let us invent and innovate. Let us demand political leadership but not delay effective action. We are in a formidable yet worrisome era. The Internet liberates creativity and offers each of us a global audience. We are all responsible for attracting talent to help with environmental issues, in particular stakeholders in innovation.

Today, businesses are fully responsible for inventing and for deploying their inventions while limiting their impacts and protecting the climate. We need to motivate those with ideas, showing them that business undertakings can be profitable in such areas. We need to imagine new partnerships at all levels of innovation, from incubation to worldwide success stories.

All sectors of business are affected: transport, construction, services, energy, agriculture, even the

intangible economy. This is THE humankind project for the early part of this century. It is also one of the priorities for Solutions COP21[i] that will take place at the Grand Palais exhibition centre in Paris in December 2015.

Yet to speed up the deployment of solutions, we need to create value, or rather values. And this is where intellectual property becomes involved. The word "property" may seem outdated in a digital world where collaborative work and sharing are omnipresent[ii], yet it has never been so useful, as is demonstrated by this study.

For Patent Offices, there is a new responsibility: being the accelerator of innovation to serve sustainable development and the climate, while fostering the deployment of technologies, particularly in South countries in need of rapid access to new services. These countries can only do so in a low-carbon economy, with genuine worldwide solidarity supported by the Green Climate Fund, but their capacity to modernise their economy is also important.

This is the ambition of the INPI in France and its Director General Yves Lapierre, so let us applaud their efforts. Just the decision to have undertaken this study, like the spirit shown in their remarkable international contribution for the COP21 – presenting start-ups from around the world – is a clear example.

It is now our turn to bring a fresh and creative[iii], multi-player momentum to the Paris COP21, in the spirit of the universal exhibitions of the early 20th century at the Grand Palais and elsewhere. This great adventure is waiting for us, with I hope, more emphasis on entrepreneurship. We also need to attract talented people.

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i www.solutionscop21.org

ii Propriétaire ou artiste ? Manifeste pour une écologie de l'être. Ed. de l'Aube, 2013.

iii Nouveaux imaginaires pour le développement durable. Edited by Gilles Berhault and Carine Dartiguepeyrou. Ed. Les Petits Matins, 2015.

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ABBREVIATIONS AND ACRONYMS

3GPP	3rd Generation Partnership Project
ADEME	Agence de l'environnement et de la maîtrise de l'Énergie (French Environment and Energy Management Agency)
AFD	Agence française pour le développement (French Development Agency)
AIPPI	International Association for the Protection of Intellectual Property
AITIC	Agency for International Trade Information and Cooperation
AOP	Appellation d'origine protégée (Protected appellation of origin)
APEC	Asia-Pacific Economic Cooperation
BRICS	Brazil, Russia, India, China and South Africa
C.f.	See
CBD	Convention on Biological Diversity
CC	Climate Change
CDM	Clean Development Mechanism
COM	European Commission
COP	Conference of the Parties
CTCN	Climate Technology Centre and Network
CTI	Climate Technology Initiative
DAC	Development Assistance Committee
DC	Developing country
DEC	Decision
EGTT	Expert Group on Technology Transfer
EIPR	European Intellectual Property Review
EPC	European Patent Convention
EPC	European Patent Convention
EPO	European Patent Office
EPO	European Patent Office
EPRI	Electric Power Research Institute
EST	Environmentally Sound Project
ETSI	European Telecommunications Standards Institute
EU ETS	European Union Emissions Trading Scheme
EU ETS	European Union Emissions Trading System
EU	European Union
EV	Electrical vehicle
FGEF	French Global Environment Facility
FGIS	Gabon Strategic Investment Fund
FRAND	Fair and reasonable non-discriminatory royalties
FTA	Free trade agreement
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEF	Global Environment Facility
GG	Greenhouse Gases

GNI	Gross National Income
GTPP	Green Technology Package Program
IEEE	Institute of Electrical and Electronics Engineers
INPI	French Industrial Property Office
IP	Intellectual property / Industrial property
IPC	Intellectual Property Code
IPCC	Intergovernmental Panel on Climate Change
IPCC	Intergovernmental Panel on Climate Change
IPOPHL	Intellectual Property Office of the Philippines
IPR	Intellectual Property Rights
IPRs	Intellectual property rights
IT	Information technology
KIPO	Korean Intellectual Property Office
LDCF	Least Developed Countries Fund
LDCs	Least developed countries
MDGs	Millennium Development Goals
MEA	Multilateral Environmental Agreements
MPEG	Moving Pictures Expert Group
NAPA	National Adaptation Programme of Action
NDB	National Development Bank
OAPI	African Intellectual Property Organization
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OMPIC	Moroccan Office of Industrial and Commercial Property
OPA	Open Patent Alliance
PACE	Programme for accelerated prosecution of European patent applications
PCT	Patent Cooperation Treaty
PGI	Protected geographical indication
PME	Petites et moyennes entreprises (SMEs)
PNTTA	Moroccan Programme of Technology Transfer in Agriculture
R&D	Research and development
RAND	Reasonable and non-discriminatory
SD	Sustainable Development
Sect.	Section
SF	Sovereign Funds
SICAV	French Open-Ended Investment Scheme
SME	Small and medium-sized enterprise
SPRÉ	Collecting society for the collection of the equitable remuneration (Société pour la perception de la rémunération équitable)
SSA	Sub-Saharan Africa
TBGRI	Tropical Botanic Garden and Research Institute
TEC	Technology Executive Committee

TEC	Technology Executive Committee
TRIPS	Trade-Related aspects of Intellectual Property Rights
TRIPS	Trade-Related Aspects of Intellectual Property Rights
TT	Technology transfer
TTM	Technology Transfer Mechanism
TWN	Third World Network
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UN-DESA	United Nations - Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
USPTO	United States Patent and Trademark Office
WBCSD	World Business Council for Sustainable Development
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WIPO	World Intellectual Property Organization
WTO	World Trade Organization
WWF	World Wildlife Fund

INTRODUCTION

"Innovation concerning emerging economies is as much a challenge for the development of industrial property tools as it is for sustainable development."

1. **Sustainable development: a necessity.** Sustainable development is a long-term human necessity, a genuine inter-generational project. Yet due to climate change, it has become an urgent matter. In developing countries in particular, it requires the large-scale deployment of "clean" or environmentally sound technologies and systems. Such deployment needs to be considered with two factors in mind:

- The current rate of deployment of technologies and know-how is too slow. Indeed, in light of the urgency to act and declared ambitions in terms of sustainable development, the deployment of "clean" technologies must be widespread and rapid: it needs to involve all technologies in all sectors, in all countries of the world, whether developed or developing.
- New practices and new networks are born each day to stimulate innovation.

2. **Industrial property: a much-debated role.** The role of industrial property is habitually invoked in this distribution role, either as a catalyst or a hindrance to the development of environmentally sound technologies. Industrial property comprises a diverse palette of tools whose essential essence, at least for patents, is to guarantee a geographical monopoly (on a specific and defined element) for a certain amount of time in a certain territory *in exchange* for the disclosure of information to assist in the development of the 'next generation' of techniques and know-how.

But the multiple natures of stakeholders, territories and time-related dynamics associated with the current phase of industrial globalisation could shed new light on the question of the methods of application of industrial property tools.

Moreover, a very clear observation is required: whether it concerns research or implementation, the worlds of intellectual property and sustainable development are all too often unaware of each other. Disagreements and at least misunderstandings occur about the global issues and their respective dynamics. Consequently, each of these "two universes", or fields of activity, risks underestimating the impacts of changes generated by developments in practices in the other field.

3. **Bringing together two worlds unaware of each other.** The purpose of this study is twofold:

a) Establish a dialogue between these two worlds – between two *modes* of thought – represented by stakeholders in sustainable development and intellectual property. So that on one hand, the stakeholders of sustainable development perceive the benefits offered by intellectual property in the construction and definition of sustainable development policies, and on the other hand, so that stakeholders in intellectual property identify the technological, economic and social issues of sustainable development and the manner in which patent law or trademark law can be exercised to participate in the deployment of environmentally sound technologies and more generally in the pursuit of sustainable development.

b) Suggest that innovation concerning emerging economies is as much a challenge for the development of industrial property tools as it is for sustainable development.

4. **Obstacles to technology transfers.** For several years, one of the issues debated on both national and international policy levels is permitting access to these technologies by developing countries. The debates are often difficult as the possibilities and indeed the success of these transfers are conditional on multiple factors and encounter many different obstacles, such as political, technological and human conditions for receiving a technology, knowledge of the needs of receiving countries, need to adapt existing technologies, knowledge of new markets, the vision of 'requesting' countries according to their knowledge of what is available on the 'technology market' around the world, etc. In particular, concerning the dissemination of innovation, the market is more influenced by demand than by supply, which must sometimes needs stimulation or even creation, from access to analysis to the creation of support functions, via the creation and supply of qualified and quantified information.

It is therefore useful to ask questions about the tools and methods used to *accelerate* access for developing countries to sustainable development technologies. The intention of this study is to highlight the role already played by industrial property and which it will continue to play in technology transfers to developing countries, including new trends which are admittedly recent but already influential.

5. **Identifying the role of industrial property in sustainable growth.** In an effort to go beyond the positions of principle for or against industrial property, the purpose of this study is to leave these antagonistic and epidermal positions aside and highlight the firm and successful uses of industrial property rights to facilitate access to technologies. Indeed, alongside "conventional" contracts, a myriad of erstwhile atypical technology transfers have now taken on a greater importance. Starting as secondary phenomena, they become 'weak signals', precursors of the foundations of the industrialisation of developing countries.

This is the objective of our study: Identify, understand, analyse and critique these new modes of access to technologies, particularly environmentally sound technologies. Our ambition is therefore to highlight these new practices which reconcile the interests of developing countries without sacrificing those of persons who have invested to develop new technologies, even offering them perspectives of growth, because the economy, even in a development context, is not a zero-sum game. On the contrary, it enables the establishment of fields of co-creation of value, well-being and development *capacities*.

This issue is part of the larger question of determining the conditions that will enable the use of environmentally sound technologies in developing countries. In the end, the issue for developing countries is that of *access* to sustainable development technologies, whatever the method. Intellectual property is only one aspect of the issue.

Providing a response to the issue of sustainable development in developing countries requires us to extend our questioning much wider:

- What is the role of industrial property (patents and trademarks) in favouring access to these technologies?
- Where is innovation occurring to stimulate development in a global and post-emergent economy?
- What is the support role played by official policies on access to technologies (bilateral and multi-lateral cooperation)?

"Reconcile the interests of developing countries without sacrificing those of persons who have invested to develop new technologies."

Therefore, although this study focuses principally on patents, it is not limited to this field and covers access to environmentally sound technologies on a wider basis, as part of international cooperation and in a rapidly-changing world economic and industrial context due to the arrival of businesses from large emerging economies. We have also considered the general conditions that enable the development of sustainable industries or technology transfers. In this respect, the precise role of patents in the area of environmentally sound technologies and their transfer to developing countries may be clarified.

6. **Industrial property: an opportunity for sustainable development.** Intellectual property is often regarded as a constraint. One of the aims of this study is to highlight the conditions under which industrial property and in particular patenting, can become an *opportunity*.

In addition, the role of other industrial property rights shall be discussed, with trademark law at the top of the list. This tool is within the grasp of the majority of developing countries and enables the monetization of local products, occasionally to a significant extent.

The role of intellectual property will be considered, taking into account international modes of governance and the possibilities offered by the international climate regime and other multilateral forums to aid in the transfer of environmentally sound technologies to developing countries.

Lastly, another more political issue is to *anticipate* the manner in which developing countries could claim rights within the framework of negotiation on the climate change agreement, which must be concluded at the UNFCCC COP21 in Paris.

7. **Method: a stylised empirical study**. The methodology adopted in this study is founded primarily on case studies. Indeed, it seemed essential to illustrate this work with concrete examples of technology transfers and use of industrial property rights, so as to understand the reasons for the successful or failed reception of environmentally sound technologies in developing countries. The selection of case studies is conditioned by the objective of revealing certain principles and best practices that may be used to guide developing countries and their representatives in order to ensure successful technology transfers and co-innovation.

DEFINITION OF SUBJECT TERMS

1. DEFINITION OF INDUSTRIAL PROPERTY

8. In law terms, the expression 'intellectual property' generally denotes human technical or aesthetic creations that are legally protected by an intellectual property right. It is customary to distinguish copyright, which protects aesthetic creations that are perceptible by the senses, from industrial property rights.

Our study focuses on industrial property. Industrial property is split into several subdivisions: on one hand technical creations (patents, plant variety rights) and on the other, distinctive signs (trademarks, certification marks).[1] This study attempts to analyse the role of technical creations (patents and plant variety rights) and of distinctive signs (trademarks) in sustainable development.

KNOW-HOW AND TECHNOLOGY

9. In law, but also in economic theory, an initial distinction must be made between know-how and technology.

10. 'Technology' does not have a specific legal definition in intellectual property law. It may be defined generally as a collection of knowledge, experience and practices in a given technical field, based on scientific principles.

11. However the notion of 'know-how' is considered under a particular light by law.

Know-how is defined as *"a package of non-patented practical information, resulting from experience and testing, which is:*

(i) secret (that is to say, not generally known or easily accessible),

(ii) substantial (that is to say, significant and useful for the production of the contract products), and

(iii) identified (that is to say, described in a sufficiently comprehensive manner so as to make it possible to verify that it fulfils the criteria of secrecy and substantiality)."[2]

Mousseron defines know-how as *"a set of technical knowledge, not immediately accessible to the public."*[3].

The key characteristic of know-how is secrecy, because if it is disclosed, it loses the legal status of know-how.

1 Design rights are also referred to as industrial property rights.

2 Article 1(1)(i), Regulation (EC) No. 772/2004 of 27 April 2004 on technology transfer agreements.

3 J.M. Mousseron, "Aspects juridiques du know-how", *Cahiers de droit de l'entreprise*, 1/1972, p. 2 ff.

But unlike intellectual property rights, know-how cannot be subject to exclusive property rights. Know-how is nonetheless recognised in law as a value, i.e. an asset.

Though it is not protected by intellectual property rights, know-how can nevertheless be the subject of contracts to transfer technical, industrial or commercial knowledge to a third party.

12. In the industrial economy field, know-how is defined more widely and includes all knowledge of a technical, industrial, or commercial nature that is necessary to develop a given activity. Indeed, in a given industrial field, the creation of an activity requires specific know-how ranging from personnel training to the identification of outlet markets and distributors, not forgetting all the production processes in between. The majority of this knowledge may be public and therefore not satisfy the legal requirement of secrecy. Nevertheless, the aggregation of all this knowledge to feed an industrial project may come at a very high cost. As an illustration, the value of a production plant includes that of the intangible know-how of its teams, which in many cases is higher than the value of the physical equipment. And in technology fields, supplier-customer relationships include a certain time of explicit or implicit transmission of know-how concerning the technology product, independently of a contractual intent to transfer. So while the notion of transfer is already enthroned in law, know-how is exchanged without it but is the source of technology catch-up by businesses or regions.

In this study, we have used this wider notion of economic know-how.

PATENTS

13. A patent is a property right granted by the government, which excludes others from making use of the invention. The fundamental idea behind patent law is that technological progress is beneficial to society. Progress in technology requires investment; to make sure that investment pays off, it is justified that the creators of new inventions involving an inventive step and susceptible of industrial application enjoy a monopoly for a variable period of time, usually 20 years. Beyond this period, the patent falls into the public domain and the invention becomes freely available.

But for the right to be granted, the inventor must disclose their invention publicly, i.e. provide a full description in the patent specification under conditions that enable a person skilled in the art (i.e. a technician in the relevant technical field) to carry it out. It is thus generally considered that two-thirds of scientific publications throughout the world are represented by patents, the majority of which can today be consulted online.

14. Moreover, we must underline that the patent is a *territorial* right, which means that each country operates an Office which grants a national right limited to its territory.

The sole exception is the International Convention establishing OAPI, the African Intellectual Property Organization, which grants unitary rights covering 17 countries.

In Europe, the European Patent Office (EPO) performs a unified examination of patentability. But once the patent is granted by the EPO, it splits into national patents that are independent of one another.

15. At this point some economy-oriented remarks may be useful to complement the law aspects. This 20-year term may seem extremely long in light of the rapidity of developments in the world economy and therefore an obstacle to the dissemination of technologies. In reality, patents cover limited aspects and the acceleration of technological innovation covers a vast range of practices and products. In many industries where the race for innovation is at its fiercest, patentees esteem that their patents only have economic value for a shorter period of a few years, to just a few months in some cases (including in the pharmaceutical industry, this actual advantage often does not last long and is only extended by advertising). Today, the legal advantage conferred by the patent is ipso facto a genuine, durable economic advantage. Inversely, and especially within a portfolio as one of many, a patent assumes a value of publicity for the technical expertise and non-formalised knowledge behind the portfolio, which in economic terms create what is almost a *trademark* effect.

TRADEMARKS

16. Distinctive signs are words, logos, designs, colours, etc. which have the function of identifying and distinguishing people, products or services. Mathely gives the following definition: *"Distinctive signs are defined as the phonetic or visual means, particularly words or images, which are used in social and economic life to designate people or businesses, along with the products or services they supply, in order to distinguish them and enable the public to recognize them."*

There are many distinctive signs which serve to distinguish a different aspect:

- the trademark which distinguishes products and services;
- the company name which designates a legal person, i.e. a company;
- the trade name is the name under which business is conducted;
- the shop sign which designates a commercial establishment, i.e. a location;
- the domain name which designates a website;

— the appellation of origin which designates the geographic place from where a product originates when the specific characteristics of this place (through natural or human factors) confer on it specific characteristics.

This study focuses on trademarks and appellations of origin.

17. Like patent applications, trademark applications must be filed with a National Office and the registration of a trademark grants a property right to its owner for the products and services indicated in the application and which the owner delivers. The exclusive right granted by a registered trademark is also territorial[4].

The cost for applying for a trademark is much less than for a patent. It represents an intellectual property right accessible to a large portion of businesses, including in developing countries. The trademark is an essential intangible asset and a fundamental tool for protecting one's products and services, often even more so than the patent, in particular in service fields, in sectors with low capital intensity, or increasingly, in agriculture (also a very investment-intensive sector). Moreover, the best-known trademarks are valued much higher than patents protecting the most important inventions.

18. This leads us to the mechanism of economic valuation that reflects the revenues expected over coming years: due to its stability and the fact that it theoretically can last forever, a trademark is implicitly considered as more durable than a portfolio of patents. The first consequence, on the condition of being in contact with the end market and not separated by an intermediary, the deployment of a trademark will be a good strategy for a stakeholder in a developing country. The second consequence, all other things being equal, a portfolio of patents is valued lower as it is less durable.

GEOGRAPHICAL INDICATIONS

Geographical indications are a special intellectual property right essential to several sectors of the economy, in particular agriculture and the agri-food sector, but remain little known, especially in developing countries.

Article 22 of the TRIPS Agreement defines geographical indications as *"indications which identify a good as originating in the territory of a Member (of the WTO), or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is*

4 Trademarks can be renewed indefinitely. In the European Union, the Community Trademark enables applicants to request protection in all 28 Member States with just one application.

essentially attributable to its geographical origin."[5] And the TRIPS Agreement requires WTO Member States to protect geographical indications[6].

Geographical indications consolidate several different protection systems (Protected Geographical Indications, Indications of Source, Appellations of Origin, etc.)[7]. The legal system applicable to geographical indications varies from country to country.

But whatever the type, geographical indications all share the quality of being distinctive signs that designate a location from where a given product originates. The link between the product and the location may be close or more distant depending on the applicable legal provisions. The other main specific feature is that the rights attached to the geographical indication are not the exclusive property of one party. The indication may be used by all economic agents whose products originate from the relevant region and which satisfy the specification.

Moreover, several international conventions (Convention of the Union of Paris (1883) and its special agreements, TRIPS Agreement, specific bilateral agreements) implement the recognition and protection of a national geographical indication in other countries. This last point is essential because in principle it dispenses the rights holder from applying for protection in each country, even though the principle has certain limits.

THE ISSUES OF INTELLECTUAL PROPERTY

19. **Universal recognition of intellectual property.** The precise historical origin of industrial property and more particularly patents, has been debated by law historians since the French Revolution, yet intellectual property rights have progressively imposed their existence as the main tool used to protect creations of the mind and promote incentives to create, with the matching development of an area of the economy: intellectual property economy.

5 TRIPS: Agreement on Trade-Related Aspects of Intellectual Property Rights. This Agreement is annexed to the 1994 Marrakesh Agreement establishing the World Trade Organization.

6 Article 22: "2. In respect of geographical indications, Members shall provide the legal means for interested parties to prevent: a) the use of any means in the designation or presentation of a good that indicates or suggests that the good in question originates in a geographical area other than the true place of origin in a manner which misleads the public as to the geographical origin of the good; b) any use which constitutes an act of unfair competition within the meaning of Article 10bis of the Paris Convention (1967)."

7 France has recently introduced a new geographical indication that protects industrial and artisanal products. Article L. 721-2 of the Intellectual Property Code provides that: "Shall constitute a geographical indication a name designating a geographical area or a specific location used to designate a product other than agricultural, forestry, food or sea products, originating therein and having a specific quality, a reputation or other characteristics essentially related to such geographical origin. The production or processing conditions of this product, such as the cutting, extraction or the manufacture, comply with the specification approved by a decision taken pursuant to article L. 411-4."

Very early on, intellectual property was subject to international harmonisation by the two main international conventions, the 1883 Paris Convention for patents and trademarks, alongside the 1886 Bern Convention for copyright. A century later, intellectual property rights became even more widely used with the adoption of the TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights) annexed to the 1994 Marrakesh Agreement establishing the WTO.

20. **Zones of tension for intellectual property.** Although intellectual property and in particular patent law seem to prevail in most countries (in 2011 China for the first time filed the most patent applications worldwide), we have observed the emergence of zones of tension, even movements to contest intellectual property.

Copyright has been brutally destabilised by the internet and the technical possibility of downloading almost any work with a basic computer connected to the internet.

Tension over patent law is mostly visible at international level. As an example, in recent years there have been tensions over medicinal patents between private companies holding patents on medicines and countries where the standard of living does not enable their populations to access these medicines.

Another area of recurrent tension over the past few years is found within the United Nations Framework Convention on Climate Change (UNFCCC). The sticking point primarily concerns the means of mitigating climate change by reducing greenhouse gas emissions as part of a universalist approach to meet a global challenge, while ensuring equity in order to take into account the differentiated responsibilities and respective capacities of developed and developing countries, including emerging countries, to achieve this goal.

Indeed, developing countries hold that beyond the historical responsibility of developed nations due to their emissions since the start of the first industrial revolution, a transition towards a low-carbon, climate-resilient economy is a problem, mainly for two reasons: one, in a first phase, their economies cannot develop without reducing greenhouse gas emissions, if only to meet higher demand for goods and services, the supply of which requires higher production rates; two, they blame developed countries for keeping for their own use the environmentally-sound technologies they have developed thanks to the patent system. In summary, and somewhat crudely put, businesses in North countries have built monopolies on clean technologies that they have developed while taking advantage of the carbon budget without limit to the detriment of South countries, by protecting their technologies with patents and using this legal instrument to deny access to others. A somewhat ambiguous illustration was provided by China, attempting to limit Western industrial property. A 2012 draft law on climate change stated that any Chinese business buying technologies in this field with State financial support, had to put them at

the service of national development (i.e. in practice, make them available to other Chinese businesses).

Access that is free or subsidised by financial backers to environmentally sound technologies by developing countries is a recurrent topic in international negotiations that attempt to establish a global regime to combat climate change, to complete the UNFCCC and to succeed the Kyoto Protocol. For their part, developed countries refuse to bargain intellectual property rights as part of the Convention on Climate Change, stating that their natural negotiation forum is the WTO, as the TRIPS Agreement is annexed to the 1994 Marrakesh Agreement establishing this organization.

2. DEFINITION OF SUSTAINABLE DEVELOPMENT

21. The Brundtland Report (World Commission on Environment and Development, 1987) provided the first definition of sustainable development: *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."* This idea picks up on the idea of 'sustainability' already present in the Stockholm Declaration of 1972. In 1987, the United Nations General Assembly considered that sustainable development *"should become a central guiding principle of the United Nations, governments and private institutions, organisations and enterprises"*[8].

The notion of sustainable development conceptualises the necessary transition to a mode of social and economic development free of harmful consequences for the environment and humanity. This approach made the link between models that were *a priori* contradictory and which each sought to defend a given pillar -economic development, social protection, the combat against poverty, and the protection of the environment- which eventually led the International Court of Justice to state -in a famous case in which the principle of the obligation to avoid causing environmental damage to other States was established- that *"this need to reconcile economic development with protection of the environment is aptly expressed in the concept of sustainable development."* [9]

22. Sustainable development is a *meta-project* and its content is global: it extends far beyond simply environmental issues to take into account all human activities and their interactions with the surrounding environment. And the ambition of achieving it has to be approached on a planetary scale and across all generations. It must therefore be firstly considered as a political doctrine that guides the actions of public authorities in all fields, but as such cannot constitute a positive law standard as its content is on the whole uncertain. The concept appeared initially in international declarations and subsequently impregnated and was cited in the content of all legal norms.

8 UNGA, Res. 42/187, 1987.

9 Gabcikovo-Nagymaros, ICJ, Hungary v. Slovakia, 25 Sept. 1997.

At the Rio Earth Summit in 1992, the notion appeared as a miracle solution to solve environmental issues but in reality did not generate any firm measures. Chapter 28 of Agenda 21, an action programme of the 1992 Rio Declaration, considered that local authorities, as the "level of governance closest to the people", were best placed to raise public awareness to sustainable development. At the Johannesburg World Summit on Sustainable Development (2002), a definition of sustainable development was proposed based on three pillars: economic development, social justice and environmental protection. We had to wait until 2012 and the outcome document adopted at Rio+20 (*"The future we want"*) for a commitment to a new sustainable development policy, including such points as creating a green economy, defining more precise objectives and reinforcing the institutional framework.

23. The notion of sustainable development became a general objective appearing more or less explicitly in most multilateral conventions on the environment adopted following the 1992 Rio Summit, though without becoming a legal obligation. This is the case of the United Nations Framework Convention on Climate Change of 1992 (UNFCCC), the ultimate objective of which is to *"stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system"* (Article 2), and which affirms in its preamble that *"responses to climate change should be coordinated with social and economic development in an integrated manner with a view to avoiding adverse impacts on the latter, taking into full account the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty"* The Convention on Biological Diversity (1992) defines measures to ensure the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of natural resources, including the adoption of national strategies, plans or programmes, and provides for the integration of such objectives into internal sectoral or cross-sectoral plans, programmes and policies[10], after recalling the determination to "conserve and sustainably use biological diversity for the benefit of present and future generations". Note also that sustainable development appears in the preamble to the 1994 Marrakesh Agreement establishing the WTO, echoing the Rio Declaration of two years earlier (1992) stipulating that an open, equitable and non-discriminatory multilateral trading system has an essential role to play in national and international efforts to better protect and conserve natural resources and promote sustainable development.

It is in this context that we must understand the combat against climate change as a major challenge to ensure sustainable development. The figures presented by the IPCC[11] in its fifth assessment report (2014) demonstrate the urgent need to initiate and

10 In particular, see the 2003 Cartagena Protocol on Biosafety and the 2010 Nagoya Conference.

11 Between 2016 and 2035, it is projected that average air temperatures will rise by 0.5 °C on average (between 0.3 °C and 0.7 °C depending on the scenarios), which is 1.2 °C warmer between 2016 and 2035 compared to 1850. The most pessimistic scenario projects that temperatures could rise by up to 5.5 °C by 2100.

complete in all countries the necessary transition toward low-carbon (even carbon-neutral), climate-resilient development. This requires a significant reinforcement of international and bilateral cooperation, in particular to support the efforts of developing countries in this direction.

3. DEFINITION OF ACCESS TO TECHNOLOGY

24. The transfer of environmentally sound technologies and access to these technologies are two distinct notions. Technology transfer is mainly defined as the process of transferring scientific findings for the purpose of further development and commercialisation[12]: the initiator (developed country) transfers new technologies to a secondary user (receiving developing country) in an effort to stimulate its economy. Nonetheless, for environmentally sound technologies to be easily transferred to developing countries, the latter must have access to these technologies, in particular by possessing the indispensable know-how, i.e. the economic, technical and management capabilities to make efficient use of the transferred technologies[13]. The notion of access to technology is complementary to that of technology transfer and concerns all services such as information, capacity building, know-how, etc., all these elements being required for technology transfer to be genuinely possible and result in real access to the technology.

25. No definitions of technology transfer or access to technology exist either in the United Nations Framework Convention on Climate Change (UNFCCC) or in the Kyoto Protocol. These agreements only provide for the means of implementation (article 4.5[14] of the UNFCCC or Article 10 c) of the Kyoto Protocol[15]) such as financing, the enhancement of capacities, the dissemination of know-how and environmentally sound practices, in order to facilitate access to and the transfer of technologies.

12 WIPO - 2006 - Definition provided by AUTM (Association of University Technology Managers).

13 Chapter 34 of Agenda 21 states that "environmentally sound technologies are not just individual technologies, but total systems which include know-how, procedures, goods and services, and equipment as well as organizational and managerial procedures. This implies that when discussing transfer of technologies, the human resource development should also be addressed (…)"

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

15 c) Cooperate in the promotion of effective modalities for the development, application and dissemination 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.

The Intergovernmental Panel on Climate Change (IPCC) proposes a definition of technology transfer as *"a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organisations (NGOs) and research/education institutions."*[16]

Here the term 'technology transfer' includes the dissemination of technology and technological cooperation on national and international levels, between developed countries, developing countries and countries with economies in transition. The term includes the process of understanding, use and reproduction of the technology, including the capacity to choose the local conditions and adapt to them, and to integrate the technology into indigenous techniques.

All in all, the concept of technology transfer exceeds the intellectual and material dimensions to encompass capacities, know-how, policies and institutions.

26. Lastly, note that 'access to technology' in its assessment and measurement (for possible payment of fees) is in practice complicated due to the fact that objectives specific to local markets may lead to a fairly complex mix of elements borrowed from a wide range of technologies, via the direct or indirect mediation of various methods of cooperation. In practice for developing countries, behind the trade in technologies, there are real dynamics in terms of production, design, innovation and technology catch-up, so we must understand that innovation in emerging developing countries has no reason to solely serve the objectives initially designated by Western countries. By seeking to create and serve local markets, the difficulty in identifying the elements of an end product protected by industrial property rights makes the technology correspondingly more 'accessible.'

4. STAKEHOLDERS IN SUSTAINABLE DEVELOPMENT

DEFINITION OF DEVELOPING COUNTRIES

27. There is no universally accepted definition of 'developing country.' Several definitions are available:

— Usual definition in International Law: A country that has initiated a process in both economic and social terms to raise the living standards of its inhabitants, by attempting to overcome the low development of its industry, the insufficiency of its agricultural productions, the imbalance between the rapidity of its population growth and the increase of its national income.

16 IPCC Special report, Methodological and technological issues in technology transfer, 2000.

— OECD / DAC definition: the term 'developing country' is used without qualification and generally refers to a country eligible for official development assistance (ODA). The list of ODA recipients drawn up by the DAC (Development Assistance Committee) includes all low and middle income countries with the exception of G8 members and EU members. The list separately includes all less developed countries as defined by the United Nations.
— World Bank definition: low- and middle-income countries based on gross national income (GNI) per capita.
— Definition of UNFCCC (United Nations Framework Convention on Climate Change 1992): country not appearing in Annex I (developed countries) nor in Annex II (developed countries appearing in Annex I with capacities to provide financial resources).

28. This study does not use a specific definition of the term developing country. Countries we have analysed were selected only on the basis of their need for access to technologies that are not yet available to them to ensure their development and in particular their sustainable development.

Moreover, the two giant, emerging economies that are India and China are not considered to be developing countries, neither in international classifications, nor in this study. Their importance will nonetheless be underlined as their role in shaking up the innovation economy is central and they are the precursors of the multipolar knowledge economy. The development of large emerging economies cannot of course be directly transposed to most developing countries. But they alter the paradigm of innovation by providing different models. They enlarge the scope of avenues of development.

ORIGINATORS

29. Conventionally, originators are entities (businesses, countries, universities, etc.) who own or hold the technologies required for sustainable development.

However, in addition to originators from OECD economies who are relatively well-known, it is important to underline how much and in what way China and India contribute to structuring the dissemination of environmentally sound technologies. To such an extent that they are both originators and transmitters of these technologies, sources of new 'transfer models' to developing countries.

30. In their respective countries, China and India are building an industrial ecosystem of new technologies, in particular environmental technologies.

The two emerging economies are betting on the industrial revolution of new technologies and are organising the development of various industrial sectors involved in these sectors:

- In India's case, around fairly conventional public incentive mechanisms, but which are largely targeted on the benefits acquired by their flagship enterprises.
- From upstream (natural resources - public financing) to downstream (subsidies on sales) for China, not forgetting specific inter-enterprise agreements (exchanges of resources-technologies-training), which in a certain way speed up the transfer and the real economic value of 'Western' patents[17].

31. So, massive investment in new technologies by these two emerging economies tends to confirm the strategic character of these industrial sectors. But China's practices also underline the importance of their monetization through a coordinated public policy, developed according to the strengths and weaknesses of the country's economic and industrial fabric.

In China today, an 'industrial ecosystem advantage' is being built by political forces to do beyond just innovation in a market context (through subsidies, explicit transfer demands in exchange of access to natural resources for which China has an advantageous position, in particular 'rare earth elements', etc.).

This type of industrialisation, commencing in China in the 2000's with solar power, is the result of a strong proactive political approach and suitable means. It has been a success in industrial sectors with a moderate technological complexity and is being progressively extended to more complex sectors that offer greater added value: wind power, alloys, composites, energy efficiency, sustainable mobility, etc.

We can illustrate how China and India have moved on from being recipients which they widely remain for the development of their land, to become originators for South countries.

Catch-up: China and India - two strategies in green technologies.

32. China is targeting the development of national industries specialised in various industrial sectors and technologies involved in environmentally sound technologies. Using a very broad and full approach to the sector, China's government is organising the development of national sectors that are highly vertically-integrated and extremely diversified on a horizontal level. These new, fully Chinese industries, controlled and coordinated by political bodies, are intended to compete internationally and drive the country's future economic development. The purpose of industrialising these sectors considered as strategic also serves the national industrial diversification and energy independence policy.

17 Regards Sur la Terre 2014, Chapter 8: "Chine: comment la transition économique redessine l'innovation", Zhao Wei and Joël Ruet.

India, however, is positioned as a platform to host international clean-tech industries. The priority of India's national government is not to develop world-competing national industries but to host international industrial clean-tech firms and make their national industries benefit from growth driven in these sectors. India's second objective is to benefit from the presence of industrial firms active in new energy technologies in order to develop its electricity network, the age and condition of which is a hindrance to the country's economic growth.

China and India: two new originators.

33. The means implemented by the two emerging markets are proportional to their capacities for action, their qualities and their needs; but above all define the tools and modalities of their own technology transfer practices to South countries:

34. China, through a market control policy and highly targeted subsidy grants, has adopted a highly aggressive key technologies import strategy that it has implemented on a large scale. The Chinese domestic market is used as an incubator to develop national industries, which also benefit from preferred access to financing, guaranteed by the country's large monetary reserves. In China, the State provides extensive funding to build 'clean-tech' (environmentally-sound technology) industries and then counts on the world market to monetize its investment, on which national development has already generated a return.

35. India has implemented measures to build a political and economic framework that is attractive to international industrial firms active in new technologies. These measures guarantee the relaxation of customs controls and the quasi-exemption of customs duties on the importation of certain technologies involved in clean-tech sectors, extensive facilities for the implantation of foreign companies and guaranteed purchase of locally produced renewable energy at advantageous feed-in tariffs. This economic and political framework attracts international clean-tech industrials to set up operations in India, to develop renewable energy production plants but also to install their production and assembly plants for clean-tech products intended for export. This policy is sometimes unfavourable to Indian clean-tech industrial firms, but has enabled the development of domestic outsourcing channels for the international industrial firms, through which domestic firms are now developing towards international competitiveness, and re-exportation.

36. In ten years, the countries have successfully industrialised sectors where the required degree of technological expertise is moderate. The extension of their development now concerns clean-techs of greater complexity, such as electric vehicles and smart grids. Progressively, the whole industrial clean-tech ecosystem has been structured in these two countries.

So India and China are undergoing a transition in their financing models for clean-tech industrial firms. Supported by government undertakings that provide guarantees for international investors, Chinese and Indian clean-tech industries are receiving more international private sector funding, in particular from investment funds or venture capitalists. As these parties are by definition much more geographically mobile, we may be observing an acceleration of dissemination via the venture capital and private equity segments (acquisition of stakes in local firms by high-tech stakeholders).

RECIPIENTS

37. Recipients are entities in developing countries (businesses, local authorities, national interests) which need access to sustainable development technologies.

In light of growth in Asia, many African countries now consider themselves as 'emerging' at a time when a large part of the world has already emerged.

The African Union or the UN Economic Commission for Africa (UNECA) confirms these objectives for the whole continent. The existence of these 'late emergers' (comparable to 'late developers' such as South Korea), presents advantages and drawbacks. Concerning the advantages, they are able to draw from mature technologies and forms of innovation. Industries in China, India, Brazil, Turkey, Morocco, South Africa, the Middle East, etc. have enabled all types of resources (technology, infrastructure, finance, know-how, organisation) to be accessible for developing countries that have certain assets; either that they are rich in natural resources, or presenting capital confidence for international financing, or present local dynamics that are likely to generate jobs and projects associated with sustainable development. But in terms of drawbacks, they need to learn quickly to arbitrate between competition and partnerships, to determine the level of involvement demanded by local players in the development of technology projects and what level of return to give international financial backers. Everything is new.

The role of transmitters will be primordial and Industrial Property Offices may find an opportunity here to renew their role.

TRANSMITTERS

38. Transmitters are third party intermediaries who enable the recipient to access a given technology (through training, etc.).

The universe of 'transmitters' is virtually infinite. At a time when funds and sustainable growth initiatives are multiplying, when it becomes difficult to identify good projects, two

types of stakeholders emerge as essential:

— financial backers with technical expertise: project investment funds with technical skills and small sovereign wealth funds,
— stakeholders providing support-training-assessment.

39. As an illustration, the Gabonese Strategic Investment Fund (Fonds Gabonais d'Investissement Stratégique - FGIS) is tasked with developing new industries in Gabon that can generate sufficient revenue to replace oil revenues and also pro-actively assist on future investment projects in the African region.

This fund is central to the country's transformation, because in the medium term its profits need to achieve three goals: ensure the sustainability of the state budget in light of perspectives of declining oil revenues, foster the diversification of the national economy and lastly, more ambitiously, build bridges between African economies[18]. The FGIS is innovative in that it pursues different objectives: intergenerational transfer, internal and external financial diversification and support for the country's growth. This hybrid approach is characteristic of the strategic redeployment of major Sovereign Funds (SF) in the world; it is surely a model for the rest of Africa to learn from.

The first investments made favours the direct domestic effect and national sustainable development through the local transformation of raw materials, such as the acquisition of a stake in Eramet (French company active in Nickel and Manganese), at a time when a previous shareholder was disinvesting. The aim is to support the company in the future local monetization of mineral ore. The FGIS also supported the capital issue by Rougier, a family company active since 1923 in logging. The aim is to support the national policy of local value creation by financing a new local transformation complex, which is already operational.

FGIS investment in other (notably African) countries aims to create economic bridges with other countries, around which other investment projects will be developed and economic relationships intensified. As a domestic 'fixer' for international investors, the FGIS has an essential strong point: being an investor itself, it knows it must propose an exit point for investors choosing Gabon. To assess this exit point, independent evaluations are needed and financial engineering is essential. More precisely, the FGIS co-invests in Gabon and other countries, in private funds that finance sustainable infrastructure projects or suburban agricultural funds, health funds, etc., supporting the expansion of expertise. These funds act as the independent evaluators of projects.

18 See African Banker no. 16 July 2013, article "Fonds souverain gabonais mode d'emploi" by Joël Ruet.

5. DEFINITION OF ENVIRONMENTALLY SOUND TECHNOLOGIES

40. There is no universally accepted definition of 'green technologies', 'eco-technologies' 'clean-technologies' or 'environmentally-sound technologies'[19].

Under a broad acceptance, environmentally sound technologies can be defined as all technologies that for a given human activity, significantly reduce the impact in quantifiable terms on the environment at a constant rate of activity.

This definition covers most fields. It cannot be reduced to traditional types and classifications of human activities. It concerns the traditional three sectors – primary (agriculture), secondary (industry) and tertiary (services). It involves all industrial fields, such as automotive, chemistry, agriculture, energy production, medicine, etc.

41. Defining clean technologies is hindered by an intrinsic delimitation, a frontier even:

- Within a technology family, distinct processes can make a technology more or less 'clean'[20],
- It is important to take into account the whole life cycle of the product sold or service delivered to determine the environmental or carbon footprint of such and such technology,
- Moreover, the notion of clean technology is relative, as qualitative and quantitative standards and targets, whether local or worldwide, depend on the location and the timing. In terms of sustainability as a whole (environmental, social and economic), these standards and limits depend not only on the state of the markets at a given time, but also on the trajectories of technological and economic transformations: a technology may be 'relatively clean' in a given context, taking into account a reference scenario that permits comparison in terms of carbon footprint or environmental footprint.
- Lastly, this frontier is very porous depending on the systems and methods of organisation, usage, assistance and actual effectiveness in the local or national context of deployment.

19 The European Commission describes them thus: " 'Green products' can be defined as those that use resources more efficiently and cause less environmental damage along their life cycle, from the extraction of raw materials, to their production, distribution, use, up to their end of life (including reuse, recycling and recovery) compared to other similar products of the same category." Communication from the Commission to the European parliament and the Council: Building the single market for green products. Facilitating better information on the environmental performance of products and organisations, COM (2013) 196 Final of 9 April 2013 p.3.

20 Amongst the many classifications of environmentally sound technologies, we can cite the distinction between technologies for transformation and technologies for adaptation. The first category is transformation technologies: such technologies aim to reduce the impact of human activities on the environment. They therefore represent progress from an environmental standpoint. The technologies applied to renewable energy sources (wind, biomass, photovoltaic, etc.), CO_2 capture technologies or those used to reduce machine power use limit the damage to the environment in relation to previous technologies. The second category is technologies for adaptation, enabling humans to adapt to environmental changes, for example climate change (new generation of dykes, etc.).

In the end, it could be tempting to define a series of environmentally sound technologies or sectors (which the press does easily: solar, wind, electric vehicles, etc.), yet the reality of the interlinking between industrial activities leads us rather to believe that each sector has its own 'clean' technologies.

42. As an example, the rapid growth of air transport in Asia is not generally perceived as good news by environmentalists. In quantitative terms, it is undeniable that it increases CO_2 emissions. However in quantitative terms, a host of industrial changes are revealed. Demand led airlines to bring forward the new generation medium-haul aircraft, which were firstly designed for and in Asia, not in Europe. The Chinese aircraft builder Avic is developing a new single-aisle aircraft series (the future C919) to challenge the duopoly of the A320 and B737, for operations on the Asian market. It is here that the new world technology model is invented: with a head start in the demand for composite materials and electronics, this medium-haul aircraft is already driving innovation in Western companies (Saint Gobain, Safran, etc.) alongside SMEs in the Apulia region of Italy, not forgetting the US giant General Electric Aviation. It is already driving the emergence of a composite materials industry in China (Tianjin) and supports Chinese metal producers such as Baosteel and Chinalco in the race towards special aluminium alloys, new technologies using lighter components or which generate energy savings through the use of rare earth elements, etc. These components are themselves used in new generations of solar panels, wind turbine pales or electric motors… and aircraft engines.

So in contrast to many pre-conceptions, environmentally sound technologies are not forcibly associated with the outright elimination or replacement of a non-clean technology; clean technologies 'significantly' reduce the consumption of materials and/or energy. Yet this definition is not without ambiguity: we can consider that over a 10-year period, even combustion engines powering cars have made substantial progress in this area.

METHODOLOGICAL CONCLUSION: INDUSTRIAL PROPERTY, INDUSTRIAL ECONOMY AND NEGOTIATIONS

43. To conclude this section, there exists today an issue of industrial adaptation that is widespread and is strongly impacting the ability of originators and transmitters to remain competitive, and for recipients to identify, receive and mobilise the most efficient technologies. It is also taking into account the industrial adaptability of systems of technology deployment and their limitations, that we must evaluate the efficiency and limitations of industrial property tools and practices, indeed re-consider the 20-year monopoly granted by patents in light of these rapid developments.

Similarly, it is pertinent to compare and associate observations made during negotiations on climate change, where the regime is perpetually evolving since 1992, with those made in the fields of industrial property and sustainable development. Although certain developing countries, notably India, have maintained quite a radical position in the aftermath of the medicines case to demand the provision of patented environmentally sound technologies free of charge or through compulsory licences, the vast majority of developing countries are today asking for support to identify their technology needs, promote innovation and develop the capacities needed to receive and deploy these technologies. Only a few countries continue to invoke industrial property rights as an obstacle to technology transfers and request financial assistance to take licences, for example via the UNFCCC Green Climate Fund created in Cancún (2010) and adopted in Durban in 2011, which has become operational just prior to the COP21 in Paris, December 2015.

The links between industrial property and sustainable development are highly mobile and are at a turning point. The individual analysis of each field must be completed and their interactions observed, often in terms of 'weak signals': signals that are sufficiently recurrent in stakeholder practices that they start to sketch out future trends, inflections and opportunities beyond the conventional toolboxes in each field (industrial property, sustainable development and climate negotiations). It is from this standpoint that our case studies will be presented, as they are not isolated and represent practices that are multiplying and becoming widespread.

CONTENTS PART ONE

INTRODUCTION TO PART ONE

44. In general, we can stylise two types of industrial ecosystem models concerning their relationship to know-how (each actual segment of each actual industry borrows partially from each of the reference models).

The best-known in the IP universe, but which is not forcibly the most frequently used in world industry, is the case where industries rely on such specific, niche know-how within a more conventional and generic system, that once patented, this know-how represents the main component of their competitive advantage. This is often the case in the pharmaceutical industry or where new materials are developed: it is essential to know the specific temperature, pressure and duration of a process central to a production chain, where all other items are relatively standard, from the chemical reagent to the packaging.

The inverse case is fairly well represented in mechanical industries. Aside the core engine technologies, most of a vehicle's components are patented with relatively low technology content and the real skill is the assembly process and know-how used: how to interoperate thousands of components and technologies in a complex network of suppliers and plants that is constantly being redefined.

45. In a context of technology transfers to developing countries, certain other limitations impair the effectiveness of industrial property rights and particularly that of patents (1), especially in a global economy where the technology transfer paradigms have been shaken up, where for originators, the key factors are the capacity to form partnerships and attract investors, and where at the same time acute competition has appeared between originators to intervene in developing countries (2).

For originators, patents are a traditional tool to manage and secure technology transfers (1.1). However, when it concerns technology transfers to developing countries, more often than not they turn out to be much less effective (1.2).

1
THE PATENT: AN INADEQUATE TOOL to transfer technologies to developing countries

1.1 THE MONOPOLY OF USE OF THE PATENT: AN EFFICIENT LEGAL METHOD FOR SECURING CERTAIN TECHNOLOGY TRANSFERS

46. Because it grants the patentee or the licensee the exclusive right to a particular technology, the patent is a tool that favours technology transfers, in two ways:

— the monopoly favours investment on new markets,
— the monopoly enables the implementation of a price differentiation policy.

A. The monopoly generated by the patent fosters investment on new markets

47. Illustration: an industrial firm from a Western country wants to gain a foothold in a developing country. Whether this firm restricts itself to distributing its products on this new market, whether it builds its own production units or forms a partnership with a local player, the patent is a legal tool that enables it to secure the technology transfer.

If the industrial firm owns a patent on this new market, it will benefit from a legal monopoly on the use of the invention. What does that mean?

If the industrial firm distributes its products on the new market, it will be able to prevent any third party from manufacturing or selling products that use its invention.

Similarly, if the firm decides to build its own local production unit, a transfer of technology, in particular of know-how, is an automatic consequence. The patent covering this new market prohibits third parties from building production units that use the invention, so that the initial investment establishing the plant can be monetized much more easily.

Lastly, the existence of a patent on this new market also makes it much easier to identify local partners, i.e. potential partners investing in the technology who through licensing will also benefit from an exclusive right to use the invention, by manufacturing and selling products that contain it.

48. The effectiveness of the patent as a legal tool to manage technology transfers is obviously conditional on the fact that in practice, the patentee can indeed uphold the

protection of their exclusive rights on the new market. Yet, we must recognise that the protection granted by a patent is always relative.

Firstly, the initial condition is clearly that the country in question has a patent system and an Office granting rights. For a patent system to function correctly, there also needs to be a patent ecosystem in place and in particular that a human community of IP attorneys, lawyers and specialist magistrates has emerged. There are many jurisdictions where patents exist but where the ecosystem is still under construction.

Moreover, as the validity of patents may be challenged in court in most countries, even if the right was granted by an Office, protection remains relative and cannot provide a total guarantee[21]. Nonetheless, we must remember that although imperfect, violation of the legal monopoly granted by a patent means that infringers are taking serious risks.

Observation no. 1
The patent is a legal tool that facilitates investment in a new market by ensuring the patentee has an exclusive right on its use.

B. The patent as an essential tool in a technology distribution strategy

49. As we have seen, the patent is an industrial property right that grants the patentee a territorial monopoly of use, limited to the designated country of filing[22].

Each right is independent of others. So a firm which files patents in several countries can compartmentalise its markets. Let us use the example of a French firm that has protected its invention in France and in Indonesia. The French firm may grant a licence on its Indonesian patent to a local firm at a relatively low price. The Indonesian licensee may manufacture and sell the patented product in Indonesia. However, the licensee may not export the product for sale in France as this would infringe the French patent[23]. Effectively, the Indonesian licensee has no rights on the French patent; it cannot manufacture or sell products in France. So the patentee protects their market using patents.

An agile strategy to filing patents therefore enables a firm to implement a price-differentiated policy for access to an invention or a technology.

21 In this respect, we must also state that it is generally considered that in countries such as Germany or France, between a third and half of the decisions issued in patent infringement cases end in the patent being invalidated.

22 See *supra*, page 39.

23 This system of separating markets is not possible in a unified market such as the European Union, due to the rule of exhaustion.

50. Moreover, a licence enables the French company to exert a certain amount of control on the quantity and quality of products manufactured by the Indonesian company. Indeed, the licence is a contract and the patentee may contractually require the licensee to ensure a certain quality of the product or limit the quantities produced, for example to restrict production to simply supplying the local market.

Reciprocally, if the Indonesian licensee holds an exclusive licence for the territory, it has a monopoly on using the invention or technology in Indonesia. It may prohibit any third party from manufacturing and selling the product on Indonesian territory. This monopoly is important as it enables the licensee to more easily monetize the investment supported to launch production and commercialise the products (plant, personnel, distribution network, etc.).

Such provisions are not purely theoretical and licensing contracts frequently contain provisions that strictly define the rights of the licensee, both in terms of the quantities produced and the markets reserved for its activities.

51. The condition of effectiveness of such provisions is that the legal system in the recipient country enables respect of the contractual undertakings and the monopoly of use granted by the patents. The reticence of patentees to grant licences to use their patents are often due to the fact, whether rightly or wrongly, that they consider that the legal systems of recipient countries will not in reality enable them to ensure the contractual provisions are respected (limitation on production, no exports of products to other markets, etc.). The firm possibilities of ensuring observance of contractual limits, like industrial property rights, are therefore an important factor in convincing technology owners to transfer the rights to stakeholders implanted in developing countries.

There are of course exceptions, such as China. But its position is highly specific due to the size of its market and its high growth. For this reason, most large international groups choose to be present on the Chinese market as it offers considerable revenue perspectives, even if the risk of IP infringement is clear and present. However, a country that does not offer such considerable advantages should offer other attractive points to originators in order to convince them to undertake a technology transfer process.

Practical example

INTELLECTUAL PROPERTY: A SHARING TOOL TO SERVE SOCIAL BUSINESS?

A solution studied by Danone

Danone is a worldwide group, specialising in the food industry where it enjoys leadership positions in four business lines: Fresh Dairy Products, Waters, Early Life Nutrition and Medical Nutrition. Its mission statement is *"bringing health through food to as many people as possible."* All over the world, Danone actively adapts to local conditions of nutrition and economics, while inventing new models throughout.

In 2007, Danone launched the "danone.communities" fund, with the mission of funding and developing local businesses based on a sustainable business model, strongly oriented to social objectives: favouring access to water and increasing food security. Alongside social business incubators, this support involves both financial investment via a SICAV (French Open Ended Investment Scheme), and technical assistance through a network of committed experts who pass on their expertise.

Between 2008 and 2014, danone.communities helped develop and market a low-price nutrition bar to help improve the nutrition of school age children in the region of Dakar, using essentially local ingredients. During the product design phase, the danone.communities team and Danone group R&D worked with a Senegalese restaurant owner to pool their know-how:

— The restaurant owner oversaw the selection of local ingredients to ensure that the product suited the tastes of children.
— Danone provided its know-how in terms of industrial processes and specifically for this project, developed a microbiological protection process to be able to store the product outside the cold chain without heavy investment.

During this project Danone looked at the possibility of using intellectual property as a sharing tool in order to replicate their efforts on other social business projects based on the following principles:

— Recognition of co-creation, the pooling of values created or implemented in social business projects;
— The search for a social and economic balance by ensuring the equitable compensation of contributions from all parties involved;
— The creation of an autonomous and independent legal entity, within which the intellectual property rights used and/or developed during social business projects are centralised in order to be granted to other parties in the future under pre-determined conditions;

— The introduction of governance to define the conditions of access to these intellectual property rights and in particular the grant of non-exclusive open source licences for certified social business projects, while conserving the possibility of granting commercial licences to conventional private enterprise users.

The issues involved in the practical implementation of this project involve the food safety of products and the transmission of know-how (the essential part of the value shared), which supposes prior training, the provision of manpower and of course financial backing.

This legal model is currently under construction. At the same time, with danone. communities, Danone continues its work in the field with its partners, replicating successful social business models.

Danone and Accenture joined forces with the NGO 1001 Fontaines to develop a training tool to inventory the know-how needed to develop and manage small water purification plants. The mission of 1001 Fontaines is to propose a sustainable solution to purify pond water and improve the health of rural populations. The solution consists in building small stations that filter surface water. They are managed by a person from the community, who is trained to manage the equipment, test the water quality, bottle the water and distribute it to the surrounding villages. This person becomes the operator and the activity represents their main source of income.

The first project has been implemented in Cambodia. On the basis of this success, 1001 Fontaines, Danone and Accenture wished to pool their skills and know-how to facilitate the replication of this model through a training tool available online and via a "train the trainer" programme delivered in the field on an ongoing basis.

— 1001 Fontaines has therefore successfully consolidated practices tried and tested in the field, whether technical or managerial.
— For its part, Danone has enriched the sales and quality models and supported all the deployment of marketing efforts.
— Accenture supplied the platform hosting the training content and structured the training programme alongside 1001 Fontaines.

A second project is currently under development in India, with the Indian NGO Naandi Community Water Services, a specialist in the same sector. By accessing the platform, Naandi benefits from the expertise developed by 1001 Fontaines, Danone and Accenture, but also contributes to its enrichment by making its know-how available to other users.

To ensure the equitable and sustainable access and enrichment of this know-how to other local stakeholders, a governance charter has been drawn up based on the principles identified above as part of the open source approach adopted by Danone.

Favouring access to water is a mission that requires the participation of many stakeholders. Increasing the number of stakeholders who benefit from expertise in this area, while enabling them to enrich their know-how through ventures with other partners active in the same sector, generates greater chances of meeting this global challenge.

Practical example

GOLDEN RICE: THE PATENT AS A TOOL TO GEOGRAPHICALLY DIFFERENTIATE THE CONDITIONS OF USE OF A PRODUCT

I. GOLDEN RICE, A VARIETY ENRICHED WITH VITAMIN A

Golden Rice is a genetically-modified rice variety. The modification is that its vitamin A content is higher than other rice varieties. The aim of the creators of this variety of rice was to combat the lack of vitamin A in developing countries.

II. GOLDEN RICE, A VARIETY PROTECTED BY MULTIPLE PATENTS

Almost 70 patents concerning processes and products protected the Golden Rice technology. Amongst these patents belonging to 32 businesses and universities, 14 were in conflict due to the fact that the claims were highly similar to each other. Several multinationals such as Astra Zeneca, Monsanto, Aventis and Dupont were the main patentees on the processes and products associated to the rice variety. But in reality, only 12 patents were really necessary to the production of Golden Rice. Although these patents were not, in the majority of cases, filed in the developing countries, it was nonetheless necessary to obtain licences to use the registered patents in the developing countries where the production of Golden Rice was planned.

III. THE PATENT AS A PRICE DISCRIMINATION TOOL

The main difficulty for interested producers to access this patent network involving the processes and products used to produce Golden Rice was in fact the price. They therefore negotiated an agreement with Astra Zeneca (now owned by Syngenta). Syngenta took several patent licences on Golden Rice enabling it to use the patented technology. It also undertook to allow the distribution of this rice to farmers in

developing countries free of charge. The firm then contacted the owners of the main patents required to use the Golden Rice technology (including Bayer and Monsanto), to obtain free licences.

The humanitarian character of the licences on the patents required to produce Golden Rice did not fundamentally impair the commercial monopoly for the patentees. Quite the opposite in fact, as in addition to creating the conditions to ensure adequate return on investment for the rights holders, the conditions of grant for 'humanitarian' licences on Golden Rice contribute to protecting the environment and to biosafety. For the most part, these conditions are the following:

- Syngenta conserves its commercial rights on Golden Rice.
- The 'humanitarian' use of Golden Rice cannot be granted to a country where regulations on biosafety do not exist or where the official government controls on health and environmental security are lacking. 'Humanitarian use' is defined as use by low-income farmers in developing countries.
- Golden Rice may not be exported, except to other patent licensees and only for 'humanitarian' research.
- Farmers in developing countries may sell the Golden Rice to meet their needs. They are authorised to reuse the seeds harvested to replant their fields.

Observation no. 2
The patent is a legal tool that facilitates the implementation of a price differentiation policy according to markets and the control of local partner activities.

Recommendation
The patent is a useful legal vehicle for technology transfers and more particularly for enabling access to new technologies in developing countries.

For countries who wish to gain access to new technologies, the development of a patent system (filing Office) and its ecosystem (judges, IP attorneys, lawyers, etc.) will favour foreign investment and technology transfers.

Several initiatives are to be applauded, such as the creation of the Moroccan National Patent Office (OMPIC) or the African Intellectual Property Organization (OAPI), which is the only IP Office in the world to grant a unitary industrial property right valid in 17 countries.

Moreover, all too often development agencies ignore industrial property rights yet when used suitably, they can make assistance more efficient: possibility of creating a source of revenue for local stakeholders using licences, dissemination of information when patents are published, etc.

Practical example

AFRICAN INTELLECTUAL PROPERTY ORGANIZATION (OAPI)

As the descendent of the African and Malagasy Common Organization (OCAM) the OAPI was established by the Bangui Agreement of 2 March 1977. Today this organization features 17 Member States [24] and has set up a single Office for filing applications and granting industrial property rights (patents, marks, designs).

The headquarters of the OAPI is in Yaoundé, Cameroon and represents the IP Office shared by all Member States. It operates all fee payment procedures. Moreover, a uniform law enacted by the Bangui Agreement and its appendices is applied throughout all these states.

The unitary patent system differs from that implemented in Europe under the European Patent Convention (EPC) signed in Munich. Indeed, although it is subject to a single application and examination like the unitary patent granted by the OAPI, once granted the European Patent is split into independent national patents, contrary to the unitary African patent.

Lastly, in the event of legal proceedings involving the granted patent (concerning its validity or in the event of infringement), the courts of all OAPI Member States are competent and a definitive decision issued in one Member State is fully valid in all others.

So a genuine patent system has been implemented within the OAPI, which considerably facilitates patent filing and enforcement.

The unitary patent represents a genuine advantage for attracting investors.

24 Benin, Burkina Faso, Cameroon, Central African Republic, Comoros, Congo, Ivory Coast, Gabon, Guinea, Guinea Bissau, Equatorial Guinea, Mali, Mauritania, Niger, Senegal, Chad and Togo.

1.2 THE CONTRACTION OF THE ROLE OF PATENTS IN TECHNOLOGY TRANSFERS TO DEVELOPING COUNTRIES

52. In practice, the role of the patent in technology transfers to developing countries is often limited for two reasons: on one hand the access to know-how is the most sensitive point (A) and on the other hand, in most cases, patents are not granted in developing countries (B).

A. The extrinsic limit of patent law in technology transfers: the primordial role of know-how

53. As we saw earlier, the notions of patents and technology must be distinguished[25]. A patent is a right granted by an authority, which confers on the patentee a monopoly of use of an invention, i.e. a technical creation that is new, inventive and susceptible of industrial application. The purpose of the patent is therefore limited.

So when a firm wishes to have access to a technology that it does not possess, a basic patent licence is more often than not, totally inadequate.

The basic patent licence is only of interest when the originator (patentee) and the recipient (licensee) are approximately equivalent in terms of mastering a technology. In this case, in practice the licensee has sufficient know-how to make use of the invention without assistance. So the patent plays the role of a legal lock, prohibiting the licensee by law from developing, manufacturing and selling patented products or processes. This first situation is characterised by a degree of symmetry between the respective levels of technical knowledge possessed by the patentee and the licensee. But this symmetry is rare in technology transfers to developing countries and in practice, more often than not a basic patent license does not enable the licensee to be capable of developing and industrialising the invention.

54. The effective use of the invention often requires extensive know-how, even if the patent must legally disclose the invention in conditions enabling a person skilled in the art to carry out the invention[26]. Effectively, the reference to a person skilled in the art means that a person who has technical skills in the invention field is capable of carrying it out with their existing skills. The person skilled in the art is defined as follows: *"The person skilled in the art has at least the following characteristics:*

a) This person possesses common general knowledge as well as knowledge in the field (or fields) to which the invention relates that the average person in that field (or fields) would be expected to have or which would be readily available to that average person through routine searches;

25 See *supra*, page 21.

26 See *supra*, page 22 and 23.

b) This person possesses the skills that are expected from the average person in the field (or fields) to which the invention relates.
c) This person is able to perform routine experimentation and research and can be expected to obtain predictable solutions as compared to the prior art."[27].

So for an invention to be used, the recipient business must have personnel with sufficient skills in the field. If this is not the case, there is a risk of the basic patent licence being useless.

55. It is for this reason that in the case of technology transfers, in addition to the patent licence when the territory of the recipient country is covered by a patent, contracts most commonly include a transfer of know-how so that the recipient business is elevated to a position of being able to carry out the processes or produce the products itself. In general this implies the transmission of a large volume of technical data, monitoring and support in deploying the industrial process and training personnel on site.

Furthermore, more often than not the patent only covers a part of a product or a process. It represents a link in the technology chain used to manufacture a product or implement a process.

So know-how plays a fundamentally important role in access to technology for a developing country. It is for this reason that compulsory patent licences (or simply the abandonment of the patent system) are not the ideal solution to promote technology transfers[28]. Indeed, the sole purpose of compulsory patent licences is to legally authorise the licensee to make use of the invention. But compulsory licensing cannot oblige the patentee to transfer their know-how, which is nonetheless essential for the licensee to produce the product or carry out the process protected by the patent. In law as in practice, it seems impossible to oblige an originator to transfer know-how, which is often a trade secret, of which the originator alone knows the content. The conclusion is that successful technology transfer also involves the transmission of a substantial amount of know-how, which can only be done on a voluntary basis. Compulsory patent licences are therefore more often than not an ineffective tool for technology transfers.

56. The issue of successful transfer of know-how is that the recipient (business, local authority) effectively obtains the information needed so that it can make use of it.

The dissemination of technologies via industrial property can only function in a homogeneous environment of technology and know-how. Only a recipient with sufficient know-how is able to make practical use of the patented invention.

27 AIPPI resolution Q213 of 6 October 2010.

28 Such licences are granted by the administrative authorities or by a judge despite the refusal of the patentee.

However if the recipient does not have the minimum know-how required to make use of the technology, it must imperatively acquire the essential know-how, either directly from the originator or via a transmitter. This is the situation for most developing countries. Inversely, certain South countries have taken into consideration the organisation of reception and technology development. In Brazil, the State interventionist structure continues irrespective of the political standpoints or nature of governments. The National Development Bank (NDB) for example, has contributed to developing entire industrial sectors, whether the country is run by the right or the left, by a dictator or a democratic government. The NDB has means that are often more extensive than those of ministries, to push forward policies about which these same ministries may be cold-footed. For example, under the Lula Government, on a matter of national importance such as biofuels, it was powerful enough to deploy incentives to promote new technologies via subsidised loans, while the ministry in question had just stepped back from introducing price incentives.

It is in part this type of national system that certain countries try to emulate, such as Morocco which sought to deploy massive solar power or water conservation projects and that are dreamed of by certain leaders of Western African countries, for example in the scientific management of self-sustainable agriculture. In these cases, the issue is to create or instigate the creation of a suitable local IP regime.

Once this know-how is acquired in one way or another, the technology transfers can be limited to industrial property. This is the case in the large emerging economies (India, China, or Brazil) in certain technology fields. And they may even become originators to developing countries or even innovators.

Observation no. 3
To access a technology, the primordial issue is the transfer and mastering of the know-how involved. A basic patent licence is more often than not insufficient, even useless, to ensure effective technology transfers to a developing country.

B. The intrinsic limit of patent law in technology transfers: the low volume of patent applications in developing countries

57. As we have seen, the patent is a territorial i.e. national right[29]. Worldwide patents do not exist. The PCT system operated by WIPO in Geneva is sometimes vaunted as a worldwide patent system, but does not protect the patentee in all countries. In reality, using just one filing process with WIPO, a PCT application enables the inventor to designate the countries where they wish to *apply for* a patent. WIPO manages a part of the grant phase (prior art search, search reports, etc.) then forwards the application to the national office of each country designated by the applicant[30]. Each national office completes the grant procedure and grants a patent which is valid solely on its territory, independently of all other countries. So a worldwide patent does not exist.

Consequently, an inventor must file a patent application in each country where they are seeking protection. The cumulative cost is therefore high (translation, consulting fees to ensure compliance with procedure, renewal fees, etc.). Due to this cost, industrial firms implement protection policies that are suited to their technical fields and their business strategy. The filing strategy is often as follows: a patent considered to be important for the firm is filed both in the main countries where the product is manufactured (location of main competitors) and in the countries where its essential markets are located. As an example, in the European automotive industry, vehicle makers apply for patent protection of their inventions in around five countries.

It is for this reason that in most developing countries, the majority of inventions are not protected as companies have not identified the market as sufficiently buoyant.

58. This is particularly true in the field of environmentally-sound technologies. The European Patent Office (EPO) has produced a special classification which determines in which countries a specific patent has been filed. Class Y02E 10/50 is titles "Photovoltaic (PV) Energy".

29 The only exception currently in existence is the patent granted by OAPI.

30 In reality, the prior art search is outsourced by WIPO to a national or regional office (e.g. European Patent Office).

NUMBER OF PATENT APPLICATIONS FILED PER COUNTRY FOR CLASS Y02E 10/50 (PV ENERGY)[31]

Country	Cumulative number of patent applications in Espacenet[32]		Cumulative number of patent applications claiming priority[33]	
Year for which Espacenet was searched	2012	2015	2012	2015
USA	11,261	9,845	16,312	13,970
China	7,100	12,836	4,472	9,732
Germany	4,599	3,858	7,905	6,540
France	1,055	845	1,838	1,850
Mexico	218	209	4	5
South Africa	98	70	6	4
Argentina	30	14	1	1
Indonesia	10	5	0	0
Egypt	9	10	0	1
Algeria	2	0	0	0
Chile	1	7	0	0
Zimbabwe	2	0	0	0
Vietnam	0	0	1	0
Uruguay	0	0	0	0
Albania	0	0	0	0
Zambia	0	0	0	0
Morocco	5	27	0	9
India	0	52	0	22
Brazil	4	140	0	19
OAPI	0	4	0	0

31 The database <www.espacenet.com> was consulted twice on 30 July 2012 and on 27 March 2015.

32 The "Number of applications" column indicates the number of patent applications filed in the country in question and in the "Photovoltaic (PV) Energy" category. Each patent filed, if granted, assigns the monopoly of use of the invention to the patentee. The number of patents filed in a given country shows the importance of its market, because a patent is only filed in a country if at least a potential market (or the presence of competition) is identified.

33 The "Priority right" enables the applicant filing a patent application in their home country to then file a corresponding patent application in other countries. As an example, a French inventor files an initial patent application at the French Industrial Property Office (INPI), then based on this initial application, files applications in Germany, Japan, Russia and Morocco. So the same priority can give rise to several patents in other countries. The "Priority" column therefore indicates the number of patent applications filed in the whole world and which at the time of their filing, claimed a priority for the patent in the country in question. The number of priorities provides an indication on the dynamic nature of a country in a given field of technology as in the majority of cases, a firm will start by filing a patent application in its home country and then 'extend' it to other countries.

According to our consultation of the EPO database, the country in which photovoltaic technologies are the most difficult to use due to patents filed was the USA in 2012 (11,261 applications), but by 2015, had become China (12,836 applications). However, in countries such as Albania or Uruguay, no patents protect these technologies so they are free to be used. In Indonesia, only 10 patents protected these technologies in 2012, but in 2015 none were in existence. Similarly, while 30 patents were filed in Argentina in 2012, only one exists in 2015.

59. So we observe that due to the costs of patents, all firms are obliged to limit the number of countries in which their invention is protected. The consequence of this limitation is that very few patents are filed in developing countries due to the absence of a sold market identified at the time of filing the patent[34].

And the movement progressed further between 2012 and 2015. It is also interesting to consider the evolution of the "Priority" category between 2012 and 2015 for China, which more than doubled. This demonstrates that China, aside from becoming a market where it is important to protect inventions, has become a highly significant originator.

In a global economy where new players and markets are constantly emerging, it is obviously more complex for firms to anticipate how markets will function over the 20-year patent protection period.

The practice is very simple and can be summed up as a blind spot practice: everything that is not within the direct geographical field of self-produced exports or even localised production is in general simply ignored. This is obvious for SMEs, but also true for large Fortune 500 groups, which are for example, many (and no doubt a majority) to have no core philosophy, analysis procedures and monitoring of the question of industrial property in sub-Saharan Africa, for example. If a market emerges, a firm will always be able to file future inventions. If *ex-post* is not always the most effective way, the more reasonable approach is *ex-ante* with territorial rights. And it is almost certainly reasonable in light of the shorter period of real economic value of the invention (independently of the legal duration of protection) and the primordial importance of the know-how.

In addition to these conventional limitations of the lifetime of industrial property, generated by the type of recipient countries, there is also a very rapid contemporary development of the originator-transmitter market.

34 The inventor who files an initial patent application in a country must file all applications in other countries within one year. After this time, such patent applications will be rejected. This principle was established by the priority right of the 1883 Paris Union Convention.

Observation no. 4
Patents cannot be an obstacle to access to technology by developing countries, because most patents are not applied for in these countries, so the technologies are freely accessible at no charge.

60. Today the world is engaged in tumultuous changes in its geography, practices in innovation and the sharing of technical and industrial knowledge. In this light, we must admit that the role of industrial property today is neither predominant nor pre-eminent, that this second characteristic limits the role of industrial property as an explanatory factor of the spread of sustainable development.

2
END OF THE OLIGOPOLY OF CONTROL OVER TECHNOLOGY and widespread competition in access to the new markets represented by developing countries

2.1 INNOVATION BECOMES MULTI-POLAR

61. The emergence of a multi-polar world can be seen particularly in innovation. The number of large innovation clusters around the world has exploded over the past few years. And the exponential development of means of communication (transport, internet) now enables unrivalled distribution of technologies. In the field of environmentally sound technologies, this acceleration of distribution of technologies is sought after in order to limit climate change.

62. Western countries are no longer the sole models of development and the only source of technical innovation for developing countries. Large emerging countries such as China or Brazil and developing countries in advanced transition stages (Thailand, Philippines, etc.) are now fully valid models in their own right. And moreover, these countries provide not only possible development models, but are also potential partners, as for developing countries they are a source of alternatives to the technologies of Western countries. Of course, the most innovative technologies and the largest industrial projects (power plants, desalination plants, carbon capture plants, etc.) are still most commonly developed by Western countries. But in many fields, the technologies proposed by large emerging countries tend to be similar to those owned by Western countries and above all, present the benefit of being accessible at a lower cost. Beyond this, transfers may generate original practices that are not in line with IP as historically built, and in competition with established systems, as suggested by a brief examination of patent practices and applications in China, India and Brazil.

In this situation, the question of know-how is of even greater interest: with the emergence of countries or clean technology transfers to developing countries, the possibility of *joint procedural learning* becomes available. Access to developing markets and their low unit margins requires specific skills when competition is already high. Indeed, after years of competing at the top end of the market, Western firms have sometimes lost their skills in dealing with low unit margin markets. They need to re-learn this know-how; in

an 'emerging environment', they must also innovate in terms of production processes: adapt assembly lines to a more labour-intensive environment or transitional demand (fractured demand, need for wide ranges at controlled costs), or even 'industrialise' the processes of IT departments, etc. From this point of view the experience earned in a developing country raises the skill level or the portfolio of know-how, representing a long-term investment. At some level, local partners also gain know-how in participating in this process.

All in all, with the entry of emerging economies into the global production system, this system is affected less by a proportional expansion than by an in-depth transformation, even a revolution in some sectors. More than ever before, a large industrial, services or financial firm has become a set of functions that are constantly broken down and redesigned, hardly has the system become stable before it is being reinvented again. Furthermore, the very rapid introduction of emerging economies into the global economy has managed to render complex the question of the boundaries of the firm and its relation to the national territory.

This movement means that the management teams of many large firms don't know who their competitors will be in a few years. Structurally, the era of the global oligopoly between the countries of the North club is well and truly over.

Observation no. 5
Today, innovation is multi-polar and businesses in North countries are now competing with firms from emerging economies, even those from developing countries, on the market for environmentally sound technologies.

2.2 TECHNOLOGIES ARE OFTEN ALREADY KNOWN

63. A growing proportion of technology is becoming similar to a **common asset**, where access is open to an immense majority of economic territories and to all companies. This phenomenon has taken place in two phases.

In years past, industrial globalisation by the separation of tasks had given the supplier of technological services a central role. But now, technologies and know-how migrate and evolve easily, as the multiplication of relationships formed within the world economy has required the adoption of standards (electronics, household appliances, for example) and generated the creation of logistics firms. Under these conditions, through its territories and firms, the emerging industrial globalisation has largely accelerated and restructured

this phenomenon. Equipment makers in emerging economies have liberated themselves from their Western principals to develop their own markets, along with many markets in developing economies. The markets and technologies involving sustainable development are not left out.

64. In the end, competition is becoming more widespread amongst originators and experience demonstrates that filing for IP protection and the monopoly it grants on new markets are not determining elements in a business strategy. They are often neglected, except for the particular case of firms focusing on South markets. Indeed, certain multinational firms are specialised in the products which concern the 'base of the consumption pyramid' (the billion poorest people on the planet, or the next billion). These firms extend the scope of the market in all South countries, 'creating activity' without 'pre-empting an existing market'. In the same way, firms seek a client base whose purchasing power is weak (or falling) and as such position themselves as the champions of a quality that is "good enough".

For these firms it may be important to stand out in widespread competition; but in general they depend on the depth of the distribution network, or when this fails, on communication involving a trademark; patents are rarely involved.

Observation no. 6
A growing proportion of non-leading edge technologies is accessible to a great many players, for the lion's share of economic activity, so that in the majority of economic transactions, competition through purely intellectual property tends to disappear in favour of competitive offerings concerning technical *guidance* delivered by originators to recipients.

2.3 THE NEW INDUSTRIAL ECOSYSTEMS AND INNOVATION GEOGRAPHY

65. The major lesson of emergence, both in itself and regarding the developing world is to make us collectively realise that we have overlooked the modern operation of many industries outside Europe for several decades.

The two current approaches of emerging economies are:

— A macro-economic approach consisting in the evaluation of their share in world GDP over a certain time line, which means nothing to businesses;
— A cost-based approach by asking which countries are likely to occupy such and such function in the implicitly Western value chain.

66. These two approaches are insufficient as they overlook the potential and mechanisms of innovation in these territories.

The second approach has of course ultimately shown that for Western firms, there could be more competition outside Europe, but it has nonetheless not revealed to what point the new value creation chains would compete with existing ones in the West.

Today we need to re-consider emergence. It is not the integration of emerging countries into the Westernised global economy; on the contrary, emergence may be defined as the meeting and the pooling of different industrial traditions.

EMERGING ECOSYSTEMS STRUCTURED AROUND FOUR 'CAPITALS'

67. Today industrial development depends on four 'capitals': technical, natural, human and social, deployed in an ecosystem of 'energy – materials – industry'.

The important factor in the concept of ecosystem is that a firm never works alone; it operates with suppliers, clients and *learns* from them. The very principle of the ecosystem is the possibility of choice that it offers, e.g. of various suppliers. We often see emerging countries as 'black boxes' in which Western firms gather partners or suppliers without understanding the richness of the ecosystems in which these black boxes are integrated.

68. Concerning the four capitals that form an ecosystem, a part of the Western system has been built around an unlimited and low-cost natural capital. Also, by standardising human capital, 'human resources' have pushed factories into using a Taylorist approach, which has extended to offices.

Social capital, at least in large countries with a diversified economy such as India, large South American countries or the largest African countries, can deliver much larger capacities for innovation.

The importance of this intangible capital is high; it can in part - and in part only - be expressed by trademarks but affects all the issues related to know-how.

69. **The waves of globalisation have reconfigured the world's industrial geography; when technology becomes standardised, the issue is more than ever to capture and accumulate know-how.**

Current industrial geography is therefore becoming increasingly difficult to represent on maps. We need "sub-maps" with separate floors or levels. In the past, we had clearly separate world regions where distinct models existed. Today we have business parks,

industrial districts, competitiveness clusters, which are in contact with other clusters, districts and parks. We now need a layered or segmented image of international trade. For each type of trade, we observe interconnected zones with centres of gravity. This can be verified on firm examples such as the Dacia Logan vehicle, initially intended to be sold in emerging countries, but which has sold very well in France.

In effect, production sites are getting closer to the consumption locations. Relocations – we speak of 'delocations' but in truth all of industrial history involves relocations – are associated to the manner in which a territory changes its production methods and how a population changes its consumption modes. All industries tend to move closer to their markets, either as sites for sourcing their inputs, or sources of financing.

Industrial trajectories will change, and future developments are clearly visible.

70. China for example, has absorbed a major part of the know-how available around the world. A very open China, as it has been for the last 15 years, may well very soon become a country that is not totally closed-off but which limits its trade and focuses on its domestic market. This is also a political objective stated by the Chinese government. In cartographic terms, we have here one of the regions – if not the only one in the world – which could be self-sufficient in technology and which secures its access to natural resources through non-market-based solutions.

71. India and the poorer part of South East Asia – including Indonesia – still have to open up in terms of industrialisation and attract investment to transform their economies and their countries.

72. South America – without generalising – was for a long time self-sufficient with a relatively wide industrial base and strong business relations with the West. It has completely overhauled its business relationships and now favours China, India and Asia in general. This change in trajectory poses a question: how will the region make its industry thrive? There is a high risk of de-industrialisation in South America, which could be easily tempted to live off income from natural capital. In Brazil, it is already a major issue. Chile and Peru have retained the pre-crisis liberal dogma. It remains that this region of the world has without doubt the best balance between its four capitals.

73. In Africa and the Middle East, the industrial foundation is much weaker than elsewhere (sub-Saharan Africa) or much more obsolete (Arab countries). In certain of these countries, we should observe macro-economic impacts favourable to sub-Saharan Africa, through the exploitation of new mining and energy deposits (Angola, Ghana, Gabon, Congo, even Niger). Similarly, many Arab countries need to manage post-resource industries. These are completely new challenges. China had to invent a new business model in a new economic situation never before seen in History. To do so, it fully mobilised its four capitals. In a

certain manner, it is what needs to be done in African and Arab countries. But in terms of breakout scenarios, it is very difficult to be prospective in terms of 'growth' models. Africa is not a new India, which was not a new China; it is not the 'next emerger'; it's a new unknown, a new mystery. And with a population of 80% young people, the vast majority of whom have internet access, it's altogether a new Africa!

IS AFRICA THE WORLD'S NEW 'INDUSTRIAL FRONTIER'?

74. Most sub-Saharan economies make little use of banking systems. Growth exists. Many projects are alive; there is therefore a major need to create banks and independent project evaluation systems. For the time being, a few banks are located in sub-Saharan Africa – Moroccan, Turkish or Chinese banks – but the situation is still in the early stages. Moreover, there are very few private equity funds, another source of finance for businesses; above all, businesses struggle to monetize their projects. They lack a financial intermediation and evaluation system. For the most part, the economy is still dependent on natural resources and rent income, and is on its way to becoming capital-oriented.

CONCLUSION TO PART ONE

1) In conclusion to this part, as soon as it involves an asymmetric exchange in terms of technical skills (but which in no way implies inequality in economic terms), i.e. in developing countries where inventions are more often not protected by patents, intellectual property rights cannot represent as such an obstacle to the transfer of environmentally sound technologies[35].

2) In this way, the claims of certain developing countries that the solution to technology transfers would be the large-scale implementation of compulsory patent licences[36], is actually quite unrealistic and in practice ineffective for two reasons: firstly, patents are most often not filed on their territory, so that inventions are freely accessible, and secondly, the crucial point is access to the necessary know-how, which by essence cannot be accessed by compulsory transmission.

3) The essential factor for a territory or a country (sustainable development has greater meaning on a territorial level than just on a company level), is to develop a strategic and operational vision of the skills to be acquired and shared throughout its lands.

4) It is therefore essential to reposition these issues in a dynamic economic context. Innovation is multi-polar, as are technology transfers. Access to know-how is the crucial factor. Yet know-how cannot be transferred without the agreement of the originator. The effective transfer of technology is therefore conditional on the interest of the originator in allowing such a transfer: access to a market, security of the transfer, identifying reliable partners, all within a fully competitive environment.

5) Today we are seeing a partial displacement of global innovation (if we accept to qualify innovation by international firms as such) towards large emerging economies. The multiplication of installations involving R&D labs in these economies by multinationals bears witness to this fact, but a large part of *local* innovation is also emerging. This is particularly true in Brazil, India and China in sectors such as electronics, IT, mechanics, which are all sectors where, using the segmentation of value chains, the energetic standardisation of communication protocols between clients and suppliers has accelerated transfers. But above all, once the stock of know-how is transferred, we observe *local* innovation, as all the necessary know-how is in place.

35 In 2009, only 275 patent applications were filed in Bangladesh by foreign firms: cf. A. Tessensohn, Review of Intellectual Property and Climate Change: Inventing Clean Technologies by M. Rimmer, European Intellectual Property Review (EIPR), 2012, p. 364, spec. p. 366.

36 For the purposes of the Convention on Climate Change, this claim is supported by the G77, a group of 134 developing countries (including China) which form an informal coalition to defend their interest during the UN negotiations. The original group of 77 countries was created in 1964 under the UNCTAD (United Nations Conference on Trade and Development). On technology transfers and biodiversity: G. Ghidini, Equitable sharing of benefits of biodiversity-based innovation: some reflections Under the shadow of a neem tree, Italian Intellectual Property, July 2002, p. 39-51.

Will this be limited to these sectors where standardisation has been the most prevalent? We are not sure. These sectors have no real advantage over the others; simply that due to standardisation, the transfer of the stock of know-how was done earlier. In light of the very short time needed to renew technologies (2 to 5 years depending on the sector), all transfers are inexorable in a world where technical knowledge is shared due to the intricate meshing of supplier networks.

This could renew the role of industrial property. There are forerunner signals that are already being seen (part 2). This position as a source of innovation by co-development that the large emerging economies have reached in some sectors is also encouraged to spread to other technologies and over time, to other developing countries that are able to learn from this emergence, adapting it to their national or regional strong points and limitations.

SUMMARY AND RECOMMENDATIONS FOR PART ONE

1 Contrary to what is sometimes claimed, patents do not represent an obstacle to technology transfers, and particularly sustainable development technologies, to developing countries. The vision entertained by developing countries of the patent as a legal padlock is erroneous.

The key factor in ensuring technology transfers is know-how.

2 As know-how is intrinsically secret and complex because it collates elements of information, it cannot be transferred by using a legal weapon such as compulsory licensing.

3 To access a new technology, developing countries need to convince investors and technology owners to carry out these transfers of their own accord.

4 The development of industrial property infrastructures (IP Offices, training for judges, IP attorneys, lawyers, etc.) is a useful strategy for developing countries because if industrial property rights are protected, technology owners are more inclined to grant licences and transfer their technologies.

5 Pooling is an efficient solution to limit the cost of developing these infrastructures. This method has been used by the member states of OAPI, the only IP Office in the world to grant industrial property rights valid in 17 countries.

6 Industrial property is a tool that should be used by development agencies to improve the effectiveness and effects of their programmes, both in terms of technology and financing.

7 Moreover, in a global economy, developing countries have at their disposal a multitude of originators able to transfer technologies ('traditional' developed countries, large emerging economies, developing countries with expertise in certain fields, etc.).

8 For originating countries and firms located there, the markets of developing countries are their best hope for growth.

CONTENTS PART TWO

2 TRADEMARK RIGHTS: A GROWING ROLE IN SUSTAINABLE DEVELOPMENT

3 TRADITIONAL KNOWLEDGE: ANECDOTAL RE-APPROPRIATION OF THEIR OWN KNOWLEDGE BY DEVELOPING COUNTRIES OR THE SYMBOL OF DEEP CHANGES?

INTRODUCTION TO PART TWO

75. The emergence of new industrial players and consequently new players in the universe of industrial property alters certain traditional roles of patent law and trademark law.

Patents are no longer used in their primary role of granting a monopoly of use to the creator of a technical invention, and all the more so in developing countries. Indeed, patents more frequently represent an information signal for investors and for stakeholders in innovation alike (1).

Moreover, trademark law, much underused in developing countries, is a simple tool and its social and economic effects can be extensive (2).

Lastly, if traditional know-how is today recognised by international conventions, its role in the development of emerging countries remains difficult to evaluate (3).

1
THE NEW ROLE OF THE PATENT as a signal (information / signalling)

76. At a time when information has become both a fact and an economic paradigm, the field of industry and technologies cannot escape this requirement of circulation of information. This phenomenon can be observed on at least two levels: firstly, the patent has become a signal or a label of innovative enterprise for investors (1.1); elsewhere, big data processing rejuvenates the role of the patent as the primary source of scientific information (1.2).

In this context, the current issue is the identification, collation and broadcast of needs of developing countries (1.3).

1.1. THE PATENT, AN INDICATOR OF INNOVATIVE ENTERPRISE FOR INVESTORS

77. The role of the patent as a signal is not a new one. But this role tends to become important, especially in receptive, developing economies.

A patent is a property right granted by the State. The right is granted through an Office that has several characteristics: it is *independent* of the patentee, the personnel are *highly skilled* (engineers, legal analysts, etc.) and the Office only grants the property right if *strict conditions* of patentability are satisfied.

78. For third parties, the grant of a property right is a strong signal. Not only because the patentee enjoys a monopoly of use on their invention, but also and frequently because it reveals the innovative character of the patentee. The patent is a *marker of innovation*. The patent is a sign of a company which not only invests in R&D, but also whose research brings about new inventions that are inventive and are susceptible of industrial application. To put it bluntly, the patent is the sign of a company that not only seeks, but finds.

79. Of course, we should not over-estimate the data provided by a patent. Firstly, simply filing a patent application does not automatically mean that one day the patent will be granted by the Office. Furthermore, the IP Office only performs a *technical* analysis of the invention. However revolutionary an invention may be, this does not guarantee it will be a commercial success. Lastly, the quality of the information supplied also depends on the quality of the examination of patentability of the patent carried out by the IP Office.

Certain Patent Offices are considered to be particularly demanding when they examine the patentability of an invention (e.g. the European Patent Office), whereas other Offices are considered to be more lenient (such as the US Patent Office). To have a precise idea of the severity of the examination, therefore of the quality of the technical analysis, it is sometimes useful to know the procedure in detail. As an illustration, the French Industrial Property Office (INPI) outsources the prior art search to the EPO. The search report is therefore of high quality and provides essential data on the technical quality of the invention. However, within the patent application examination procedure, the INPI only analyses the novelty and not the inventive step. So the INPI is less stringent at the examination stage than at the search report stage. Whatever the situation, the signal is essential for a patentee.

80. For investors, patent ownership is an important asset that presents several interests: firstly, it provides information about the innovative character of the firm. Then it provides expectations for a more certain and more rapid return on investment, due to the monopoly of use granted. Lastly, it is an intangible asset that can be monetized in several ways: access to funding because the patent can be provided as collateral (pledge), income if licences are granted to third parties, etc.

So for a young company, the filing (and above all the grant) of a patent is an avenue of growth that helps to convince investors to inject capital. This dimension of funding, particularly important in developing economies where there is little banking intermediation, even less venture capital and almost no ecosystems offering support in financial analysis, is extremely important in some cases. We provide two illustrations below in Nigeria and Burkina Faso, examples of 'spontaneous' innovation (see pages 71 and 72).

81. This situation is frequent, even in developing countries. This strategy can take several forms. The first is the national filing of a patent application. It offers all the advantages of the patent, including a monopoly on the market. But a second strategy may consist in also filing a patent application abroad with an Office reputed to examine the patentability of inventions with an extremely severe eye. As an illustration, a firm may decide to file a patent application in its home country and also file a patent application with the EPO in Munich or with a national IP Office that outsources a part of the procedure to the EPO. As seen before, this is the case for the French Industrial Property Office, and also for the Moroccan Office.

82. If the patent is granted, the advantage is major concerning investors, as the firm gains a monopoly of use on a new market alongside the guarantee of the quality of the invention, which has been examined by two Offices. A difficulty may be encountered in the duration of the grant procedures. The obstacle can nonetheless be overcome. Effectively, many Patent Offices propose fast-track patent

examination and grantprocedures[37]. And we must underline that in the field of green technologies, several Offices have set up specific fast-track procedures for the examination and grant of patents.

The new fast track procedures for 'environmental inventions' were brought in by the UK Intellectual Property Office (UKIPO) in 2009 under the name "Green Channel"[38]. Today, almost a dozen IP offices around the world propose an accelerated procedure for 'green' patents[39].

83. So the patent is considered by potential investors as much as a monetizable asset, a guarantee of creativity, as a potential source of income. It often enables fledgling companies to secure the financing essential to their development.

Observation no. 7

The filing and above all the grant of a patent is a strong signal transmitted by the patentee to their market. In this case the signal is that the patent guarantees the quality of the patent owner's research and development efforts.

In a real economy where information is asymmetric, this signal is an element that reduces this asymmetry. The information is essential to all partners (banks, investors, business partners, government aid agencies, etc.).

37 The EPO has deployed the PACE programme, which enables an applicant for a European patent to request the expedited processing of the search phase (search report) and/or the examination. However this programme is not specific to green patents.

38 On 12 May 2009, the UKIPO introduced a fast track procedure for green technologies. This programme is reserved for inventions with alleged environmental benefits. The applicant must provide proof of this benefit but the Office only performs a perfunctory examination of the claims concerned. Applicants can choose which phase of the procedure they wish to accelerate: search, examination and/or publication. The director of the UKIPO indicated that the time line between filing the application and the grant of the patent has been reduced to 8 or 9 months from the customary 3 to 5 years.

39 - In October 2009, the Korean Intellectual Property Office (KIPO) also introduced a fast track procedure programme *(super-accelerated examination)* but only for the phase concerning the examination of patentability. This programme is reserved for technologies qualified as 'green' by the government, i.e. which have received financial support or certification, and technologies covered by environmental legislation (e.g. law on preservation of air quality). Since 2012, products receiving government subsidies under the law on greenhouse gas emission reductions *(Low-Carbon Green Growth Basic Act)* have also been eligible for this programme. The examination period has been reduced from a usual 17 months to around one month. In December 2009 the United States Patent and Trademark Office (USPTO) launched a similar programme *(Green Technology Pilot Program)*. The duration of the procedure was reduced to about 16 months. The programme was modified on several occasions and renewed, but was shut down on 30 march 2012. At that date, 5,500 patent applications had benefited from the accelerated examination procedure and 3,500 had been granted. In September 2009, the Australian Intellectual Property Office (IP Australia) also introduced a fast track procedure. On November 1st 2009, the Japanese Patent Office (JPO) introduced a fast track examination programme, reduced to around 2 months, for environmentally friendly inventions. In December 2009, the Israeli Patent Office launched an accelerated examination procedure for inventions claiming environmental benefits. In March 2011, the Canadian Intellectual Property Office (CIPO) introduced an accelerated examination programme for patent applications involving green technologies. Brazil's *National Institute of Industrial Property* (INPI) introduced a similar procedure in February 2012. Lastly, China's IP Office also introduced a fast track procedure for green patents.

Practical example

EAT-SET INDUSTRIES: USING INTELLECTUAL PROPERTY TO ATTRACT INVESTMENT

During his career, Nigerian military doctor Dr. Otu Oviemo Ovadje was confronted with the extreme scarcity of blood stocks in his country, and the accordingly high number of patient deaths due to haemorrhaging. Aware of the need to find a cheap solution to combat the risks of death from haemorrhaging, he researched an effective way of re-using the patient's own blood rather than having to depend on blood donations.

He therefore invented the EAT-SET device (Emergency Auto-Transfusion Set) which recovers the blood from the patient's body cavities during surgery and re-injects it into them after filtration[40].

Dr Ovadje's invention, the EAT-SET is simple, efficient and cheap compared to traditional auto-transfusion techniques used in industrialised countries.

When his project was launched, Dr Ovadje did not have sufficient funds to produce his device. He received aid from the Government and from the United Nations Development Programme. With this support, Dr Ovadje filed a patent that was granted by the African Industrial Property Office (OAPI)[41]. The device is now patented in nine African countries.

Filing the patent afforded him visibility on the market and also attracted investors.

In April 2001, the company EAT-SET Industries was established to market this medical device. It is marketed jointly by EAT-SET Industries and First Medical and Sterile Products.

40 http://youtu.be/s2aVJ3FWBcw

41 Patent no. 40893.

Practical example

INVENTION OF A PLASTIC WASTE RECYCLING PROCESS IN BURKINA FASO

Intellectual property and conservation of the environment

In Burkina Faso, there are certain issues in health and cleaning services. Populations live alongside waste, notably plastic waste. This waste often clogs up drains and dams, creating excellent breeding grounds for mosquitoes.

To remedy the risks generated by this waste on public health and the environment, Philippe Yoda developed a process to recycle plastic products and make finished products. These include knitted animals, bags, coffee tables, flower pots, garden borders, floor tiles or cobbles, etc.

To vulgarise the plastic waste recycling process he invented, Philippe Yoda created the Association AIRTAE to promote innovation and appropriate technology research in the environment. The purpose of the association is environmental, but it also has a socio-economic dimension. Indeed, the aim is to rid Burkina Faso and other countries of abandoned plastic waste which creates a threat for the environment, while creating job opportunities at the same time.

Philippe Yoda has received several awards for his invention, including a gold medal from the WIPO International Exhibition of Inventions. In December 2008 at the 8th Forum on Scientific Research and Technological Innovation (FRSIT), he received the President of Burkina Faso's award in the senior category. He also received a prize from the African Industrial Property Office (OAPI) for encouraging research.

Patent: positive signal for investors

To secure his rights on the plastic waste recycling process he invented, Philippe Yoda filed a patent application with the African Industrial Property Office (OAPI).

After being granted the patent, he won a contract with the National Water and Sanitation office (ONEA) to build meter cabinets made of plastic. He also received financial support from the Regional Bank of Solidarity (BRS), which granted him a loan of FCFA 30 million (approx. €45,800).

1.2. PATENT DATABASES: A SOURCE OF FREE TECHNOLOGIES FOR DEVELOPING COUNTRIES

84. Another form of innovation is "programmed," incremental and adaptive. When a firm or a country adopts an industrial development policy founded on technology transfers, the first step is to identify the existing technologies and who owns them. At this stage, patent law plays an essential and growing role.

Indeed, the disclosure of the invention by the patent applicant is a key element of the patent protection system, because in exchange for the grant of a monopoly of use on their technical invention, the inventor agrees to disclose it with sufficient information to enable a person skilled in the art to carry it out[42]. The idea is that the community of scientists and technicians may use the information disclosed in the patent description to pursue their research. The essential function of the patent is to be a source of information for researchers. For developing countries, consulting databases is extremely useful as they provide information about technologies which for the most part is (a) free and (b) concerns potential partners. Although for a long time these databases were infrequently consulted by engineers, today the national IP Offices are improving them through major overhauls.

A. Databases: a source of descriptions of free technologies

85. The primary function of patent databases is to supply scientific information on the state of the art of human knowledge in the field.

So to know the state of development of a given technology, the main source of information is indeed the patent databases operated by the national and regional IP Offices. Patent Offices publish all patent applications filed (some online). These databases are the largest source of scientific information in the world. It is considered that patent applications represent a quarter of all scientific publications in the world.

86. Moreover, for each field and each country, patent databases also provide information on the technologies that can be used freely and those which are protected by a patent. This freedom-to-operate search is frequently carried out by firms wishing to develop a technology and/or conquer a new geographical market.

87. So for developing countries where few inventions are patented, patent databases provide descriptions of technologies that are often unrestricted, free and which can be used without having to ask for the patentee's consent.

42 Without a sufficient description, a patent is also likely to be cancelled. C.f. article L.613-25 of the French Intellectual Property Code which states that "A patent shall be revoked by court decision: (…) b) If it does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art."

This technique may extend to generating genuine multinational firms; Biocon in India is a prime example. What is more, countries wishing to adopt an innovation policy may encourage the provision of these databases to their national businesses. Such a case is Morocco.

Practical example

BIOCON: HOW AN INDIAN FIRM HAS BECOME A WORLD LEADER THROUGH PATENTS

Biocon was established in 1978 by Mrs Mazumbar-Shaw, nicknamed the Queen of invention. Today this company is a leader in biotech and especially active in treating diabetes, oncology and autoimmune diseases.

In 1999, Biocon filed its first international patent application (PCT) on PlaFractor[43]. In 2004, it filed a patent application on Insugen with the Indian Intellectual Property Office (granted in 2010 - patent no. 239944).

According to Biocon's founder, IP was a key component in the company's growth and business strategy in its early days and remains strongly so now, with patents representing not only a source of information, but also a lever to monetize its research and create the attractiveness that helped the company develop partnerships.

I. PATENT DATABASES: AN ESSENTIAL SOURCE OF INFORMATION

IP Office databases containing published patent applications represented a key tool to determine the research fields focused on by Biocon.

As an illustration, Biocon studied IP databases to identify the main methods of human insulin production. The firm saw that many patents on insulin production processes were in force but the product itself was not protected.

By completing an exhaustive analysis of all patents on insulin production processes, Biocon saw, according to Mrs Mazumdar-Shaw, that *"almost all the patented processes used e-coli and baking yeast (...). At Biocon, we had expertise in another sort of yeast, and we had already licensed the intellectual property (IP) for it from a small company in the United States. So the way was clear. We started making our own insulin using Pichia yeast. This was a new and unique process, which wasn't covered by any of the*

43 PCT international application WO/2000/029544. A corresponding European patent was granted in 2005.

existing patents"[44]. The resulting product was introduced to market in India in 2004 under the name Insugen, and is now sold all over the world.

II. PATENTS: A TOOL FOR MANAGING PARTNERSHIPS

The development of Biocon was based on a policy of partnerships and technology transfers. The Biocon founder explains; *"Sharing IP is the way to develop business very fast in today's world."*

As an example, Biocon established a partnership with US firm Nobex, which using their respective technologies, enabled it to develop orally-administered insulin, for which a joint patent application was filed on 16 October 2008[45]. The two partners shared the market for use of the invention: Nobex claimed the USA and Biocon the rest of the world.

Another fruitful partnership was established with the Cuban Centre for Molecular Immunology, resulting in several co-owned patent applications, concerning a vaccine against cancer and medicines relieving the suffering of cancer patients[46].

88. Certain IP Offices of developing countries, such as the Moroccan Office, envisage their role as enabling local firms to protect their inventions with patents and identify existing technologies that they can use freely in their country.

44 http://www.wipo.int/ipadvantage/en/details.jsp?id=2602

45 International application WO/2009/050738: An orally administerable solid pharmaceutical composition and a process thereof.

46 International application WO/2015/011660: Methods for controlling fucosylation levels in proteins and WO/2015/011658: Use of a CD6 binding partner and method based thereon concerning the treatment and prevention of disease conditions.

Practical example

MOROCCAN INDUSTRIAL AND COMMERCIAL PROPERTY OFFICE (OMPIC)

Although patents are often perceived as a right of exclusion due to the monopoly of use they confer, they are also a source of information due to the description of the invention they contain, provided to be able to benefit from protection.

Being aware of this important source of information and knowledge, under the Horizon 2015 strategic vision, OMPIC set itself the mission of facilitating public access to technical and legal information, thereby contributing to the economic and technological development of the country.

This distribution of information involves the creation of a patent database that will enable the authorities not only to verify the novelty and prior art, conditions that the patent must satisfy to be granted, but which also enables them to assess the technological interest of patents and monitor technology trends in a field of activity, even analyse the future orientations of competitors. For more information, see the OMPIC website[47].

Therefore the OMPIC does not perceive itself as a simple filing office, but also as a stakeholder capable of contributing to the economic development of Morocco by supporting firms in their development and publishing legal and technical information for Moroccan businesses[48].

This original approach possibly explains the growth in the number of patent applications filed with the OMPIC, which receives over a thousand applications per year, with a 12% increase in the number of national applications in 2014 over 2013, bringing the number of national patent applications[49] to 353.

47 http://www.ompic.org.ma/en/content/patent-search

48 http://www.ompic.org.ma/en/content/missions

49 2014 annual report published by the Moroccan Office of Industrial and Commercial Property, p.10.

B. Patent databases: a source of identification of partners

89. As seen earlier, the patent is often insufficient to effectively develop a technology and know-how is often primordial. Indeed, the other interest of patent databases is to enable the identification of businesses active in each technical field, so partnerships can be created. The consultation of databases also enables enterprises to know, for each technical field and each technology, which businesses are active in research programmes, which own patents, etc. This preliminary step in the identification of potential partners is largely facilitated by being able to consult databases. Here we use an illustration from Nigeria to spotlight the often under-analysed importance of South-South transfers.

Practical example

COWS TO KILOWATTS: AN EXAMPLE OF SOUTH/SOUTH TECHNOLOGY TRANSFER

I. THE PATENT AS AN INFORMATION SOURCE: IDENTIFICATION OF A THAI PATENT BY A NIGERIAN RESEARCHER

The Cows to kilowatts project was established on the idea of providing a solution to the dangers for human health and the environment generated by abattoir waste. Indeed, in Nigeria, wastewater from abattoirs (in particular the Bodija market abattoir in Idaban) reached the water tables without being filtered, thereby contaminating the water supplies used by local populations.

To remedy these consequences, Nigerian engineer Joseph Adelegan (founder of the NGO GNEEDR: Global Network for Environment and Economic Development Research), in cooperation with two other Nigerian organisations, The centre for Youth, Family and the law and the Sustainable Ibadan Project, designed the Cows to Kilowatts project.

The solution consisted in recovering the gaseous emissions from the abattoir waste and converting them into a useful product. This process already existed. It had been developed by the research centre on waste use and management, operated by the King Mongkut's University of Technology Thonburi in Thailand. The Thai invention enabled the production of biogas by treating agricultural and industrial effluents in anaerobic fixed film reactors.

II. CREATION OF A PARTNERSHIP RESULTING IN THE FILING OF A PATENT APPLICATION

To a great extent, the design of the project to transform abattoir waste into an energy source and fertilizer (Cows to kilowatts) depended on the technology developed in Thailand.

This technology was protected by an intellectual property right, i.e. a patent.

Firstly, the publication of the patent in Thailand enabled the sponsors of the Cows to kilowatts project to be informed of the existence of a technology needed to implement their project.

Then a partnership agreement was signed between the sponsors of the Cows to kilowatts project and the King Mongkut's University of Technology Thonburi in Thailand.

Lastly, after this agreement was put in place, a joint patent application was filed for the new process of transforming the abattoir waste.

So on one hand the technology transfer (from Thailand) enabled Nigeria to remedy the unfavourable consequences of dispersing abattoir waste in the environment and on the health of local populations. It also enabled the supply of quality, low-cost energy to the Nigerian people. And on the other hand, this technology transfer enabled Thailand to export its technology while improving it and adapting it to other situations.

C. Patent databases: a source of progressively optimised information

90. In practice, the difficulty is that consulting a patent database is sometimes a complex process. The challenge currently taken up by several IP Offices is to make searching these databases a much easier activity.

The ease of searching for information about each technology is much more important for SME and businesses in developing countries which have more limited means to carry out prior art searches and freedom-to-operate searches.

Moreover, dynamic enterprises active in environmentally sound technologies are sometimes small in size yet their importance is growing. The Chatham House think tank analysed patents from six energy categories: wind, photovoltaic, CSP, biomass, carbon capture, clean coal[50]. The findings clearly showed that multinationals own the majority

50 B. Lee, L. Lliev and F. Preston, *Who owns our low carbon future? Intellectual property and energy technologies*, Chatham House, September 2009.

of the patents in the six fields. But SMEs are sometimes very dynamic; in the wind power field, 5 to 10% of patents are owned by SMEs[51].

91. Furthermore, this information is all the more important that many environmentally sound technologies are now in the public domain. An analysis of the 30 most often cited US patents in the green energy field shows that the majority of them have become freely available to the public[52]. It is therefore crucial for economic agents to clearly distinguish the technologies protected by a monopoly of use from those that are free to use, in order to orient their research efforts.

92. In the field of environmentally sound technologies, an additional issue resides in the fact that these technologies cannot be attributed to any of the traditional categories of classification[53]. The traditional classification system is in fact based on a scientific and technical approach. But the field of environmentally sound technologies brings into play a great many different techniques. The result is that the source of information is scattered.

Moreover, most of these technologies appeared after the creation of the tradition classification system in the 1960s. Consequently, it was delicate for a business to determine with certainty, for a given environmentally sound technology, which patents had already been filed and which inventions were already free to use without the need for a licence. This was a barrier to investment, in particular for SMEs.

93. So to remedy this issue, in May 2010 the European Patent Office (EPO) announced the publication of a new online database dedicated to environmentally sound technologies (Climate Change Mitigation Technologies – CCMT)[54].

This highly ambitious project consisted in created a new class, "Y02: Technologies or applications for mitigation or adaptation against climate change"[55], which contains the patents filed in the various fields of green technologies. Currently the database has two main entries:

- Y02C: greenhouse gases - capture and storage / sequestration or disposal
- Y02E: greenhouse gases - emissions reduction technologies related to energy generation, transmission or distribution

These two classes contain approximately 200 sub-classes. The database itself contains approximately 600,000 patents relating to clean energies, selected from

51 Ibid, p.13-14, 17.

52 Ibid, p. 48. J.H. Barton, "Intellectual Property and Access to Clean Energy Technologies in Developing Countries", WIPO Magazine, February 2008, p. 6.

53 To facilitate the consultation of databases, a code is assigned to each category of invention.

54 The database has been accessible to the public since 9 June 2010. UNEP, EPO, ICTSD, Patents and clean energy: bridging the gap between evidence and Policy (final report), 2010, p. 64 s.

55 "Y02: Technologies or applications for mitigation or adaptation against climate change."

the 70 million documents referenced by the EPO. What is more, the database contains all the patents published not only by the EPO and the large IP Offices of developed countries, but also by the Offices of China, Brazil, India, Mexico, amongst others.

94. For a given clean technology therefore, this database offers very rapid access to all the related patented inventions from around the world.

The creation of this database also presents other benefits. Firstly, it contributes to the emergence of a common vocabulary for each clean technology that is likely to make the work of applicants easier, as it would for all the players in these fields. Secondly, this database may foster closer cooperation between the owners of complementary patents, cross-licensing, cooperative projects, bilateral or multilateral research projects, and more, subject to capitalising the know-how.

Observation no. 8
Patent databases are becoming a primordial source of information, particularly for developing countries who know how to obtain the appropriate capacities to analyse and make use of the patents. This tool remains under-utilised yet supplies top-quality information both on existing technologies that are often free because unprotected, and on potential partners.

1.3. RECOMMENDATION: SOUTH COUNTRIES NEED TO ANALYSE, ESTIMATE AND REPORT THEIR NEEDS MORE EFFECTIVELY TO USE EXISTING TOOLS

95. Although patents supply a primordial source of information on existing technologies and their owners, they are not intended to provide information on the needs of companies and countries.

Yet, for a technology transfer to take place, it is obviously indispensable that the originators of the technologies are aware of the needs of developing countries and (A) identify potential partners, and (B) vice-versa that recipients invest in a long-term trajectory.

A. Initiatives to report the needs of developing countries in terms of environmentally sound technologies

96. In the field of technology transfers, the level of knowledge of these needs is often considered as woefully insufficient. The result is a loss of opportunities for the owners of technologies to develop new markets and a lost chance for recipients to benefit from technology transfers.

This difficulty has been known for several years. Certain initiatives are currently attempting to remedy the deficit of information on the needs of developing countries.

An example in France is the Ademe International club that brings together businesses involved in the field of energy and environmentally sound technologies. The club proposes that its members meet foreign partners to ensure the fluidity of exchange of information. It also passes on calls for tenders issued by foreign countries.

Moreover, WIPO has also launched a highly ambitious online platform where recipient countries and enterprises can register their needs: WIPO Green.

Practical example

WIPO GREEN: THE AMBITION TO CREATE A WORLDWIDE MARKET FOR CLEAN TECHNOLOGIES

The essential tool of the WIPO Green programme is an online platform providing public and private stakeholders throughout the world with information on the environmentally sound technologies available on the market and the needs expressed in this field. The aim is to create a worldwide network to foster collaborative work and support the emergence of a market for clean technologies.

Access to and use of the WIPO Green database are regulated with as few restrictions as possible. So access to the database is unlimited and users can consult summaries of the technologies on offer and view needs expressed by future recipients. However, users must register both to gain access to the full descriptions of offers and requests, and to submit offers or requests for clean technologies.

In practice, to submit a technology to the platform, its owner must complete an online form with a brief description of the technology proposed and the conditions of its transfer. Offers must respect three conditions:

1) Firstly, the technologies proposed must be environmentally sound. WIPO uses the definition of clean technologies provided by the Agenda 21 action plan adopted at the Rio Earth Summit in June 1992: *"Environmentally sound technologies protect the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they were substitutes"* (article 34.1). This definition is very broad. The submitting party must provide a brief explanation of the environmental benefits of their technology.

2) Then the essential element of the WIPO Green programme is that enterprises must propose technology transfers in conditions that enable the installation and then the efficient operation of the facilities. To this end, enterprises undertake to propose a global offering including all suitable elements: patent licences, transmission of know-how, prior analyses, training programmes, etc.

3) Lastly, enterprises wishing to propose technology offerings must pay an annual fee to WIPO. However at this time the fee is not applied in order to encourage owners of technologies to register them on the platform. Stakeholders are therefore advised to benefit from this initial period to submit their offers.

WIPO remains neutral in the negotiation of projects and collaborative work. It does not intervene at any moment; the parties themselves are responsible for the negotiation and performance of any cooperative agreements. An important point for enterprises is that technology owners don't offer their technologies up for free, or under reasonable conditions, even if this is the whole idea of the programme. The desire of WIPO is to develop the most flexible programme possible, in order to attract the most owners of environmentally sound technologies possible.

The current issue for WIPO Green is that stakeholders in developing countries register their needs on the platform. This is why WIPO Green is conducting a major publicity campaign in these countries to raise awareness of this new tool intended to make the flow of information between originators and recipients more fluid.

Practical example

THE UNIVERSITY OF SAN CARLOS IN THE PHILIPPINES : AN EXAMPLE OF THE USE OF PATENTS BY A PHILIPPINE UNIVERSITY

I. USE OF PATENTS BY PHILIPPINE UNIVERSITIES THROUGH COOPERATION WITH WIPO

Established in April 2009, the WIPO Technology and Innovation Support Centre (TISC) or Innovation and Technology Support Office (ITSO) programme aims to enable inventors in developing countries to gain access to local high-quality information services in order to protect and manage their intellectual property rights.

In practice, this programme enables its members to benefit from access to online patent resources, support in researching technologies, remote or on-site training, support in researching the patentability requirements and information about laws, management and strategies in the field of industrial property and the commercialisation of the technology.

Programme members are national IP Offices, universities, research centres, etc. Many countries make use of this programme, including Morocco, the Dominican Republic, Algeria, Nigeria or the Philippines.

It is in part thanks to this programme and to support from its national IP Office, the Intellectual Property Office of the Philippines - IPOPHL), that the University of San Carlos (USC) changed its perception of industrial property and adopted new practices to protect its inventions. The change was summarised by Mr. Danilo B. Largo, Director of the Office of Research of the University of San Carlos: *"patent, publish, profit"*, as demonstrated by the patented inventions of Dr. Evelyn Taboada, researcher at the University's College of Engineering and Director of the USC chemical engineering department (BioPERC).

The Bureau was created in March 2013 to support innovation and technology at USC. It was the first to file two patent applications under the IPOPHL's patent protection plan.

II. UNIVERSITY OF SAN CARLOS: A FIRM EXAMPLE OF THE MONETIZATION OF INVENTIONS THROUGH PATENTS

In the province of Cebu where the USC is located, local authorities are faced with the issue of treating wastewater from mango transformation plants (10% of all solid waste).

Research work has been undertaken by BioPERC, demonstrating that mango rind could have beneficial effects on health. So a new process was developed to extract the beneficial substances and transform them into a high-value product.

Patent applications were filed for these inventions at the IPOPHL on 22 March 2012 then an international patent application was filed under the Patent Cooperation Treaty (PCT) system in 2013[56].

To monetize its patents, the University struck a partnership deal with a local financial backer to create a start-up, Green Enviro Management Systems (GEMS) Inc, to which the USC granted an exclusive licence to use the process and manufacture products for multiple uses, especially in the food industry, pharmaceutical or energy sectors.

Non-exclusive sub-licences were then granted to other companies in other regions of the Philippines that were experiencing similar problems with their wastewater treatment.

These patents and licences generate additional revenues for the University and its researchers. Above all, this new policy offers the USC a stronger image and a better position to negotiate the commercialisation of its technologies with private stakeholders, as its knowledge assets are now protected by a legal monopoly.

Observation no. 9

In terms of clean technologies, several initiatives intend to enable recipient countries to declare their specific needs. Both public and private entities in developing countries should use the WIPO Green platform.

Recommendation

IP Offices should pursue their efforts to simplify and optimise patent databases to make them accessible to the greatest number of parties possible.

Furthermore, stakeholders involved in supporting development, in particular development agencies, should learn to use these databases to identify existing technologies and to encourage recipients to declare their needs, and improve the effects of their aids.

56 Product patent: *"Preparation of pectin and polyphenolic compositions from mango peels"* filed on 26 September 2009, PCT/PH2013/000009, WO/2013/141723. Process patent *"Integrated processes for the treatment of mango wastes of fruit processing and the preparation of compositions derived thereof "*, filed 29 September 2009, PCT/PH2013/000008, WO/2013/141722.

B. Long term trajectories

97. Certain technology programmes are genuine successes due to constant support and technical assistance, know-how and in the end, the monetization of patents. This is the case of Brazil and its activity of converting sugar into bioethanol. Before describing the process, let's briefly look at the controversial 'sustainable development' character of this activity. It is true that the development of this petrol alternative over the last 3 or 4 decades has caused deforestation of much land. In exchange it has helped diversify agricultural revenues. Above all, recent generations of technology mainly use the residue of sugar production (bagasse, mostly biomass) and no longer use the 'food' part of the production (little biomass). Moreover, the inversion of the main product and the by-product has enabled the relocation of plants nearer to waterways, making them more gravitational and more energy-efficient: this industry has been totally turned upside down under national efforts.

Now this information is stated, what about the process: initially, technologies were imported in the 1970s then appropriated locally. As an example, industrial firm Dedini became a world leader with a presence mainly in Brazil due to weak efforts to commercialise the products on export markets. Molasses distillation towers were developed on sugar production plants, followed by cane juice distillation plants, essential to the production of ethanol. In the 1990s, the industry suffered a deep crisis due to the regulation of the country and the structural adjustment measures adopted by the IMF, with the end of subsidies in particular. Industrial firms had to reorganise to become more competitive and sent technicians to train in France and South Africa, at the time world leaders in sugar production. They used the best South-African international consultant to update their production, fermentation and sugar extraction techniques in the production plants. The increase in yields enabled the Brazilian bioethanol industry to become the world's leading international producer. This phase was clearly one of acquisition of know-how, based on clearly-identified needs.

The next phase: Brazil developed its own technology innovations, on one hand in factory technologies (private sector innovations), technologies of use (100% ethanol engine, flex engine in 2003, public-private partnership innovations) and lastly agricultural technologies (creation of cane varieties with high fibre/sugar yield - private sector innovations). The latter phase was a spectacular one for filing patents. The same strategy is available to other developing countries.

98. Ethiopia built three large sugar plants in the 1980s based on 'turnkey' technology imports. Then in the 2000s these facilities were modernised – the process is still ongoing – to increase the production capacities and yield of the factories. The technology imports targeted several countries: Thailand, Australia, Turkey, etc. The installation of distillation

towers to produce ethanol from the residual molasses[57] is a turnkey technology import. However, Ethiopia has innovated on the market for end usage: it has created household ovens powered by ethanol to adapt its production of ethanol to local usage (replacing the coal-fired ovens used by 80% of the population).

99. Today, Morocco has also initiated an active policy of acquiring know-how and generating local innovations suited to the needs of its population, in several fields such as healthcare or energy.

Observation no. 10
The development of competitiveness clusters is often achieved through initiatives of the public authorities which set up and support private stakeholders. Detecting the real and specific needs of enterprises is an essential factor in their success. This tool is accessible to South countries (also remember that the concept and practice emerged first in Brazil).

The MAScIR foundation (see following pages) illustrates this long-term trajectory initiated in these fields by Morocco.

57 Residue of sugar production, using a different technology than Brazil where the cane juice is fermented and distilled into ethanol instead of being crystallised into sugar.

Practical example

MAScIR: THE ROLE OF PUBLIC AUTHORITIES IN THE DEVELOPMENT OF INNOVATION CLUSTERS AND THE USE OF PATENTS TO PROTECT INVENTIONS

The Moroccan Foundation for Advanced Science, Innovation and Research (MAScIR) is a not-for-profit public establishment founded in 2007 with the following missions: *"the two main missions of MAScIR are to conduct scientific research to generate intellectual property, to generate patents, and to support Moroccan industry so it can become more innovative, stronger and more competitive"* (Ahmed R. Chami, former Minister for Industry, Commerce and New Technologies)[58].

The MAScIR foundation is a firm example of the successful approach to structuring innovation and research adopted by Morocco.

On the social level, the foundation only recruits Moroccan researchers and engineers, to create job opportunities. Today over 60 researchers work at the foundation. The work of the MAScIR foundation aims to meet specific needs in fields such as energy, the environment and health.

The foundation operates a commercialisation department responsible for the implementation of the strategy for commercialising the results of its research activities. This department is also responsible for patent applications. Over the last five years, MAScIR has filed 75 patent applications and published over 280 articles in trade journals.

I. HEALTHCARE

Based on the fact that breast cancer is the leading cause of female mortality and that in Morocco, it affects over 15,000 women each year, MAScIR developed a project to produce prototype breast cancer diagnostic kits that were more reliable, faster and cheaper, in order to make them accessible to rural populations.

Through this project, the foundation filed a patent application with the Moroccan Office of Industrial and Commercial Property (OMPIC) on 27 December 2012, extended by filing an application under the Patent Cooperation Treaty (PCT) on 3 July 2014[59].

58 December 2011 press conference held to present the scientific and technological advances made by the MAScIR foundation. *"We ensure that the research and production are carried out by Moroccan researchers and engineers. We don't want to buy ready-made solutions, we want to develop our own"* explains Mohamed Lasry, speaking to L'économiste magazine: http://www.leconomiste.com/article/895997-un-nouveau-brevet-pour-produire-du-biocarburant-3g

59 International publication number: WO 2014/104867 A1.

The patent concerns the use of new probes and primers to detect and quantify the expression of the HER2 gene, which is the overexpressed gene in cancer patients.

This patent represents an improvement to former methods used to quantify the presence of the HER2 gene, traditionally done via immunohistochemistry (IHC)[60] or using fluorescence in situ hybridisation (FISH), both of which were too long and too costly.

II. ENERGY

Conscious of the fact that the high dependency of the world economy on fossil fuels makes it vulnerable to the scarcity of reserves and an environmental catastrophe, Morocco, a country where oil resources are scarce, has decided to investigate the development of renewable energies.

Among the alternative solutions to fossil fuels, the MAScIR foundation has oriented its research to an algae-based biofuel.

To increase the production yield of algae, the foundation developed a process for which a patent application was filed at OMPIC on 28 June 2013, now extended via an international PCT[61] application.

According to the description of the published invention, the process makes it possible to: *"recover microalgal biomass quickly and passively, requiring little energy and without the step of centrifugation or filtration [...]. This offers a system for cultivating microalgae that is advantageous and applicable on a large scale for the biofuel application and others."*

Patenting the process enables MAScIR to send a signal to the market that it is a pillar in this research field, and to attract potential investors or industrial firms interested in the process which is the subject-matter of the patent application, with the view to commercialising the results of its research.

60 Which consists in colouring the overexpressed protein on the cell surfaces in order to study the level of expression of the HER2 receptor.

61 PCT application claiming priority from Moroccan patent MA2013/000020.

2
TRADEMARK RIGHTS: a growing role in sustainable development

100. Distinctive signs enable enterprises to differentiate their products and services from those of their competitors[62]. They also offer consumers a guarantee on the origin of a product. Trademarks have become an essential asset, because by using communication and marketing, a business can use its trademark to convey messages on the intrinsic qualities of its products. A trademark that has a positive image will help commercialise products under the best possible conditions, i.e. increase sales and/or prices.

101. In the effort to generate sustainable development in developing countries, trademarks play an underestimated role. Their role is nonetheless double: for originators, trademarks can secure technology transfers in many scenarios (2.1). Secondly, when used by developing countries, trademarks help derive value from products and technologies in the home country and on export markets (2.2).

2.1. TRADEMARKS: A TOOL FOR PROTECTING INVESTORS ON A NEW MARKET

102. We must point out that a firm that authorises another to use its own trademark is taking a certain risk, because any difficulties encountered by the local partner (defective quality, etc.) may resurge on its own market. It is for this reason that originators sometimes prefer not to grant a licence to use their trademark to third parties and file other trademark applications for markets where they don't fully control the production and distribution process.

But even if a specific trademark is registered for a new market, a trademark licence can be useful to manage the technology transfer. For two reasons:

- On one hand, like the patent, the registered trademark confers a monopoly of use of the sign, so that the licensee is the only party authorised to use the trademark by affixing it to its products and services. And if the trademark acquires a certain reputation, this guarantees a significant competitive advantage.
- On the other hand, the trademark licence also enables more effective control over the conditions under which the local partner will develop and commercialise the technology. Indeed, even in the absence of a patent and assuming that the local partner becomes autonomous in relation to the trademark owner, it will often be in the partner's interest to continue benefiting from the trademark licence. This phenomenon is all the more important if the trademark has acquired a certain degree of reputation and the trademark is important for clients (B2C market).

62 See above, pp. 21 and 22.

So for originators, the need to protect their trademarks on all markets is even more essential than for patents.

As an example, Nutriset used both patents and trademarks to secure growth on new markets with local partners.

Practical example

NUTRISET: AN EXAMPLE OF TECHNOLOGY TRANSFER BY LOCAL PRODUCTION IN SOUTH COUNTRIES

I. SPECIFIC DETAILS OF NUTRISET

Nutriset is a French company that excels in the identification of innovative nutritional solutions to treat and prevent malnutrition in vulnerable populations. On average, 3% of its annual turnover is devoted to research and development. In 1993, Nutriset was the first company to produce ready-to-dilute therapeutic milks, F-100 and F-75, intended to treat severe acute malnutrition. In 1996, in cooperation with the French Institute of Research for Development (IRD), the company invented the first Ready-to-Use Therapeutic Food (RUTF), Plumpy'Nut, which was credited with revolutionising the handling and treatment of severe acute malnutrition. The firm is also behind the first ready-to-use food supplements used to prevent malnutrition (RUSF, LNS). Nutriset mission is to contribute to the nutritional autonomy of the countries most affected by malnutrition, by making its products ever more accessible. Nutriset works closely with humanitarian organisations, UN agencies and ministries of health.

II. INTELLECTUAL PROPERTY AND TECHNOLOGY TRANSFERS: THE EXEMPLARITY OF NUTRISET

Nutriset uses patents (co-owned with the IRD) as an instrument to support the development of South countries and to facilitate access by local partners to innovative technologies. This approach is justified by the fact that the South countries most affected by malnutrition have insufficient capacities and possibilities to undertake the research needed to remedy their difficulties. For Nutriset the question is therefore to enable access to the technological processes resulting from their research for entities located in South countries. So the requesting structures may either integrate the PlumpyField franchise network, or obtain the right to use the technologies through a simplified system. PlumpyField is a network of producers that manufacture products developed by Nutriset, thus promoting technology transfer to South countries.

Commercial success of franchisees ensured by the trademark

Nutriset has not applied for patents in all member states of the PlumpyField network; this is particularly the case of India and Haiti. Yet despite the absence of patents in these countries, Nutriset franchisees successfully produce and commercialise the company's products. This is explained by the reputation acquired by the Nutriset trademark and in particular by the Plumpy'Nut trademark. This reputation, a genuine guarantee of the quality of the products, has also been a determining factor in the commercial success of other franchisees.

Observation no. 11
For businesses investing on new markets, the trademark is often the most important asset to protect. A trademark protection system is therefore highly useful and efficient to attract originators to the markets.

2.2. TRADEMARKS: A SIMPLE AND EFFECTIVE TOOL AVAILABLE TO ALL DEVELOPING COUNTRIES

103. For developing countries, the law of distinctive signs and particularly the law of trademarks are often their first contact with intellectual property. Trademarks are indeed much more accessible than patents, for several reasons. On one hand, distinctive signs are not affected by technology barriers. Indeed, a trademark can present a utility for any product or service, whether agricultural, manufactured, high-tech or not. On the other hand, the cost of protecting a trademark is much lower.

104. Nevertheless, we must admit that until recently, protection by distinctive signs was not used sufficiently by developing countries.

This was particularly true in the agricultural sector. Many developing countries are producers of agricultural products with worldwide reputation (cocoa, coffee, fruits, etc.). Yet for too long these countries omitted to use trademark law to ensure the qualities of their products were known and recognised on the world market, and turn them into a sales argument to Western consumers.

The situation could change rapidly, in the wake of several successful cases where local players (farmers, etc.) were able to derive a direct and significant economic advantage from a communication policy focusing on trademark rights, not only on their domestic market, but also on their main export markets.

105. In practice, several different distinctive signs are available to developing countries that pursue an export market growth policy, notably for agricultural products: the trademark, the collective trademark (a special kind of trademark), or the geographical indication.

106. The choice of the most appropriate protection is dictated not only by legal considerations, but also pragmatically in order to identify the most flexible and most suitable model for the social and economic conditions of the producers. It is for this reason that the systems applied in developed countries are not always transposable.

107. Several successful cases illustrate the variety of uses of the rights attached to distinctive signs by stakeholders in developing countries:

- The trademark applied for by a company to protect organic fertilizers in Madagascar;
- An international and large-scale trademark filing policy to protect Ethiopian coffee;
- Geographical indications to protect argan oil in Morocco, or bananas from Costa Rica (B).

The results in terms of image and revenue are often significant and rapid.

Lastly, one sign has a special place in relationships between originators and recipients: labels or ecolabels often filed as trademarks, and which guarantee the qualities of a product (C).

A. Trademarks: a tool for enhancing the value of products from developing countries, both on international and domestic markets

Practical example

GUANOMAD SA:
TRADEMARK OF A MALAGASY COMPANY,
A MARKETING TOOL ON ITS
HOMEAND EXPORT MARKETS

Over the past years, Madagascar has experienced several environmental issues including soil deterioration, poor crop yields and polluted ground water. Yet the population is mostly rural and subsists through agriculture.

The aim is to reconcile agriculture and respect for the environment, which requires clean, organic fertilizers that contribute to regenerating soils but also affordable and yield-enhancing fertilizers.

Guanomad SA, founded in 2005 by Mr. Rajaonary, aims to supply affordable organic products to the country's farmers by using bat droppings (several dozen species live in Madagascar and are endemic to the island).

The company built a vast portfolio of trademarks based on the word Guano, symbol of its identity, by registering over thirty trademarks including Guanomad, Guanostar and Guanoferti-P Guanomad at the Malagasy Industrial Property Office (OMAPI).

"Guanomad", the company's main (semi-figurative) trademark, is the main element on which its marketing and commercial strategy for product sales on the island through almost 200 distributors and for exportation to the European Union and Africa is based. It is registered using the Madrid system administered by WIPO to ensure its protection in other countries[63].

Faced with a weak domestic market due to the poverty rate, the company Guanomad targeted the export market, where its trademark enabled it to identify its products, which also obtained certification from control bureau Ecocert, for the organic production method and the dropping extraction methods used by the company.

This guarantee of quality enabled the company to gain a position on the market for organic fertilizers aimed at a growing number of farmers, both in Madagascar and other counties, concerned about environmental matters.

The use of intellectual property and in particular trademark law is of strategic importance for Guanomad, as it enables to affirm its identity and register assets, as according to Mr. Rajaonary "these days, your trademark is your stock in trade"[64].

63 Trademark No. 1177658 - registered on 25 July 2013.

64 http://www.wipo.int/ipadvantage/en/details.jsp?id=3684

Practical example

ETHIOPIAN COFFEE: THE TRADEMARK AS AN INSTRUMENT TO ENHANCE THE VALUE OF SOUTH COUNTRY PRODUCTS

Coffee is one of the most widely sold products in the world. Its production is the principal activity of around 15 million people in Ethiopia. In this East African country, coffee generates around 60% of export revenues. Some coffee brands such as *Harrar, Sidamo* and *Yirgacheffe* are grown in Ethiopia. However, the majority of the profits generated by the coffee produced in Ethiopia were shared between the distributors and the trade intermediaries. Only 5 to 10% of the sale price actually came back to Ethiopia. So to reduce the difference between the retail sale price and the share received by the producers, the Ethiopian government introduced a policy to derive more value from Ethiopian coffee. To this end it made use of intellectual property. Although intellectual property rights contributed to deriving more value from Ethiopian coffee, the choice of the IP right most suitable for local realities was made after a few tentative efforts.

I. ETHIOPIAN COFFEE: CHOOSING BETWEEN TRADEMARKS AND GEOGRAPHICAL INDICATIONS

Under the Ethiopian approach to use intellectual property to derive value from locally-produced coffee, the idea was first to register a geographical indication for each coffee. This avenue was justified by the fact that several coffees produced in Ethiopia bear the name of their region of production.

A geographical indication or indication of source is a distinctive sign that informs the consumer of the geographical origin of a product. When the sign is protected, it is referred to as a protected geographical indication (PGI). This may be the name of a region, a specific location or a country. It may serve to designate an agricultural product or a food product originating from the designated geographical area. It is distinguished from the Appellation of Origin insofar that for the geographical indication to be protected, the requirements concerning the link with the geographical area of the product are less strict.

Ethiopia decided not to register geographical indications to protect locally-produced coffee. This was justified by the fact that the coffees produced are of different varieties and have special qualities, and that the introduction of a certification scheme would have been difficult and costly. Indeed, the fine coffee selected in Ethiopia is grown on many different small parcels of land tended by independent planters. And although Ethiopian coffees such as *Sidamo* and *Harrar* bear the name of specific regions, they are not all produced in the same region nor under the same conditions. For these

reasons, the Ethiopian government chose to protect the commercial origin of locally-produced coffee by registering trademarks.

A trademark is a sign capable of being represented graphically and capable of distinguishing the products or services offered by a person. More simply put, a trademark is a sign used in commerce to enable economic agents to distinguish their products or services from those of competitors. When the sign is registered with an Intellectual Property Office, a property right (or exclusive right) is granted to its owner for a determined period that is indefinitely renewable.

This intellectual property right was considered to be the best way of protecting the varieties of coffee grown in Ethiopia. Indeed, it grants the Ethiopian government the exclusive right to use and grant licences to use trademarks associated with the coffee products.

Once the trademark was decided as the appropriate tool for protecting the coffees produced in Ethiopia, the Ethiopian Intellectual Property Office (EIPO) filed applications to register the names *Harrar, Sidamo* and *Yirgacheffe* as trade marks on the main coffee markets. This was the case for the USA, Japan, the European Union and Canada. The registration of these trademarks in the USA was not an easy matter. It was only after an initial refusal and a long conflict that the US Patent and Trademark Office accepted to register the Ethiopian trademarks.

II. REVENUE CREATED BY INTELLECTUAL PROPERTY RIGHTS

After registering its coffee trademarks, Ethiopia set up a free licensing system. For the government, it was intended to promote the visibility of its coffee on international markets, in order to encourage higher export prices. Over time, Ethiopian coffee trademarks gained a large popularity on international markets. The consequence was higher prices for coffees produced in Ethiopia. The commercial results of the registration of Ethiopian coffee trademarks changed the lives of local producers. Before intellectual property rights protected its products, Ethiopia received barely 6% of the final retail price of its coffees. But since the protection was put in place, the income of growers of *Yirgacheffe* coffee for example, doubled in 2007 compared to 2006. The gain in value is estimated at $8 per kilo. Globally speaking, prior to the introduction of intellectual property protection, coffee exports amounted to $400 million, and since this trademark policy was introduced, exports are expected to reach $1.6 billion.

B. Geographical indications: a tool for enhancing the value of products and developing a geographical area

108. As seen before, a geographical indication is an intellectual property right that protects a distinctive sign designating a location from where a given product (usually agricultural) originates[65].

The geographical indication offers several benefits:

— It provides a broad protection;
— Usually a geographical indication is recognised in the other member states of the WTO without any other filings needed;
— It serves to strictly define the geographical area of production of a product and the conditions of production. The guarantee of quality for the consumer is therefore firm, which often results in the sale prices of these products rising.
— Lastly, a geographical indication provides a structure for production and can federate a population. But there may be a risk of tension when the geographical area of production is defined. If this risk is too high, it may be wiser to prefer the use of a trademark, for example a collective trademark.

For agricultural products, several successful examples show that the geographical indication serves to generate direct and sometimes substantial benefits for the inhabitants of a region. This is notably the case for argan oil in Morocco and bananas in Costa Rica.

65 Cf. supra, pp 20 and 21.

Practical example

ARGAN OIL: THE GEOGRAPHICAL INDICATION AS A DRIVER FOR SOCIAL AND ECONOMIC DEVELOPMENT

I. ARGAN OIL, A TRADITIONAL MOROCCAN PRODUCT WITH INTERNATIONAL RENOWN

The argan tree, a thorny tree the fruit of which are used to make argan oil, is endemic to Morocco. The oil is used in cooking, cosmetics and alternative medicine. For the regions that produce it, this oil is important economically but also socially as tradition dictates that the oil is extracted and prepared by Berber women.

Since 1996, to safeguard this traditional activity and sustain the social and economic development of rural regions, women have created cooperatives that ensure a regular income for over 4,500 of them.[66]

This income is a driver of independence for the women but also of the development of rural regions. Moreover, certain cooperatives use the profits earned to finance female literacy and children's schooling projects.

In 1998, the importance of the argan tree was recognised by UNESCO - the United Nations Educational, Scientific and Cultural Organization - when the South-West region of Morocco became a biosphere reserve under the UNESCO's Man and the Biosphere Programme.

II. PROTECTING ARGAN OIL WITH A GEOGRAPHICAL INDICATION: A TOOL TO ORGANISE PRODUCTION AND A MARKETING TOOL

Due to its scarcity (between 5 and 6 argan trees are needed to make one litre of oil) and its cost, argan oil was for many years subject to competition from adulterated oils sold in the Souk markets and tourist locations. What is more, when oil was exported to Europe, although inspected in terms of quality by accredited laboratories to ensure its authenticity, this verification gave no indication of the production process.

This role is now ensured by the protected geographical indication[67].

Prior to the cooperatives obtaining the geographical indication (PGI), the majority of argan oil exports were operated by private companies who did not use the traditional

66 *Le marché de l'huile d'argan et son impact sur les ménages et la forêt dans la région d'Essaouira*, Bulletin d'information et de liaison du PNTTA, No. 175, published by the Moroccan Ministry of Agriculture and Sea Fisheries in April 2009.

67 Approved on 27 April 2009 pursuant to Moroccan Law 25-06, promulgated in May 2008, on distinctive signs denoting origin and quality of agricultural and fishery products. In the European Union, argan oil is the first African product to benefit from this protection.

know-how of Berber women. The PGI provides a guarantee on the origin, and the production and processing conditions of argan oil. It also informs the consumer of the region where the oil was produced and processed, distinguishing the oil extracted and processed using traditional know-how from other oils.

Indeed, with its production specification and verifications for operator certification, the PGI imposes standards concerning traceability, product quality and identification at all stages (picking, collection, drying, crushing, production and packing).

Lastly, the name 'argan oil' is protected to sustain the exclusive nature of the oil and promotes the display of products under a unified and internationally recognised name.

Practical example

BANANAS FROM COSTA RICA: GEOGRAPHICAL INDICATIONS AND RURAL DEVELOPMENT

In terms of volume, the banana is the most exported fruit around the world. The fruit is rich in nutritional qualities, feeds millions of people and ensures jobs for a large part of the Costa Rican population. However, its market value varies according to fluctuations on international markets, weather conditions, diseases affecting crops, etc., which makes it difficult for exporting producers to ensure sufficient and regular revenues.

In order to increase their visibility and strengthen their international market position, Costa Rican banana producers joined forces to create corporations. The largest in the country, state-owned *Corporación Bananera Nacional (CORBANA)*, introduced a genuine strategy to promote and commercialise bananas by creating a portfolio of trademarks and making successful use of the geographical indication.

Aware of its know-how[68] and the incomparable taste of its products, the corporation used the geographical indication to establish a link between the products, the traditional know-how used, the resulting quality and their location of origin.

In 2010 'Banano de Costa Rica' became the first geographical indication to be registered in the country and in South America, at the National IP Office of Costa

68 In accordance with Costa Rican tradition the banana tree must be cut at mid-height and the fruit cut from the tree using a machete so that the tree can produce new fruits nine months later. This know-how enables the tree to produce several crops in a year, which it would not do otherwise.

Rica[69]. The appellation is also protected under the Lisbon system for the international registration of appellations of origin administered by WIPO[70].

The registration of a geographical indication enables the Corbana corporation to promote its export products, notably in the European Union, where it is considered a guarantee of quality, giving producers a competitive advantage because their products are recognised as being of higher quality than others due to the general specification associated with the geographical indication which defines the conditions which must be respected to benefit from the right to affix the indication on products.

This guarantee of quality also enables producers to combat competition from other countries that sell large volumes of bananas at low prices, and the banana corporation to sell its products at a comparatively higher price on the international market due to the guarantee provided by the geographical indication.

Due to the increase in exports, rural communities in Costa Rica have switched to growing bananas[71] and have raised their revenues, with a salary above the national average $16 per day) but also higher than that received by other producers in the region who have not received approval from the Corbana cooperative to use the *"Banano de Costa Rica"* appellation.

C. Ecolabels: a tool for creating value and for technology transfer

109. Labels or ecolabels are signs whose function is to provide information on a particular quality of a product, for example its environmentally virtuous character. Ecolabels are not covered by a general legal definition under an international convention nor under French law. Moreover, there is no general legal system applicable to labels, unlike trademarks. In reality, ecolabel law is currently under construction[72].

110. Ecolabels can be classified in three categories:
- Official ecolabels, verified by public or para-public, not-for-profit bodies.
- Private ecolabels, owned by private for-profit companies but whose organisation is similar to official ecolabels due to the independence of the organisation defining the specification and granting the right to use the label, in relation to the company that affixes the ecolabel to its products.

69 Registration No. 202307 registered on 03 August 2010.

70 Banano de Costa Rica, number 900, publication No. 40, January 2012. Registration for the whole of the territory of the Republic of Costa Rica.

71 In 2012, this industry employed 45,000 people directly and 100,000 indirectly, which contributed to the economic development of essentially rural and low-income regions.

72 The International Organization for Standardization (ISO) has published a series of standards (ISO 14020 to ISO 14025), the purpose of which is to define the conditions for high-quality communication on the environment by economic agents.

Voluntary declarations represent information supplied by a company about its own products outside of any ecolabel system. These signs are the most numerous. They are also the most disparate, because although certain companies use them as part of an overall policy to improve the environmental quality of their processes and products, others use them simply for marketing purposes, occasionally deceptively.

111. In certain scenarios, ecolabels can play a major role in technology transfers. The ecolabel PEFC ('Programme for the Endorsement of Forest Certification') is a prime example.

The aim of this ecolabel is to preserve forest resources by delivering a certificate for products or companies that deploy a sustainable forest management approach.

This ecolabel was filed as a collective trademark and is held by a Swiss association which via a network of local certification bodies, grants the right to affix the label to companies whose products (or the company itself) comply with the specification or reference document.

In practice, a substantial part of the wood used by industrial firms in developed countries (furniture, paper, etc.) is produced in developing countries. So to receive the certification, industrial firms must convince their suppliers to implement a policy to ensure sustainable management of their forestry resources, possibly by transferring a part of their know-how in the field.

Observation no. 12

Trademarks and geographical indications offer huge potential to stakeholders in developing countries who produce a large number of products, in particular agricultural products, which are sold on international markets.

Experience shows that the cost of setting up these tools is reasonable and that the positive impact for local populations is rapid and significant.

It is therefore in the interest of developing countries to develop policies to raise awareness and to provide guidance in using trademarks and geographical indications.

3
TRADITIONAL KNOWLEDGE: anecdotal re-appropriation of their own knowledge by developing countries or the symbol of deep changes?

112. Traditional knowledge symbolises the opposition between anonymous industrial production of products by (North) businesses and a community-based subsistence economy in sync with the environment (in South countries)[73].

One difficulty stems from the fact that innovations based on traditional knowledge may in principle benefit from the protection offered by a patent, a trademark or a geographical indication. However, traditional knowledge in the strict sense, that which is ancient and often transmitted verbally, is not protected by conventional intellectual property systems.

113. The role of traditional knowledge in preserving the environment and biodiversity was recently highlighted in a joint study by the United Nations Environment Programme (UNEP) and the World Intellectual Property Organization (WIPO)[74].

114. More and more, inventions are based on traditional knowledge while the consent of local populations who developed this knowledge is not always obtained. Indeed, these inventions are usually simple formalisations of traditional techniques, methods and knowledge known to local populations in various areas of activity. For example, it was observed that 25% of pharmaceutical products are derived from plants first used in traditional medicine and their various uses by indigenous and historical populations. This is regarded as biopiracy.

73 K. Idris, *La protection internationale des savoirs traditionnels, la nouvelle frontière de la propriété intellectuelle*, L'Harmattan, Paris, 2003, p. 38.

74 A. K. Gupta, WIPO-UNEP, *Study on the role of Intellectual Property Rights in the Sharing of Benefits Arising From the Use of Biological Resources, and Associated Traditional Knowledge*, 2004.

115. To combat this, the 1992 Convention on Biological Diversity (CBD) and the resulting 2010 Nagoya Protocol, establish the conditions of utilization of genetic resources and traditional knowledge associated to genetic resources. This notably entails the prior consent of the relevant State before utilizing a genetic resource and the disclosure of the geographical origin of the genetic resource. In particular this is valid when the invention is based on or inspired by traditional knowledge associated to genetic resources. These texts also provide for the sharing of the benefits arising out of the utilization of the traditional knowledge associated to genetic resources.

The case of *arogyapacha* in India is an example of how intellectual property can guarantee/promote the sharing of benefits arising out of the utilization of genetic resources and the associated traditional knowledge.

Practical example

AROGYAPACHA: INTELLECTUAL PROPERTY, TRADITIONAL KNOWLEDGE AND BENEFIT SHARING

I. AROGYAPACHA: TRADITIONAL KNOWLEDGE OF THE KANI PEOPLE

Traditionally, the Kani people living in India consume *arogyapacha* (scientific name: *Trichopus zelanicus ssp Travancoricus*) as a stimulant and a source of energy. Their medical knowledge of the plant enabled the development of a medicinal product for sportsmen and women. The product combats stress and fatigue, and is known as *Jeevani*, which means "lifegiver". It is delivered in granule form.

To develop the product, Indian researchers at the *Tropical Botanic Garden and Research Institute* (TBGRI) based their work on the knowledge of the Kani people. After eight years of research, they had discovered that the fruit and leaves of the *arogyapacha* not only had anti-depressant and immuno-stimulant properties, but could also increase endurance, reduce fatigue, prevent tumours and activate the body's natural defences. To reach this conclusion, the research team managed to isolate twelve active ingredients. It also demonstrated that crushing the plant's leaves was the most efficient method to produce the 12 compounds. The patent for the application was granted in 2010.

II. INDUSTRIAL PROPERTY AND SHARING THE BENEFITS ARISING OUT OF THE UTILIZATION OF TRADITIONAL KNOWLEDGE ASSOCIATED WITH GENETIC RESOURCES

The TBGRI granted a licence to commercialise *Jeevani to Arya Vaidya Pharmacy Ltd*. (AVP) of Coimbatore, one of the largest plant-based pharmacies in India. In 1995, this company signed a 7-year licensing agreement with the TBGRI. It paid a one-off fee of $50,000 and the TGBRI would receive 2% royalties on the sales of *Jeevani* products.

In November 1997, the *Kerala Kani Samudaya Kshema Trust* fund was established with the assistance of the TBGRI. Its purpose is to promote the sustainable use and conservation of the biological resources of the Kani populations. In 1999, the first instalment of $12,500 was paid into the fund under the benefit sharing agreement signed with the TBGRI. These sums are essentially intended to finance development activities, such as the installation of a phone booth and the creation of an insurance scheme for pregnant women and accidental deaths.

In 2002, the TBGRI received the United Nations Equator Prize, which recognises outstanding local community efforts to promote sustainable economic development in the Third World through the conservation of biodiversity. This project was also presented as a model of acknowledging the traditional knowledge and intellectual property rights of indigenous populations, as well as sharing the benefits under the United Nations Convention on Biological Diversity (CBD).

CONCLUSION TO PART TWO

Dissemination of technologies: from B2B access to the issues of a public policy

116. Ultimately, analysing developments in industrial property and economic trends confirms a perception of the changing role and uses of industrial property in business relationships.

117. Despite the fears of some, industrial property is not in itself an obstacle to the dissemination of technologies in a context of competition between originators. On the contrary, and in particular in terms of patent and trademark databases, it may enable the creation of relationships between recipients who are conscious of their specific needs and originators with the appropriate know-how.

118. This is compatible with a key mechanism in technology catch-up: learning from customers and suppliers, while capitalising know-how in an incremental innovation that is patented or that can be identified as a trademark.

Exchanges - often non-monetary - of know-how concerning the practices of use of a supplier's product or concerning customer specifications may drive an industrial or a service provider/project designer upwards, or even, after consolidation, federate a territorial technical system, and in the most virtuous cases, a 'national innovation system'. This learning is free, more powerful than all technology transfers between peers and as underlined by researcher Rigas Arvanitis, "[commercial] clients are often the suppliers of technology."

It is here that we must remember that sustainable development, a societal meta-project, requires modern tools for public policies: IP Offices contribute to this, as does strong coordination between industrial firms and public policies.

It is particularly in this dynamic context that the technology-related aspects of international negotiations on climate change must be revisited.

SUMMARY AND RECOMMENDATIONS FOR PART TWO

1 Patents are starting to be used more widely, notably in countries that have only recently started to use industrial property.

Beyond granting the owner a monopoly of use, patents play other roles in parallel. The first is the signal sent to market players (competitors, investors) that they are dealing with an innovative company, university or country. Such signals play an increasingly important role in a global economy, where investments, partnerships and markets extend beyond geographical borders. Moreover, patents represent around two thirds of scientific publications in the world and the vast majority of them are available to view online.

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2 Nonetheless, patent databases remain underused. Yet they are an unrivalled source of information about existing technologies that can often be used freely in developing countries. IP Offices should continue their efforts to make these databases simpler to use.

In parallel, initiatives aiming to communicate the needs of developing countries, such as WIPO Green, should be sustained and improved upon.

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3 Trademarks are essential legal and communication tools for developing countries, both to attract foreign investors and to sell their products on international markets.

This tool should be systematically developed and successful experiences provide models accessible to all countries, whatever their financial means.

CONTENTS PART THREE

INTRODUCTION TO PART THREE

119. The adoption of environmentally sound technologies is not a new question and the international community examined the question at the first United Nations conference on the environment in Stockholm in 1972[75]. Nonetheless, the current situation is no longer the same due to the issues generated by the environmental crisis we are experiencing through the overuse of natural resources, major losses in biodiversity, repeated damage to the environment and the looming challenge of climate change, as expressed by the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) published in October 2014[76]. The influence of mankind on the climate is no longer doubted and the effects are increasing, with incidences observed on all continents. If we do not control these effects, changes to the climate will raise the risk of widespread, serious and irreversible consequences for the human race and ecosystems.

Limiting the warming of the Earth's surface to 2 °C remains possible but will require huge mitigation efforts, i.e. reducing greenhouse gas emissions. It is fundamental to understand that mitigation of and adaptation to the negative impacts of climate change are linked: the less they are mitigated, the more we must adapt. The longer we wait to take suitable measures, the more adaptation and mitigation will cost us dearly.

Adaptation policies and policies designed to mitigate greenhouse gas emissions are therefore complementary strategies to reduce and manage the risks of climate change. Their efficiency depends largely on a capacity to innovate and invest in environmentally sound technologies, where the choice must be guided, whenever possible or appropriate, by this complementary nature. Beyond individual or collective choices of ways of life which naturally involve the application of these environmentally sound technologies, it is important to introduce policies to support the development, deployment and transfer of these technologies, the effectiveness of which can be supported by stronger and better-organised international cooperation.

120. The large-scale deployment of environmentally sound technologies is crucial to ensure sustainable development. The issue concerns both space and time; as quickly as possible, we must make available the most efficient technologies to all countries, in particular developing countries, as soon as they are available. This was understood early on, at the Rio Earth Summit in 1992, but today the challenge is to maintain a high level of growth in all countries while limiting their environmental (including carbon) footprint.

Indeed, the governments of all countries need to support and encourage entrepreneurial initiatives both by originators and recipients. To support these public policies, mechanisms have been introduced to facilitate the deployment of environmentally sound technologies under a certain number of Conventions concerning the environment, health and trade

75 See principle 20 of the Stockholm Declaration, 1972.

76 IPCC, 5th Assessment Report, Oct. 2014.

(Convention on Climate Change, TRIPS Agreement, cooperation between National IP Offices, etc.). Although there are multiple mechanisms facilitating the transfer of clean technologies, they remain uncoordinated, which creates a fragmented system, partly explained by the choices made at the start of the UN negotiations on sustainable development and climate change (1).

121. In a world where industrial systems have largely relocated to South countries and where innovation has become multi-polar, it is important to rethink international cooperation in order to foster universal access to environmentally sound technologies. It has become urgent that the deployment of technologies be more efficient, more coherent and simplified to enable the achievement of sustainable development objectives. It is also important to ask questions on how to improve international cooperation that supports access to environmentally sound technologies (2).

1
COOPERATION IN THE DEPLOYMENT OF ENVIRONMENTALLY SOUND TECHNOLOGIES: a framework marked by the spirit of the Rio Declaration, now fragmented

1.1. COOPERATION MARKED BY TRANSFERS FROM NORTH TO SOUTH

122. It has been understood for quite some time that the transfer of environmentally sound technologies is primordial to enable developing countries to achieve their sustainable development objectives while fully respecting the environment. The question of multilateral cooperation on the transfer of environmentally sound technologies was indeed a central point of the implementation of the Montreal Protocol to the Vienna Convention for the Protection of the Ozone Layer[77]. Multilateral cooperation was seen as a condition for the participation of developing countries in the international community's efforts. It needed an amendment to the Montreal Protocol at the 1st Meeting of the Parties in London, in June 1990, to create a financial mechanism (current Article 10) to support the transfer to developing countries of technologies designed to reduce or eliminate substances that deplete the ozone layer (Article 10.A[78]), a transfer mechanism that the Protocol Executive Committee has regularly updated since then to meet the specific needs of South countries[79]. In the role of a precursor model, the technology

77 Vienna Convention for the Protection of the Ozone Layer, 1985, UNEP.

78 The original version of the Protocol of 16 September 1987, entered into force on 1st January 1989, provided in Article 10 ('Technical Assistance') that the Parties should cooperate in promoting technical assistance intended to facilitate adhesion to the Protocol and its implementation. Article 10: *"Any Party or Signatory to this Protocol may submit a request to the Secretariat for technical assistance for the purposes of implementing or participating in the Protocol."* Article 10.A: *"Each Party shall take every practicable step, consistent with the programmes supported by the financial mechanism, to ensure: a) that the best available, environmentally safe substitutes and related technologies are expeditiously transferred" to developing countries and "b) that the transfers referred to in sub-paragraph (a) occur under fair and most favourable conditions."*

79 The Executive Committee is responsible for updating the mechanism: the Committee was requested to prepare a final report with input from developing countries on their experience with impediments to technology transfer and to identify solutions to overcome such impediments (Decision VII/26: Technology transfer). At the 8th Meeting of the Parties, an Informal Group was set up (Decision VIII/7) to assist the Executive Committee in identifying what steps can practically be taken to eliminate potential impediments to the transfer of technologies under fair conditions. The Group is equally composed of four representatives from developed countries (Australia, Italy, Netherlands, United States of America) and four representatives from developing countries (China, Colombia, Ghana, India). Since then the Executive Committee and the Informal Group report on their work undertaken to respectively improve the financial mechanism and technology transfer. Each year they must submit a report to the Parties on the operation of these two mechanisms (Decision X/31).

transfer mechanism under the Montreal Protocol undoubtedly influenced the thought processes of the international community on the question of deploying environmentally sound technologies, which led to the 1992 United Nations Conference on Environment and Development, commonly referred to as the Earth Summit, held in Rio de Janeiro. This conference concluded with the signature of the Rio Declaration, the adoption of the Agenda 21, and led to the three international Rio conventions: Convention on Biological Diversity, Convention to Combat Desertification, Convention on Climate Change.

123. The spirit of the Rio Summit reveals a strong desire to achieve a common goal, i.e. sustainable development, while taking into consideration the differences in economic, social, and environmental situations of each State and their national sovereignty. It is a compromise between the divergent claims of developed and developing countries, where the former want a brief declaration reaffirming the 1972 Stockholm Declaration which underlined the necessity to protect the planet, and the latter wish to affirm their sovereign right to development, while recognising the historical responsibility of the former in causing disturbances to the environment and the climate. Developed countries have a historical responsibility in climate change; they have contributed to the deterioration of the Earth since 1750 and have the financial and technological means to reduce their greenhouse gas emissions. In the name of their 'right to development', developing countries claim that they should not be subject to any performance obligation in terms of mitigation or surveillance and in the name of solidarity, they claim that they should benefit from financial and technical support from developed countries to achieve sustainable development.

The spirit of the Rio Summit is therefore imprinted with universalism to meet global challenges but guided by equity, which results in unequal treatment, differentiated rights and obligations for compensatory purposes and is materialised by the application of the principle that "States have common but differentiated responsibilities and respective capabilities"[80] as indicated in the Rio Declaration and international conventions on the environment adopted at the end of the 20th century after the Rio Earth Summit[81]. In concrete terms, the application of this principle commits developed countries, i.e. the OECD members in 1992, to be at the forefront of the efforts against climate change, as they have been able to secure development since the first industrial revolution by generating unrestricted amounts of greenhouse gases. It also commits them to providing

80 Principle 7 of the Rio Declaration on Environment and Development: *"States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command."*

81 UNFCCC, Art. 3.1: *"The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof."* Such a principle is not binding; States are guided by this principle amongst others. It is a way of interpreting the legal obligations incumbent on them under the Convention.

technological, financial and capacity-building support in developing countries which need to develop to meet the basic needs and production requirements of their populations, while transitioning to a low-carbon or zero-carbon, climate-resilient economy, keeping in mind that a certain number of them are highly vulnerable to the negative impacts of climate change.

124. Early on, the mobilisation of financial resources, the exchange of information, the transfer of know-how and capacity building were considered as essential means to facilitate technology transfer, in particular from developed countries to developing countries. This clearly appears in the successive declarations by the international community on sustainable development (1992 Rio Declaration[82], Agenda 21, 2002 Johannesburg Declaration[83], Rio+20 Declaration in 2012) which make reference to technology transfer. In particular, Chapter 34 of Agenda 21 describes "the transfer of environmentally sound technology, cooperation and capacity-building" as essential factors in sustainable development. It sets out the principles for action, the objectives, the activities and the funding framework to ensure that environmentally sound technologies be easily accessible and transferable[84]. There is a need for developing countries to access technologies not protected by patents or which lie in the public domain (34.9) or -through commercial channels- techniques protected by intellectual property rights (34.10 and 34.11).

125. On this basis, many provisions concerning technology access were introduced into conventions and protocols on the environment, health and safety[85]. But each treaty or agreement includes rights and obligations incumbent on States to

82 The 1992 Rio Declaration on Environment and Development, which is not legally binding but is an authoritative reference for governments, covers the question of technology transfer and indicates that States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies (principle 9).

83 Technology transfer was also discussed at the 2002 World Summit on Sustainable Development in Johannesburg, where representatives insisted on the establishment of genuine international cooperation in the field of technology transfer (A/CONF.199/20, Johannesburg, 2002, Introduction, § 4). This avenue is considered as an essential measure in eradicating poverty, changing non-viable methods of consumption and production, securing access to drinking water, fighting desertification, protecting biological diversity or ensuring sustainable forest management.

84 Supportive measures should enable the "transfer of necessary technological know-how as well as building up of economic, technical, and managerial capabilities for the efficient use and further development of transferred technology" (34.4).

85 Convention on the Transboundary Effects of Industrial Accidents; Protocol to the 1979 Convention on Long-range Transboundary Air Pollution concerning the Abatement of Acidification, Eutrophication and Ground-level Ozone; Protocol to the 1979 Convention on Long-range Transboundary Air Pollution concerning Persistent Organic Pollutants; Protocol to the 1979 Convention on Long-range Transboundary Air Pollution concerning Heavy Metals; Convention on the Protection and Use of Transboundary Watercourses and International Lakes; Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; Convention on Nuclear Safety; United Nations Convention on the Law of the Sea; International Treaty on Plant Genetic Resources for Food and Agriculture; United Nations Convention to Combat Desertification; Convention on Biological Diversity.

facilitate the transfer of environmentally sound technologies; these rights and obligations are specifically designed to achieve the aims of said treaty or agreement, without referring to or taking into consideration the mechanisms already established elsewhere. The result is that international cooperation in the transfer of and/or access to technologies rapidly became fragmented.

For example a Committee on Science and Technology (CST) was established under the United Nations Convention to Combat Desertification. This body collects, analyses and reviews relevant data in order to promote cooperation between sub-regional, regional and national institutions. It also makes available the latest knowledge and provides scientific advice[86]. To reinforce the implementation of the Convention, the Eighth Conference of the Parties (Madrid, 2007) adopted the ten-year strategic plan and framework (2008-2018), wherein it decided that future ordinary meetings of the CST would essentially be organised in the format of a scientific and technical conference[87], to facilitate the exchange of information with other institutions.

Moreover, Article 16 of the 1992 United Nations Convention on Biological Diversity provides that access to and transfer of technology to developing countries shall be provided and/or facilitated under fair and most favourable terms by each Contracting Party. To achieve this, each Party must establish a clearing house to facilitate scientific and technical cooperation and the use of financial mechanisms. It is also specified that *"in the case of technology subject to patents and other intellectual property rights, such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights"*[88]. In paragraph 5 of this same article, the Parties are reminded that they shall ensure that patents and other intellectual property rights are supportive of and do not run counter to the objectives of the Convention on Biological Diversity.

126. What is more, United Nations programmes and agencies have set up mechanisms dedicated to technology transfer (UNDP, UNEP, UN Habitat, UNIDO, WIPO).

The United Nations Industrial Development Organization (UNIDO) set up International Technology Centres (ITC - 14 centres) created to promote industrial development and ITPOs (Investment and Technology Promotion Offices) which deliver services to businesses and institutions seeking to form international alliances for the industrial investment and commercialisation of technologies (7 offices). The Subcontracting and Partnership Exchange Programme (SPX) was set up to help local enterprises to

86 See Articles 5, 18 and 21 of the United Nations Convention to Combat Desertification.

87 Annex 13/COP.8 - The third UNCCD international scientific conference on "Combating drought, land degradation and desertification for poverty reduction and sustainable development: the contribution of science, technology, traditional knowledge and practices" took place on 9-12 March 2015 in Cancún, Mexico. This was part of the fourth special session of the Committee on Science and Technology (CST S-4) of the United Nations Convention to Combat Desertification (UNCCD).

88 1992 Convention on Biological Diversity, Article 16(2).

successfully meet the challenges of globalisation and to take advantage of the emerging opportunities that evolve from industrial subcontracting (22 centres). Lastly, UNIDO and UNEP jointly set up National Cleaner Production Centres (NCPCs) to promote rational use of resources and increase industrial productivity through cleaner production techniques. The programme delivers technical assistance and helps countries devise policies to encourage investment in the transfer of clean technologies.

127. Let's not forget that in 2010 the World Intellectual Property Organization (WIPO) introduced the WIPO Green platform. The platform is an interactive marketplace to match clean technologies on offer with needs. It was introduced to accelerate the adaptation, adoption and deployment of environmentally sound technologies (See Insert, Part II, page 81). This marketplace provides private and public sector entities with information on the clean technologies available. Access to the database is unlimited and includes summaries of the technologies on offer and the needs expressed. The procedure enabling a technology owner to propose their technology is simple: the technology must be environmentally sound as defined by Agenda 21, the provider must explain the environmental benefits of their technology and indicate the field (IPC Green Inventory classification - 2010), as well as the intellectual property rights that protect the technology and the conditions of transfer (patent licence, sale of finished products, etc.).

Also, the International Energy Agency introduced the multilateral Climate Technology Initiative (CTI)[89], the mission of which is to promote international cooperation in the development and dissemination of climate-friendly and environmentally sound technologies and practices.

128. It is important to realise that the framework for international cooperation on technology access for sustainable development is highly fragmented. The UN instruments and mechanisms supporting technology transfers have multiplied yet initiatives are rarely coordinated in terms of objectives and content. The technology mechanism set up by the United Nations Framework Convention on Climate Change is part of this proliferating but fragmented framework.

89 See the CTI website.

1.2 THE DEPLOYMENT OF ENVIRONMENTALLY SOUND TECHNOLOGIES UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

A. Provisions of the UNFCCC

129. Inspired by the experience of the Montreal Protocol, the Parties to the UNFCCC wished to set up a system to take all steps to promote international cooperation with a view to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how. According to Article 4.5 of the UNFCCC, it is incumbent on developed countries to support developing countries in these matters. Article 4.7 of the UNFCCC clarifies that: "the extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed countries of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of developing countries". These commitments are similar to those identified in the Kyoto Protocol (Article 10 (c) and Article 11).

130. In this framework as set up by the text of the UNFCCC, no definition is provided concerning technology transfers, which are firstly considered in terms of the means, financial and other, required to achieve them. The Intergovernmental Panel on Climate Change (IPCC) attempted to define technology transfer as *"a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders."*

Seen from this angle, technology transfer is a very broad concept that includes the dissemination of technology and technological cooperation on national and international scale between developed countries, developing countries and also countries whose economies are transitioning. It includes a process of understanding, using and reproducing the technology, taking into account local conditions and adapting to them, and integrating the technology into indigenous techniques. The concept of technology transfer therefore exceeds intellectual and material dimensions to encompass capacities, know-how, policies and institutions.

131. The UNFCCC creates an obligation for North countries to provide financial support to South countries to enable access to mitigation and adaptation technologies. Initially, the Conference of Parties to the Convention assigned the Global Environment Facility (GEF, a financial body initially established by the World Bank, the UNDP and the UNEP, independent since 1994) the task to administer the financial mechanism of the UNFCCC in accordance with its Article 11. In 2010, as part of the Cancún Agreements, the Parties

decided to establish the Green Climate Fund[90] as an operating entity of the financial mechanism of the Convention. Officially based in Durban (Decision 3/CP.17), the Green Climate Fund became operational after $10 billion was pledged to fund it at the COP20 meeting in Lima in December 2014. It is intended to become the main vehicle for multilateral investment in mitigation and adaptation measures, including the transfer of and access to environmentally sound technologies and know-how.

Today bilateral cooperation remains the main source of finance for the transfer of clean technologies to developing countries. For example, the French Development Agency (AFD, *Agence Française de Développement)* is a pivotal operator in France's public aid for development efforts. It finances multiple technology transfer projects in developing countries.

Practical example

AFD: MAJOR STAKEHOLDER IN FRENCH BILATERAL FINANCIAL AGREEMENTS WITH DEVELOPING COUNTRIES

With over 7 billion Euro in funding (i.e. approx. 10% of international public funding) between 2009 and 2011, it is a major international operator in climate issues. One of the pillars of the 2012-2016 action plan is a long-term commitment to combating climate change by earmarking 50% of its annual allocations to developing countries within its scope of intervention.

For example, in emerging countries in Asia and Latin America, where most issues affecting developing countries in terms of greenhouse gas emissions are present, the 'climate' interventions of the AFD are mainly focused on renewable energies and energy efficiency in fields such as urban transport, local authorities, forestry and agriculture.

90 The Green Climate Fund is equally composed of representatives from developing countries and developed countries. Recently at the Conference of the Parties in Lima in December 2014, the capitalisation of the Fund passed the $10 billion mark, yet some countries had undertaken to provide funds rising to $100 billion per year by 2020.

B. Technology transfer in the Kyoto Protocol

Article 10 (c) of the Kyoto Protocol is largely similar to article 4.5 of the UNFCCC but also specifies that technology transfer, in particular to developing countries, depends in particular on 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."

132. The Clean Development Mechanism[91] is a flexibility instrument introduced by Article 12 of the Kyoto Protocol to stimulate technology transfers by the private sector. It operates as follows: industrialised countries finance projects to reduce or prevent greenhouse gas emissions in developing countries (which under the Kyoto Protocol are under no binding obligation concerning mitigation) and may in return obtain emissions credits to be used to attain their own objectives as regards emissions. Developing countries benefit from advanced mitigation technologies, in particular because the reductions in emissions achieved by each project must be additional to any that would have occurred without the project eligible under this Clean Development Mechanism.

Nonetheless after over 10 years of experience and over 5,000 CDM projects, the effects in terms of technology transfer are contrasted, not to say contested, with a technology transfer rate that is in the end fairly low[92], and limited to mitigation only. This experience demonstrates the need to go further in the introduction of mechanisms to transfer clean mitigation and adaptation technologies (see E. below).

91 Article 12 of the Kyoto Protocol:
(...) 2. The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.
3. Under the clean development mechanism: (a) Parties not included in Annex I will benefit from project activities resulting in certified emission reductions; and (b) Parties included in Annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments under Article 3, as determined by the Conference of the Parties serving as the meeting of the Parties to this Protocol. (...)
5. Emission reductions resulting from each project activity shall be certified by operational entities to be designated by the Conference of the Parties serving as the meeting of the Parties to this Protocol, on the basis of: (a) Voluntary participation approved by each Party involved; (b) Real, measurable, and long-term benefits related to the mitigation of climate change; and (c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity. (...)

92 68% in 2006, 42% in 2007, 32% in 2008, 30% in 2009 and 29% in 2010 (UNFCCC, 2011).

C. The evaluation of technology needs as a prior requirement for access to mitigation and adaptation technologies

133. At the Fourth Conference of the Parties (COP4, Buenos Aires, December 1998), the Parties adopted the 'Buenos Aires Plan of Action' to implement article 4.5 of the UNFCCC. This Plan mandates the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UNFCCC to make recommendations to achieve agreement on a framework for *"meaningful and effective actions to enhance implementation of article 4.5 of the Convention"*[93]. This framework on technology transfers was adopted at the Seventh Conference of the Parties in 2001 and is an integral part of the Marrakesh Accords[94]. The Parties underline that the successful development and transfer of environmentally sound technologies requires a *"country-driven, integrated approach, at a national and sectoral level."* This requires multilateral cooperation among various stakeholders (the private and public sectors, bilateral and multilateral institutions, non-governmental organisations and research institutions).

134. The framework defined is based on the adoption of a consultative process on five themes:

- Technology needs assessments,
- Technology information,
- Enabling environment,
- Capacity building and
- Mechanisms for technology transfer, in particular the creation of the Expert Group on Technology Transfer (EGTT)[95].

The core element of this framework is the technology needs assessments (TNAs), which aim to help identify and analyse technology priorities in order to determine the appropriate projects to facilitate transfers of technology and know-how. Developing countries are encouraged to conduct these assessments and to compile dossiers[96] based on a common methodology (handbook[97]).

93 Decision 4/CP.4, §9: Development and transfer of technologies.

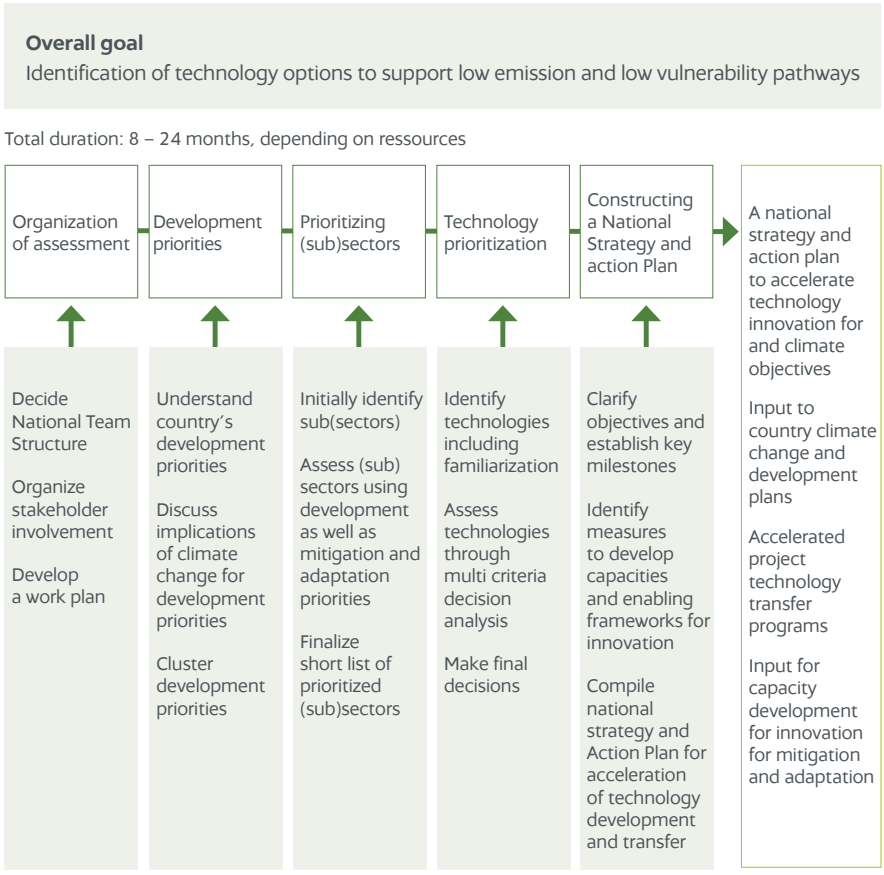
94 Decision 4/CP.7, Development and transfer of technologies (Decisions 4/CP.4 and 9/CP.5).

95 Decision 4/CP.7 - ANNEX - Framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention.

96 Each country should appoint a national entity responsible for coordinating its TNAs and submit its results in national reports to the Secretariat. The Subsidiary Body for Scientific and Technological Advice examines them regularly. Currently, 31 developing countries have fully conducted their TNAs and 85 other countries have initiated the process. In Africa, several countries have completed it: Ivory Coast, Ghana, Kenya, Mali, Mauritania, Morocco, Rwanda, Senegal, Sudan and Zambia (TNA Flyer, March 2014, UNFCCC, produced by the UNFCCC Finance, Technology and Capacity-building Programme).

97 To assist countries in conducting their TNAs, the UNDP has joined forces with the Climate Technology Initiative (CTI), the Expert Group on Technology Transfer (EGTT) and the UNFCCC Secretariat to produce a Handbook for Conducting Technology Needs Assessments for Climate Change.

KEY STEPS IN THE TECHNOLOGY NEEDS ASSESSMENTS PROCEDURE



Source : UNDP, TNA handbook, 2010

D. Capacity building

135. Building capacities is a central pillar of international cooperation on the transfer of environmentally sound technologies. It enables developing countries to consolidate, complete and improve their skills, their capacities and scientific/technical structures. The aim is to reinforce activities such as training in the use of environmentally sound technologies, enhancing skills in order to adopt, adapt, implement, use and manage technologies: all these activities contribute to the transmission of know-how.

136. In terms of French cooperation, the new international technical expertise agency, Expertise France, participates alongside the INPI in technical capacity-building through the transfer of expertise and know-how.

Practical example

MULTILATERAL AND BILATERAL COOPERATION OF THE FRENCH INDUSTRIAL PROPERTY OFFICE (INPI)

The INPI works jointly with its international peers in fighting counterfeiting (cooperation actions under article R.411-1 of the Intellectual Property Code concerning the organisation of the INPI).

In a bilateral framework, the INPI orients its actions in three fields:

1) Signature of bilateral technical cooperation agreements with around 30 countries on all continents. The INPI is active in several fields: exchange of information and dissemination of best practices, organisation of training sessions on specific legal points, organisation of seminars and workshops on counterfeiting, dispute settlement, etc.
2) Creation of an international INPI network in the trade missions of Embassies in 'sensitive' countries. Experts inform enterprises on the best way to protect their products, monitor cooperation agreements and define a catalogue of the sectors most affected by counterfeiting.
3) Cooperation actions outside agreements: the INPI regularly receives international delegations to raise their awareness about all issues of industrial property.
   — In a multilateral framework, the INPI takes part in expertise assignments, in seminars organised by the Office for Harmonization in the Internal Market (OHIM), WIPO (World Intellectual Property Organization).
   — Under the activities of the French Facility for Global Environment (FFEM), every year the INPI trains government employees from emerging countries in intellectual property and issues concerning counterfeiting. For example, in 2010 the INPI organised the Global Congress on Combating Counterfeiting and Piracy in Paris, jointly with WIPO, the World Customs Organization and Interpol.

Practical example

TECHNICAL COOPERATION BY EXPERTISE FRANCE (INAUGURATED IN JANUARY 2015)

Expertise France uses a broad network of public and private sector experts to support government administrations and local authorities in integrating the costs and opportunities involved in climate change in their strategy and action programmes.

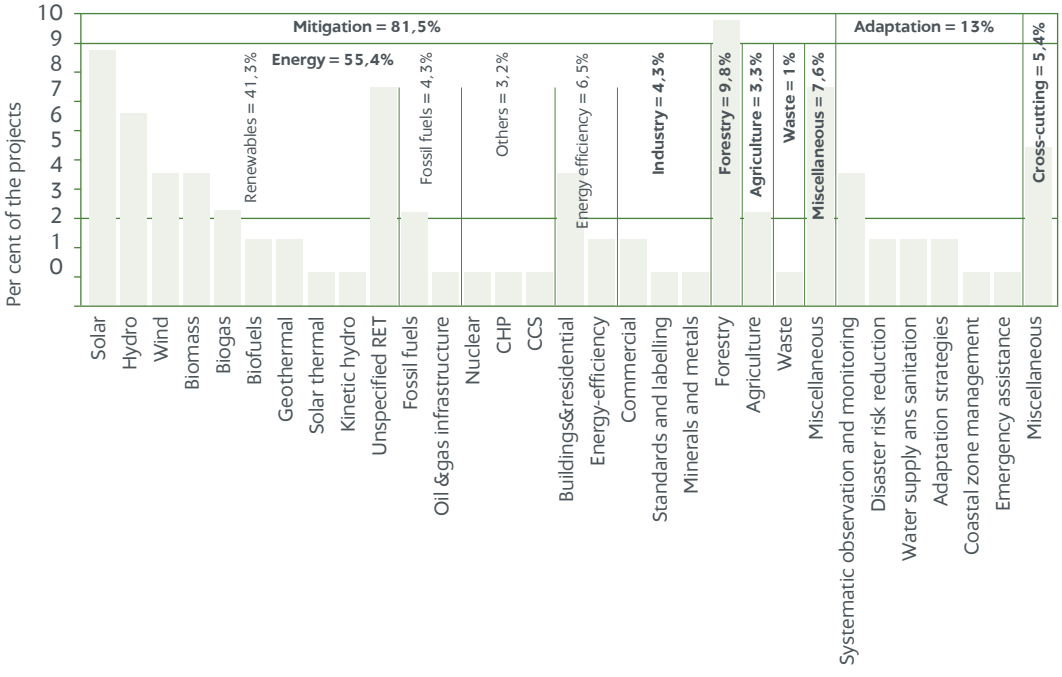
For example, Expertise France has implemented a capacity-building project in four African countries to assist them in defining national climate change policies: Kenya, Uganda, Gabon and Benin - €3 million of AFD-FFEM funding.

137. Developed countries are obliged to publish information on the measures taken to promote technology transfer and support the development and reinforcement of capacities in developing countries. A compilation of the activities of developed countries is accessible on the Climate Convention website[98] using the TT: CLEAR system which consolidates all the data[99].

98 Compilation and synthesis of fifth national communications on technology transfer, Bonn, Germany, June 2011.

99 The TT:CLEAR system was proposed by the Secretariat in 2001 as a prototype. At the Conference of the Parties in Buenos Aires, the Parties encouraged the Secretariat to pursue its pilot project (Decision 6/CP.10).

BREAKDOWN BY SECTOR AND BY TECHNOLOGY OF TECHNOLOGY TRANSFER PROGRAMMES AND PROJECTS COMMUNICATED BY PARTIES LISTED IN ANNEX II



Source: Compilation and synthesis of 5th national communications - 2011

E. The UNFCCC Technology Mechanism

138. In the Bali Action Plan which aimed to structure the negotiation of a climate agreement for beyond 2012[100], it was proposed that the Parties develop *"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."* In December 2009 at the Conference of Copenhagen, the Parties agreed to create a Technology Mechanism that was formally adopted under the auspices of the UNFCCC as part of the Cancún Agreements of 2010.

100 Decision 1/CP. 13 Bali Action Plan.

De facto, the introduction of this mechanism ended the mandate of the Expert Group on Technology Transfer (EGTT) introduced by the 2001 Marrakesh Accords. This mechanism under the authority and control of the Conference of the Parties[101], is responsible for speeding up technology transfers to support mitigation and adaptation measures[102]. The mechanism comprises the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN). The organisation, operation and procedures for these two entities were progressively defined by subsequent COP meetings: (COP16 in Cancún, COP17 in Durban, COP18 in Doha, COP19 in Warsaw, COP20 in Lima).

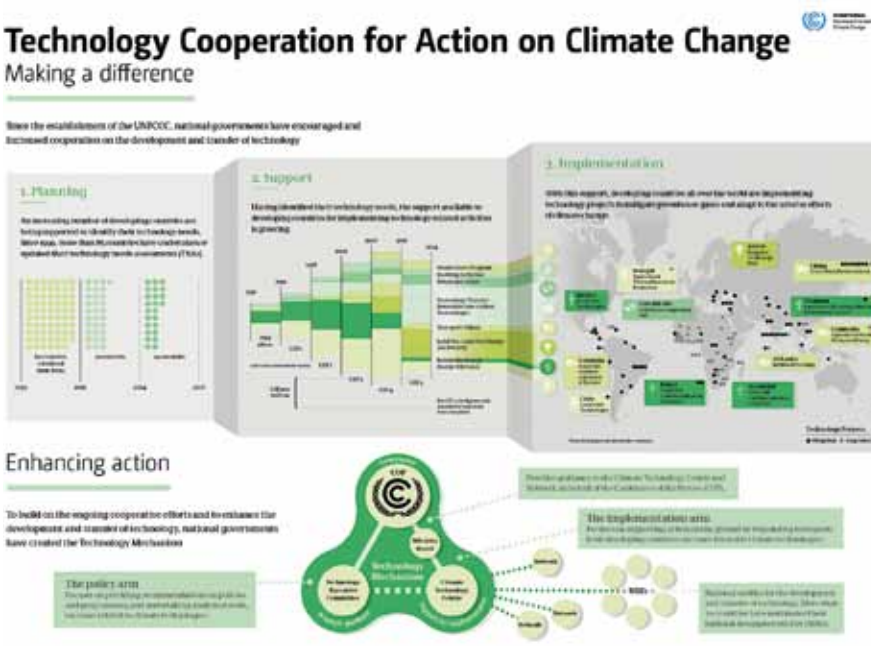
139. The mission of the TEC is to draft and submit to the COP such orientations and political recommendations as to promote the development and transfer of technologies in order to facilitate the operation of the mechanism (see insert below). The purpose of the CTCN is to stimulate technological cooperation and to provide assistance at the request of developing countries in line with their respective capacities and national priorities and situations, to ensure their ability to identify their technology needs, facilitate the elaboration and implementation of technology projects and strategies (see insert below).

At COP 20 in Lima in December 2014, the Parties approved the latest joint report submitted by the TEC and the CTCN[103] which strongly reaffirms that the development of, access to, and transfer of technologies for both adaptation and mitigation is central to addressing climate change. Their main recommendations to improve the framework are that financial support should be sustainable and predictable to ensure the effective operation of the Technology Mechanism, that the TNA process should be improved and that economic, environmental and social aspects should be better integrated in the assessments carried out.

101 The two bodies report regularly to the Conference of the Parties, through the subsidiary bodies, on their respective activities and the performance of their respective functions, Decision 1/CP.16, paragraph 126.

102 Decision 2/CP. 15.

103 FCCC/SB/2014/3, paragraphs 11 and 53.



Source: UNFCCC website, 2015

140. The Technology Mechanism is not the only system to facilitate technology transfer. Other measures concerning the technology cycle have been introduced by UN organizations[104] (see table below).

104 "Technology development and transfer for climate change: a survey of activities by United Nations system organizations", UN Department of Economic and Social Affairs and UNIDO, working paper, 2010.

Practical example

THE TECHNOLOGY EXECUTIVE COMMITTEE

Functions (Dec.1/CP.16)

a) Provide an overview of technological needs and analysis of policy and technical issues related to the development and transfer of technologies for mitigation and adaptation;
b) Consider and recommend actions to promote technology development and transfer, in order to accelerate action on mitigation and adaptation;
c) Recommend guidance on policies and programme priorities related to technology development and transfer with special consideration given to the least developed country Parties;
d) Promote and facilitate collaboration on the development and transfer of technologies for mitigation and adaptation between governments, the private sector, non-profit organizations and academic and research communities;
e) Recommend actions to address the barriers to technology development and transfer in order to enable enhanced action on mitigation and adaptation;
f) Seek cooperation with relevant international technology initiatives, stakeholders and organizations, and promote coherence and cooperation across technology activities, including activities under and outside of the Convention;
g) Catalyse the development and use of technology road maps or action plans at the international, regional and national levels through cooperation between relevant stakeholders, particularly governments and relevant organizations or bodies, including the development of best practice guidelines as facilitative tools for action on mitigation and adaptation.

Composition (Dec.4/CP17 - 2012)

The TEC comprises 20 expert members elected by the COP:
— nine members from Parties included in Annex I to the Convention
— three members from each of the three regions of the Parties not included in Annex I to the Convention, namely Africa, Asia and the Pacific, and Latin America and the Caribbean; one member from a small island developing State; and one member from a least developed country Party.

Modalities and procedures (Dec.4/CP17)

1) Analysis and Synthesis: the TEC shall produce periodic technology outlooks; collate, collect and synthesize a range of information on technology research and development and other technology-related activities from various sources;
2) Policy recommendations: actions to promote technology development and transfer and to address barriers; recommending guidance on policies and programme priorities related to technology development and transfer;
3) Facilitation and catalysing: organise workshops and forums to increase experience, establish an inventory of existing collaboration activities, develop technology road maps and action plans;
4) Linkage with other institutional arrangements;
5) Engagement of stakeholders: engage a broad range of stakeholders (public institutions, the business community, academia and non-governmental organizations) in the forums and meetings;
6) Information and knowledge sharing: facilitate knowledge sharing through a well-functioning information platform and upgrade TT: CLEAR.

Practical example

CLIMATE TECHNOLOGY CENTRE AND NETWORK

Functions (Dec.1/CP.16)

The Climate Technology Centre facilitates a network of national, regional, sectoral and international technology networks, organizations and initiatives. It is hosted by the UNEP (United Nations Environment Programme - Dec. 14/CP.18). Its missions are as follows:

a) At the request of a developing country Party:
   i) Provide advice and support related to the identification of technology needs and the implementation of environmentally sound technologies, practices and processes;
   ii) Facilitate the provision of information, training and support for programmes to build or strengthen capacity of developing countries to identify technology options, make technology choices and operate, maintain and adapt technology;
   iii) Facilitate prompt action on the deployment of existing technology in developing country Parties based on identified needs;

b) Stimulate and encourage, through collaboration with the private sector, public institutions, academia and research institutions, the development and transfer of existing and emerging environmentally sound technologies, as well as opportunities for North–South, South–South and triangular technology cooperation;

c) Facilitate a network of national, regional, sectoral and international technology centres, networks, organizations and initiatives with a view to:

i) Enhancing cooperation with national, regional and international technology centres and relevant national institutions;

ii) Facilitating international partnerships among public and private stakeholders to accelerate the innovation and diffusion of environmentally sound technologies to developing country Parties;

ii) Providing, at the request of a developing country Party, in-country technical assistance and training to support identified technology actions in developing country Parties;

iv) Stimulating the establishment of twinning centre arrangements to promote North–South, South–South and triangular partnerships, with a view to encouraging cooperative research and development;

v) Identifying, disseminating and assisting with developing analytical tools, policies and best practices for country-driven planning to support the dissemination of environmentally sound technologies;

d) Performing other such activities as may be necessary to carry out its functions.

Roles and responsibilities (Annex VII of Decision2/CP.17)

The Climate Technology Centre shall manage the process of receiving and responding to requests from developing country Parties and shall work with the Network to respond to such requests.

The Climate Technology Centre responds to requests by developing country Parties either by itself or by identifying the appropriate organizations in the Network in consultation with the requesting developing country Party. The Centre shall:

a) receive and assess requests and refine and prioritise those requests in conjunction with the nationally designated entity with the aim of establishing its technical feasibility;

b) respond to requests, through either the Centre or the Network, based on the use of the most appropriate capacity and expertise in accordance with its approved modalities and procedures.

In October 2014, 96 countries had a nationally-appointed authority (necessary to expand the network), including 14 Parties included in Annex I to the Convention (Annex I Parties) and 82 Parties not included in Annex I to the Convention (non-Annex I Parties).

Practical example

ACTIVITIES UNDERTAKEN IN TECHNOLOGY TRANSFER BY UN ORGANIZATIONS

Organization	Technology Needs Assessments	Technology Information	Enabling Environment
UN-DESA		- Development of indicators for development, including those relevant to technology transfer (TT) - Assessment of progress in the implementation of targets under the Millennium Development Goals (MDGs)	- Support for integrating climate change (CC) in national sustainable development (SD) plans - Documentation on TT in relation to CC - Publications on CC issues and solutions - SD platform for partners
UNDP	- Services to assist countries in preparing their TNAs - Handbook for Conducting Technology Needs Assessments		- Support in preparing the CC national adaptation programme of action (NAPA)
UNEP	- Assessment of impacts and adaptation programmes in relation to CC - Assistance in preparing TNAs		- Support in preparing the national action programme for adaptation to CC (NAPA)
UNCTAD		- Expert meetings on renewable energies	- Expert meetings on trade and climate change
World Bank	- Services to assist States in preparing TNAs		
UNIDO		- Environmentally sound technology dissemination tools and platform	- Development support (international energy standard).

IN RELATION TO CLIMATE CHANGE

Capacity-building	Mechanism for Technology Transfer
	- Participation in TT-themed workshops/conferences
- Capacity-building for TT - Support in setting up Clean Development Mechanism (CDM) projects - Training on the Global Environment Facility (GEF)	- Portfolio on CC adaptation programmes and training in their operation - Support for UN-REDD programme - Support for TT in relation to CC - Technical expertise on SD projects - Participation as a partner on the issue of TT
- Capacity-building for TT - Support in setting up Clean Development Mechanism (CDM) projects - Training on the Global Environment Facility (GEF)	- Network on adapting to CC - Energy and carbon finance programme - REDD initiative - Development of Environmentally Sound Technology (EST) projects through workshops/programmes
- CDM handbook - Training on biofuels	
- Capacity-building in EST projects - Capacity-building in CDM projects - Training on the GEF and the Least Developed Countries Fund (LDCF)	- Creation of a carbon fund - Climate investment fund - Technology and climate programme
- Capacity-building in EST and CDM projects - PLATECH platform for the development of science and technology parks - Publications and handbooks on TT	- Centre for South/South cooperation - International Technology centre - Technology investment and promotion network - Technical support for environmentally sound projects

Source: United Nations Department of Economic and Social Affairs - United Nations Industrial Development Organization – 2010

F. Know-how

141. The first two parts of this work have highlighted the importance of know-how and its dissemination to access to environmentally sound technologies. This is especially the case in efforts to combat climate change. Know-how is disseminated incidentally when developed countries reinforce the capacities or contribute to the dissemination of technology information in developing countries. This depends on a broad definition of the notion of know-how which involves staff training as much as it does technical assistance, which may be delivered within the framework of a bilateral or multilateral cooperation. The dissemination of know-how may be the main purpose of the cooperation or a tool accessory to the execution of a project to adapt to or mitigate climate change.

There are many examples of bilateral cooperation that illustrate this approach well. As part of a sustainable management programme for natural resources in Ethiopia, Austria transmits know-how in managing pasture land, manure or biogas production equipment[105]. Also, in the Kocani geothermal system programme, Austria delivered to Macedonia its know-how on the co-generation of heat and electricity[106].

As part of its programme to adapt to climate change, Switzerland aims to reinforce the capacities of Peru's local governments and communities. This pilot project was initiated in 2008 to improve the system in terms of access to information, data interpretation and adaptation strategies. To this end, Switzerland transmits its scientific know-how on climate change forecasts, data collection, the creation of an information system and data modelling[107].

Furthermore, to assist in reducing CO_2 emissions and energy consumption in the energy sector in South Africa, Switzerland disseminates its know-how in terms of production and use of energy-efficient materials in the construction of buildings, through the creation of partnerships between South Africa and Swiss research institutes. Switzerland also promotes South-South cooperation in terms of technology and know-how transfer to ensure the project is a success[108].

142. Analysis of the compilation of developed country activities demonstrates that the dissemination of know-how is more frequently envisaged within the framework of bilateral cooperation. This seems fairly logical as technical information is transmitted from a clearly determined originator to a recipient enterprise. Let us also note that transmission of know-

105 Bilateral cooperation between Austria and Ethiopia, agriculture programme in place since 2008, $7.68 million.

106 Bilateral cooperation between Austria and Macedonia, energy supply programme in place since 1998, $2.30 million.

107 Bilateral cooperation between Switzerland and Peru on water resources management, food safety and risk management, 2008-2011. CHF4.9 million to implement the programme and CHF1.12 million to transfer scientific know-how.

108 Bilateral cooperation between Switzerland and South Africa, construction sector, 2008-2013, CHF16 million.

how as such is not automatically included. However this observation should not be interpreted as a fault or weakness of international and bilateral cooperation in this field since as we have underlined, the dissemination of know-how is spread over the various fields of action covered by the framework.

Observation no. 13
The concern about providing developing countries with access to environmentally sound technologies has become omnipresent in the international dialogue on the environment and climate change. Initiatives are multiple but too fragmented, which impairs their effectiveness.

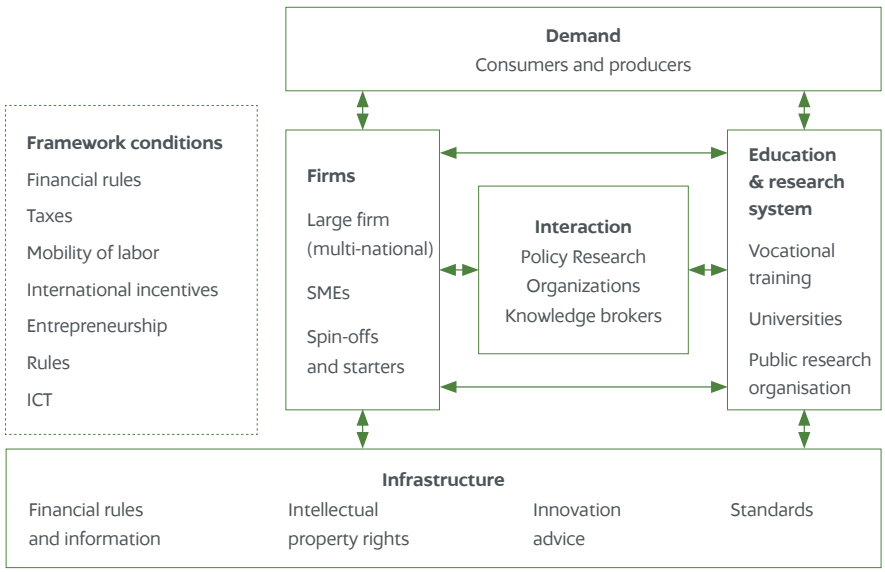
2
THE INDISPENSABLE IMPROVEMENT OF THE COOPERATION FRAMEWORK supporting access to environmentally sound technologies

2.1. INNOVATION, THE KEY TO THE LARGE-SCALE DEPLOYMENT OF ENVIRONMENTALLY SOUND TECHNOLOGIES

143. Innovation is often defined as the creation of a new technology that is more efficient, more refined or better suited to consumer needs. Innovation must stand apart from absorption, which is simply the sufficient understanding of a technology developed elsewhere to be able to apply it, without significant modifications, in a new local context. Successful absorption requires serious investment on the part of the enterprise or country seeking to use the new technology.

Technology innovation can be improved on under a system that was first designed on a national level (see illustration below). However, such a national system of innovation only functions if it respects certain factors and only if certain circumstances are satisfied: for example, interaction between university R&D departments and the private sector (SMEs and large firms), legal and institutional provisions, and an institutional framework that supports enterprises.

FIGURE 1 : THE BENCHMARK NIS MODEL



Source : National innovation system - Bremer *et al.*, 2001

144. It is often agreed that technological progress requires the combination of effective innovation and absorption at all levels of economic development. In terms of combating climate change, this is valid to rapidly achieve, at a lower or more affordable cost, the global mitigation and adaptation objectives that must be set by the international community. The innovation system approach was formally adopted in December 2014 at the 20th Conference of the Parties to the UNFCCC (COP20) in Lima, Peru. The Technology Executive Committee (TEC) presented its workplan for 2015, proposing to prepare a briefing on national innovation systems. The TEC decided to continue working on the issue of barriers to the introduction of innovation systems in 2015.

Currently, countries are considering the possibility of international innovation systems, for several reasons. Firstly, it is a fact that innovation systems are no longer simply national, their scope has become international. We can also evoke the mobility of experts and the multiplication of exchanges between major universities. Enterprises are increasingly developing R&D centres outside their country of origin.

In this environment, intellectual property rights only represent a part of the institutional framework that facilitates innovation. As we saw in the first part of this work, the role of patents in the transfer of environmentally sound technologies to developing countrieshas been significantly eroded. It is fundamental that the international cooperation framework takes this into account to integrate all factors affecting innovation and to optimise existing mechanisms to ensure speedier deployment.

2.2. ESTABLISHING A MORE EFFICIENT COOPERATION FRAMEWORK TO SUPPORT ACCESS TO ENVIRONMENTALLY SOUND TECHNOLOGIES

145. The advent of the third millennium was the occasion for the UN to present a strategy suited to today's challenges (2000 Millennium Summit) and enabled the organization to define the eight Millennium Development Goals (MDGs)[109] aiming, notably, at eradicating extreme poverty in the world. After the Rio+20 Summit, the international community decided to establish Sustainable Development Goals (SDGs)[110] to guide the efforts to be made through cooperation and development aid to contribute to sustainable development. These SDGs are intended to replace the MDGs and were adopted at the UN General Assembly of 25 September 2015, under the banner "Transforming our World: The 2030 Agenda for Sustainable Development". The SDGs apply to developed countries as well as developing countries, and are designed to conclude the efforts made under the Millennium Development Goals by 2030. As part of this post-2015 development agenda, which also includes a vast rethink of development financing, access to environmentally sound technologies is considered as a primary issue, which UN Secretary-General Ban Ki-Moon insisted on, underlining the importance of coordinated partnerships in the field of technology, and the necessity to maximise synergy between existing technology transfer mechanisms on an international level.[111].

146. In this context, possible arrangements are discussed to set up a technology facilitation mechanism, subsequent to the declaration adopted at the Rio+20 Summit, "The future we want", wherein a whole chapter (see paragraphs 269 to 276) was devoted to the question of access to environmentally sound technologies as an indispensable means of fully and effectively implementing the sustainable development commitments. This declaration called on United Nations agencies to *"identify options*

109 MDGs: Eradicate extreme poverty and hunger, achieve universal primary education, promote gender equality, reduce child mortality, improve maternal health, combat HIV/AIDS and other diseases, ensure environmental sustainability and develop a global partnership for development. Millennium Summit (September 2000, New York) and Millennium Report - A/54/2000. See also other summits: 2002-2006 Millennium Project; 2005 World Summit; 2008 High-level meeting on MDG achievement; Summit on MDGs in 2010.

110 Of the 17 SDGs negotiated, we can highlight the following: 9. Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation; 12. Ensure sustainable consumption and production patterns; 13. Take urgent action to combat climate change and its impacts.

111 Forum organised by the United Nations General Assembly and the Economic and Social Council (ECOSOC), New York, 9 April 2014.

for a facilitation mechanism that promotes the development, transfer and dissemination of clean and environmentally sound technologies by, inter alia, assessing the technology needs of developing countries, options to address those needs and capacity-building."[112]

The Secretary-General of the United Nations published a report on the options for such a technology facilitation mechanism (A/67/348), the purpose of which is to accelerate technology progress on a global scale in a manner commensurate with the sustainable development challenge and to address gaps throughout the full technology cycle. The aim is to provide special support to the poorest or especially vulnerable countries, improve technology transfer between developing countries and support projects contributing to the achievement of the SDGs[113]. Concerning intellectual property, this mechanism should pragmatically address intellectual property rights constraints for technology transfer by exploring "innovative voluntary approaches." The mechanism also needs to be practical and flexible in order to quickly adjust to new challenges and opportunities, while being coordinated with other technology-related international commitments, to achieve a genuinely international dimension.

147. Solutions were suggested in debates in the United Nations on technology for sustainable development: the mechanism should aim at

"a) strengthening international cooperation to close implementation gaps in terms of capacity, funds, technology and political commitment;
b) promoting "big push" technology transfer, including hardware, to developing countries;
c) building indigenous capacity and providing equitable access to overcome technology gaps; and
d) promoting partnerships with or solutions by the private sector and non-governmental organizations, supported by further privatisation, liberalisation and trade"[114].

Moreover, the organisations of the United Nations system participating in the report proposed 48 institutional proposals for improved technology facilitation.

112 A/Res/66/288, § 273.

113 A/67/348, pp. 16-17.

114 A/67/348, p. 17.

THE SUM OF PROPOSALS FOR A GLOBAL TECHNOLOGY FACILITATION MECHANISM

a) A global network, mechanism, or partnership, together with a technology development fund, in order to strengthen global research, development and demonstration cooperation, technology transfer and participation of developing countries;
b) A global network of national business incubators, together with support programmes and technology prizes;
c) A global clean technology venture capital fund, and sharing pools/funds related to intellectual property;
d) A global network of technology transfer and information mechanisms, based on existing global and regional centres, online platforms, clearing houses, international conventions with technology provisions and economic partnership agreements;
e) Public-private partnerships on collaborative systems for intellectual property and patents;
f) A network of capacity development programmes and knowledge platforms within the United Nations system, to promote clean technology transfer, diffusion and public participation;
g) An international network of technology assessment centres and/or national and global advisory groups on technology assessment and ethics;
h) An independent advisory team (or dialogue mechanism) within the United Nations, composed of experts and stakeholders, possibly drawing on a large pool of experts;
i) A management and coordination structure within the United Nations, including regional and subregional cooperative mechanisms and national coordination units.

Source: Report A/67/348

To determine the form, content and conditions of operation of this future mechanism, the UN General Assembly invited the Secretary-General to hold a series of four structured dialogues[115].

148. In order to simplify the mechanisms and create a global structure, the scope of such a structure will be the focal point of the panellists' efforts[116]. The challenge is to determine how this mechanism can function effectively with other existing structures, such as the UNFCCC Technology Mechanism. Indeed, certain observers express their concern about the scope of this mechanism, which may be limited,

115 A/RES/68/210, § 11. Relevant stakeholders, Member states, international organizations, the private sector, foundations and universities are invited to take part in these dialogues.

116 UN General Assembly Dialogues on Technology.

or the risks of overlapping[117]. In legal terms, the Technology Facilitation Mechanism and the Technology Mechanism cannot be consolidated into a single structure, as the first is attached to the UN Development Programme and the second to the legal framework of the UNFCCC. Nonetheless, within the conditions of operation in relation to other structures, a mutual support clause to facilitate coordination at least on an institutional level could be included. For example, the possibility for each structure to have observers or advisory experts participating in the meetings of the other structures, the possibility to participate within the framework of special technical teams, multipartite forums and/or advisory groups, or even concluding bilateral cooperation arrangements would undoubtedly bring more coherence to the framework.

149. The co-moderators of the last day devoted to possible arrangements for the Technology Facilitation Mechanism proposed various options that could be covered by this mechanism (progressive approach, the options are not mutually exclusive):

- Better information and a mapping of existing facilitation activities;
- Improved coherency and synergy between facilitation activities;
- Analyses of technology needs and missing arrangements to fulfil them;
- Promotion of the development, transfer and dissemination of environmentally sound technologies.

150. As part of the implementation of the post-2015 agenda for development, we can note the project to create a partnership initiative on technology and innovation between public and private sector stakeholders, and academic and scientific institutions. This initiative would involve 5 domains:

1) mapping the activities carried out within the framework of UN mechanisms or within a multilateral framework
2) an online platform to create links between existing technology and innovation platforms,
3) an annual forum on SDG-related technology and innovation,
4) capacity building,
5) support for current work on a Technology Bank for least developed countries. All these areas are similar to those covered by the UNFCCC. This initiative once again shows that policymakers want to make firm progress and build stronger cooperation in the deployment of environmentally sound technologies.

117 United Nations, 4th one-day dialogue, Technology Facilitation, July 2014.

2.3. BETTER COOPERATION BETWEEN MULTILATERAL ENVIRONMENTAL AGREEMENTS (MEAS) AND THE WORLD TRADE ORGANIZATION

151. Multilateral environmental agreements (MEAs) and international trade law have objectives that are closely linked but which could be sources of friction, despite the mutual support provision in the preamble to the Marrakesh Agreement, which refers to "protecting the environment and (...) promoting sustainable development" as legitimate objectives, alongside an "open and non-discriminatory trading system." For its part, the UNFCCC which was adopted prior to the Marrakesh Agreement, contains Article 3(5) which encourages the Parties to "cooperate to promote a supportive and open international economic system that would lead to sustainable economic growth and development in all Parties, particularly developing country Parties, thus enabling them better to address the problems of climate change."

Very soon after the entry into force of the UNFCCC, some developing countries claimed that industrial property rights, in particular patents, were preventing them from dealing with climate change issues and more generally, from meeting their sustainable development needs, as they represented a barrier to access to environmental goods and services.

This question was considered by the World Trade Organization at the Doha Conference in 2001[118] to clarify the relationship between the WTO rules and obligations set out in multilateral environmental agreements[119], in particular concerning the opening up of markets for environmental goods and services and the exchange of information between the systems.

152. The Doha Round particularly encourages countries to engage in the reduction or elimination of tariff and non-tariff barriers to environmental goods and services (§31(iii)). At the 4th dialogue on the Technology Facilitation Mechanism, a technical consultant from 'clean tech' companies pointed out that tariff barriers represented one of the barriers to entry to the environmentally sound technology markets. In 2012, the APEC (Asia-Pacific Economic Cooperation) leaders reached an agreement wherein customs duties would be reduced for 54 environmental goods by the end of 2015[120]. Today, the European Union and thirteen other members of the WTO have officially opened multilateral negotiations on the liberalisation of trade in environmental goods[121].

118 Doha Round 2001.

119 The relationship between the WTO and other international organizations is addressed in the Doha Ministerial Declaration which indicates that enhancing the mutual supportiveness of trade and environment must be done by improving the relationship between existing WTO rules and specific trade obligations set out in multilateral environmental agreements (MEAs) such as the UNFCCC (paragraph 31(i)).

120 APEC leaders' declaration - List of environmental goods - Annex C.

121 Joint statement regarding the launch of the environmental goods agreement negotiations, Geneva, 8 July 2014.

They wish to extend the APEC list of environmental goods, which is why the first rounds of talks covered potential environmental goods[122]. Once a list of environmental goods is finalised, the agreement will define the modalities of reducing the tariff and non-tariff barriers to trade and services.

The elimination or reduction of barriers to trade in this field are of benefit to the environment and the combat against climate change as they enable developing countries to acquire environmental goods and services at a lower cost. Moreover, the liberalisation of these goods and services will generate more lively competition and hence technology innovation.

153. Lastly, the question of the interaction between the WTO and the United Nations on technology transfer is all the more important as only the TRIPS Agreement covers the issue of intellectual property rights. Since the start of negotiations on climate change, intellectual property rights have been a sticking point between developed countries and developing countries. For developed countries, the question of intellectual property rights is not a matter for the Climate Convention but only for the WTO, which is contrary to the position of developing countries. The latter have considered IPRs as a barrier to technology transfer for some time and have proposed that reduced-cost or free licences be enabled, alongside patent pools, a reduced duration for patents, sharing of intellectual property in R&D, compulsory licensing or an exclusion from patentability for certain technologies (see Part One and Part Two of this study).

At the Cancún conference (COP17), the President of Ecuador declared that for developing countries, one way of making environmentally sound technologies more accessible was that they "lie in the public domain" and not be "protected by intellectual property rights"[123].

154. After the 20th Conference of the Parties in Lima in December 2014, the Parties adopted an initial negotiating text, the "Lima Call for Climate Action", with a view to a future Paris Agreement on climate (COP21, Paris, December 2015), in which the question of IPRs remains a subject of disagreement. Chapter H devoted to this matter recognises that the development and transfer of technologies must be operative to achieve the aim of limiting the temperature increase to below 2 °C or 1.5 °C above pre-industrial levels. Concerning the obligations of developed countries to encourage or facilitate technology transfer, policymakers continue to present diametrically opposed points of view on the role of intellectual property rights and swing between considering them as beneficial, indifferent or unfavourable for technology transfer. For some, the Parties must "recognize

122 The second round of talks (September 2014) covered goods concerning air pollution control and the management of solid and hazardous waste. The third round (December 2014) covered goods concerning wastewater management and water treatment, environmental remediation and clean-up, noise and vibration abatement.

123 Speech by Rafael Correa, President of Ecuador, to the General Assembly - COP17.

that IPRs create an enabling environment for the promotion of technology innovation in environmentally sound technologies" (Option 1). For the European Union, for example, intellectual property rights "are not to be addressed in this agreement" (Option 2). Inversely, for India, these rights remain a barrier and the agreement should stipulate that "developed countries should make available intellectual property rights either through a multilateral mechanism as a public good or through the purchase of the intellectual property rights" (Option 3). In such a case a multilateral institution such as the Green Climate Fund should be responsible for acquiring licences from developed countries to facilitate technology transfer to developing countries.

CONCLUSION TO PART THREE

The framework for international cooperation on the transfer of environmentally sound technologies has progressively shown that the essential point is to firstly clearly identify the needs of developing countries and to provide them with the information needed for technology transfer, especially know-how. Capacity building of public authorities in developing countries remains a priority, so that they can identify the needs and support the creation of innovative businesses.

In a context where international innovation is a major contributory factor to economic growth, the framework for international cooperation must integrate innovation factors in activities and projects, in order to optimise the performance of technology transfer mechanisms and enable a speedier, better directed deployment of technologies.

Intellectual property rights only represent a part of the institutional framework that facilitates innovation. As we saw in the first part of this work, the role of patents in the transfer of environmentally sound technologies to developing countries has been significantly eroded.

As part of international negotiations on climate change, a single country, India, continues to put a strong case forward for patents to be made available to developing countries, not for free, but with the financial support of the Green Climate Fund, or via a reduction in the severity of rights, as it claims that intellectual property rights are a barrier to the widespread use of green technologies. India has made it a question of principle in order to substantiate its strict approach to the differentiation of rights and obligations between developed and developing countries and, beyond the framework of climate negotiations, requests a loosening of intellectual property rules, citing the necessity to meet the essential requirements of its growing population.

Aside the fact that neither the UNFCCC nor the Paris Agreement adopted under its auspices appear to be the most appropriate instruments to reform intellectual property law, the conclusions of the first two parts of this study, like positions taken by a great many countries, indicate that neither does it seem fitting to do so.

In the combat against climate change, what matters first is to give the international community a predictable long-term roadmap of the collective effort required in order to achieve the objective of limiting global temperature rise to below 2 °C by the end of the 21st century in relation to the pre-industrial era. This aspirational objective will enable countries to propose national contributions that take into account their national priorities and circumstances, if the international cooperation framework provides the means of implementation and encourages the adoption of further ambitions through the ongoing improvement of contributions over the commitment cycle to be defined in the Paris

Agreement. With such a long-term signal, developing countries will necessarily establish the enabling environment, in particular on the institutional level, to orient markets to the appropriate technologies, with priority given to the most profitable to stimulate investment.

Aside the funding used to support the low-carbon, climate-resilient economy of developing countries, it is essential to make the best use of the existing mechanisms under the UNFCCC, in particular the Technology Mechanism, and to develop a genuine 'positive agenda' to ensure better coordination of multilateral initiatives in other forums, including those aiming at reinforcing the political dialogue specifically dedicated to intellectual property under the auspices of the TRIPS Agreement. This effort to optimise the synergy between existing multilateral mechanisms is the core element in the proposal for a Technology Facilitation Mechanism, which aims to deploy environmentally sound technologies on a large scale to foster sustainable development. Concerning patents and other intellectual property rights, the Mechanism should promote public-private partnerships to develop collaborative systems and enable direct contact between originators and recipients, in order to target real opportunities for market growth while respecting the environment and protecting the climate. Because beyond institutional facilitation, the dialogue between originators and recipients takes place firstly between private businesses. Most technology transfers are operated with private funds. 80% of transfers concerning climate change are private, 20% are public. Today the annual value is around $300 billion.

COP21 should produce a Paris Agreement that is sustainable and flexible, defines predictable collective objectives, wherein countries may specify their national contributions, and which reflects both their priorities in terms of innovation and their technology needs, both for mitigation and adaptation; these contributions could be improved upon over the commitment cycles, supported by existing mechanisms, whether climate-related or not, operating in a more optimised manner with the imperative to be cost-effective to develop competitive markets and support efficient public services. The Paris Agreement may also send a clear message in this direction, by using its preamble to call for mutual support from other international conventions or instruments, including the WTO, to enable development with the Sustainable Development Goals in mind and to call for the reinforcement of existing systems, in particular the UNFCCC Technology Mechanism through the support of the Green Climate Fund.

SUMMARY AND RECOMMENDATIONS FOR PART THREE

1 Since international negotiations on the environment started in the 1970's, the question of transferring environmentally sound technologies or adaptation technologies from North countries to South countries has been approached in most conventions, protocols and declarations.

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2 In the last 20 years the mechanisms intended to speed up the transfer of environmentally sound technologies have multiplied, with varying degrees of success: International Technology Centres (ITCs), Global Environment Facility (GEF), Clean Development Mechanism (CDM), Sustainable Development Goals (SDGs), etc.

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3 In general these mechanisms do not directly cover questions of intellectual property and in particular patents, because the real issue is the transfer of know-how in a wider sense (training, technical knowledge, networks, etc.).

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4 The current challenge is to rationalise technology transfer mechanisms in order to raise their effectiveness.

GENERAL CONCLUSION

Ultimately, the dissemination of sustainable development tools and practices and even more so innovation in this field, depend on economic interactions at multiple levels, from enterprises to States, through the intermediaries, much like a network node: ecosystems comprising businesses on the one hand, stakeholders having a link with a certain territory on the other hand.

In such a dynamic context, this study has attempted to refute the idea that industrial property prevents the progression of sustainable development and has sought to demonstrate that on the contrary, it generates a host of new practices, by suggesting two opportunities:

- For countries and territories who are recipients of technologies and know-how, the current opportunity to implement a long-term attractiveness strategy and connect to innovation networks by being in phase with the diversity of industrial property tools. In this way, technology can be grafted into these countries or territories.
- For originators and more generally industrial property users, the opportunity to make use of the sustainable development approach to review and renew their practices.

This overlap is seemingly small but could generate many interfaces for evolution.

Without referring back to the conclusions of each part of this study, here we really would like to look at their interconnection, starting with an overview of the question of energy efficiency and access to modern energy sources, from the issue of forests to world urbanisation.

Today, most countries or organizations in the 'originators' category implement programmes to co-preserve the environment and co-innovate with South countries.

The United Nations Organization has set up the "Sustainable Energy for All" initiative, the aim of which is to deal with both development and climate change (in this case, concerning access to electricity).

Similarly, the European Union has set the "20-20-20" targets as a sustainable development model: ensure 20% of EU energy is from renewable sources by 2020, 20% improvement in energy efficiency and a 20% cut in greenhouse gas emissions[124]. Article 9 of the EU directive provides for the possibility of joint projects between Member States and third countries.

124 See Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. See also: Communication from the Commission of 13 November 2008 - Energy efficiency: delivering the 20% target, COM(2008) 772 final.

"Intellectual property and sustainable development may well be commencing a new era in their interactions."

In France, the French Development Agency (AFD) is also active. In 2011, the Association of Power Utilities of Africa (APUA, formerly UPDEA), contacted the AFD to set up training for electricity companies on the possibility of pooling their resources on this matter[125]. A first seminar was held in 2012 in Yamoussoukro in Ivory Coast, where some fifty HR executives from 16 African companies were present. To a large extent, this initiative will be grafted onto capacities already in place in some recipient countries: The Institut Supérieur d'Ingénierie with sub-regional scope (West Africa), 2iE (International Institute for Water and Environmental Engineering) in Burkina Faso, the Institut National Polytechnique Félix Houphouët-Boigny (INP-HB) in Ivory Coast, or the Institut Polytechnique in Senegal.

The new transmitters, the emerging countries, are also more and more present.

The promotion of the Brazilian family-run agricultural model was firstly based on technical cooperation programmes with Portuguese-speaking African nations; this model then spread to neighbouring countries. The installation of an office operated by Brazilian agronomic agency Embrapa in Accra (Ghana) in 2007, enabled Brazil to appear as a sustainable development model according to an AFD report[126]. The same report cites the example of the Chinese government which has initiated dialogue on the sustainable management of forests and the export of certified wood products. There remains a long road ahead, between declaring intentions to adopt a sustainable development approach and respect international standards (FLEGT, APV) and taking the 'laissez-faire' option of non-interventionism. But the authors underline that observation of standards is progressing in terms of exports to Europe. In our opinion it is more interesting that South countries themselves (Gabon for wood, Bolivia for minerals, etc.) are progressing towards models that seek to impose transformation on site,

125 Confrontations Europe - Meeting of the EU-Africa(s) working group in Paris on 16 December 2013 on the topic: Energy infrastructures and regional integration in West and Central Africa: speech by Bernard Duhamel.

126 *L'Afrique et les grands émergents*, report by Jean-Raphaël Chaponnière, Dominique Perreau, Patrick Plane, AFD, April 2013.

with the transfer of technology and know-how, while respecting national standards: COFCO and its sustainably managed forest concessions (CFAD) is the first Chinese company to adhere to the Gabon union of forest operators (UFIGA).

Beyond the interactions between originator enterprises in emerging countries and developing countries, emerging countries themselves have developed a genuine support policy. In May 2014 following the visit of Li Keqiang to Africa, low-carbon cooperation was highlighted as a priority component of cooperation between China and Africa. China already has modern laboratories in Africa: in 2012, six Chinese Special Economic Zones in Africa (CSEZA) existed, in Mauritius, Egypt, Nigeria (two CSEZA in this country), Zambia and Ethiopia. In Mauritius and Ethiopia the local governments are partners and shareholders in the projects[127].

These few examples demonstrate the degree of proliferation. Although many questions of governance are not settled, they do however reveal a dynamic nature to be taken into account to identify solutions at the sessions of the Conference of the Parties to the UNFCCC, locate markets for enterprises, or achieve genuine sustainable development in the field.

Intellectual property and sustainable development have ignored each other for a long time. So now their stakeholders have started working together, intellectual property and sustainable development may well be commencing a new era in their interactions.

127 See *Chinese influence on urban Africa*, Liu Xuan and Benoît Lefèvre, http://www.sciencespo.fr/affaires-urbaines/sites/default/files/Xuan%20LIU_Publication_IDDRI.pdf, 2012. This important study completes two other earlier studies on the matter: Deborah Brautigam and Tang Xiaoyang, *"African Shenzhen: China's special economic zones"* (2011) ; Brautigam, Farole and Tang Xiaoyang, *"China's Investment in African Special Economic Zones: Prospects, Challenges and Opportunities"*, the World Bank, 2010.

LIST OF OBSERVATIONS

1 The patent is a legal tool that facilitates investment in a new market by ensuring the patentee has an exclusive right on its use.

2 The patent is a legal tool that facilitates the implementation of a price differentiation policy according to markets and the control of local partner activities.

3 To access a technology, the primordial issue is the transfer and mastering of the know-how involved. A basic patent licence is more often than not insufficient, even useless, to ensure effective technology transfers to a developing country.

4 Patents cannot be an obstacle to access to technology by developing countries, because most patents are not applied for in these countries, so the technologies are freely accessible at no charge.

5 Today, innovation is multi-polar and businesses in North countries are now competing with firms from emerging economies, even those from developing countries, on the market for environmentally sound technologies.

6 A growing proportion of non-leading edge technologies is accessible to a great many players, for the lion's share of economic activity, so that in the majority of economic transactions, competition through purely intellectual property tends to disappear in favour of competitive offerings concerning technical guidance delivered by originators to recipients.

7 The filing and above all the grant of a patent is a strong signal transmitted by the patentee to their market. In this case the signal is that the patent guarantees the quality of the patent owner's research and development efforts.

In a real economy where information is asymmetric, this signal is an element that reduces this asymmetry. The information is essential to all partners (banks, investors, business partners, government aid agencies, etc.).

8 Patent databases are becoming a primordial source of information, particularly for developing countries who know how to obtain the appropriate capacities to analyse and make use of the patents. This tool remains under-utilised, yet supplies top-quality information both on existing technologies that are often free because unprotected, and on potential partners.

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9 In terms of clean technologies, several initiatives intend to enable recipient countries to declare their specific needs. Both public and private entities in developing countries should use the WIPO Green platform.

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10 The development of competitiveness clusters is often achieved through initiatives of the public authorities which set up and support private stakeholders. Detecting the real and specific needs of enterprises is an essential factor in their success. This tool is accessible to South countries (also remember that the concept and practice emerged first in Brazil).

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11 For businesses investing on new markets, the trademark is often the most important asset to protect. A trademark protection system is therefore highly useful and efficient to attract originators to the markets.

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12 Trademarks and geographical indications offer huge potential to stakeholders in developing countries who produce a large number of products, in particular agricultural products, which are sold on international markets. Experience shows that the cost of setting up these tools is reasonable and that the positive impact for local populations is rapid and significant.

It is therefore in the interest of developing countries to develop policies to raise awareness and to provide guidance in using trademarks and geographical indications.

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13 The concern about providing developing countries with access to environmentally sound technologies has become omnipresent in the international dialogue on the environment and climate change. Initiatives are multiple but too fragmented, which impairs their effectiveness.

LIST OF RECOMMENDATIONS

1 Contrary to what is sometimes claimed, patents do not represent an obstacle to technology transfers, and particularly sustainable development technologies, to developing countries. The vision entertained by developing countries of the patent as a legal padlock is erroneous.

The key factor in ensuring technology transfers is know-how.

As know-how is intrinsically secret and complex because it collates elements of information, it cannot be transferred by using a legal weapon such as compulsory licensing.

To access a new technology, developing countries need to convince investors and technology owners to carry out these transfers of their own accord.

The development of industrial property infrastructures (IP offices, training for judges, IP attorneys, lawyers, etc.) is a useful strategy for developing countries because if industrial property rights are protected, technology owners are more inclined to grant licences and transfer their technologies.

Pooling is an efficient solution to limit the cost of developing these infrastructures. This method has been used by the member states of OAPI, the only IP office in the world to grant industrial property rights valid in 17 countries.

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2 In a global economy, developing countries have at their disposal a multitude of originators able to transfer technologies ('traditional' developed countries, large emerging economies, developing countries with expertise in certain fields, etc.).

For originating countries and firms located there, the markets of developing countries are their best hope for growth.

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3 One of the essential issues in speeding up the deployment of environmentally sound technologies is the circulation of information, both on existing technologies and on the needs of developing countries.

4 National IP offices should pursue their efforts to simplify and optimise patent databases to make them accessible to the greatest number of parties possible.

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5 Furthermore, stakeholders involved in supporting development, in particular development agencies, should learn to use these databases to identify existing technologies and to encourage recipients to declare their needs.

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6 Trademarks and geographical indications offer huge potential to stakeholders in developing countries who produce a large number of products, in particular agricultural products, which are sold on international markets.

Experience shows that the cost of setting up these tools is reasonable and that the positive impact for local populations is rapid and significant.

It is therefore in the interest of developing countries to develop policies to raise awareness and to provide guidance in using trademarks and geographical indications.

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7 In the last 20 years the mechanisms intended to speed up the transfer of environmentally sound technologies have multiplied, with varying degrees of success: International Technology Centres (ITCs), Global Environment Facility (GEF), Clean Development Mechanism (CDM), Sustainable Development Goals (SDGs), etc.

The current challenge is to rationalise technology transfer mechanisms in order to raise their effectiveness.

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8 Dialogue and cooperation between the worlds of sustainable development and industrial property are in their early days. They need to intensify.

OVERVIEW

Sustainable development, this meta-project that aims to secure development without harmful consequences for humankind and the environment, is of great necessity as our planet is threatened by climate change. In developing countries in particular, it requires the large-scale deployment of "clean" or environmentally sound technologies. The role of industrial property is often evoked in this deployment, either as a catalyst or a hindrance to the development of environmentally sound technologies. One aim of this study is to answer the question of the role of industrial property in the adoption of environmentally sound technologies in developing countries.

This study is based on an observation: all too often the universes of intellectual property (research labs, patent applicants, National IP Offices, etc.) and of sustainable development (politicians, militants, international convention negotiators, social entrepreneurs, etc.) are unaware of each other. The objective of this study is therefore twofold:

The first aim is to establish a dialogue between these two worlds - between two *modes* of thought - represented by stakeholders in sustainable development and intellectual property, in order that on one hand, stakeholders in sustainable development perceive the benefits offered by intellectual property in the implementation of sustainable development policies: this study aims to highlight the conditions under which industrial property, and in particular patents, may become an *opportunity*. And on the other hand, so that intellectual property stakeholders identify the technological, economic and social issues of sustainable development and the manner in which patent or trademark rights can be enforced to contribute to the deployment of environmentally sound technologies and more generally in the pursuit of sustainable development.

The second aim of this study is to suggest that innovation in developing economies is as much a challenge for the evolution of industrial property tools as for sustainable development.

Our methodology is essentially based on case studies. Indeed, it seems essential to illustrate with concrete examples cases of technology transfer and use of industrial property rights, so as to understand the reasons for the successful or failed reception of environmentally sound technologies in developing countries.

Several realities have been highlighted:

1) Contrary to what is sometimes postulated, patents are not an obstacle to the transfer of technologies, and particularly sustainable technologies, to developing countries, because most patents are not applied for in these countries, so the technologies are freely accessible at no charge.

   Also, as part of international negotiations on climate change, a single country, in this case India, continues to put a strong case forward for patents to be made available to developing countries, not for free, but with the financial support of the Green Climate Fund, or via a reduction in the severity of rights, as it claims that intellectual property is a barrier to the widespread use of green technologies.

2) The primary issue is the transfer and control of know-how. As know-how is intrinsically secret and complex because it collates disparate elements of information, it cannot be transferred by using a legal weapon such as compulsory licensing. To access a new technology, developing countries need to *convince* investors and technology owners to carry out these transfers. The development of industrial property infrastructures (IP Offices, training for judges, for IP attorneys, for lawyers, etc.) is a useful strategy because if industrial property rights are protected, technology owners are more inclined to grant licences and transfer their technologies. Pooling is an efficient solution to limit the cost of developing these infrastructures. This avenue has been used by the member states of the African Intellectual Property Organization (OAPI), the only IP Office in the world to grant industrial property rights valid in 17 countries.

3) The other principal observation is that today, innovation is multi-polar and businesses in developed countries are now competing with firms from emerging economies, even those from developing countries, on the market for environmentally sound technologies. Developing countries have at their disposal a multitude of originators able to transfer technologies ('traditional' developed countries, major emerging economies, developing countries with expertise in certain fields, etc.). The consequence is that an increasing number of technologies, except for leading edge techniques, are accessible to a great many stakeholders, so that in the majority of technology transfers, the role of pure intellectual property (patents) is tending to decline, replaced by know-how and technical *guidance*.

   It is largely incumbent on the governments of developing countries to coordinate activities with their businesses and national industrial fabrics to support the access of their economic agents to environmentally sound technologies; a country such as Morocco has shown the way through the Moroccan Industrial and Commercial Property Office (OMPIC).

4) Concerning international negotiations, aside the funding used to support the low-carbon, climate-resilient economy of developing countries, the essential issue is to make the best use of the existing mechanisms under the UNFCCC (United Nations Framework Convention on Climate Change), in particular the Technology Mechanism (TM), and to develop a genuine 'positive agenda' to ensure better coordination of multilateral initiatives in other forums, including those aiming at reinforcing the political dialogue specifically dedicated to intellectual property, under the auspices of the TRIPS Agreement.

   This effort to optimise the synergy between existing multilateral mechanisms is the core element in the proposal for a Technology Facilitation Mechanism (TFM), which aims to deploy environmentally sound technologies on a large scale to foster sustainable development. This Mechanism is currently being discussed in the wider framework of the United Nations. Concerning patents and other intellectual property rights, the Mechanism should promote public-private partnerships to develop collaborative systems and enable direct contact between technology owners (originators) and potential recipients, in order to target real opportunities for market growth while respecting the environment. Because beyond institutional facilitation, the dialogue between originators and recipients takes place firstly between private businesses. Most technology transfers are carried out with private funding: 80% of transfers concerning climate change are private, 20% are public. Today the annual value is around $300 billion.

5) In this global economy, a key factor in accelerating technology transfer is the dissemination of *information* concerning existing technologies and the needs of developing countries.

   Capacity building of public authorities in developing countries remains a priority, with a view to identify the needs and support the creation of innovative businesses. This capacity building already exists, in particular within the framework of the UNFCCC and needs further support still, especially to enable developing countries to assess their needs according to their situation and national priorities.

   In parallel, National IP Offices should pursue their efforts to simplify and optimise patent databases to make them accessible to the greatest number of parties possible. Furthermore, stakeholders involved in supporting development, in particular development agencies, should learn to use these databases to identify existing technologies and to encourage recipients to declare their needs.

   In the field of environmentally sound technologies, several initiatives intend to enable recipient countries to declare their specific needs. Both public and private entities in developing countries should use the WIPO Green platform. This platform helps

make available to development agencies a selection of tools used to identify the technologies available and the needs. It should also be noted that these agencies could use intellectual property rights to improve the effectiveness and the effects of their programmes, both financially and in terms of technology.

On the increasingly informative role of patents, it must be noted that the filing and above all grant of a patent is a strong signal transmitted by the holder to the market: the signal is that it represents a guarantee of the quality of the holder's research and development. This information is essential to all partners (banks, investors, business partners, public aid agencies, etc.). And patent applications in developing countries are often considered as a sign of economic transition by foreign investors.

6) What is more, trademarks and geographical indications are the other two main industrial property rights available to developing countries, but still under-used. They are essential legal and communication tools for developing countries, both to attract foreign investors and to sell their products on international markets.

They offer immense perspectives to stakeholders in developing countries who produce a large number of products, in particular agricultural products, sold on international markets. Experience shows that the cost of setting up these tools is reasonable and that the positive impact for local populations can be rapid and significant. It is therefore in the interest of developing countries to develop policies to raise awareness and provide guidance in using trademarks and geographical indications.

APPENDIX 1
OBJECTIVES OF CHAPTER 34 OF AGENDA 21

1) To help to ensure the access, in particular of developing countries, to scientific and technological information, including information on state-of-the-art technologies;

2) To promote, facilitate, and finance, as appropriate, the access to and the transfer of environmentally sound technologies and corresponding know-how, in particular to developing countries, on favourable terms, including on concessional and preferential terms, as mutually agreed, taking into account the need to protect intellectual property rights as well as the special needs of developing countries for the implementation of Agenda 21;

3) To facilitate the maintenance and promotion of environmentally sound indigenous technologies that may have been neglected or displaced, in particular in developing countries, paying particular attention to their priority needs and taking into account the complementary roles of men and women;

4) To support endogenous capacity-building, in particular in developing countries, so they can assess, adopt, manage and apply environmentally sound technologies. This could be achieved through inter alia:
   - Human resource development;
   - Strengthening of institutional capacities for research and development and programme implementation;
   - Integrated sector assessments of technology needs, in accordance with countries' plans, objectives and priorities as foreseen in the implementation of Agenda 21 at the national level;

5) To promote long-term technological partnerships between holders of environmentally sound technologies and potential users.

APPENDIX 2
INDUSTRIAL ECOSYSTEMS IN EMERGING ECONOMIES have led to the rise of new stakeholders as technology originators

Joël Ruet

The purpose of this appendix is to illustrate the original technology catch-up modes of large Emerging countries to provide a basis for the elements presented in the report: having obtained technologies through an industrial ecosystem strongly supported by the State and associated to the strategic use of resources (natural, human, technical, know-how, etc.), large Emerging countries have thereby acquired a 'support technique' which they use in their technology relationships with South countries. This makes them "originators" and "transmitters" of a particular type.

The major lesson of emergence is to make us collectively realise that we have overlooked the modern operation of many industries outside Europe for several decades. If the paradigm of modernity since Voltaire and the Enlightenment is that the future can be totally different, since 1991 the West has been outside of this paradigm, preferring competition between highly similar models as it was persuaded that it was capable of controlling the future. Michel Albert's work, *Capitalisme contre capitalisme*, drew up a comparison of Anglo-Saxon, Rhineland and *"colbertiste"* capitalism, variants of Western capitalism but highly similar nonetheless. This competition between multinationals or between SMEs has completely blanked out future competition, i.e. competition between extremely different enterprises.

THE DISCOVERY OF EMERGENCE

The West focused on its own model because the regions of the world where other models existed were relatively closed-off. The American model of multinational firms, or the UK and German models of relationships between banks and enterprises, were the ones to follow. We only have to look at how a publication like the *Harvard Business Review* was able to influence consideration of business models in the West.

In this context, 'emerging' countries were discovered in two ways:

— through a **macro-economic approach** consisting in the evaluation of their share in world GDP over a certain time line, which means nothing to businesses;
— through a **cost-based approach** by asking which countries are likely to occupy such and such function in the implicitly Western value chain.

The latter approach has ultimately showed that there could be more competition outside Europe, but has nonetheless not revealed to what point the new value chains would compete with existing ones in the West. Understanding of these developments has been progressive at best, as the West attempted to apply the old, seemingly unique model to this emergence.

DIFFERENT INDUSTRIAL TRADITIONS

Today we need to reconsider emergence: it is not the integration of large zones into the Western global economy. On the contrary, emergence can be defined as communication between and sharing of different industrial traditions.

To return to the initial question of modernity, the issue is not so much to know who, in these industrial trajectories, was the holder of obsolete or modern technologies, but to recognise that today these trajectories meet and communicate. We are no longer in a single industrial model, the future has considerably opened up and history provides no clues as to the future; suddenly the West has no historical income to live off, to which political debates in Europe are blind, which the USA underestimates due to the power of the dollar. But for how long?

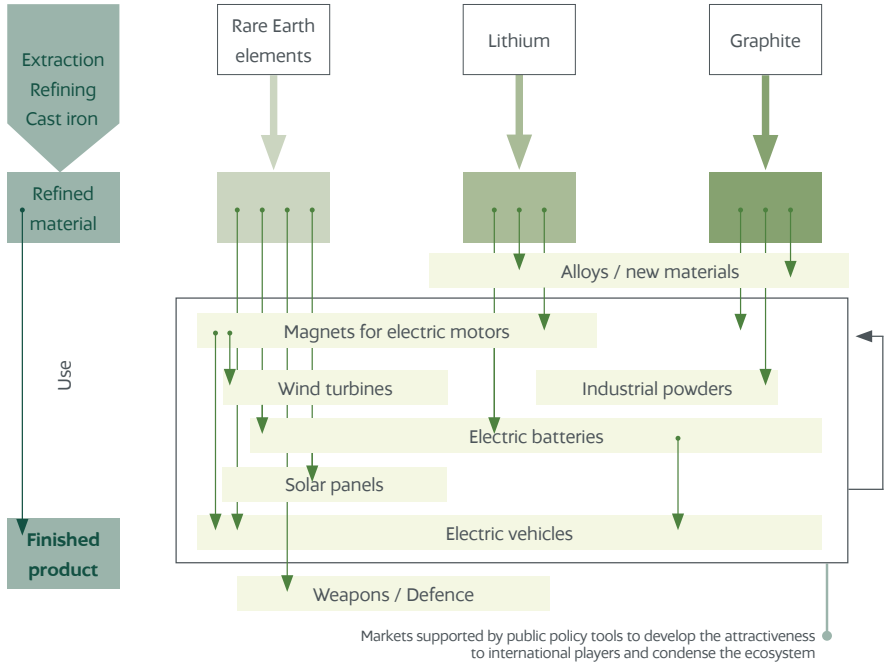
THE FOUR CAPITALS

Today industrial development depends on four 'capitals': technical, natural, human and social, deployed in an ecosystem of 'energy - materials - industry'.

The important factor in the ecosystem concept is that a firm never works alone; it operates with suppliers, clients and *learns* from them. The very principle of the ecosystem is the possibility of choice that it offers, e.g. of various suppliers. We often see emerging countries as 'black boxes' in which Western firms gather partners or suppliers without understanding the richness of the ecosystems to which these black boxes belong. In this respect, it is symptomatic to see how much the industrial ecosystem in France has disappeared in a certain number of sectors. In Europe, only Germany has managed to sustain a degree of diversity in its industrial ecosystem, similar to that of China.

Figure 1 illustrates the 'broad' ecosystem structured by Beijing around the clean technology industry. The Chinese government has developed a strategy to attract leading international industrial firms active in clean technologies and form a competitive ecosystem for clean technologies in its country. This strategy is based on i) guaranteed access at competitive prices to raw materials and ii) the creation of a guaranteed local market for selected clean technologies.

FIG. 1 : THE ECOSYSTEM OF NEW CHINESE TECHNOLOGIES HAS UPSTREAM ACCESS TO 'OFF-MARKET' RESOURCES



In a certain manner, the West is paying for the historical phase of Fordism, which simplified ways of doing things to the extreme. The diversity of participants is essential in the concept of an ecosystem; it is for this reason that know-how must be safeguarded even if they are attacked at a given time, because at some other time in the future, it will again be useful. From this point of view, the example of re-used know-how in France's textile industry is very eloquent.

NATURAL AND HUMAN RESOURCES

In terms of the four capitals that make up an ecosystem, a part of the Western model was built around a natural unlimited and low-cost capital, and by standardising human capital to the extreme - 'human resources' pushed Taylorism from the factories into the offices. Now we need to reinvent human capital that is more mobile, more agile, etc. The Western economic system has been excessive, by considerably increasing physical capital to the detriment of investing in other forms of capital. Today, it is extremely important to know how these four capitals are constructed and co-constructed. The main issue is to invest in human capital, even to simply monetize it when it pre-exists. The West has never had a youth as well educated and open-minded as today. Consequently, the issue of revisiting this question of the four capitals is a considerable one.

STRONG LINKS BETWEEN ENTERPRISES AND GOVERNMENTS

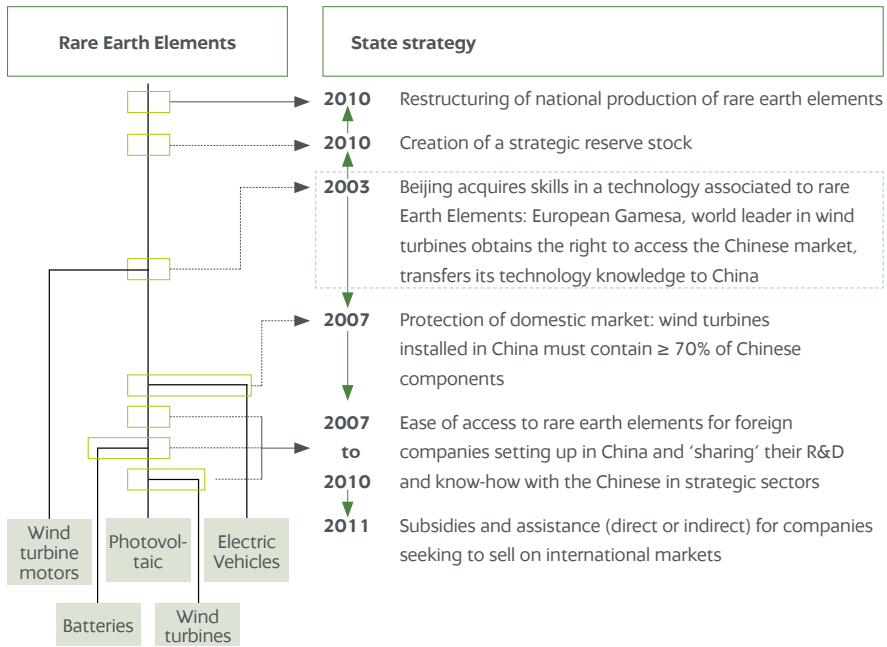
Let us use an assumption, a filter to analyse the relationships between State and industry in Large Emerging countries. 'Reversible capitalism', half-way between the journalistic wording and the economic concept, sees itself as open and questions what we are observing in China or in India, summed up in the West as 'State capitalism'. In reality this term is rather unsuitable.

Is not the border between State and capitalism more porous than we think? If we consider that capitalism is 'how production is financed', we deduce that large Chinese banks are totally dependent on the State and consequently, that the State favours virtually all the enterprises that it wants to. In India, the situation is less clear from this standpoint, but asks a question nonetheless. Large privately-owned banks were a full sail in 1991. After 2009, the support or lack thereof to private groups suffering financial difficulties was negotiated on a governmental level. Similarly, the State bankrolled a certain number of public or semi-private groups which then became instruments by intervening on behalf of its investment policy. In all events, the reforms are more 'pro-business' (favouring specific enterprises) than 'pro-market' (general rules applicable to all). This is quite distant from liberalism.

'CAPITALISM OR REVERSIBLE LIBERALISM?'

We should probably be thinking more of 'reversible liberalism'. The Chinese authorities even practice 'discreet control' on a day to day basis when they finance or re-finance. These are hard issues. These models are highly specific, and far from German or Japanese capitalism where the links between banks and enterprises are very strong. Without going into a value judgement. The pragmatic criterion for judgement is ultimately the capacity of China and India to stimulate their four capitals.

FIG. 2 : STRONG INTERACTIONS BETWEEN STATE AND INDUSTRIES HAVE ENABLED CHINA TO ACQUIRE COMPETITIVE ADVANTAGES IN EV TECHNOLOGIES AND CLEAN TECHNOLOGIES IN GENERAL



Through an industrial strategy blending off-market advantages with procurement of raw materials, financing selected industrial sectors and creating preferred market conditions, the Chinese State has stimulated the creation of industrial districts specialising in leading-edge technologies. The graph above looks at the main chronological steps in the structuring of the Chinese clean technology ecosystem, starting from the import of strategic technologies into China.

HOW GLOBALISATION HAS RECONFIGURED THE INDUSTRIAL GEOGRAPHY OF THE WORLD

Current industrial geography is therefore becoming increasingly difficult to represent on maps. We need to use 'sub-maps' with separate floors or levels. In the past, we had clearly separate world regions where distinct models existed. Today we have business parks, industrial districts, competitiveness clusters, which are in contact with other clusters, districts and parks. We now need a layered or segmented image of international trade.

For each type of trade, we observe interconnected zones with centres of gravity. This can be verified on firm examples such as the Dacia Logan vehicle, initially intended to be sold in emerging countries, but which has sold very well in France.

In effect, production sites are getting closer to the consumption locations. Relocations – we speak of 'delocations' but in truth all of industrial history involves relocations – are associated to the manner in which a territory changes its production methods and how a population changes its consumption modes. All industries tend to move closer to their markets, either as sites for sourcing their inputs, or sources of financing.

PROMOTE A RAPID REDEPLOYMENT CAPACITY

The result is that specialisation sites are increasingly temporary. This is the main lesson of emergence: the idea of specialisation, the 'major economic idea' which since the end of the 19th century has been the basis of the theory of trade, becomes sluggish or at least less dangerous for an economic territory. In the time taken to implement a specialisation, the industry has already changed. It is therefore important to promote the potential of rapid redeployment. And here we need to fertilize the diversity of economic territories. This is probably a role for the State, not forcibly in taking action, but in promoting and adopting the 'laissez faire' attitude.

For example, India no longer envisages any major technology contracts without its own enterprises and engineers being involved. The era of Make in India 'for' India is now fully open and increasingly the objective of securing sustainable trade relations with India is now built around technology-related negotiations between industrial partners.

Enterprises such as EDF, Areva or DCNS for example, French flagship companies particularly interested in India's extensive need for energy infrastructures or its shipyards, should seriously invest in understanding India's industrial strategy. We rapidly need a system of industrial and partnership intelligence with India. In Europe, Germany is India's leading trade partner (trade has doubled in ten years). The Indian prime minister continues to try and attract German investors to assist in his country's creation of a leading-edge industrial sector.

Today in general, on the matter of technology, all these infrastructure sectors and industries require support in terms of financial engineering, investment and legal structuring suited to the national structures seen in the various forms of emerging countries.

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DECLARATIONS

INTERNATIONAL DECLARATIONS AND AGREEMENTS

- Declaration of the United Nations Conference on the Human Environment, Stockholm, Sweden, 5-16 June 1972
- Vienna Convention for the Protection of the Ozone Layer, 1985
- Agenda 21, an action plan for the 21st century, Rio de Janeiro, Brazil, 1992
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- **Decision 4/CP.4** - Development and Transfer of Technologies - Report of the Conference of the Parties on its fourth session, held in Buenos Aires from 2 to 14 November 1998 - FCCC/CP/1998/16/Add.1

- **Decision 4/CP.7** - Development and Transfer of Technologies - Report of the Conference of the Parties on its seventh session, held in Marrakesh from 29 October to 10 November 2001 - FCCC/CP/2001/13/Add.1

- **Decision 4/CP.7** - ANNEX - Framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention

- **Decision 1/CP.13** - Bali Action Plan - Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007 - FCCC/CP/2007/6/Add.1

- **Decision 2/CP.14** - Development and Transfer of Technologies - Report of the Conference of the Parties on its fourteenth session, held in Poznan from 1 to 12 December 2008 - FCCC/CP/2008/7/Add.1

- **Decision 2/CP.15** - Copenhagen Accord - Report of the Conference of the Parties on its fifteenth session, held in Copenhagen from 7 to 19 December 2009 - FCCC/CP/2009/11/Add.1

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SUSTAINABLE DEVELOPMENT
& INTELLECTUAL PROPERTY
Access to technologies in developing countries

Intellectual property and sustainable development are two separate universes which often ignore each other or meet with distrust.

This work shows that fruitful dialogue is not only possible but essential.

The world of sustainable development and access to clean technologies by developing countries may make highly effective use of patents and trademarks to optimise, or enable, technology transfer.

For intellectual property stakeholders, the field of clean technologies is a source of innovative ideas (creation of technology markets, better information) that are likely to serve as models in all areas of innovation.

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