Munich Personal RePEc Archive

International Entrepreneurship and Technology Transfer: The CDMs Reality in China

Aleluia, João and Leitão, João

Instituto Superior Técnico, Technical University of Lisbon, Instituto Superior Técnico, Technical University of Lisbon, Center for Innovation, Technology and Policy Research IN+

15 June 2009

Online at https://mpra.ub.uni-muenchen.de/16150/
MPRA Paper No. 16150, posted 10 Jul 2009 00:41 UTC

International Entrepreneurship and Technology Transfer: The CDM´s Reality in China

João Aleluia[1]
João Leitão[2*]

[1, 2] Instituto Superior Técnico, Technical University of Lisbon,
Av. Rovisco Pais, 1049-001 Lisbon, Portugal
*Center for Innovation, Technology and Policy Research IN+
and European Council for Small Business and Entrepreneurship
[2] Contacting author: joao.correia.leitao@ist.utl.pt

Abstract:
Entrepreneurship as a determinant of economic growth and innovation intensity has been increasingly used by governments for shaping public policies with sustainable development purposes. This chapter positions the Clean Development Mechanism as an example of an international technology transfer mechanism that can stimulate knowledge spillovers in the host economies. Taking as reference the Chinese context, a benchmarking approach is proposed to assess the performance of distinct mechanisms of climate friendly technology transfers. This is particularly relevant since it is an innovative attempt for addressing the caveat found in the literature of international entrepreneurship and technology transfer, especially focused in the need for developing both qualitative and quantitative analyses about distinct experiences in adopting technology transfer mechanisms into developing countries. This is useful not only in the scope of global efforts to mitigate the emission of greenhouse gases, but also in the accomplishment of sustainable development goals of host economies. Moreover, from the current proposal an operative tool is derived for guiding the action of policy makers, managers and practitioners engaged in the field of Energy Entrepreneurship.

Key words: Benchmarking, Clean Development Mechanism, CDM, International Entrepreneurship, Technology Transfer.

1. Introduction

Set-up in the wake of the Kyoto Protocol in 1997, the Clean Development Mechanism (CDM) is a market-based tool aimed at reducing the emission of greenhouse gases (GHG) in developing countries (Olsen, 2005). By providing financial and technological assistance to the developing world, the CDM not only contributes to the mitigation of climate change effects and sustainable development, but it also enables developed nations to achieve lower compliance costs on their GHG reduction commitments (Castro & Michaelowa, 2008).

Drawing on theories of international entrepreneurship and technology transfer, the goal of this chapter is twofold, that is, to analyze the CDM phenomenon and to present a benchmarking proposal for evaluating CDM projects in China. The focus on this country is due to two main reasons. First, China is currently the world's largest emitter of GHG (IEA, 2007). Second, China is one of the countries with the highest number of CDM projects implemented so far (Schneider *et al.*, 2008), enabling a more comprehensive study of this phenomenon in comparison to other CDM host countries.

The literature review includes an overview of the main streams of research on international entrepreneurship (IE), and of the relevant entry modes (Acs, 2006; Acs & Varga, 2005; Acs & Szerb, 2006). The cornerstones of the literature on economics of science and technology presented by Audretsch *et al.* (2002) are also reviewed, in order to reveal the importance of international technology transfer (ITT) mechanisms under the framework of energy entrepreneurship. The focus will turn to the essentials of CDM, namely its importance in the scope of the Kyoto Protocol, intended goals, and *modus operandi*. The empirical approach will provide the evaluation of the CDM´s performance, as both a technology transfer mechanism, and as a foreign entry mode for international entrepreneurs. A set of key performance indicators will be identified and, based on these, a benchmarking proposal about technology transfer mechanisms will be presented.

The remainder of the chapter is as follows. First, it reviews the international linkage between entrepreneurship and technology transfer, and mechanisms for international technology transfer. Second, it addresses the need for promoting qualified technology transfer in order to surpass the challenges posed by climate change. Moreover, it reveals the importance of the CDM as a flexible mechanism under the Kyoto Protocol that provides the opportunity exploitation of delocalized investments made by technological start-ups. Third, it presents a benchmarking proposal for evaluating CDM projects based in China. Finally, it concludes and presents implications for policy makers, managers and practitioners interested in energy entrepreneurship and technology transfer.

2. Entrepreneurship and Technology Transfer: The International Linkage

2.1. Literature Streams

The identification of literature streams that explain the emergence of companies that can be considered internationally entrepreneurial in their behavior has been extensively performed by IE scholars and practitioners. As such, the goal here is to briefly review the most relevant theoretical frameworks used by IE researchers: Theory of the firm; Transaction cost theory; Theory of the growth of the firm; Resource-based view; Network perspective; Knowledge-based view; and the Internationalization process model.

According to Foss (1997), the theory of the firm corresponds to a theoretical framework that addresses aspects such as the existence of the firm, the boundaries of the firm, and its internal organization. The main tasks of the theory of the firm were formulated in the seminal work of Ronald Coase (1937). Coase argued that market exchanges entail certain costs, such as the determination of relevant prices or the negotiation and enforcement of contracts. These transaction costs may be reduced by coordinating these activities within the firm. However, internal organization brings other kinds of costs, derived from information asymmetry, incentives, and performance evaluation. The boundaries of the firm are, therefore, determined by the trade-off, at the margin, between the relative transaction costs of external and internal exchange.

In short, the basic premise underlying the transaction cost theory is that business activities conducted on behalf of the firm by external parties – i.e. the market – are costly and inefficient, and hence the firm benefits by internalizing as many activities as possible.

Adopting a different stance, Edith Penrose's work has been an important contribution to the theory of the firm, mainly as a precursor of the resource-based view and knowledge-based theories. In 1959, Penrose's book 'The Theory of the Growth of the Firm' described the firm as a collection of productive resources, under administrative and authoritative coordination, producing products for sale in the market for a profit. Penrose suggested that the performance of these productive operations gave rise to the creation of knowledge within the firm. Most in particular, this originated 'excess resources', as an increase in productivity could lead to less time being required to perform a certain set of activities. According to Penrose (1959), these excess resources could be put into profitable use at zero marginal cost, which represented a strong incentive for the firm's expansion and innovation.

The resource-based view holds that firms can leverage their resources by building distinctive capabilities that allow them to gain competitive advantages (Zahra *et al.*, 2003). According to Rugman and Verbeke (2002), in the post-1980 academic work the resource-based approach shares the following characteristics: (i) the firm's ultimate objective is to achieve sustained, above-normal returns, as compared to rivals; (ii) a set of resources, not equally available to all firms, and their specific combination into capabilities and competences; (iii) the resources must be valuable to customers, rare, difficult to imitate and non-substitutable[1]; and the fact that (iv) innovations, in terms of new resource combinations, can significantly contribute to sustainable superior returns.

The network approach considers markets as systems of social and business relationships, which are established among customers, suppliers and/or competitors (Coviello and Munro, 1997). Almost by definition, small entrepreneurial firms lack the resources of larger established firms. The network approach suggests that entrepreneurs can gain access to valuable resources not under their control in a cost effective way by means of networking activities (Zhao and Aram, 1995; Gabrielsson and Kirpalani, 2004). Networks are a knowledge source, and allow firms to leapfrog several stages in their learning process (Mtigwe, 2006).

Drawing heavily from Penrose's theory of the firm's growth, the knowledge-based view considers firms as «social communities that serve as efficient mechanisms for the creation and transformation of knowledge into economically rewarded products and services» (Kogut and Zander, 1993: 627). According to Grant (2002), the knowledge-based view of the firm is more about a set of ideas pertaining to the existence and nature of the firm that emphasizes the role of knowledge, than a *de facto* theory of the firm. Thus, competitive advantage is based on knowledge instead of raw materials, and firms create and sustain competitive advantage by protecting valuable knowledge, either by preventing its migration or by eliminating the possibility of imitation (Prashantham, 2005).

Finally, the internationalization process model (also known as the Uppsala-Model), posits that firms internationalize in a gradual and incremental manner, through a series of evolutionary stages (Johanson and Vahlne, 1977; Bell *et al.*, 2003). According to this model, a firm starts to export to a certain target country and, after acquiring some

---

[1] For a seminal contribution, it's worthwhile to mention the work of Barney (1991), where the author proposed the previously referred characteristics and also analyzed the conditions under which firm resources may be a sustainable source of competitive advantage of the firm.

experience, it targets countries which are increasingly 'psychically' distant from its domestic market.

Many authors consider that these traditional theoretical frameworks fail to explain the internationalization process of born-globals and INVs as, for example, small firms lack the resources for a gradual and stage progression (Wright and Dana, 2003). However, some authors have applied this theoretical construct to the born-global phenomenon. One case in point is Hashai and Almor's (2004) study of knowledge-intensive born-globals in Israel, whose internationalization behavior is explained in light of this evolutionary stage theory.

It should also be noted that, rather than individually, these theoretical frameworks have been used in combination to explain the international operations of young entrepreneurial firms, as can be attested in Table 1. This is in tandem with Rialp *et al.* (2005), who assert that the use of a single framework is a somewhat reductionist approach, and a holistic and comprehensive understanding of the IE phenomenon is more likely to emerge with the combined use of multiple theoretical constructs.

PLEASE INSERT TABLE 1 HERE

2.2. International Entrepreneurship

Entrepreneurship is one of the driving forces of growth in modern economies. As a primary source of job creation, economic competitiveness and innovation, governments are increasingly aware of its importance, and have been shaping public policies to encourage entrepreneurial initiatives (Monitor Group, 2009; Leitão and Baptista, 2009a; Leitão and Baptista, 2009b).

The identification and exploitation of business opportunities lies at the core of entrepreneurship. While, for many years, opportunities available to entrepreneurs were confined to domestic borders, the globalization of markets has expanded the scope of opportunity exploitation to the global arena. This has enabled many companies to adopt a global focus from inception and pursue a rapid internationalization path (Oviatt and McDougall, 1994). Due to this, the study of IE has raised considerable interest among academics and practitioners in recent years, emerging as an independent field of academic studies.

The study of IE can be viewed in the backdrop of international efforts to curb climate change. The engagement of the private sector is fundamental to climate change mitigation, and will create innumerous business opportunities to individuals and companies directly or indirectly involved in the 'decarbonization' of our economies. According to Stern (2007), these markets could be worth hundreds of billions of dollars per year, and be an important source of employment generation.

According to several authors (e.g. Wennekers *et al.*, 2005; Stearns and Hills, 1996), no singular definition of entrepreneurship exists. Grilo and Thurik (2004) contend that entrepreneurship is a multidimensional concept, whose definition largely depends on the focus of the research undertaken. Concurrent with this view, the OECD considers that entrepreneurship manifests itself in many different ways, with the result that several definitions have been proposed and no single definition has been generally agreed upon (OECD, 2008).

Regardless of the approach adopted, there is some consensus that entrepreneurship revolves around the process of change (Audretsch, 2002) and innovation (Michael, 2007). Audretsch (2002, 2007) asserts that entrepreneurship is about change, since entrepreneurs are agents of change. Nevertheless, such conceptualization poses considerable complexity, as the concept of change is relative to some benchmark, i.e. what may be perceived as change to an individual or organization may not imply any novelty to the related industry. As such, the concept of entrepreneurship is embedded in the local context.

While 'invention' can be defined as the creation of something new, 'innovation' refers to an invention which is brought into use (Bozeman and Link, 1983). Taking into consideration this notion, authors such as Michael (2007), and Dimitratos and Plakoyiannaki (2003), contend that innovation is at the heart of entrepreneurship, with the entrepreneur bringing innovation to the customer whenever it takes place and in this sense exploiting opportunities based on needs that are not perfectly addressed by the competitors.

It should be noted at this stage that the efforts to curb climate change create opportunities of a special kind to entrepreneurs. These opportunities are 'special' because they result from a market failure – climate change – which, according to Stern (2007), is the greatest market failure the world has ever seen. In common with many other environmental problems, climate change is an externality at its most basic level, and requires public intervention in order to be corrected. As Dean and McMullen (2007) and Cohen and Winn (2007) observe, market failures that contribute to environmental degradation are important to entrepreneurs because they provide significant opportunities for the creation of new technologies and innovative business models.

In the context of the entrepreneurship field of study, the importance of policy instruments is not confined to the correction of market failures that may give rise to new business opportunities. Further than that, policymakers are increasingly recognizing entrepreneurship as a fundamental lever to build and sustain economic growth (Acs and Szerb, 2006).

The importance of public policy oriented to entrepreneurship is reflected in the EU Commission's acknowledgment that the challenge for the EU is to identify the main factors that create an enabling environment for entrepreneurial initiatives in all sectors of the economy (EU Commission, 2003). In respect to a sector related to the transition towards a low-carbon economy, Jacobsson *et al.* (2009) observe that such concerns should be taken into consideration in the EU's renewable energy policy, which should be designed to secure attractive conditions for new entrants and entrepreneurs across the value chain of the energy industry and for a broad range of technological solutions.

A literature review of the International Business field of study could be an endless task in itself (Chandra and Newburry, 1997). Notwithstanding these difficulties, some authors have endeavoured to review this field, such as Wright and Ricks (1994), Chandra and Newburry (1997) and Mtigwe (2006).

While for many years the study of international business considered the 'nation' as the main unit of analysis, the post second world war period shifted the analytical emphasis to the firm. The main focus since then has been on the activities of multinational companies (MNCs) (McDougall and Oviatt, 1996; Acs *et al.*, 2003), and a more significant attention to small and medium-sized enterprises (SMEs) in this field of study has only been observed since the mid-1970s (Gilroy *et al.*, 2008).

Some authors assert that the reductions in international transportation and communication costs, and the shortening of products' life cycle, are some of the motivations that enabled smaller firms to operate internationally (Hashai and Almor, 2004). Other authors contend that the increasing globalisation of markets has made international business as much a sphere of activity for multinational firms as for entrepreneurs, an aspect which encouraged companies to expand internationally and explore new revenue streams (Karra *et al.*, 2008; Zahra and Hayton, 2008).

Mtigwe (2006) considers IE as the practical expression of the motivations and *rationale* of international business theory, many authors consider that IE lies at the intersection path between the fields of entrepreneurship and international business (e.g. Dimitratos and Jones, 2005; Gabrielsson *et al.*, 2008).

One of the most consensual and quoted definitions of IE was proposed by McDougall and Oviatt (2003: 7), who assert that «international entrepreneurship is the discovery, enactment, evaluation, and exploitation of opportunities – across national borders – to create future goods and services». In a similar direction, Zahra and George (2005:6) consider IE as «the process of creatively discovering and exploiting opportunities that lie outside a firm's domestic markets in the pursuit of competitive advantage».

From these definitions, we can conclude that the opportunity concept is present in all of them, as well as the idea of crossing borders. This comes to no surprise, as the opportunity exploitation lies at the core of entrepreneurship research, and international entrepreneurial firms should have the ability to identify and exploit opportunities in the international marketplace (Dimitratos and Plakoyiannaki, 2003). In short, irrespective of the definition that is adopted, it is widely agreed that IE broadly involves the recognition and exploitation of overseas opportunities (Spence *et al.*, 2008).

The challenges posed by climate change are opening a wide range of opportunities to entrepreneurs, with policy makers worldwide seeking to create the adequate environmental settings to encourage the exploitation of these opportunities. The CDM, one of the most innovative tools originating from the Kyoto Protocol, should be mentioned as having been specifically designed to stimulate entrepreneurs in industrialized countries to cross national borders and invest in greenhouse gas reduction projects in developing countries. By doing so, they are also facilitating the transfer of technologies to developing countries and contributing for reaching sustainable development goals.

2.3. International Technology Transfer

The 'North-South divide' is an expression frequently used to designate the economic and socio-political division that exists between the world's wealthy nations, known as the 'North', and the poor developing countries, known as the 'South'. One of the aspects contributing to this rift is the profound technological gap that exists between developing countries and its developed counterparts. However, historical and empirical evidence suggests that latecomer countries are able to significantly progress in their technological evolution by effectively harnessing an international pool of existing technologies already available from more technologically advanced nations (Radosevic, 1999; Magic, 2003; Hu et al., 2005).

It is against this backdrop that the study of ITT assumes special importance. Technology transfer is a key element for economic development across all levels of industry, and is a fundamental mechanism to foster economic growth and innovation intensity (Radosevic, 1999; Morrisey and Almonacid, 2005).

According to Maskus (2004), ITT can be defined as a comprehensive term covering a set of mechanisms for shifting information across borders and its effective diffusion into the host economies. In short, and in line with Graham (1982), ITT can be understood as the reception and utilization by one country of the technology developed in another.

An important definition of technology transfer to be taken into consideration in the scope of this chapter is the one proposed by the UN Intergovernmental Panel on Climate Change (IPCC, 2001). Drawing on climate change concerns, technology transfer is described as a broad set of processes covering the flows of know-how, experience and equipment aimed at mitigating and adapting to climate change amongst different stakeholders such as governments, private companies, NGOs and research institutions. In its definition of technology transfer, the IPCC also includes the concept of technology diffusion, which refers to the extent to which a technology is utilized, i.e. the amount of people or entities which have adopted the technology.

Another relevant modality is related to the institutional path through which technology transfers flow. The IPCC (2001) identifies three technology transfer pathways: (i) government-driven; (ii) private-driven; and (iii) community-driven pathways. Government-driven pathways are technology transfers initiated by governments to fulfill specific policy goals. Private sector-driven pathways essentially involve transfers between commercially oriented private-owned organizations; and community-driven pathways are those transfers involving community organizations with a high degree of collective decision-making.

As the content of the technologies transferred can vary significantly, Bell (1987) proposes a typology to classify them. According to this author, technology flows can be classified into three categories: (1) capital goods and technological services, such as the purchase of machinery and equipment; (2) skills and know-how for operation and maintenance; and (3) knowledge, expertise and experience for the generation and management of technical change.

A commonly used distinction pertains to technology being classified as explicit or implicit. Whereas technology that can be codified into formulas, patent applications and the like can be deemed as explicit, uncodified technology – uncodified in the sense it requires some degree of implicit know-how from the personnel handling it – can be regarded as implicit technology (Maskus, 2004). This distinction is important, because whereas explicit technology can be quickly transferred across organizational contexts, implicit knowledge poses more difficulties on its transfer (Duanmu and Fai, 2007).

The definitions of technology transfer found in the literature do not take into consideration specific modes of transfer (Radosevic, 1999). However, to overcome this caveat reported in the literature, there are numerous dimensions that can be used to classify technology transfers modes.

One relevant modality or dimension of analysis pertains to the maturity of the technology that is transferred. The movement of an established technology from one entity to another is usually known as a horizontal transfer. In contrast, vertical transfers are those technologies that are transferred directly from the R&D stage to the commercialisation phase (Ockwell *et al.*, 2008; Andersen *et al*., 2007).

Technology transfers do not necessarily occur towards market interactions. As such, another modality of transfer stems on the market vs. non-market dichotomy. The non-market alternative involves the acquisition of technology without the consent of the provider, such as through imitation, internet research or industrial espionage (Maskus, 2004; Andersen *et al.*, 2007).

We can conclude from the above on the complexity of technology transfer flows. In effect, to capture all these dimensions into a comprehensive model or analytical framework is a difficult task and, indeed, few authors have endeavored to undertake such challenge. One exception is worth of note – Reisman (2005) – who proposed a taxonomy to classify technology transfer modalities, for providing a broad understanding of the conceptual depth of this topic. Adopting what he calls a 'cross-disciplinary meta-approach', the author concludes that technology transfer can be characterized by 173 attributes, which, in combination, make up a large array of technology transfer possibilities.

We have shown in the above paragraphs that there are several dimensions associated with the modes of technology transfer, which emphasize different aspects of the transfer process. In spite of this, and following Radosevic (1999) most researchers and practitioners have placed their attention on the examination of the mechanisms that lead to technology transfer technologies. Due to its importance for the current approach, we examine them in a subsequent way.

2.4. Mechanisms for International Technology Transfer

Drawing mainly from Maskus (2004)'s categorization, which stems on a market vs. non-market dichotomy, in the following paragraphs we briefly go through the most important ITT mechanisms found in the literature. We start with those that can be considered ITT market mechanisms, and then we turn to those that can be considered non-market ones. We finalize with other mechanisms that do not necessarily fall into any of these categories.

The first ITT mechanism pertains to the trade of goods and services across borders. In fact, exports carry some potential for the transmission of technological information, not the least because they can be studied for design characteristics and reverse engineering (Maskus, 2004).

Foreign Direct Investment (FDI) is another important mechanism of ITT. In principle, companies that invest abroad are expected, in some way, to transfer some form of technological information to the subsidiaries located in the host economy (Maskus, 2004). FDI can be seen as a way of transferring technology among affiliated firms, being a mechanism that usually involves large resource commitments and provides a high degree of control over the technology that is transferred (Radosevic, 1999; Vishwasrao, 2007; Leitão and Baptista, 2009.b).

A third market-based ITT mechanism is technology licensing. Licensing consists in the permission by the owner of a patented invention to another person or legal entity to perform, in a certain country and for the duration of the patent rights, one or more of the acts which are covered by the rights to the patented invention in that country (WIPO, 2004). Licensing contracts can vary in several ways, which may affect the degree of control that the licenser can retain over the technology, as well as the profits that he can obtain from the licensee (Vishwasrao, 2007).

Franchising is a contract-based organizational structure which, in general, involves two parties: a franchisor firm that compromises to transfer a business concept that it has developed; and a franchisee, which will implement this business concept in a non-domestic market (Teegen, 2000). Franchising is a type of license agreement between parties, under which there is a transfer of rights and some form of know-how between the franchisor and the franchisee (Welsh, 2007; WIPO, 2004). This process of transfer can assume various guises, namely, in the form of direct franchising, area development franchising, or master franchising (Teegen, 2000).

Another type of cooperative contract is the one that implies the creation of joint ventures (JVs), which are based on the creation of an entity that embraces two or more firms that pool a portion of their resources, in order to create a separate jointly owned organization. As an ITT mechanism, JVs are likely to lead to effective technology transfers, as the technology owner has an incentive to ensure that the underlying tacit knowledge is effectively transferred (Stern, 2007).

In addition to the above, there are other noteworthy cooperative and commercial means of ITT that the WIPO (2004) considers: (i) assignments; (ii) consultancy arrangements; and (iii) turn-key projects. Firstly, an assignment consists in the sale by the owner of all his exclusive rights in a patented innovation, and the corresponding purchase of those rights by another entity. Secondly, a consultancy arrangement pertains to the provision of advice and rendering of other services concerning the planning for, and the actual acquisition of, a given technology that is required by entities located in other countries that do not possess that technology. Thirdly, a turn-key contract arrangement is one in which a party designs and installs a system and transfers it to another party who will then operate it.

In regard to non-market mechanisms, a spin-off can be defined as a new company that is formed by individuals who were former employees of a parent organization, with a technology which is transferred from the parent organization. According to Rogers *et al.* (2001), spin-offs represent the transfer of a technological innovation to a new entrepreneurial firm that is formed around that technological innovation.

Another non-market mechanism for ITT that is worth mentioning is imitation. Imitation is the process by which rival firms learn the technological secrets of other firms' products or services (Maskus, 2004). Imitation can be carried out by means of product inspections or reverse engineering, for example.

An alternative means of acquiring technological information without compensation is to study public available information about those technologies. By reading patent applications, for example, rival firms can obtain knowledge about the underlying technologies, which may enable them to develop alternative technologies that do not infringe the rights of the original applicants (Maskus, 2004).

In the reference literature other important ITT mechanisms can be found that do not necessarily fall into the market vs. non-market dichotomy. One case in point are the so-called "Cooperative Research and Development Agreements" (CRADAs), which are an example of cooperative arrangements established between an R&D organization and a receptor organization for the transfer of technology (Rogers, 2002). As defined by the same author, CRADAs pertain to the transfer of technologies from federal R&D laboratories in the US to private companies. However, in the context of ITT this kind of agreements should be seen in the light of the strategic technology alliance (STA).

Another means of ITT is to move people who have the technology into receptor organizations. This can either be observed in a market or non-market situation. For example, this situation can happen when the human resources that have the knowledge of a certain technology leave the firm and join a competitor based on that knowledge.

We finish the current item by summarizing in table 2 the most relevant of these mechanisms, providing a brief description and outlining their strengths and weaknesses, both from the perspective of the transferor and the technology host.

PLEASE INSERT TABLE 2 HERE

----

3. Climate Change and Technology Transfer

3.1. Background

Climate change is one of the most important challenges the humanity currently faces. The warming of the planet due to the emission of anthropogenic greenhouse gases (GHGs) is now considered unequivocal (IPCC, 2007), and international collective action is required to address this challenge (Stern, 2007; World Bank, 2008).

The first noteworthy event was the World Climate Conference of 1979, which called the attention for the increasing quantities of CO_2 being released into the atmosphere. In 1988, the United Nations Environmental Programme (UNEP) and the World Meteorological Organization (WMO) jointly created the Intergovernmental Panel on Climate Change (IPCC), whose main propose is to assess the latest scientific, technical and socio-economic literature produced on climate change, in order to assist governments in their policy decisions (IPCC, 2009).

In 1992, at the Earth Summit Conference held in Rio de Janeiro, concerns over climate change led over 150 nations to sign the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC sets out the global framework for action with the goal of stabilizing GHGs concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the Earth’s climate system. The Convention entered into force in March 1994, and has achieved near universal ratification to date.

The UNFCCC establishes key principles for the collective international response, highlighting the fact that the greatest share of the responsibility to achieve GHG reductions is assigned to the so-called 'Annex-I countries'. These include 27 industrialized economies and 12 'transition economies', as they are the source of most GHG emissions.

The UNFCCC established the Conference of the Parties (COP), the supreme body for decision-making and implementation of the Convention, which is convened on an annual basis. The most significant meeting on climate change so far was the Third Conference of the Parties (COP-3), which was held in Kyoto in December 1997. The outcome of this conference was the agreement on the first international treaty binding Annex-I countries to reduce GHG emissions: the Kyoto Protocol. Now ratified by almost every country in the world, the treaty entered into force in February 2005.

The Kyoto Protocol determines that Annex-I countries reduce their combined GHG emissions (excluding the GHGs controlled by the Montreal Protocol[2]) by an average of 5.2% below 1990 levels between 2008 and 2012 (which is called the 'first commitment period'). The Protocol does not stipulate how these reductions should be achieved, but it proposes three flexible market-based mechanisms to allow Annex-I countries to meet their commitments: (i) Emissions Trading Schemes (ETS); (ii) Joint Implementation (JI); and (iii) Clean Development Mechanism (CDM). The focus of our study is the CDM, which will be examined later in this section.

Multilateral frameworks such as the UNFCCC and the Kyoto Protocol are one 'dimension' of the international collective action required to mitigate climate change. According to Stern (2007) two other 'dimensions' should be considered: (1) the role of organizations, partnerships and networks such as the International Energy Agency (IEA) or the recently established International Renewable Energy Agency (IRENA), which facilitate and support coordinated international action; and (2) the existence of domestic policy goals that support mandatory initiatives to reduce GHG emissions (Stern, 2007).

The IPCC (2007) highlighted the need for three fundamental policy instruments in order to decarbonise world economies: (i) carbon pricing; (ii) traditional regulation (through mandates and subsidies); and (iii) innovation policy.

---

[2] The Montreal Protocol is an international treaty designed to protect the ozone layer by phasing out the production of chemicals that destroy the ozone layer. In addition to destroying the ozone layer, these ozone depletion gases are also GHGs, with GWP thousands of times superior to CO_2 (Andersen *et al.*, 2007).

As observed in a Deutsche Bank (2008)'s report, the potential regulation tools previously outlined can be also considered as major drivers of investment opportunities in climate change.

There are a number of measures that governments can undertake for creating a suitable environment for investing in solutions that address climate change issues, either serving mitigation or adaptation purposes. These include, for example, the assignment of subsidies to renewable energy generation, taxes on fossil-fuels, and the enforcement of environmental standards (Moore and Wüstenhagen, 2004).

Worth mentioning in this regard is Germany's renewable energy law (EEG), which was very successful in increasing the share of renewable energies in the country' electricity mix, and also enabled the country to achieve leadership status in terms of installed wind power capacity (Wüstenhagen and Bilharz, 2006).

Such type of policy measures is likely to open a wide array of opportunities to entrepreneurs, who can reap great benefits if they are able to quickly exploit them. As we will see below, the CDM is an example of a policy-driven mechanism which was specifically tailored to stimulate international entrepreneurs.

For addressing climate change, in the Deutsche Bank's (2008) report four main categories of solutions are proposed: (i) clean energy; (ii) environmental resource management; (iii) energy and material efficiency; and (iv) environmental services. Throughout this chapter we will use the designation 'environmentally sound technologies' (ESTs) to encompass the first three categories of solutions (see table 3 below).

PLEASE INSERT TABLE 3 HERE

A fundamental aspect of public policy intervention in the global fight against climate change pertains to technology transfer issues. In effect, the transfer of ESTs to the developing world has been a clear mandate under the UNFCCC, and this is enshrined in Article 4, paragraph 5 of the Convention: «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» (UNFCCC, 2009a).

Public policy in this area is particularly important since, as observed by Less and McMillan (2005), one of the main differences between the transfer of ESTs and 'normal' technologies is that the former are more reliant on regulation and public policy.

As many climate friendly technologies already exist in developed countries (Pascala and Socolow, 2004), its transfer to developing countries will enable them to leapfrog some stages in the technology development process (Popp, 2008; Stern, 2007).

The motivation for developing countries rely on the support of developed countries in transferring the ESTs is threefold. First, they are more dependent on climate sensitive sectors (such as agriculture and forestry). Second, they lack the resources and/or infrastructure to respond to the consequences of climate change. Third, these countries have to deal with social challenges such as poverty reduction and may be reluctant to adopt policies that could limit their economic growth (Stern, 2007).

The success of the Montreal Protocol has been due, to a large extent, to the process of continuous technological innovation and transfer. Although the climate change challenge is different in scope and dimension, the major stakeholders involved should learn from the Montreal lessons[3], as both problems share a set of basic similarities: they address an externality, they lie on the principle of common but different responsibilities between developed and developing countries, and rely on technology for their successful resolution. The next section will analyze the CDM and highlight its importance as a mechanism to the transfer of ESTs.

3.2. The Clean Development Mechanism

The Clean Development Mechanism (CDM) is one of the three flexible mechanisms under the Kyoto Protocol. The CDM has two main purposes: (i) to allow Annex-I countries to invest in projects that reduce emissions in developing countries to offset a part of their domestic obligations; and (ii) to assist non-Annex-I countries in achieving sustainable development. Certified Emission Reductions (CERs) are the CDM's currency, and they are the measure of the quantity of GHG emissions that has been avoided by CDM projects.

Notwithstanding the fact that the CDM does not have an explicit technology transfer mandate, one of the sustainable development benefits that CDM projects are expected to

[3] Which include taking mitigation actions early, the development of a 'visionary' technology assessment, the encouragement of MNC's leadership in mitigation efforts, the importance of the financial mechanisms under the Montreal protocol, among others. For more information on this, see Andersen *et al.* (2007).

bring is the use of technologies and know-how that are not available in the host countries (de Conick *et al.*, 2008; Doranova *et al.*, 2009; Seres, 2007).

In the COP-7 held in Marrakech in 2001 were established the rules that govern the CDM. Among the most important of these rules are the concepts of 'additionality' and 'baseline'. In what concerns the first concept, a CDM project is considered 'additional' if the anthropogenic emissions of GHGs are reduced below those that would have occurred in the absence of the project. References need to be made in relation to a 'business-as-usual' scenario – the 'baseline', the second concept – which represents the GHG emissions that would occur in the absence of the proposed CDM project. If the emissions of the planned CDM project activity fall below those of the appropriate baseline, the project can be considered additional (see figure 1 for an illustration of the concept).

PLEASE INSERT FIGURE 1 HERE

There are three main approaches to develop a CDM project: (1) bilateral; (2) unilateral and; (3) multilateral. A bilateral approach is observed when an Annex-I country or one of its legal entities invest in projects in partnership with a non-Annex-I country (Yamin, 2005). Unilateral projects are those where there is no foreign investment and the project is developed entirely in the host economy (Wilder, 2005). A multilateral approach is where an international financial institution or intermediary puts together a portfolio of CDM activities on behalf of others (Yamin, 2005).

One key aspect related to the CDM is that it is intended to stimulate private sector investments in climate-friendly projects, because at its core is the generation of credits (CERs) that have market value and can be sold for a profit (Yamin, 2005; Stern, 2007).

In this sense, if we exclude unilateral project types from our analysis, then CDM projects can be considered as a form of IE. In fact, the CDM laid out an institutional framework that enables and stimulates firms that own some type of 'climate-friendly technology' to proactively seek new markets for their technologies and, in complement, to benefit from the extra revenues provided by the sale of CERs. By installing in a certain country a technological solution that leads to the reduction of GHGs, entrepreneurs are moving innovations across borders, bringing change to where it is needed, being expected to contribute to local sustainable development goals.

As already observed, CDM projects are expected to contribute to technology transfer by financing GHG reduction activities that use technologies not available in host countries. For instance, in one section of the PDD (the standard template document that describes the CDM project) project developers are required to include a description of how ESTs are going to be transferred to host countries. Moreover, certain host countries, such as, China, India and Brazil require that some sort of technology transfer occurs for the CDM project to be approved by the respective Designated National Authority (DNA), the entity that supervises the CDM process at national level (Seres, 2007).

According to van der Gaast *et al.* (2009), it remains to be seen how important CDM's contribution in transferring ESTs to developing countries is. Nevertheless, we can find in the literature some studies that have analyzed technology transfer issues within the CDM. Most of them use data available from CDM projects in order to analyse these issues. In the majority of these studies, this info is collected from the analysis of PDDs.

Haites *et al.* (2006) concluded that technology transfers occur in one third of the projects analyzed (860), accounting for two-thirds of the CERs generated.

Seres (2007), making an analysis out of the 2293 projects existent in the CDM pipeline, found technology transfer to be very heterogeneous across project types, varying in terms of reliance on imported technology, knowledge and equipment flows, and the countries where the technology came from. The results obtained pointed out that technology transfer is more common in larger projects, and also on those that count with some sort of foreign participation (i.e. bilateral and multilateral projects).

Dechezleprêtre *et al.* (2008) concluded that the probability of transfer is 50% higher when a CDM project is developed by a subsidiary of an Annex-I country. The study also confirms that the technological capabilities of the host economy strongly influence the likelihood of technology transfers, but only in the energy and chemical industry sectors. In the case of agriculture, the authors concluded that technological capabilities reduce the likelihood of accomplishing an effective technology transfer.

Albeit recognizing improvement opportunities in the CDM as a mechanism to the transfer of ESTs, most studies in the reference literature have been moderately positive to the results so far achieved. However, the analysis of alternative mechanisms to the transfer of these technologies has barely received any attention in the literature. That is the main motivation for presenting, in the next item, an alternative approach for identifying and analysing other technology transfer mechanisms, based on the presentation of a benchmarking proposal that aims to assess how well do these mechanisms fare compared with the CDM.

3.3. Evaluating CDM Projects in China: A Benchmarking Proposal

China is the world's most populous and fastest-developing country. Its economy has grown at an average 8% rate per year in the period 1980-2001, and its per capita income is expected to be more than treble by 2020 (Li and Oberheitmann, 2009). Notwithstanding the improvement of the economic welfare of the Chinese population in the past three decades, this staggering economic growth has engendered some serious negative side effects, most in particular the growing emissions of GHGs.

According to the World Watch Institute (2009), China's carbon dioxide emissions are now estimated to be about 24% of the total amount, higher that US' contribution of 21%.

Given the fact that China is among the world's largest energy consumers and producers of GHGs, its policymakers have been directing their efforts to drive the country into a more sustainable path. Policies include the implementation of ambitious energy efficiency programmes, and the setting up of a renewable energy law in the beginning of 2006. The transfer of ESTs from developed countries into China is also one of the objectives of Chinese policymakers, and the CDM is considered an important instrument to support this goal (EU- China CDM Facilitation Project, 2009).

As of the 22nd April 2009, around 75% of the CDM projects registered by the UNFCCC were located in four countries – China, India, Brazil and Mexico – with China accounting for around one third of the total (UNFCCC, 2009c). This trend is expected to continue, as in the end of 2008 73% of the CDM projects in the pipeline were located in theses four countries (UNEP Riso, 2009).

China was a relatively latecomer in regard to the setting up of an internal CDM policy, which has only entered into force in October 2005. However, the Chinese CDM framework differs in some important points from the majority of the other non-Annex I countries, with two aspects worth mentioning. First, the existence of a minimum purchase price of the CERs generated. Second, the obligation of all Chinese CDM projects to have a 51% Chinese ownership stake (Lütken and Michaelowa, 2008). Such measures have deterred many foreign entrepreneurs from investing in CDM projects in China and, as a consequence, a significant majority of the projects implemented so far has been of the unilateral type. This has hindered the potential transfer of technologies from developed countries to China by means of CDM projects. Notwithstanding this fact, the transfer of technologies into China has been reported in many CDM projects. For example, all projects implemented leading to the elimination of HFC-23 (a GHG with a warming potential thousands of times higher than carbon dioxide) involved some sort of international technology transfer (Dechezleprêre *et al.*, 2009).

This said, given the limitations of the CDM both as technology transfer mechanism and as a vehicle for foreign investments into China, other alternative mechanisms to the transfer of ESTs should be taken into consideration for the Chinese reality. They can roughly be grouped into two sets: (i) mechanisms that fall under the UNFCCC (which include the CDM or the Global Environmental Facility); and (ii) those that fall outside its jurisdiction (e.g. private sector mechanisms, such as JVs and licensing agreements, as previously pointed out in section 2.4). Due to the existence of these alternatives to the transfer ESTs, we find it particularly important to propose a methodological tool to compare them, following a benchmarking approach.

In the literature we can identify some studies which have attempted to perform a comparative analysis among technology transfer mechanisms (examples include Connell, 1987; Autio and Laamanen, 1995). However, few studies can be found that compare mechanisms leading to the transfer of ESTs. In this regard, one notable exception has been the work of the UNFCCC Expert Group on Technology Transfer, which has been developing a set of performance indicators to evaluate the effectiveness of the UNFCCC's technology transfer framework (see UNFCCC, 2009b). As a potential limitation, this methodology was not specifically designed to compare technology transfer mechanisms.

The benchmarking framework we propose is aimed at analyzing four focus areas which, in our view, are quintessential in the scope of international transfers of ESTs.

The first area pertains to 'capacity building'. This consists on the strengthening of the host economy's technological infrastructure, including its human and institutional capabilities (IEA, 2001). According to many authors (e.g. Wei, 1995; Radosevic, 1999; IISD, 2008), the capacity to master the received technology and innovate on that knowledge is a critical aspect on the technology transfer process.

The second area of analysis relates to the financial flows associated with investment and operational costs of the mechanism under evaluation. As observed in section 3.1, many developing countries lack the financial resources needed to reduce the carbon intensity of their economies. As such, the propensity of the mechanism to financially contribute to the implementation of ESTs in the host economy is an aspect that needs to be taken into consideration. Mechanisms that have a financial component include, for example, the CDM, FDI and JVs. Mechanisms deprived of such component are, for example, the UNFCCC's Technology Information Clearing House or the IEA's Networks of Expertise in Energy Technology.

The third area pertains to the ‘enabling environment’ of the host economy. This aspect has to do with the policies, regulations and institutions that exist in the country and that strongly influence the effectiveness of the technology transfer process. For example, the protection of IPR is an aspect which is usually taken into consideration by the private sector when analysing to enter into a foreign market. There are mechanisms that can exert some influence in shaping the enabling environment of the host economy. Examples include some projects implemented in the scope of the Global Environmental Facility (GEF, 2009), and some programmes implemented by the World Bank.

Finally, the fourth area is related to the extent the technology transfer mechanism contributes to sustainable development goals in the host economy, an aspect which is very important in the case of ESTs (de Conick *et al.*, 2008; Doranova *et al.*, 2009). For example, one of the reasons the HFC-23 CDM projects mentioned above having been strongly criticized (e.g. Taiyab, 2005; Ellis et al., 2007) has been due to their limited contribution to local communities’ sustainable development needs.

Following the approach designed by Raposo *et al.* (2006), we suggest a qualitative evaluation of these KPIs, for each technology transfer mechanism, ranging on a scale from 1 (lowest performance) to 5 (highest performance). Taking into consideration the areas identified, in table 4 presented below we propose a set of key performance indicators (KPIs) to assess how well the mechanism under evaluation (that is, in our case focused on CDM), fares in respect to each of these areas.

PLEASE INSERT TABLE 4 HERE

The performance analysis will provide the production of comparative studies and the identification of corrective measures that should be oriented to the accomplishing of sustainability goals, according to the perspectives of the investor and host economy. This is particularly relevant in undertaking benchmarking analyses that make possible, on the one hand, an accurate evaluation of the implementation of CDM projects, by using both qualitative and quantitative indicators. On the other hand, it will be very useful in contrasting international experiences of CDM projects, especially, the ones that are related to investments in developing countries, for comparative purposes. Lastly, the current benchmarking proposal makes it possible to perform innovative assessments of ITT mechanisms, which until now have been extremely difficult to evaluate, due to the inexistence of adequate methodological tools, which should guide both policy makers and managers in the emergent field of Energy Entrepreneurship.

4. Final Remarks and Implications

Under the cross framework of international entrepreneurship and technology transfer, the chapter reviewed the main theories of internationalization by posing FDI as a mechanism of technology transfer.

In this context CDM projects have a special importance, since they can be considered a mechanism of ITT, under a delocalization scenario. Moreover, the CDM can be approached as an example of public policy measure aiming to stimulate knowledge spillovers and dissemination of environmental sound technologies in developing countries. In this line of reasoning, with this chapter we also aimed to present a benchmarking approach based on the need for evaluating the implementation of CDM projects in developing economies, such as China.

In comparison to other CDM Projects, the proposed benchmarking approach can be used to assess the relative performance of alternative ITT mechanisms. The contribution of the current chapter into the literature of Energy Entrepreneurship is threefold: (1) to analyse the CDM in the framework of International Entrepreneurship; (2) to propose a benchmarking approach for evaluating performance of ITT mechanisms in climate friendly technologies; and (3) to provide an operative tool for guiding policy makers, entrepreneurs and practitioners in promotion of sustainability goals.

Although the current approach is based on a mix of qualitative and quantitative measures, it is a first attempt to overcome the caveat found in the reference literature related to the evaluation of ITT mechanisms. Further studies are needed, especially, in what concerns collecting data that can make viable the realization of quantitative studies and forecasting analysis. In addition to this, the definition of what are the best practices according to the perspectives of both the investor and the host economy is somewhat subjective. This requires further attention in future studies, namely, in longitudinal studies that preferably contrast investment experiences in developed and developing economies.

For future research, several guidelines are proposed: (i) to measure the contribution of the CDM to the reduction of the Carbon Intensity of host economies; (ii) to evaluate the impact of performing CDM projects on the economic growth (or productivity); (iii) to identify the main barriers for accomplishing in an efficient way distinct ITT mechanisms; and (iv) to determine the relative importance of ITT mechanisms in facilitating knowledge spillovers.

References

Acs, Z. (2006), “How is Entrepreneurship Good for Economic Growth?”, *Innovations*, 1(1): 97-107.

Acs, Z.; Dana, L.-P.; Jones, M. (2003), “Toward New Horizons: the Internationalization of Entrepreneurship”, *Journal of International Entrepreneurship*, 1(1): 5-12.

Acs, Z.; Varga, A. (2005), “Entrepreneurship, Agglomeration and Technological Change”, *Small Business Economics*, 24(3): 323-334.

Acs, Z.; Szerb, L. (2006), “Entrepreneurship, Economic Growth and Public Policy”, *Small Business Economics*, 28(2): 109-122.

Andersen, S. O.; Sarma, K. M.; Taddonio; K. N. (2007), “Technology Transfer for the Ozone Layer: Lessons for Climate Change”, *Earthscan*, London.

Audretsch, D. B. (2002), “Entrepreneurship: A Survey of the Literature”, *European Commission*, http://ec.europa.eu/enterprise/entrepreneurship/green_paper/literature_survey_2002.pdf, [Accessed: 12.01.09].

Audretsch, D.; Bozeman, B.; Combs, K.; Feldman, M.; Link, A.; Siegel, D.; Stephan, P.; Tassey, G.; Wessner, C. (2002), "Economics of Science and Technology", *Journal of Technology Transfer*, 27(2): 155-203.

Audretsch, D. (2007), “The Entrepreneurial Society”, *Oxford University Press*, USA

Autio, E.; Laamanen, T. (1995), "Measurement and evaluation of technology transfer: review of technology transfer mechanisms and indicators", *International Journal of Technology Management*, 10(7/8): 643-664.

Barney, J. (1991), “Firm Resources and Sustained Competitive Advantage”, *Journal of Management*, 17(1): 99-120.

Bell, M. (1987), “The Acquisition of Imported Technology for Industrial Development: Problems of Strategies and Management in Arab Region”, *ESCWA*, *UN*: 13-29.

Bell, J.; McNaughton, R.; Young, S.; Crick, D. (2001), “’Born-again global’ firms – An extension to the ‘born-global’ phenomenon”, *Journal of International Management*, 7(4): 173-189.

Bozeman, B.; Link, A. N. (1983), “Investments in Technology: Corporate Strategies and Public Policy Alternatives”, *Praeger Publishers*, New York.

Castro, P.; Michaelowa, A. (2008). “Empirical Analysis of Performance of CDM Projects”, *Climate Strategies*, http://www.indiaenvironmentportal.org.in/files/empirical-done.pdf [Accessed: 12.11.08].

Chandra, R.; Newburry, W. (1997), “A Cognitive Map of the International Business Field”, *International Business Review*, 6(4): 387-410.

Coase, R. (1937), “The Nature of the Firm”, *Economica*, 4: 386-405.

Cohen, B.; Winn, M. I. (2007), “Market imperfections, opportunity and sustainable entrepreneurship”, *Journal of Business Venturing*, 22(1): 29-49.

ConneIl, D. (1987), “Bridging the gap between academic researchers and industrial corporations”, *Industrial Management & Data Systems*, 87(1/2): 19-24.

Coviello, N.; Munro, H. (1997), “Network relationships and the internationalisation process of small software firms”, *Journal of Business Venturing*, 6(4): 361-386.

Dechezleprêtre, A.; Glachant, M.; Ménière, Y. (2008), “The Clean Development Mechanism and the international diffusion of technologies: An empirical study”, *Energy Policy*, 36(4): 1273-1282.

Dechezleprêtre, A.; Glachant, M.; Ménière, Y. (2009), “Technology transfer by CDM projects: A comparison of Brazil, China, India and Mexico”, *Energy Policy*, 37(2): 703-711.

de Connick, H.; Fischer, C.; Newell, R.; and Ueno, T. (2008), “International technology-oriented agreements to address climate change”, *Energy Policy*, 36(1): 335-356.

Dean, T. J.; McMullen, J. S. (2007), "Toward a theory of sustainable entrepreneurship: Reducing environmental degradation through entrepreneurial action", *Journal of Business Venturing*, 22(1): 50-76.

Deutsche Bank (2008), "Investing in Climate Change 2009", *Deutsche Bank Advisors*, http://dbadvisors.com/climatechange, [Accessed: 12.11.08].

Dimitratos, P.; Plakoyiannaki, E. (2003), "Theoretical Foundations of an International Entrepreneurial Culture", *Journal of International Entrepreneurship*, 1(2): 187-215.

Dimitratos, P.; Johnson, J.; Slow, J.; Young, S. (2003), "Micromultinationals: New Types of Firms for the Global Competitive Landscape", *European Management Journal*, 21(2): 164-174.

Dimitratos, P.; Jones, M. (2005), "Future directions for international entrepreneurship research", *International Business Review*, 14(2): 119-128.

Doranova, A.; Costa, I.; Duysters, G. (2009), "Knowledge Base Determinants of Technology Sourcing in the Clean Development Mechanism Projects", *UNU-MERIT Working Paper Series,* http://www.merit.unu.edu/publications/wppdf/2009/wp2009-015.pdf, [Accessed: 02.04.09].

Duanmu, J.-I.; Fai, F. M. (2007), "A processual analysis of knowledge transfer: From foreign MNEs to Chinese suppliers", *International Business Review*, 16(4): 449-473.

Ellis, J.; Winkler, H.; Corfee-Morlot, J.; Gagnon-Lebrun, F. (2007), "CDM: Taking stock and looking forward", *Energy Policy*, 35(1): 15-28.

EU Commission (2003), "Green Paper: Entrepreneurship in Europe", *Enterprise Publications*, http://ec.europa.eu/enterprise/entrepreneurship/green_paper/index.htm, [Accessed: 19.02.09].

EU- China CDM Facilitation Project (2009), "The Pre- 2012 CDM Market in China: Policy Context and Current Developments", EU- China CDM Facilitation Project, http://www.euchina-cdm.org/media/docs/EU-China%20CDM%20Project%20The%20Pre_2012%20CDM%20Market%20in%20China%2020090415.pdf, [Accessed: 19.04.09].

Foss, N. (1997), "Austrian Economics and the Theory of the Firm", *IVS/CBS Working Papers 97-3*, http://ideas.repec.org/p/ivs/iivswp/97-3.html, [Accessed: 16.02.09].

Gabrielsson, M.; Kirpalani, V. (2004), "Born globals:how to reach new business space rapidly", *International Business Review*, 13(5): 555-571.

Gabrielsson, M.; Kirpalani, V.; Dimitratos, P.; Solberg, C.; Zucchella, A. (2008), "Born globals: Propositions to help advance the theory", *International Business Review*, 17(4): 385-401.

Gilroy, M.; Baier, M.; Elmer, L.; (2008), "Small- and Medium-sized Enterprises (SMEs) in internationally operating R&D networks: recent findings and trends", *International Journal of Globalisation and Small Business*, 2(3): 325-341.

Global Environmental Facility (GEF) (2009), "What is the GEF?", *Global Environmental Facility*, http://www.gefweb.org/interior_right.aspx?id=50, [Accessed: 02.04.09].

Graham, E. M. (1982), "The terms of transfer of technology to the developing nations: a survey of the major issues", *OECD, North/South Technology Transfer, OECD*, Paris.

Grant, R. M. (2002), "'The Knowledge-Based View of the Firm', in "The Strategic Management of Intellectual Capital and Organizational Knowledge", *Oxford University Press*, Oxford.

Grilo, I.; Thurik, R. (2004), "Determinants of Entrepreneurship in Europe", Erasmus Research Institute of Management: Report Series Research in Management, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=636815, [Accessed: 20.02.09].

Haites, E.; Duan, M.; Seres, S. (2006), "Technology transfer by CDM projects", *Climate Policy*, 6(3): 327-344.

Hashai, N.; Almor, T. (2004), "Gradually internationalizing 'born global' firms: an oxymoron?", *International Business Review*, 13(4): 465-483.

Hu, A. G.Z.; Jefferson, G. H.; Jinchang, Q. (2005), "R&D and Technology Transfer: Firm-Level Evidence from Chinese Industry", *Review of Economic and Statistics*, 87(4).

Intergovernmental Panel on Climate Change (IPCC) (2001), "IPCC Special Report: Methodological and Technological Issues in Technology Transfer: Summary for Policymakers", IPCC, http://www.ipcc.ch/pdf/special-reports/spm/srtt-en.pdf, [Accessed: 31.10.08].

Intergovernmental Panel on Climate Change (IPCC) (2007), "IPCC Fourth Assessment Report: Climate Change 2007: Synthesis Report", *IPCC*, http://www.ipcc.ch/ipccreports/assessments-reports.htm, [Accessed: 12.12.08].

Intergovernmental Panel on Climate Change (IPCC) (2009), "About IPCC", *IPCC*, http://www.ipcc.ch/about/index.htm, [Accessed: 10.04.09].

International Energy Agency (IEA) (2001), "Technology Without Borders: Case Studies of Successful Technology Transfer", *IEA*, Paris.

International Energy Agency (IEA) (2007). "World Energy Outlook 2007 – China and India Insights", *IEA*, Paris.

ISIS (2004), "Intellectual Property, Patents and Licences", *Isis Innovation Limited*, http://www.isis-innovation.com/researchers/patents.pdf, [Accessed: 30.11.08].

Jacobsson, S.; Bergek, A.; Finon, D.; Lauber, V.; Mitchell, C.; Toke, D.; Verbruggen, A. (2009), "EU renewable energy support policy: Faith or facts?", *Energy Policy*, 37(6): 2143-2146.

Johanson, J.; Vahlne, J.-E. (1977), "The internationalization process of the firm—a model of knowledge development and increasing foreign market commitment", *Journal of International Business Studies*, 8(1): 23-32

Johnson, J. E. (2004), "Factors Influencing the Early Internationalization of High Technology Start-ups: US and UK Evidence", *Journal of International Entrepreneurship*, 2(1-2): 139-154.

Karra, N.; Philips, N.; Tracey, P.; (2008), "Building the Born Global Firm – Developing Entrepreneurial Capabilities for International New Venture Success", *Long Range Planning*, 41(4): 440-458.

Knight, G.; Cavusgil, S. (1996), "The born global firm: A challenge to traditional internationalization theory", *Advances in International Marketing*, 8(1): 11-26.

Kogut, B.; Zander, U. (1993), "Knowledge of the Firm and the Evolutionary Theory of the Multinational Corporation", *Journal of International Business Studies*, 24(4): 625-645.

Kuemmerle, W. (2002), "Home base and knowledge management in international ventures", *Journal of Business Venturing*, 17(2): 99-122.

Leitão, J.; Baptista, R. (2009a), "Public Policies for Fostering Entrepreneurship: A European Perspective", *Series: International Studies in Entrepreneurship*, Vol. 22, Springer, July 2009, US. ISBN: 978-1-4419-0248-1.

Leitão, J.; Baptista, R. (2009b), "Inward FDI and ICT: Are They a Joint Technological Driver of Entrepreneurship?", *International Journal of Technology Transfer and Commercialization*, Forthcoming.

Less, C. T.; McMillan, S. (2005), "Achieving the Successful Transfer of Environmentally Sound Technologies: Trade- Related Aspects", *OECD*, http://www.oecd.org/dataoecd/44/20/35837552.pdf, [Accessed: 12.01.09].

Li, Y.; Oberheitmann, A. (2009), "Challenges of rapid economic growth in China: Reconciling sustainable energy use, environmental stewardship and social development", *Energy Policy*, 37(4): 1412-1422.

Lütken, S. E.; Michaelowa, A. (2008), "Corporate Strategies And The Clean Development Mechanism: Developing Country Financing for Developed Country Commitments?", *Edward Elgar*, Cheltenham.

Magic, P. (2003), "International Technology Transfer & Intellectual Property Rights", *University of Texas*, http://www.cs.utexas.edu/users/fussell/courses/econtech/public-final-papers/Peter_Magic_International_IP_Rights.pdf, [Accessed: 25.03.09].
Maskus, K. E. (2004), "Encouraging International Technology Transfer", *UNCTAD-ICTSD Project on IPRs and Sustainable Development*, http://www.iprsonline.org/unctadictsd/docs/CS_Maskus.pdf, [Accessed: 12.02.09]
McDougall, P.; Oviatt, B. (1996), "New Venture Internationalization, Strategic Change, And Performance: a Follow-up Study", *Journal of Business Venturing*, 11(1): 23-40.
McDougall, P.; Oviatt, B. (2003), "Some Fundamental Issues in International Entrepreneurship", *United States Association for Small Business and Entrepreneurship*, http://www.usasbe.org/knowledge/whitepapers/mcdougall2003.pdf, [Accessed: 13.01.09].
Michael, S. C. (2007), "Transaction cost entrepreneurship", *Journal of Business Venturing*, 22(3): 412-426.
Monitor Group (2009), "Paths to Prosperity: Promoting Entrepreneurship in the 21st century", *Monitor Group*, s http://www.compete.monitor.com/App_Themes/MRCCorpSite_v1/DownloadFiles/NED_report_final.pdf, [Accessed: 21.03.09].
Moore, B.; Wüstenhagen, R. (2004), "Innovative and Sustainable Energy Technologies: the Role of Venture Capital", *Business Strategy and the Environment*, 13(2): 235-245.
Morrissey, M.; Almonacid, S. (2005), "Rethinking Technology Transfer", *Journal of Food Engineering*, 67(1): 135-145.
Mtigwe, B. (2006), "Theoretical milestones in international business: The journey to international entrepreneurship theory", *Journal of International Entrepreneurship*, 4(1): 5-25.
Ockwell, D. G.; Watson, J.; MacKerron, G.; Pal, P.; Yamin, F. (2008), "Key policy considerations for facilitating low carbon technology transfer to developing countries", *Energy Policy*, 38(6): 4104-4115.
OECD (2008), "Measuring Entrepreneurship – A digest of indicators", *OECD*, http://www.oecd.org/document/31/0,3343,en_2649_34233_41663647_1_1_1_1,00.htm, [Accessed: 17.01.09].
Olsen, K. (2005). "The Clean Development Mechanism's Contribution to Sustainable Development", *UNEP Risoe Centre*, http://www.cd4cdm.org/Publications/CDM&SustainDevelop_literature.pdf [Accessed: 10.01.09].
Oviatt, B.; McDougall, P. (1994), "Toward a theory of international new ventures", *Journal of International Business Studies*, 25(1): 45-64.
Pascala, S.; Socolow, R. (2004), "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies", *Carbonsequestration.us*, http://carbonsequestration.us/Papers-presentations/htm/Pacala-Socolow-ScienceMag-Aug2004.pdf, [Accessed: 04.04.09].
Penrose, E. (1959), "The Theory of the Growth of the Firm", *Oxford University Press*, Oxford.
Popp, D. (2008), "International Technology Transfer for Climate Policy", *Syracuse University: Maxwell School of Citizenship and Public Affairs*, http://www-cpr.maxwell.syr.edu/pbriefs/pb39.pdf, [Accessed: 13.04.09].
Prashantham, S. (2005), "Toward a Knowledge-Based Conceptualization of Internationalization", *Journal of International Entrepreneurship*, 3(1): 37-52.
Radosevic, S. (1999), "International Technology Transfer and Catch-up in Economic Development", *Edward Elgar*, Cheltenham.
Raposo, M.L. B.; Paço, A.; Leitão, D.; Ferreira, J.; Leitão, J.; Silva, M. J.; Rodrigues, R.; Serrasqueiro, Z. (2006), "Manual de Benchmarking para as Universidades", *Publisher Team*, Lisboa.

Reisman, A. (2005), "Transfer of technologies: a cross-disciplinary taxonomy", *The International Journal of Management Science,* 33(3): 189-202.
Rialp, A.; Rialp, J.; Knight, G. A. (2005), "The phenomenon of early internationalizing firms: what do we know after a decade (1993–2003) of scientific inquiry?", *International Business Review*, 14(2): 147-166.
Rogers, E. M. (2002), "The Nature of Technology Transfer", *Science Communication*, 23(3): 323-341.
Rogers, E. M.; Takegami, S.; Yin, J. (2001), "Lessons learned about technology transfer", *Technovation*, 21(4): 253-261.
Rugman, A.; Verbeke, A. (2002), "Edith Penrose's Contribution to the Resource-based view of Strategic Management", *Strategic Management Journal*, 23(8): 769-780.
Schneider, M.; Holzer, A.; Hoffmann, V. (2008), "Understanding the CDM's contribution to technology transfer", *Energy Policy*, 36(8): 2930-2938.
Seres, S. (2007), "Analysis of Technology Transfer in CDM Projects", *the UNFCCC Registration & Issuance Unit CDM/SDM*, http://cdm.unfccc.int/Reference/Reports/TTreport/TTrep07.pdf, [Accessed: 12.11.08].
Spence, M.; Manning, L.; Crick, D. (2008), "An investigation into the use of collaborative ventures in the internationalization of high performing Canadian SMEs", *European Management Journal*, 26(6): 412-428.
Stearns, T.; Hills, G. (1996), "Entrepreneurship and new firm development: A definitional introduction", *Journal of Business Research*, 36(1): 1-4.
Stern, N. (2007), "The Economics of Climate Change", *Cambridge University Press*, Cambridge.
Taiyab, N. (2005), "The Market for Voluntary Offsets: a New Tool for Sustainable Development?", *International Institute for Environment and Development*, http://fletcher.tufts.edu/ierp/pdfs/NadaaTaiyab-Gatekeeper121.pdf, [Accessed: 02.02.09].
Teegen, H. (2000), "Examining strategic and economic development implications of globalising through franchising", *International Business Review*, 9(4): 497-521.
UNEP Riso (2009), "CDM projects by region", UNEP Riso, http://www.cdmpipeline.org/cdm-projects-region.htm, [Accessed: 18.04.09].
United Nations Framework Convention on Climate Change (UNFCCC) (2009a), "Full Text of the Convention: Article 4", *UNFCCC*, http://unfccc.int/essential_background/convention/background/items/1362.php, [Accessed: 10.04.09].
United Nations Framework Convention on Climate Change (UNFCCC) (2009b), "Advance report on performance indicators to monitor and evaluate the effectiveness of the implementation of the technology transfer framework", *UNFCCC*, http://unfccc.int/resource/docs/2009/sb/eng/inf03.pdf, [Accessed: 18.04.09].
United Nations Framework Convention on Climate Change (UNFCCC) (2009c), "Registered project activities by host parties", *UNFCCC*, http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html, [Accessed: 22.04.09].
van der Gaast, W.; Begg, K.; Flamos, A. (2009), "Promoting sustainable energy technology transfers to developing countries through the CDM", *Applied Energy*, 86(1): 230-236.
Vishwasrao, S. (2007), "Royalties vs. fees: How do firms pay for foreign technology?", *International Journal of Industrial Organization*, 25(4): 741-759.
Wei, L. (1995) "International Technology Transfer and Development of Technological Capabilities: A Theoretical Framework", *Technology in Society*, 17(1): 103-120.
Welsh, D. (2007), "Introduction from the guest editor", *The International Entrepreneurship and Management Journal*, 3(4): 349-353.

Wennekers, S.; van Stel, A.; Thurik, R.; Reynolds, P. (2005), "Nascent Entrepreneurship and the Level of Economic Development", *Small Business Economics*, 24(3): 293-309.

Wilder, M. (2005), "Implementing the Clean Development Mechanism and emissions trading beyond Europe", in "Climate Change and Carbon Markets: a Handbook of Emissions Reduction Mechanisms" *Earthscan*, London.

World Bank (2008), "International Trade and Climate Change: Economic, Legal and Institutional Perspectives", *The World Bank*, Washington.

World Intellectual Property Organization (WIPO), (2004). "WIPO Intellectual Property Handbook: Policy, Law and Use", *World Intellectual Property Organization*, http://www.wipo.int/about-ip/en/iprm/index.html, [Accessed: 28.03.09]

World Watch Institute (2009), "State of the World: Into a Warming World", *World Watch Institute*, www.worldwatch.org, [Accessed: 15.03.09].

Wright, R.; Dana, L.-P. (2003), "Changing Paradigms of International Entrepreneurship Strategy", *Journal of International Entrepreneurship*, 1(1): 135-152.

Wright, R.; Ricks, D.-A. (1994), "Trends in International Business Research: twenty-five years later", *Journal of International Business Studies*, 25(4): 687-701.

Wüstenhagen, R.; Bilharz, M. (2006), "Green energy market development in Germany: effective public policy and emerging customer demand", *Energy Policy*, 34(13): 1681-1696.

Yamin, F. (2005), "The international rules on the Kyoto mechanisms", in "Climate Change and Carbon Markets: a Handbook of Emissions Reduction Mechanisms" *Earthscan*, London.

Zahra, S.; Matherne, B. P.; Carleton, J. M. (2003), "Technological Resource Leveraging and the Internationalization of New Ventures", *Journal of International Entrepreneurship*, 1(3): 163-186.

Zahra, S.; George, G. (2005), "International Entrepreneurship: the current status of the field and future research agenda", *Wisconsin School of Business*, http://instruction.bus.wisc.edu/ggeorge/research/IE.pdf, [Accessed: 17.01.09].

Zahra, S.; Hayton, J. (2008), "The effect of international venturing on firm performance: The moderating influence of absorptive capacity", *Journal of Business Venturing*, 23(2): 195-220.

Zhao, L.; Aram, J. (1995), "Networking and Growth of Young Technology-Intensive Ventures in China", *Journal of Business Venturing*, 10(5): 349-370

TABLES

Table 1 Typology of new ventures studied in the framework of International Entrepreneurship

Type of Venture	Authors	Definition	Theoretical Constructs used	Mode of Foreign Entry	Criteria
Born-Global	- Knight and Cavusgil (1996)	Small, technology-oriented companies that operate in international markets from the earliest days of their establishment.	- Knowledge-based view - Network theory	- Licensing - Alliances (e.g. JVs, use of agents, distributors) - Exporting	- Begin exporting one or several products within 2 years of establishment
International New Venture*	- Oviatt and McDougall (1994)	A business organization that, from inception, seeks to derive significant competitive advantage from the use of resources and the sale of outputs in multiple countries.	- Transaction cost theory - Resource-based view - Network theory - Knowledge-based view	- Exporting - FDI - Alliances	- Firms that are global from inception or inter-nationalize within 2 years of establishment - Begin with a proactive international strategy
Born-Again Global	- Bell *et al.* (2001)	Well-established firms that have previously focused on their domestic markets, but which suddenly embrace rapid and dedicated internationalisation.	- Network theory - Resource-based view - Knowledge-based view - internationalization process model	- FDI - Acquisition - Franchising - Exporting	- Predominantly, 'traditional' firms, whose internationalization process was prompted by a 'critical incident'
International Start-up	- Johnson (2004)	A new venture that exhibits an innate propensity to engage in a meaningful level of international business activity at or near inception, with the intent of achieving strategic competitive advantage	- Knowledge-based view - Network theory	- Exporting	- Firms internationalize within five years of founding, and - International sales represent a minimum of 20% of total revenue
International venture	- Kuemmerle (2002)	Companies that, from their inception, engage in either home-base-augmenting (HBA) or home-base-exploiting (HBE) activities or both, thus viewing their operating domain as international from the initial stages of the firm's operation.	- Knowledge-based view - Network theory	- HBA activities and/or - HBE activities	- The ventures are built from one rather than several home bases - Rapid growth of the venture
Micro-multinational	- Dimitratos *et al.*, 2003	A small- and medium-sized firm that controls and manages value-added activities through constellation and investment modes in more than one country.	- Network theory - Resource-based view - Knowledge-based view	- 'Constellation and investment' modes, such as licensing, franchising, JV or strategic alliances	- In comparison to large multination-nals, micro-multinationals possess a lower level of resources; have a lower degree of value-added activities abroad; and tend to engage in higher degrees of networking.

Source: Own elaboration. * Note: these authors distinguish 4 types of international new ventures: (i) import-export start-up; (ii) multinational trader; (iii) geographically-focused start-up; and (iv) global start-up.

Table 2 International Technology Transfer Mechanisms

Transfer Mechanism	Brief Description	Strengths and Weaknesses
Foreign Direct Investment (FDI)	An investment abroad, where the company being invested in is controlled by the foreign corporation.	- FDI provides a high degree of control over the technology which is transferred; - Due to the above, FDI is more appropriate to the transfer of recent, complex and costly technology; - FDI often raises awareness among local companies of the new technological possibilities brought by the foreign firm; - FDI creates a situation whereby foreign firms fight with local companies for high-skilled personnel.
Joint Venture (JV)	An entity that is created when two or more firms pool a portion of their resources and create a separate jointly owned organization.	- Compared to other mechanisms, JVs are likely to lead to effective technology transfers, as the technology owner has an incentive to ensure that the underlying tacit knowledge is effectively transferred; - Under the JV, the technology receptor has access to the technology and know-how, as well as capital and market access; - Allows the spread of costs and risks, as well as different parties to learn news skills from each other.
International Trade	The exchange of services and goods across international borders.	- All exports carry some potential for the transfer of technological information, and as such they can be studied for design characteristics and reverse engineering; - The transfer of technological inputs to be incorporated into production processes can improve production processes, thereby accelerating technological change in the host economy; - The acquisition of technology does not assure its effective transfer; - Technology transfer that is limited to capital goods can hardly lead to the development of technological capabilities.
Licensing	Contractual agreement granting permission to another party to use intellectual property under specific conditions.	- Low risk method for technology owners to obtain additional returns from their investments in R&D; - Licensors keep significant control over the dissemination, use, and protection of proprietary rights; - The technology licensed may experiment some sort of inefficiencies if there are no representatives in the host economy providing warranty or maintenance services; - Licensing is a preferable strategy for companies which do not have sufficient resources to enter in a foreign country by means of FDI; - The benefits of licensing largely depend on the latter's ability to negotiate the conditions of the agreement; - Licensing may be more appropriate for less complex technologies.
Franchising	A contractual-based arrangement involving a franchisor and a franchisee, whereupon the former compromises to transfer a business concept and some knowledge to the latter.	- Low risk method for technology owners to enter into a new market; - Franchisors keep significant control over the dissemination, use, and protection of proprietary rights; - Long-term commitment for the commercialization of the underlying business concept, both from the part of the franchisor and the franchisee.
Assignment Contract	Sale, by the owner of, all his exclusive rights in a patented innovation to another.	- Technology suppliers do not retain any significant control over the use of the technology that is transferred; - From the part of the technology supplier, it is the most appropriate means of technology transfer if he finds it impractical to impose restrictions on the use of the technology.
Consultancy Arrangements	Provision of advice and services by specialized professionals in a certain area.	- Consultancy arrangements usually do not entail the responsibility of the consultant for the results; - They do not provide means to a continuous involvement of the technology supplier so that upgrades to the technology transferred can be more easily facilitated to the host; - Does not include measures to provide resources that may be needed for further growth of the host firm.
Turnkey Projects	A party designs and installs a system and transfers it to another party who will then operate it.	- It can be advantageous in the case of large projects that require sophisticated planning and coordination skills - Turnkey projects are often ill adapted to local conditions; - They do not provide means to a continuous involvement of the technology supplier so that advances in the technology transferred can be more easily facilitated to the host;
Mobility of Personnel	Movement of people who have the technology to receptor organizations.	- The transfer of specialized personnel, even if for just a limited period of time, is likely to enhance the effectiveness of the technology transfer.
Spin-Off	A new company that is established by individuals who were former employees of a parent organization, using a technology that is transferred from the parent organization.	- The parent organization may, in some cases, support the spin-off firm, either with the provision of physical assets or financial resources; - Problems with the transfer of IPR from the parent organization to the new company may arise.

Source: Own elaboration.

Table 3 Solutions for addressing climate change issues

Categories	Sub-categories
Clean Energy	• Power Generation (e.g. renewable energy technologies; clean coal technologies) • Cleantech Infrastructure • Power Storage Technologies • Biofuels
Environmental Resource Management	• Water (e.g. desalination / purification; wastewater treatment) • Agriculture (e.g. irrigation innovation, clean pesticides, seeds) • Waste management (e.g. recycling, energy from waste)
Energy & Material Efficiency	• Advanced Materials (e.g. advanced coatings, lightweight substitutes) • Building Efficiency (e.g. insulation, micro-generation) • Power Grid Efficiency (e.g. storage, smart-metering)
Environmental Services	• Environmental Protection (e.g. land conservation, sea defense, forestry) • Business Services (e.g. insurance, consultancy/advisory, intellectual property, microfinance, 'green' focused banking)

Source: Adapted from Deutsche Bank (2008).

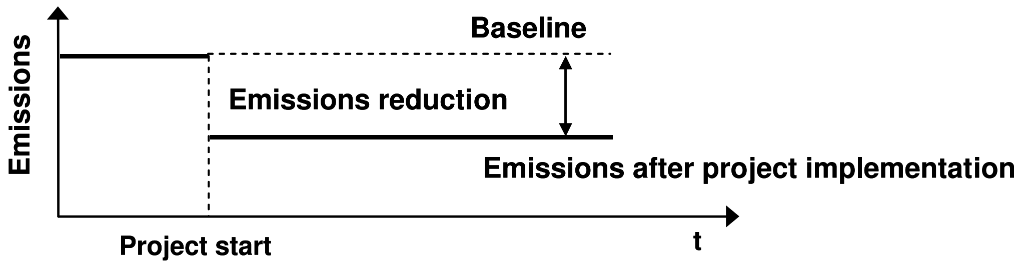
Table 4 Key performance indicators to evaluate mechanisms to transfer ESTs

Focus Areas	Key Performance Indicator (Qualitative or Quantitative)	Description	Perspective		Performance level (Investor) (scale: 1 to 5)		Performance level (Host Economy) (scale: 1 to 5)		Deviation (A-B) (+/-)		Corrective Measures
			Investor	**Host Economy**	**Real (A)**	**Est. (B)**	**Real (A)**	**Est. (B)**	**Inv.**	**Host Economy**	
1 – Capacity Building	1.1 Type of technology transferred (QUAL)	The indicator assesses whether the technologies transferred are in the form of equipment, explicit or tacit knowledge. The higher the amount of tacit knowledge transferred, the higher the likelihood of technology capacity enhancement.	X	X							
	1.2 Maturity of the technology transferred (QUAL)	The indicator assesses whether the technologies transferred are vertical or horizontal. Vertical technology transfers are more likely to contribute to the build-up of local technological capacities than horizontal transfers.	X	X							
	1.3 Transfer of complementary non-technological capabilities (QUAL)	The indicator evaluates if non-technological capabilities are involved in the scope of the transfer, such as managerial, marketing and organizational capabilities.	X	X							
	1.4 Knowledge spillovers into the host economy (QUAL)	The indicator evaluates the extent to which technologies transferred through the mechanism under consideration are likely to 'spill over' the economy.	X	X							
2 – Investment and Operational Costs	2.1 Total annual investment (QUANT)	The indicator measures the total amount of financial flows in ESTs into the host economy using the mechanism.	X				N/A	N/A		N/A	
	2.2 Technology transfer costs (QUANT)	The indicator measures the costs entailed by the host economy (i.e. through the host firm) by using the transfer mechanism.	X				N/A	N/A		N/A	
3 – Enabling Environment	3.1 Stakeholders involved (QUAL)	The indicator assesses the type of stakeholders involved in the host economy in the technology transfer process. In the case of governmental stakeholders being involved, it is likely that the mechanism can contribute to the improvement of the regulatory framework of the host economy.		X	N/A	N/A			N/A		
	3.2 IPR Protection (QUAL)	The indicator assesses the degree to which the mechanism contributes to the enhancement of IPR protection in the host economy.	X				N/A	N/A		N/A	
4 – Sustainable Development	4.1 Economic Benefits to Local Communities (QUAL)	The indicator assesses the economic benefits accrued to local communities as a consequence of the technology transferred using the mechanism under consideration		X	N/A	N/A					
	4.2 Social Benefits to Local Communities (QUAL)	The indicator assesses the social benefits accrued to local communities as a consequence of the technology transferred using the mechanism under consideration		X	N/A	N/A			N/A		
	4.3 Environmental Benefits to Local Communities (QUAL)	The indicator assesses the environmental benefits accrued to local communities as a consequence of the technology transferred using the mechanism under consideration		X	N/A	N/A			N/A		

Source: Own elaboration. Legend: Quantitative (QUANT); Qualitative (QUAL) Indicator ; Non Applicable (N/A).

FIGURE

Figure 1 The principle of the 'baseline'.



Source: Adapted from Lütken and Michaelowa (2008).