

MARKETING OF CARBON CREDIT: AN EMPIRICAL STUDY

Abstract

The Kyoto Protocol was approved in February 2005 and the carbon market without rules, played by pioneer companies interested in learning by doing and worried about their corporate image, started working towards a formality. As the market of Certified Emissions Reduction (CER) has already established Institutional Environment, it is interesting to study, based on the Transaction Cost Economics (TCE) theory, how the transaction costs induce alternative ways of production, in particular the contracts between private companies, with CDM (Clean Development Mechanism) projects, and the commercialization channels developed by multilateral organizations. For this, the research uses the case studies method to obtain private information about the transactions of CER, and their contracts between Brazilian companies and a multi-lateral organization, the World Bank. A result is that, in contrast with the spot market relationship, the Brazilian CDM projects benefited - in terms of reduction of transaction costs - with the CERs transactions (contracts) involving the World Bank since this bank does all distribution channel functions except the acquisition of CERs property rights.

KEY-WORDS: Kyoto Protocol, Clean Development Mechanism, Transaction Costs Economics, Distribution Channels.

1. Introduction

Based on the Distribution Channels Theory (Marketing) and the Transaction Cost Economics (TCE), the main problem of this research was defined as: *Why did Brazilian companies, players of the CERs market, choose a multilateral organization as a commercialization channel?; How do these CERs transactions happen?*

Although the enterprise participation in the CDM projects in the Certified Emissions Reductions (CERs) international market is not simple, it is clear today what steps are necessary (project cycle) to have an eligible project approved. These steps are as followed: a) to contract a specialized consultancy company; b) elaboration of the Project Design Document (PDD) jointly with the consultancy, with the amount of GHG emissions reductions (ERS) that can be traded; c) approval of the baseline methodology by the CDM Executive Board (EB); d) project approval by the National Authority (Interministerial Commission on Global Climate Change - CIMGC) and validation by a certifier entity (Designated Operational Entity - DOE); e) project register by the CDM Executive Board; f) monitoring of the emissions reductions by the developer company; g) verification and certification by the DOE; h) CERs issuance by the EB.

Therefore, the institutional environment that conducts the CERs market establish clearly who can participate, what kinds of projects are eligible, the development process of this new product (project cycle), what it is the product life cycle (cycles of 7 years or only a cycle of 10 years), who are the responsible agencies for the market regulation, etc. Therefore, the Macro Institutions that signal the set of opportunities are defined.

However, the transactions involving risks - that happen through the organizational forms (market, vertical integration or contracts) - are not only impacted by the Institutional Environment, but also by the transaction characteristics (asset specificity, frequency and uncertainty), the behaviour assumptions (bounded rationality and opportunism), and the main objective of firm is the reduction of transaction costs.

The carbon problem analysis, by the CERs buyers' perspective, reveals that the choice of the transaction's governance structure depends on the necessary costs to design a CER purchase agreement, in comparison with the necessary costs to internalize these activities (emissions reduction) inside the scope of the target company. They should remember that as the transaction costs as well as the production costs must be considered in a firm's decision process. For example, a company which needs to reduce its CO₂ emissions should evaluate the transaction and production costs enrolled as apart of a new clean technology - that allows the emissions reduction inside the

firm – as the purchase of CERs generated by other companies, in developing countries or transition economies. Both emissions reductions could be used for the company’s compliance with its national targets (after Kyoto Protocol).

In this context of high risks and high asset specificities, as in the carbon case, the chosen governance structure should be the vertical integration, that is, the company investing and installing clean technologies to reduce emissions, but in practice this organizational form is not verified. Some possible explanations with important implications in the financial structure of the CDM projects, are: (i) the costs of emissions reduction inside the firm are high; (ii) the investment in CDM projects requires technical capability; (iii) the CDM project is not part of the company’s core business; (iv) the CER market price doesn’t make possible the investment; (v) the distance to the developing countries and/or transition economies and the coordination costs are high.

In fact, the countries and/or organizations, that need to reduce their GHG emissions, would rather buy CERs in the spot market, then reducing their risk exposition. Even though this future cash flow (sale of CERs) contributes to increasing the investment’s internal rate of return (IRR), the project developers (sellers of CERs, located in developing countries or transition economies, with lower reduction costs) frequently need something else, as a loan (up-front payment) to cover project’s construction costs (Lecocq & Capoor, 2005).

Since the payments for the CERs are made in strong currency (dollar, euros or yens) and by purchasers with high credit rating, it is easier to obtain equity loans with the financial sector just offering the carbon purchase agreement (contract) as warranty. However, the small size of the market associated with the market risks and environmental uncertainties have discouraged the performance of great financial institutions (Lecocq & Capoor, 2005).

Therefore, there is an extremely peculiar situation that needs a bigger theoretical basement: in one hand, the CERs buyer wants to use the spot market, taking no risk and paying when it occurs the credits delivery, and in the other hand, the CERs seller wants to share risks and get equity loan – that can be paid with CERs - to make possible the investment, since the CER market price still is on a lower level. In this context, the transactions are blocked and the market does not evolve (Figure 1).

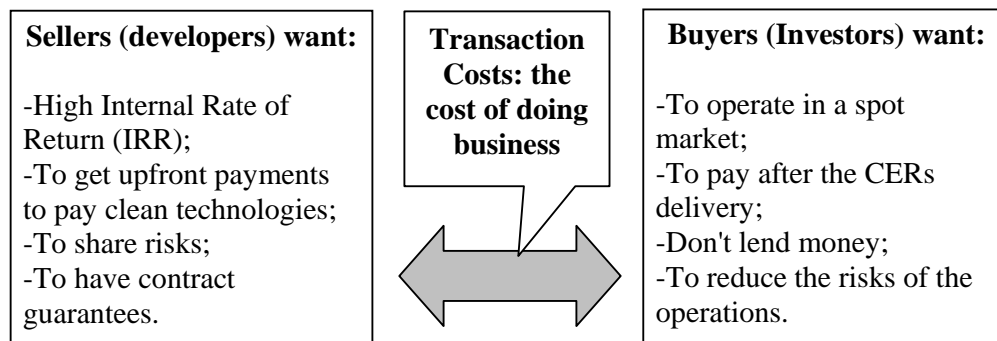


Figure 1 – Economical interest of the agents
Source: Authors.

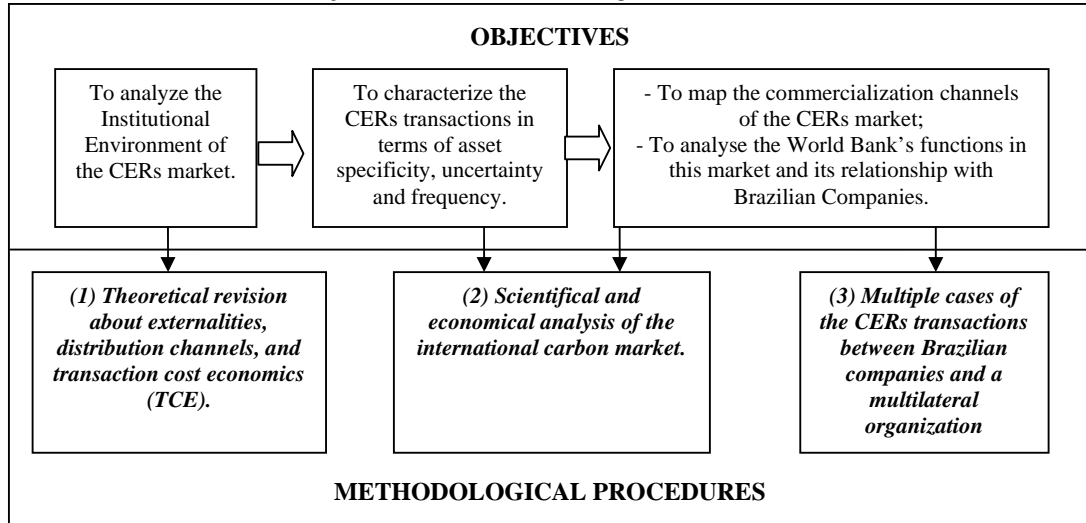
Why the study of Distribution Channels? Amongst the marketing’s controlable variables (price, product, communication and distribution channels) that are available to the developers’ companies, to define green marketing strategies, the distribution channels are the only way of differentiation. The development process of the CER product is relatively well-known, as well as the clean technologies for GHG reduction and the product life cycle. The CERs are traded as commodities products, so the price is determined by the market. The CDM project developer communicates its product lines associated with the climate-friendly company image, but it does not make it for the CER product. Then, the only strategic variable is the distribution channels (or commercialization), and they are very important for reduction of the high transaction costs.

In a scenario of high uncertainty, high asset specificities, repetition of the transactions, high transaction and production costs, the multilateral organizations, as the World Bank, appear to stimulate the CERs market acting as intermediaries between sellers and buyers, designing long-run contracts with the buyers, trying to minimize these costs and making feasible the CDM projects.

2. Objectives and Methodological Procedures

The main objective is to study the organization and the coordination of the Certified Emissions Reductions (CERs) transactions between Brazilian companies and a multilateral organization. For this, there are three specific objectives. The figure 2 presents the methodological procedures used to reach the proposed objectives.

Figure 2 – Relation between Objectives and Methodological Procedures.



Source: Authors.

2.1. The Case Study Method

Since this work is an exploratory and qualitative research, it was used the multiple cases studies method (or strategy), that was proposed by Yin (1989). Multiple-case studies follow replication logic, because they permit observation of the same evidence in different contexts. This is not to be confused with sampling logic where a selection is made out of a population, for inclusion in the study. This type of sample selection is improper in a case study. Each individual case study consists of a "whole" study, in which facts are gathered from various sources and conclusions drawn on those facts.

Bonoma (1985) and Lazzarini (1997) believe that the case study is particularly applicable when it wants to get analytical generalizations (theoretical), not statistical, which can contribute for a theoretical approach that needs consolidation and/or improvement. Without this orientation, the case study is only a story or tail well told.

Yin (1989) says that a research method is as a "strategy" that deals with, at least, three problems: which questions to study, which data to collect, and how to analyze the results. The same author identified five components of research design that are important for case studies:

- *The study's questions*: the strategy of case study is more appropriate to answer "why" and "how" questions. Therefore, the basic questions of the study have been defined:

Why did some Brazilian Companies, players of the CERs market, choose a multilateral organization as a commercialization channel?

How do these CERs transactions happen?

- *The theoretical propositions:* the assumptions that is helpful in focusing the study's goals. Here, the propositions are:

P1: In an embryonic market of a new product, the commercialization channels, developed by multilateral organizations, in the full exercise of their functions, contribute for the reduction of the actual transaction costs.

P2: In an embryonic market of a new product, with high transaction costs, the commercialization channels, in the full exercise of their functions, are intermediaries agents who coordinate the transaction, using contractual mechanisms, and allow the exchange between buyers and sellers.

- *The case study unit of analysis:* the primary unit that defines what the case is. Therefore, this research used as unit of analysis the CERs transaction between the company where the project was developed and the commercialization channel developed by a multilateral organization. Moreover, as an embedded case study, the sub-units of analysis are the flows of information, product, payments, finance, negotiation and risk.

Linking the data to propositions and the criteria for interpreting the findings are the least developed aspects in case studies.

- *The logic linking the data to the propositions:* construct validity is especially problematic in case study research. It has been a source of criticism because of potential investigator subjectivity. Yin (1989) proposed three remedies to counteract this: using multiple sources of evidence, establishing a chain of evidence, and having a draft case study report reviewed by key informants. One of the most important methods is the development of the case study protocol. These solutions were taken to write the results section.

- *The criteria for interpreting the findings:* a joint analysis between theoretical framework and evidences is done in order to propose analytical generalizations (theoretical). So, it's important to rely on theoretical propositions of the study, and then to analyze the evidences based on those propositions. It also was made in the results section.

In a context of information scarcity and high share of the World Bank in the carbon market, the multiple cases study selected four CERs transactions involving the Brazilian companies and the funds of the World Bank Carbon Finance Unit (CFU) for deeper analysis: 1) transaction Plantar S.A. (pig-iron industry with coal) and Prototype Carbon Fund (PCF); 2) transaction Using Alta Magana S.A. (to sugar mill - cogeneration of energy with biogases) and Prototype Carbon Fund (PCF); 3) Transaction Lags Bioenergetics Leda. (co-generation of energy with wood) and Prototype Carbon Fund (PCF); e 4) transaction Nova Gerard Ecoenergia S.A. (flare the biogas and cogeneration of energy in landfill) and Netherlands Clean Development Facility (NCDF).

The data collection was carried through interviews in depth with managers of the selected companies - responsible for the CDM projects - and with employees of the World Bank - responsible for the carbon finance in Latin America. The research instrument was a check-list, with guidelines, in way to allow the interviewed to add extra issues to be considered in the problem analysis.

The reasons for the choice of these cases are:

- The developers companies of CDM projects are Brazilian organizations that negotiated total or partially their CERs;
- The companies are pioneers in their respective productive sectors, since they are investing in clean technologies, adopting environmental-friendly inputs and productive process, reducing GHG emissions, participating of the CERs market, and promoting the sustainable development.
- The pioneering of the World Bank in the creation and management of mutual and governmental funds to purchase project-based GHG emission reductions in developing countries;
- The bank has high participation (market share) in the CERs market and a differentiated performance in comparison with other commercialization channels, in terms of finance, contractual warranties; supply of information etc.;

- The researcher had previous experience with the interviewed organizations, making easier the agreement process, communication and contact with these entities.

3. Theoretical Framework

3.1. Externalities and Transaction Cost Economics (TCE)

In the past, economists have already been alerted about the development's invisible costs (social) related with the indiscriminate use of natural resources (public goods) and, therefore, related with the externality problem (Pigou, 1920; Coase, 1960; Demsetz, 1967). Externalities exist when the actions of one party affect the utility or production possibility of another party outside an exchange relationship, and emerge because there is an obscure definition of private property rights. Cooter and Ulen (apud Mueller, 2002) define the property as a bundle of rights on a resource, that the owner is free to use as he wants, and whose activity is protected against the external interference. However, this owner necessarily does not have the absolute right on all aspects of that resource, but only a partial right.

Coase (1960) told that the (re)allocation of property rights (pollution permits) is a way to solve the phenomenon of externality. If the transaction costs are low and the property rights are well defined and being able to be traded, there is an incentive to the rearrangement (exchange) of these rights to increase the economic efficiency and to solve the problem of externality. This general principle is called as the Coase Theorem (Coase, 1960). The often recommended government intervention, as the Pigou pollution tax (1920), might be unnecessary and in many cases undesirable.

Nevertheless, as Coase points out, free-market exchange will not always solve the problem of externalities. The transactions that are necessary to overcome this problem are not free – there are *transaction costs* - and the property rights are not often well defined. These costs include basically search and information costs, bargaining and decision costs, policing and enforcement costs. North (1990) states that institutions are important when there are costs of exchange. This is the basic assumption of the Transaction Cost Economics (TCE).

Williamson (1993) gives a whole definition of transaction costs as the ex-ante costs to prepare, to negotiate and to protect an agreement as well as the ex-post costs to make adjustments and adaptations in a contract, that it is exposed to errors, omissions, and/or unexpected modifications. That is, “the costs of running the economic system”. Applying the transaction costs approach to the CERs transactions, there are the following types of costs:

Table 1 – Ex-ante and ex-post transaction costs applied to the CERs transactions

<i>Types</i>	<i>Details about the costs</i>	<i>Applied to the CERs transactions</i>
Ex-ante	<i>Information search</i>	Procedures for CDM project submission; the eligible projects and the available methodologies; the study of the Brazilian Environmental Law; selection of a specialized consultancy to elaborate the PDD and a new methodology; selection of a EOD (certifier entity) to monitor and to verify the evolution of estimated emissions; data about the market structure, the buyers and sellers, the prices and volumes traded, possible partnerships etc.
	<i>Bargain and contracts writing</i>	Definition of the contractual terms in the CERs trade agreements as period of delivery; acquired volume; prices; warranties against the environmental uncertainty; warranties against the hold-up problem; damages and penalties clauses; distribution of the expenses with the specialized companies (consultancy and certifier entities) and fees with the National Authority and the CDM Executive Board.
	<i>Intermediaries/ facilitators services</i>	The specialized consultancy company that elaborates the project idea; the certification company that validates the project; the certification company that issues social and environmental labels; the banks that make loan operations (up-front payments) based on the future CERs; the insurance companies that work in different phases of the project cycle etc.

	<i>Other costs</i>	Trips; allocated time to elaboration of technical reports and lead time to the CDM project be validated and registered by the national and international agencies; organization of debates and public hearings (stakeholders); search of specialized workers in carbon and renewable energy etc.
Ex-post	<i>Measurement and monitoring of performance</i>	Technical visits by the buyers; the monitoring and verification process controlled by the certifier entity; full-time workers dedicated to monitoring etc.
	<i>Administrative and legal policing and enforcement</i>	Technical visits and monitoring the register of the project by the CDM Executive Board, payments of salaries and commissions to specialized lawyers involved with hold-up or delinquency cases etc.
	<i>Renegotiation and redesigning contracts</i>	In cases of under performance – in terms of expected CERs production -, non-existence of the Kyoto market after-2012, non-register of the project by the CDM Executive Board, a new negotiation process should be started.

Source: Authors

As a result, the institutions must assume the role of reducing the transformation and transaction costs to achieve the economic efficiency involved in these transactions (North, 1990). Thus the property rights, that are institutions, should be well defined and exchangeable. It's important to give attention to different analytical approaches from North and Williamson to characterize the institutions. The first analyses the institutions in a macroanalytical view, as the "game rules", which are part of the Institutional Environment. In the other hand, Williamson analyses the institutions in a microanalytical view, considering the Modes (institutions) of Governance (market, hybrid forms and hierarchy).

As the Kyoto Protocol was approved and the CERs development process was consolidated, it could be assumed that the Institutional Environment and the Property Rights are relatively well-defined. However, the transaction costs in this market are still high, and the better way to reduce them is to understand the used modes of governance.

The model proposed by Williamson (1993; 1985), and reviewed by Zylbersztajn (1995), establishes that the efficient modes of governance depend on the boundaries imposed by the Institutional Environment, by the agents' behavior assumptions and by the characteristics of transactions.

3.1.1. Transaction Characteristics and Behaviour Assumptions

The transaction characteristics or dimensions are considered the basic analysis' unit of the ECT. According with Williamson (1985, p. 68), "the ECT affirms that the organizational diversity [contractual] can be explained, over all, by the differences in terms of transaction attributes". The behaviour assumptions of bounded rationality and opportunism should be included in this analysis.

The asset specificity refers to how much any investment (asset) is specific to any activity and how expensive is his reallocation to another use (Williamson, 1985); or the loss of value by the asset in a second option (Klein et al, 1990). In a general way, for the carbon problem, there exist the following specificities:

Perishability

Table 2 – Types of asset specificity applied to the CERs transactions

<i>Type of asset specificity</i>	<i>Definition</i>	<i>Applied to the CERs transactions</i>
<i>Temporal</i>	Related with perishable products, with eventual loss of quality with the time.	The CERs have institutional validity only up to 2012, when it'll finish the first period of fulfilment.
<i>Human</i>	Professionals direct or indirectly employed to transactions.	The most of companies employ or enable own professionals to deal with the CDM projects.
<i>Physical and</i>	Investment in technological	Clean technologies involved:

<i>Type of asset specificity</i>	<i>Definition</i>	<i>Applied to the CERs transactions</i>
<i>technological</i>	process and physical assets that can be sophisticated and specific.	- Boiler of high capacity to energy co-generation; - System for canalization of landfill gas and treatment of leachate; - Biodigestors for exploitation of methane gas proceeding from the decomposition of animal waste; - Technologies for generation of pig-iron made from vegetable coal, for wood carbonization process in charcoal production to mitigate methane emissions, and for co-generation of energy with recuperation of LDG (Lindz- Donawitz Gas) gas.
<i>Site</i>	Closeness between the agents involved in the transactions.	Localization of the different types of CDM projects according with the spatial concentration of the involved productive sectors. Moreover, in a general way, the developing countries have a less marginal cost of emission reductions.
<i>Brand name</i>	Creation of a name, a brand, a reputation in a specific market.	The organizations or give the central company brand to the CDM project or create a new brand to the new business.

Source: Authors, based on Williamson (1985) and Neves and Castro (2003)

As well as asset specificity, the uncertainty factor, associated to the existence of opportunism possibilities, implies the addition of transaction costs in the marketplace, and motivates the organizations to create alternative modes of governance (Zylbersztajn, 1995). North (1990) offers a sufficiently broad definition of uncertainty, for who the concept effectively corresponds to the unknowledge of possible future events.

In the uncertainty presence, the alternative structures of governance are evaluated according with the adaptation possibility against the occurrence of unexpected events, or not foreseen ex-ante. Such events occur given to the bounded rationality of the agents and the environmental changes, and involve positive transactions costs. For example, it happens with the resolution of ex-post disputes since the agents can act with opportunism (Williamson, 1985).

Farina et al. (1997) clearly show the uncertainty together with bounded rationality make difficult to design detailed contracts, and then the result is incomplete contracts. Contracts with more gaps - less complete - are exposed to the opportunist attitudes of the involved parts and, therefore, there are transaction costs. The table below presents the involved risks in a CERs transaction.

Table 3 - Risks (uncertainty) applied to the CERs transactions

<i>Environmental uncertainty</i>	
<i>Non-existence of Kyoto market after-2012</i>	It's the main limitation for the Kyoto Protocol success. If there isn't a second period of fulfilment, there won't be incentives to the countries cut emissions. The penalties by the no fulfilment of the goals today are the no participation in the market for a second period. That is, there insn't enforcement.
<i>Legally binding GHG reduction targets for developing countries in a second commitment period.</i>	There is a consensus that it is important the existence of goals to all countries reduce emissions, in order to obtain an agreement during the international negotiations. If Brazil has goals of emissions reduction, it will participate in the market through the Joint Implementation (JI) and it will develop a domestic market (cap-and-trade). Therefore, it doesn't arrive to be a threat.
<i>Non-validity of the CERs in the EU ETS (European Union Emissions Trading Scheme).</i>	This risk is low, because today there are specific rules for acceptance of the CERs in the European trading scheme.
<i>Country risk with any kind of confiscation by developing countries.</i>	Since the CDM project has a letter of approval by National Authority, this risk does not exist more. If there is any case of CERs confiscation, there will be some consequences in the foreign commerce of this country.
<i>Risks related with the CDM Project</i>	
<i>Non-register of the project by the</i>	For some types of the eligible projects can be difficult to proof their

<i>Environmental uncertainty</i>	
<i>CDM Executive Board.</i>	additionality, mainly to forest projects.
<i>Non-approval of the baseline methodology.</i>	This kind of risk is real, mainly in function of the CDM Executive Board slowness in its performance. Although, it believes that with the availability of a good number of approved methodologies, projects will be able to replicate and thus the market will have liquidity.
<i>Under performance in terms of expected CERs production.</i>	Perhaps this is the main risk of a CDM project, since the calculus of the total emissions reduction - and volume of CERs - is made based on a scenario. Therefore, the contracts need to include soft penalties in no fulfillment case and to allow adaptations and adjustments of relationship.
<i>Hold-up and other opportunistic actions.</i>	It is in the basis of other risks, and it comes from the bounded rationality of the agents and, consequently, from the incomplete nature of the contracts.

Source: Authors, based on Lecocq e Capoor (2005)

Finally, the frequency (repetition) of a transaction is one of the most important elements for the choice of the better structure of governance to this transaction. The importance of this dimension can be summarized in three aspects: a) the repetition of the transaction allows the parts to know each other - what it reduces the uncertainty; b) the repetition makes possible the creation of reputation around a brand - what it creates a specific asset; and c) in some cases, the repetition allows the beginning of a trustworthy commitment between parts around a steady relationship, avoiding any opportunistic behavior (Farina et al., 1997).

In the carbon case, the transactions are recurrent, because annually there is a delivery flow of CERs after a verification process made by a Designated Operational Entity (EOD) and an issuance work made by the CDM Executive Board. These transactions can last from 10 until 21 years (three cycles of 7 years) for the energy projects and from 20 until 60 years (two cycles of 30 years) for the forest projects. Then, the repetition of the transaction stimulates the construction of relational contracts, which are characterized by flexibility and adaptability.

3.2. Distribution Channels

As different as it seems, a previous analysis of the transaction characteristics and the individual behavior assumptions reveal that until this particular kind of transaction – as the carbon credits - the distribution channels or intermediaries are so important for the complete functioning of the market and for reducing the transaction costs. A real view of this can be obtained by the following analysis.

For Stern et al. (1996), ‘a marketing channel is a set of interdependent organizations involved in the process to take available a product or service for the consumer’. This approach is about how to plan, to organize, and to control the internal relations inside a company (or hierarchic relations) and the relations between companies. This point of view calls the attention to the relationships between companies participants of a channel structure. There are lots of reasons for the channels existence, but the main explanation related with this research – as the World Bank - is presented in the sequence:

Table 4 – Role of Intermediaries in the CERs transactions

<i>Reasons of existence</i>	<i>Application in the carbon problem</i>
<i>Reduction the number of transactions</i>	The World Bank, for example, creates mutual and governmental funds, acting as trustee to these sponsors. So, the Bank distributes the acquired CERs between the financiers around the World.
<i>Small quantities and higher variety</i>	It believes that the World Bank buys CERs from diverse CDM and JI projects, in differentes stages of development, using different sources of emissions reduction, and with different social and environmental additionalities.
<i>Reduction of negotiation cost</i>	It believes that the company negotiation with the World Bank allows dealing a contract with good price, with low risks, and that shows a quality label for the future

<i>Reasons of existence</i>	<i>Application in the carbon problem</i>
	sales agreements of CERs.
<i>Reduction of information search cost (consumer)</i>	The World Bank presents publicly diverse informations about the market of CERs and about the evolution of the institutional environment.
<i>Reduction of information search cost (company)</i>	Moreover, it believes that the World Bank helps in the elaboration of PDDs and designing of the baseline methodology to the CDM and JI projects contracted.
<i>Hybride modes (contractual) of governance and especialization in some activities</i>	The intermediaries, as the World Bank, allow that the CDM developers companies concentrate their efforts in the equipments installation and emissions reduction monitoring, that is, in their core business.

Source: Authors, based on Stern *et al.* (1996), Berman (1996), Rosembloon (1999), Pelton *et al.* (1997), Corey *et al.* (1989), Neves *et al.* (2001) and Neves and Castro (2003).

In the carbon market, it is believed that the intermediaries collaborate for the reduction of the information search costs, for the reduction of the negotiation costs with standardized contracts and with the developer company focusing in the emissions reduction management inside the bordies of the project.

3.2.1. Functions/ Flows in Distribution Channels

To understand the marketing channel is important to analyze the existing relations between the different members: producers, intermediaries and consumers who carry through exchange flows between theirselves. The existence of channel members depends on their capacity to execute and to monitor the necessary flows to attend the necessities of the final users. The table below presents the nine main flows played by the distribution channels, the direction between the members, a short explanation about each one of them, and an application for the carbon problem.

Table 5 – Flows of distribution channels in the CERs transactions

<i>Flows</i>	<i>Direction (producers – intermediaries – consumers)</i>	<i>Description</i>	<i>Application</i>
<i>Products and Services</i>	Upstream	To refer to the physical flow of the product from the producer until the consumer. It's the part where the logistic predominates.	A CER is an intangible product.
<i>Property</i>	Upstream	It's to have the property rights on the product (almost all agents assume this flow, except facilitators).	The channel acquires the CERs to price speculation in futures and options markets or to direct sales for other companies.
<i>Promotion</i>	Upstream	It's the activity carried through with the objective to create demand, because the channels participants are the responsible by the contacts.	In general terms, this function is performed by some commercialization channels of CERs to formation of new investment funds in CDM projects.
<i>Negotiation</i>	Both directions	It exists in all the stages of the channel.	There is an attempt to simplify the negotiation flow with the adoption of standardized contracts.
<i>Information</i>	Both directions	It's the communication between the agents, sharing the perceptions of each one about the products and services, and, mainly, the information that comes from the final consumers that is the basic importance for all the agents.	Informations about the consumer market, the developer's organizations, prices, transacted volumes, regional trading schemes, commodities markets, contracts, evolution of the COPs meetings.
<i>Finance</i>	Both directions	They are ways of payments and the financial flows related with the capital cost.	Finance to pay the consultancy responsible by the elaboration of the PDD and the certifier (EOD) responsible by the project validation; Loans (up-front

<i>Flows</i>	<i>Direction (producers – intermediaries – consumers)</i>	<i>Description</i>	<i>Application</i>
			payment) to purchase the equipments and to install the clean technology.
<i>Risks</i>	Both directions	They are involved in the flows, including those ones related with obsolescence, floods, fires, seasonal, growth of the competition, economical problems, recalls, and low acceptance of these, among others.	The involved risks in the CERs transactions have detailed in the previous section.
<i>Payments</i>	Downstream	It's the payments flow existing in the system.	In a general way, there is an annual flow of payments, according with the delivered volume of CERs.

Source: Authors, based on Stern et al. (1996), Neves *et al.* (2001), Neves and Castro (2003), Berman (1996) and Rosembloon (1999)

At the same time what about the structure? The channels can present lots of levels, but the producer and the consumer always will be present. It believes that a channel of level 2, when there is an intermediarie between the producer and the consumer, is predominant in the carbon market, because the developer companies of CDM projects don't have any experience in the carbon transactions. The next chart will present the main buyers of the carbon market:

Table 6 – The main buyers of the CERs market

<i>Buyer</i>	<i>Examples</i>
<i>Companies with mandatory domestic GHG reduction targets</i>	European Union Emissions Trading Scheme, Japan, Canada and other National Allocation Plans (NAPs)
<i>Governmental agencies from developed countries</i>	The Dutch Government CERUPT and ERUPT Tenders, Swedish Energy Agency
<i>Companies with voluntary GHG reduction targets</i>	Ontario Power Generation, Eletric Power Development Co. Ltd.
<i>Companies looking for hedge against future risks</i>	Shell Trading International Limited (STIL), Toyota Tsusho.
<i>Private Carbon Funds</i>	Dexia-Fondelec, CleanTech Fund
<i>Commercial banks</i>	Rabobank, ABN-Amro, Sumitomo-Mitsui, Itaú (Brazilian Bank) etc.
<i>Multilateral organizations</i>	United Nations Development Programme (UNDP), World Bank Prototype Carbon Fund (PCF), Corporacion Andina de Fomento (CAF), International Finance Corporation (IFC).
<i>Other market intermediaries/facilitators</i>	Brokers like CO2e.com, Evolution Markets and Natsource.

Source: Authors

Between the eight buyers cited above, the first four are final buyers and the others are intermediaries. However, much of these final buyers use intermediaries – mainly the governammental agencies – to adcquire CERS, trying to mitigate the risks involved to the business. The World Bank, that is a multilateral organization, is very distinguished amongst these intermediaries, perhaps by the execution of the main functions of a typical distribution channel.

4. Results

The different contexts and/or particularities of each CDM project selected can be explained through the following chart:

Table 7 – Characteristics of the selected Brazilian CDM Projects

<i>Characteristics</i>	<i>Cases</i>
<i>General Project Description</i>	<ul style="list-style-type: none"> - Plantar: production of pig-iron with vegetable coal coming from certified renewable forests. This project will avoid a fuel switch from charcoal to fossil fuel in pig iron production; it will also reduce pressure on the native forest. - Lages Bioenergetica: the project will install a energy cogeneration unit, using as fuel wood residues from the sawmill industries of the region. - Alta Mogiana: the project will substitute electricity produced by thermal plants with electricity from renewable sources using sugar cane bagasse. For this, it will improve the energy efficiencies of the Alta Mogiana Cogeneration facility to increase the electricity output supply to the national grid. - Nova Gerar Ecoenergia: the project involves the investment in a landfill gas collection system to combust the methane and to produce electricity for export to the grid.
<i>Baseline Methodology</i>	The Nova Gerar, Alta Mogiana and Lages projects have methodologies approved by the CDM Executive Board, but the Plantar project, the pioneer in the market, not yet.
<i>Phase in the Project Cycle</i>	<ul style="list-style-type: none"> - Nova Gerar: registered by the CDM Executive Board; - Lages and Alta Mogiana: approved by the Brazilian Interministerial Commission on Global Climate Change (CIMGC); - Plantar: methodology under consideration of the CDM Executive Board.
<i>Project Scale</i>	<ul style="list-style-type: none"> - Small scale: Lages; - Large scale: Alta Mogiana, Plantar and Nova Gerar.
<i>Type of Fund</i>	Two kinds of funds: <ul style="list-style-type: none"> - Mutual fund (Private/Public): <i>Prototype Carbon Fund (PCF)</i>; - Public fund: <i>Netherlands Clean Development Facility (NCDF)</i>.
<i>Location</i>	<ul style="list-style-type: none"> - Plantar: Belo Horizonte-MG and some units in cities of Minas Gerais State; - Alta Mogiana: São João da Boa Vista-SP; - Lages: Florianópolis-SC and a unit in Lages-SC; - Nova Gerar: São Paulo and a unit in Nova Iguaçu-RJ.
<i>Productive Sector</i>	The CDM projects are related with four productive sectors: <ul style="list-style-type: none"> - Sugar cane: Alta Mogiana; - Energy industries (renewable - / non-renewable sources): Lages; - Landfill: Nova Gerar; - Coal and Pig-iron: Plantar.
<i>Type of Project</i>	As consequence of the productive sectors involved, there are four kinds of CDM projects: <ul style="list-style-type: none"> - Landfill gas capture and electricity generation: Nova Gerar; - Grid-connected electricity generation from renewable sources (biomass residues): Alta Mogiana; - Avoidance of methane production from biomass decay through controlled combustion: Lages; - Mitigation of methane emissions in the wood carbonization activity for charcoal production: Plantar - Afforestation and Reforestation: Plantar.
<i>Consumer market</i>	<ul style="list-style-type: none"> - Operations in the industrial market: Nova Gerar; Plantar e Lages; - Operations in the final consumer market: Alta Mogiana.
<i>Corporate governance</i>	<ul style="list-style-type: none"> - Family/ closed capital/ Brazilian: Plantar S.A. e Alta Mogiana S.A.; - Joint Venture/ closed capital/ Brazilian and British: Nova Gerar/ S.A. Paulista e EcoSecurities; - Transnational/ open capital/ Belgian and French: Lages/ Tractebel Energia/ Grupo Suez.

Source: Authors

4.1. Characteristics of the CERs transactions

4.1.1. Frequency

As said before, the transactions in the carbon are frequent because there is an annual flow of CERs delivery after a verification process made by a Designated Operational Entity (DOE) and the issuance of the certificates made by the CDM Executive Board. The following chart displays clearly the frequency of the transactions inside the total duration of the contract (transaction).

Table 8 – Frequency of the analysed CERs transactions

	<i>Plantar</i>	<i>Lages</i>	<i>Alta Mogiana</i>	<i>Nova Gerar</i>
<i>Frequency</i>	Annual	Annual	Annual	Annual
<i>Transaction duration</i>	Until 2028	Until 2014	Until 2008	Until 2012
<i>Project duration</i>	28 years 2001-2028	10 years 2004-2014	7 years 2002-2008	21 years 2004-2024

Source: Authors

Except the Nova Gerar case that sold only CERs delivered up to 2012 for requirement of the Dutch government, the transaction with the delivery of CERs used to happen during the project life cycle. In general, the frequency of the transaction must create a trustworthy commitment between the Brazilian companies and the World Bank to continue the relationship while to last the contract.

4.1.2. Asset Especificity

The following chart shows the existence of asset specificity in the analyzed CERs transactions. Each one of the asset specificities can be detailed as it follows:

- *Temporal especificity*: considering that the CERs has institucional validity only up to 2012, when it'll finish the first period of fulfilment, Plantar and Nova Gerar are in a worse situation, therefore their credits surpass this period;
- *Human especificity*: with exception of the Alta Mogiana, the other companies have formed and capabilited an own team for management of the carbon business as well as for use of this human capital to prospect new CDM projects in the respective productive sectors;
- *Phisical and technological especificity*: the technologies and instaled equipments in the Plantar (improvement of the carbonozation process) and Nova Gerar (thermoelectrial plant of biogas) projects have been acquired and/or improved exclusively because the existence of the project. On the other hand, in the Lages and Alta Mogiana cases, the co-generation equipment is mainly used for sales transaction of energy, while the CERs transaction is only additional revenue;
- *Brand especificity*: this type of especificity only exists to Plantar and Nova Gerar cases, because the 'Plantar' brand and the proper company have the risk of disappearance if the CDM project doesn't exist; whereas, the 'Nova Gerar' brand was created specifically for the CERs transactions. In any way, the success of the analyzed CDM projects must allow the positioning of the company, and its main brand, as an environmentlly friendly company.

Table 9 – Asset especificities involved in the analysed CERs transactions

	<i>Plantar</i>	<i>Lages</i>	<i>Alta Mogiana</i>	<i>Nova Gerar</i>
	<i>Asset specificities</i>			
<i>Temporal</i>	CERs until 2028	CERs until 2014	CERs until 2008	CERs until 2024
<i>Human</i>	Own team	Own team	Contracted Consultancy	Own team
<i>Physical and technological</i>	Wood carbonization process in charcoal production.	Thermoelectrical plant of wood residues.	Thermoelectrical plant of sugarcane bagasse.	- Leachate Treatment Center; - Thermoelectrical plant of landfill gas.
<i>Brand name</i>	Plantar Brand	-	-	Nova Gerar Brand
<i>Final avaliation</i>	<i>High</i>	<i>Middle</i>	<i>Low</i>	<i>High</i>

Source: Authors

4.1.3. Uncertainty (risks)

Beyond the environmental uncertainty, that influences all the CDM projects in a uniform way, it can be detailed the intrinsic risks to the selected cases as it follows:

- *Non-register of the project by the CDM Executive Board*: with exception of the Nova Gerar project, that was already registered, for the other projects this kind of risk is significant. It goes from a high risk to Plantar, that doesn't have approved methodologies, medium risk to Alta Mogiana, since the sugar cane sector has a negative image in the international community as a polluting agent and employer of enslaved work, and low risk to Lages, because the project have already initiated the annual verification process and as a small scale project it has simplified rules of approval;

- *Non-approval of the baseline methodology*: this risk is only applicable to Plantar, because any of its methodologies haven't the approval by the CDM Executive Board yet;

- *Under performance in terms of expected CERs production*: to the Plantar, Lages and Nova Gerar projects, the risk of under performance is high, because the scenario to emission reductions is made based on other scenarios to production of vegetable coal, wood consumption and capture of biogas, respectively. Moreover, to the Plantar reforestation project, this risk is still more high, since there is the possibility for non-permanence of the carbon stock in the renewable forests, then the difficulty to prove the aditionality. However, in the Alta Mogiana project, this risk is small, since the scenario to emission reductions is made based on a fixed emission factor (tCO₂e/MWh generated by a natural gas thermoelectrial plant).

The following chart presents a summary of the risks involved directly in the CERs transactions:

Table 10 – Risks involved in the analysed CERs transactions

	<i>Plantar</i>	<i>Lages</i>	<i>Alta Mogiana</i>	<i>Nova Gerar</i>
		<i>Risks</i>		
<i>Non-register of the project by the CDM Executive Board.</i>	<i>High</i> – not approved methodologies	<i>Low</i> – project has validated and it started the annual verification.	<i>Medium</i> – project has validated, but the sector has a negative social and environmental image.	<i>Zero</i> – project has already registered.
<i>Under performance in terms of expected CERs production.</i>	<i>High</i> – methane project: projection of the vegetable coal production; <i>High</i> – reforestation project: risk for no permanence of the carbon stock in the forests.	<i>High</i> – projection of the wood consumption in the plant.	<i>Medium</i> – Emission factor is fixed, but with projection to energy co-generation.	<i>High</i> – projection of the landfill gas captation and using the GWP index (1 ton of CH ₄ is equal to 21 tonnes of CO ₂) that can be changed.
<i>Non-approval of the baseline methodology.</i>	<i>Medium</i> – methane project; <i>Zero</i> – reforestation project.	<i>Zero</i> – methodology has already approved.	<i>Zero</i> – methodology has already approved.	<i>Zero</i> – methodology has already approved.
<i>Particular risks related with each project</i>	- fire in the forests; - low productivity in the forests; - hold-up by the financial institution.	- interruption in the wood residues supply; - hold-up by the wood industries.	- hold-up by the energy distributor; - harvest break; - quality of the sugar cane (volume of bagasse).	- hold-up of concession by the municipal government; - scavengers (human health); - change of the law (obligation of landfill gas burning).
<i>Final avaluation</i>	<i>High</i>	<i>Medium</i>	<i>Medium</i>	<i>High</i>

Source: Authors

4.2. Choice the commercialization channel of CERs

In simplified way, any CDM project, with the objective to sell emission reductions (ERs) for the CFU, must fill a project proposal, called 'Project Idea Note' (PIN). After to be analyzed by the

CFU, the project developer can receive a letter of purchase intention (ERs), but the transaction isn't carried through yet. In a new phase, the selected project will pass for a financial analysis, where the strategy of mortgage will be defined (up-front payment), through out the elaboration of a document called 'Carbon Finance Document' (CFD), for attainment of loans with financial institutions payable in CERs. These loans are used in the acquisition of equipments and technologies for emission reductions. The final phase is that for signature of the contract called 'Emission Reductions Purchase Agreement' (ERPA).

It is necessary now to verify, based on the analysed cases, what are the channel functions performed by the World Bank, through the Carbon Finance Unit (CFU). It can be said that the World Bank manages and monitores the following flows:

Table 11 – Reasons to choose the World Bank as a commercialization channel

<i>Channels flows</i>	<i>Description</i>
<i>Products and Services</i>	The CFU is responsible by the CERs delivery and the payment of the financial institutions by the loans payable in CERs.
<i>Property</i>	The CFU doesn't acquire the CERs property rights. It works as a trustee for the carbon funds, formed by resources of companies and governments from developed countries.
<i>Promotion</i>	The CFU stimulates the participation of the economic agents in the carbon business, through website, workshops, seminars, evaluation of Project Idea Notes from new project developers, and evaluation of financial institutions interested in making up-front payments;
<i>Negotiation</i>	The CFU adopts rigorous criteria for approval of CDM projects and a long negotiation process to design the ERPA (Emissions Reduction Purchase Agreement). However, it works as an informal quality label to the project and it allows good conditions of bargain to the project developers in future contracts with other CERs buyers.
<i>Finance</i>	The CFU pays the elaboration cost of the project - and it deduces of the amount to be paid in the first delivery of CERs -, and it stimulates the financial institutions to offer loans payable in CERs, keeping as a guarantee the signed ERPA and the World Bank international credibility.
<i>Risks</i>	The CFU shares the inherent risks of the CDM project with the developer: purchase of emissions reduction (ERs) beyond 2012, it designs contracts with fixed price and changeable volume, it guarantees the payment by the ERs even without the Kyoto Protocol existence, it establishes a relational contract with adjustment of relationship in no fulfilment situation (soft penalties), it helps the (re)elaboration of methodologies etc.
<i>Information</i>	The CFU shares informations about the procedures to apply a CDM project, informations about the market, mortgages lines in the financial institutions, other intermediaries and available CERs buyers in the market, through workshops, seminars and its website (carbonfinance.org).
<i>Payments</i>	The CFU budget is around US\$ 1 billion, and the ERPA payments are made after the annual delivery of CERs. Moreover, the CFU carries through the payment of the financial institutions in CERs.

Source: Authors

Based on what was revealed, it is possible to review the research propositions and verify if they have been answered. In terms of proposition 1 (P1), it is important to clarify that the term 'commercialization channels' is appropriated, because the CFU of the World Bank does not acquire the property rights on the CERs, and therefore it is not a typical distribution channel, but it performs some channel functions as presented above. The coordination of the transaction by the CFU occurs since the moment when the CDM project receives a letter from purchase intention until the delivery of the last CER.

In terms of proposition 2 (P2), the CFU of the World Bank adopts hard criteria for approval of CDM projects, it is slow and bureaucratic in the negotiation process of a ERPA, it does not have the market incentives (competition) for a better performance and it pays low prices in comparison with the market pattern, but its differentiated performance in the market allows us to say that it contributes for reduction of the existing transaction costs.

However, it can be said that the multilateral organizations, while commercialization channels, contribute for reduction of the existing transaction costs, not by the channel efficiency criteria, but simply for allowing the existence of channel flows in the CERs transaction. Thus, the World Bank knows that its role is just for stimulate the development and consolidation of the GHG

market, allowing the birth of new GHG reduction projects and the meeting between sponsors and developers. Made this, its function in the market is already dispensable.

5. Conclusions

Under the perspective that the relationship between Brazilian companies and multilateral organizations has an important role to achieve CERs exchanges, the exploratory research brought a possible understanding of the World Bank functions in the carbon market as a commercialization channel. Based on the cases, the CERs transactions are characterized as frequent, with medium or high asset specificity, and by involving high risks. In terms of asset specificity, the physical and technological, human and temporal specificities have been more distinguished. In terms of business risks, the risk of non-existence of Kyoto market after-2012 and the risk of project under performance - in terms of expected CERs production – have more relevance.

Taking these risks and asset specificities, the World Bank appears as a commercialization channel, allowing the existence of diverse distribution channels flows - except one, property of the credits -, reducing the transaction costs, guaranteeing the mortgage of the clean technology, and, finally, taking easier the meeting between buyers and sellers.

5.1. Limitations

We can cite the following limitations: (a) at the moment that this research was carried through, the transactions still were in the negotiation phase, the contracts still were in process of elaboration or in their initial phase of validity, so it wasn't verified any situation of conflict and/or hold-up what would be so interesting to improve the process of design contracts; (b) the analysis of an only commercialization channel, the multilateral organizations, not existing an empirical comparison with the functions played by another channel (or the efficiency); (c) this study approaches a little part of the problem, that is, the mitigation of GHG proceeding from the energy sector. However, as it discloses the Brazilian Inventory of GHG Emissions, the energy sector represents only 25% of the total emissions, whereas the activities of land use, land use change and forest (LULUCF) answer for 75% of the Brazilian GHG emissions (CGMGC, 2004).

5.2. Sugestions for future researchies

The next steps for continuity of this study are: (i) to measure, according with the Barzel's method (1982), the involved transaction costs in the elaboration of a CDM project, trying to help the policymakers with the process of institutional change; (ii) to evolute inside the object 'environment', as well as in the marketing area, and to contextualize, according with the Brazilian reality, the idea of 'green marketing' including the carbon credits as one of the analyzed products.

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Appendix I – Glossary

- **Baseline** - A baseline of a CDM project activity is a scenario that represents in a reasonable way GHG emissions by sources that would occur without the CDM project activity, including all sectors and sources listed in Annex A of the Kyoto Protocol that occur within the project boundary. It serves equally as a basis to verify additionality and as a basis to quantify the CERs resulting from the project activity. The CERs will be calculated exactly by the difference between the baseline emissions and the verified emissions that result from the CDM project activity, adjusted for leakages. The baseline is qualified and quantified based on a Reference Scenario.
- **Certified Emission Reduction (CERs)** - The reductions of emissions of GHGs from CDM project activities that have passed all Project Cycle steps (validation/registration; monitoring and verification/certification), which culminates precisely with the ex post emission of CERs. The CERs are expressed in metric tons of carbon dioxide equivalent, calculated accordingly to the Global Warming Potential (GWP). One unit of CER is equal to one metric ton of carbon dioxide equivalent. The CERs can be used by Annex I Parties to partially meet their GHG emissions reduction targets.
- **Clean Development Mechanism (CDM)** - One of three additional mechanisms in the Kyoto Protocol. It is defined by Article 12 of the Protocol and regulated by the Marrakech Accords. It defines project activities which will reduce GHG emissions or increase CO₂ removals,

implemented in Non-Annex I Parties (host countries), and that will generate Certified Emissions Reductions (CERs).

- **Conference of the Parties (COP)** - The supreme body of the United Nations Framework Convention on Climate Change (UNFCCC), comprising all countries that have ratified or acceded to the UNFCCC. The COP meets annually and there have already been eleven meetings.
- **Designated National Authority (DNA)** – Governments in developing countries need to designate to the UNFCCC a national authority for CDM projects. The Designated National Authority (DNA) certifies that the country participation is voluntary and, in the case of countries where the activities will be implemented (host country), that the project activities contribute to the sustainable development goals of the host country.
- **Designated Operational Entity (DOE)** - Entities accredited by the Executive Board of the CDM and later ratified by the COP/MOP. The responsibilities of the Designated Operational Entities (DOEs) are: (i) validate proposed CDM project activities and (ii) verify and certify GHG emissions reductions and/or CO₂ removals.
- **Executive Board** - It oversees operations of the CDM. Its responsibilities include certification of Designated Operational Entities (DOE); validation and registration of CDM project activities; issuance of CERs; development and operation of CDM registry, and establishment and improvement of baseline, monitoring and leakage methodologies.
- **Global Warming Potential (GWP)** - Index announced by the IPCC allowing express the quantities of various greenhouse gases in terms of carbon dioxide equivalent, and making it possible to add up the reductions of different gases. The GWP to be used in the first commitment period (2008 to 2012) is that published in the Second Assessment Report of the IPCC.
- **Greenhouse Gases (GHGs)** - GHGs are the gases listed in Annex A of the Kyoto Protocol, which are: (i) carbon dioxide (CO₂); (ii) methane (CH₄); (iii) nitrous oxide (N₂O); (iv) sulfur hexachloride (SF₆); (v) hydrofluorocarbon (HFCs) and Perfluorocarbon (PFCs) gas families.
- **Joint Implementation** – Another Kyoto Protocol mechanism, through which Annex I Parties can transfer to or acquire from any other Annex I Party Emissions Reduction Units (ERUs), in order to meet their greenhouse gas emissions limitation and reduction commitments.
- **Project Design Document (PDD)** – Preparation of the PDD is the first step of the CDM activity cycle. All necessary information for validation and registration, verification and certification must be included.
- **tCO₂e** – Ton of CO₂ equivalent, which puts all GHG at the same basis.