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# Investing in Clean Development Mechanism (CDM) Projects in Brazil

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**ABSTRACT:** The discussion about Clean Development Mechanism (CDM) Projects has its roots in global warming and its consequences. CDM projects enable developed countries to offset the pollution generated by the acquisition of Certified Emission Reductions (CER), concerning the reduction of Greenhouse Gases (GHG) emissions in developing countries. The article discusses the CDM in a comprehensive manner, based on the opinion of experts, and investigates the future of this market from 2012, the post-Kyoto period. The main results show that the CDM follows the principles of Sustainable Development, focusing on the climate changes and the profitability of projects. It shows that Brazil has real possibilities to act in the CER market which is expected to consolidate in the post-Kyoto. Controversial issues as the future of post-Kyoto, nuclear power and especially the conservation of forests, through the generation of CER, remain undefined.

**Keywords:** Clean Development Mechanism (CDM), Certified Emission Reductions (CER), Greenhouse Gases (GHG), Kyoto Protocol, Post-Kyoto, Sustainable Development.

## 1. INTRODUCTION

According to the Kyoto Protocol (KP 1997), industrialized countries must reduce by 5.2% the emissions of greenhouse gases (GHG) by 2012 compared to 1990 levels. In order to achieve this goal, it is possible to buy carbon credits from developing countries, or the right to pollute from a company that proves to be stopping to emit such gases.

After the KP, the firms and the world have been forced to add an extra concern in their decisions: how to reduce greenhouse gas emissions that cause global warming,

without halting development? Developing countries, according to KP, are not obliged to reduce their emissions, although they can and are taking the opportunity to explore these new market goals. Through proper environmental management and generation of carbon credits through CDM projects, Brazil could become more competitive internationally, stimulating the flow of foreign investments to the country.

CDM projects that can generate carbon credits, became the financial arm of KP for developing countries, they attract the private sector for the causes of global warming. CDM projects also bring the opportunity to

gain from the development of new technologies and the marketing of carbon credits generated.

The central question that guides this paper is the attempt to understand the reasons that lead companies to invest in CDM projects in Brazil. The main objective of this research is to show the importance and the scope of the discussion on CDM projects. To achieve this purpose, we defined the following secondary objectives: i) to verify whether CDM projects are profitable under the economic point of view, ii) to identify the importance of CDM in reducing greenhouse gas (GHG), and, iii) to investigate the future market of carbon credits in the post-Kyoto.

This paper includes the following parts: Introduction in which we seek to define and delimit its context; Literature Review and Hypotheses; Methodology in which we present the tools of qualitative research; Analysis of main results; and Final Considerations, in which we compare the hypotheses with the results.

## 2. LITERATURE REVIEW AND HYPOTHESES

### 2.1 Foreign Investment in Brazil

Table 01 shows the Foreign Direct Investments (FDI's) and Brazil's Risk, represented by the JP Morgan's Emerging Markets Bond Index Plus (EMBI +) from 2001 to 2009. The table shows a steady flow of capital, which fluctuates according to the global economic movements and Brazil's risk, measured by the EMBI +. The entry of foreign capital is inversely proportional to Brazil's risk, i.e., increasing the perceived risk of the country; the flow of capital is reduced because it seeks shelter in safer markets. Table 01. and the corresponding Figure 01. show a close relationship between the variation of FDI's and the EMBI +, represented by a Pearson's correlation coefficient of -0.40; in order to match the scales the EMBI + is divided by 10 and both are represented by their natural logarithms.

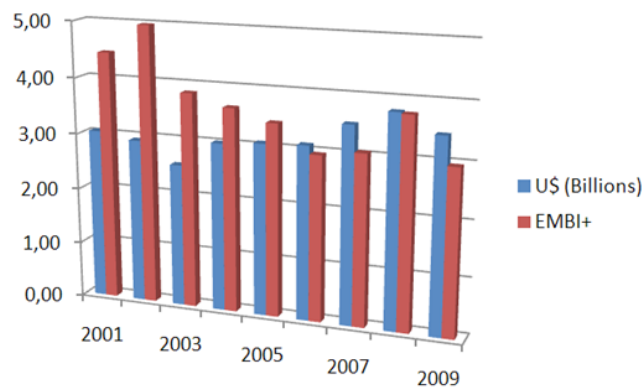
The outlook is that Brazil will become competitive in the view of investors thanks to the availability of natural resources and to a promising new market: the generation of carbon credits. The ability to generate carbon credits will be explored throughout this paper, through the discussion of CDM.

Table 01. FDI's x Brazil's Risk, 2001/2009

Year	US\$ (Billions)	EMBI+
2001	21,04	863
2002	18,78	1446
2003	12,90	468
2004	20,27	382
2005	21,52	311
2006	22,23	192
2007	33,70	211
2008	43,88	428
2009	31,68	192

Source: BACEN & Macrodados (2010)

Figure 01. FDI's X Brazil's Risk, 2001/2009



Another aspect to be considered is the new situation that Brazil is living right now. Confirming the good phase of the Brazilian economy in 2008, Standard & Poor's raised its sovereign note of Brazilian bonds, which reached the coveted investment grade, S & P was immediately followed by Fitch Ratings and, more recently in 2009, by Moody's. Given this background of favorable news, we expect a significant entry of FDI thereby making it possible to reconcile environmental concerns with economic growth.

**H<sub>A,1</sub>: Brazil will receive large amounts of foreign investments, which could be applied in environmentally responsible projects.**

## 2.2 Competitiveness and Corporate Social Responsibility (CSR)

Porter and Kramer (2006) warn that the prevailing approaches to Corporate Social Responsibility (CSR) are as fragmented and disconnected from business strategy, as CSR is unknown as a great opportunity for business to benefit society. Companies need to understand that CSR can be much more than a cost, a constraint, or a charitable activity. CSR can represent opportunity, innovation and competitive advantage. They emphasize this view of CSR recommending that: "[...] companies must

achieve its commercial success in order to meet its ethical principles, respect the citizens, communities and the natural environment."

Laville (2009) considers that a company can not prosper in a persistent manner in an environment (natural, social, etc.) that is dwindling; this is the core of what is meant by social responsibility. The idea of Laville (2009) is aligned with the thinking explained by Porter and Kramer (2006) when he says that the most important thing a corporation can do for society and the community is to contribute to the prosperity of the economy.

**H<sub>A,2</sub>: A product or service environmentally correct and responsible can be a factor of competitiveness.**

## 2.3 Strategic Competitiveness

The greenhouse effect and the consequences of global warming are already affecting consumer behavior, which begins to create a very strong environmental consciousness. According to Tachizawa (2006, p.21), the trend in the future is that Brazilian and global consumers start giving preference to companies that produce environmentally responsible products.

Strategic CSR also involves sharing value and investing in social aspects in the context of strengthening the competitiveness of the company. Strategy always involves making choices; in CSR this is not different. What is suggested is that investments to create shared value be considered as long-term investment - the same as research and development - for the future competitiveness of the Company (Porter and Kramer, 2006).

**H<sub>A,3</sub>: Projects aimed at sustainable development can be considered as investment in competitive advantage.**

From theory to practice, Laville (2009, p. 47) cites research conducted in France. The upper socio-professional categories, with greater purchasing power, are prepared to change the system to make it more sustainable and appropriate to their point of view. To differentiate themselves from mass consumers, they discard the brands and the advertising whose consumerist message does not appeal to them. The signs may be indicating a greater behavior shift in part of the population. A study focused on this population showed that the percentage of more selective

consumers rose from 15% in 2004 to 32% in 2006.

Marketing experts opine that the phenomenon has accelerated much from the documentary by Al Gore (An Inconvenient Truth) and the Nicolas Hulot's ecological pact in the French elections of 2007. About 87% of French citizens think they have a vital role in environmental matters; 89% say they will focus on products and brands that may be environmentally correct, and, 95% will find out more about the ecological impacts of consumer products (Laville, 2009, p.47).

**H<sub>A,4</sub>: Investing in green products, green services, and green marketing is important to increase the market share.**

## 2.4 Sustainable Development and Environmental Management

In 1971, at the suggestion of UNESCO, Sachs (2009) was invited to participate in the preparation of the first United Nations Conference on Environment scheduled for June 1972 in Stockholm. The preparatory meetings evidenced extreme positions, rang-

ing from zero growth to growth at any price. It was also clear the imperative for growth to change both in its terms and especially regarding the division of its fruits. "The objectives of development are always social, there is an environmental compliance that must be respected and, finally, to make things move forward, we need that the solutions conceived be economically viable" (SACHS 2009). This citation

sets up the concept of what would later be known as the Triple Bottom Line, the basic foundation for sustainable development.

The survival of human beings is based on the generation of wealth, and these depend on material coming from natural resources. It can be said that natural resources are matter and energy that nature makes available to us, so that through using them directly or transforming them, humanity is able to survive and achieve quality of life. The importance of the use of these resources is recognized in the concept of sustainable development in the Brundtland Report, also known as Our Common Future (1987), prepared by the World Commission on Environment and Development, chaired by the Norwegian Gro Harlem Brundtland. One of the important contributions of the report is the most accepted definition of sustainable development:

*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This means enabling people now and in the future, to achieve a satisfactory level of social and economic development and human and cultural realization, doing at the same time, a reasonable use of land resources and preserving species and natural habitats.*

Barbieri (2006, p. 25) reaffirms that one of the important contributions of the report was to define the concept of sustainable development: "[...] a process of transformation in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change is harmonizing and strengthening the present and future potential to meet human needs and aspirations".

### **H<sub>A,5</sub>: Investing in a CDM project can improve the image of a company, even if the company is just trying to achieve its goals and/or profit.**

## **2.5 The Kyoto Protocol and the Carbon Market**

The KP is an international treaty signed during the Third United Nations Framework Convention on Climate Change (COP 3) in Kyoto, Japan, in 1997. KP defines that industrialized countries (Annex I) would reduce at least 5.2% of their combined emissions of greenhouse gases compared to 1990 levels. If those expected levels are achieved, it is estimated that the global temperature will be reduced by 1,4° C to 5,8° C by 2012 (Greenpeace, 2007). The reduc-

Veiga (2008) deepens the discussion on development, noting that the plan of the United Nations Development Program (UNDP) reports that development has to do first and foremost, with the possibility of people to live the lifestyle they chose, and the provision of tools and opportunities to make their choices. He also recalls that the Human Development Report has insisted that this is both a political as well as an economical idea, ranging from the protection of human rights to strengthening of democracy.

Furtado (2004) had already written a definition considered complete: "Development is not just a process of accumulation and macroeconomic productivity growth, but rather the way of access to better social forms able to stimulate human creativity and meeting the aspirations of community.

Laville (2009, p. 80), points out that in the last thirty years the difference between the poorest and the richest, almost doubled. The richest 20% of the world consume about 86% of the natural resources, while the poorest 20% consume only 1% of the resources. In numbers: with six billion people on the planet, it should not be forgotten that approximately 1.1 billion people are living in extreme poverty, on less than a dollar a day. Fact as important as the disproportionate and rampant consumerism is both the social and the environmental damage caused.

The thoughts of Tachizawa (2006, p. 71), Porter and Kramer (2006, p.89), and Laville (2009, p. 138) converge as regards strategic integration and the economic model to be adopted by companies, as a decidedly oriented approach not only for the prevention of environmental risks and image risks, but for the market opportunities related to the provision of socio-environmental solutions.

tion will occur through several actions, among them one can cite the reform of the energy and transport industries, promoting the use of renewable energy sources and the protection of forests and other carbon sinks.

The Protocol establishes three flexible mechanisms that allow countries to meet the requirements for reduction of gas emissions outside their territories, or an alternative to the countries to reduce their emissions without harming economic development. The



three mechanisms are: Joint Implementation, Emission Trading applied to Annex I countries (developed countries) and the Clean Development Mechanism (CDM). The CDM is the only mechanism that involves developed and developing countries, opening an opportunity for Brazil to generate carbon credits. Through this mechanism, new technologies and investments will enter the country, and bring economic and environmental benefits to governments and businesses.

## 2.6 Questioning Kyoto

Sachs (2009, p.255), describes himself as a researcher who likes to get involved with practical things, with ideas that show concrete results, he criticizes the lack of objectivity of the measures taken, warning that they represent one tenth of the effort necessary, in the next decades, to halt the warming of our planet.

Bjørn Lomborg (2007), author of the bestseller *Cool It*, refers to two things whose relationship is not so evident: first, he refers directly to the need to cool the planet or face the endemic universal consequences, and, second (less obvious) he intends that global partners cool their heads and promote a rational discussion, seeking pragmatic solutions to these problems that affect the earth. Lomborg's basic argument is that climate problems should not be considered solely from the standpoint of reducing CO<sub>2</sub> or GHG emissions, but also under economic aspects and their possible consequences.

**H<sub>A,6</sub>: CDM projects are of great importance in the KP, but their efficiency in reducing GHG is questioned.**

## 2.7 Brazil in CDM Market

There is a crucial aspect though. Paradoxically, the Brazilian clean matrix will hinder CDM negotiations in Brazil. The GHG reduction is calculated by comparing the effect of the CDM project, with the generation of GHG's in the pre-existing matrix. As China and India have much more energy polluting matrices than Brazil, any CO<sub>2</sub> reducing project in those countries will have a much greater impact than a similar project developed in Brazil. This form of evaluation makes Chinese or Indian projects more cost-effective and efficient; than equivalent projects in Brazil.

However, considering only Latin America, Brazil could become the largest exporter of carbon credits,

Recently, Ward (2009), paleontologist, argues that past events can provide valuable information about the future of our planet. Based on recent discoveries of geological data, Ward (2009), comes up with a provocative hypothesis of Medea, who killed their children for revenge, arguing that life itself can be its worst enemy. The hypothesis of Medea opposed to the Gaia hypothesis, the good mother, suggested by James Lovelock in the sixties, by which the biosphere has a regulatory effect that acts to preserve life.

Ward (2009) argues that at least one of the mass extinctions that have hit the earth was caused by life itself. He reports the case of bacteria whose metabolism is highly toxic (hydrogen sulfide) and proliferated abnormally annihilating 90% of marine life and 70% of the biota. This is a new way of looking at the alarming decline in the diversity and the biomass - a decline generated by life itself revealing trends biocides.

Returning to a pragmatic point of view, similarly to Sachs (2009), Lomborg (2007) suggests that countries invest 0.05% of their Gross National Product (GNP) on research on energy technologies non carbon emitting. This would provide a unique universal moment of social and technological development, with costs well below the \$ 25 billion of KP and the costs even higher of Kyoto II. He suggests the intensification of research into clean energy and a balanced reduction of CO<sub>2</sub>, something around 5% to 10% by the end of the century. Lomborg's position is recognized as a pragmatic and has gained many prominent admirers.

thanks to the diversity of its biomes, the vastness of its territory, and the advanced manufacturing stage of its industry. These characteristics qualify Brazil with a great potential for the negotiation of CDM projects. It is estimated that Brazil could have a 25% stake in the CDM market and the potential of the Brazilian Agribusiness can reach 40% (ARAUJO, 2007).

Starting first in this market tends to be fundamental in achieving leadership in the ability to apportion international resources for sustainable development. Buyers or investors in carbon credits, do not just want to know how much it costs or how much the credits are worth, by employing a broad vision that involves a universal environmental awareness,

the criteria should consider issues such as management of the company, operating licenses, networking in other segments, and management practices, among others. In this market, differential is more valuable than money (Monteiro, 2007).

**H<sub>A,7</sub>: Brazil has significant potential to develop CDM projects and generate carbon credits.**

**2.8 The Carbon Market and the First Auction**

Liu (2008) presents an alternative model to the CDM, the Monetary Compensation Mechanism (MCM), which seeks - through mechanisms of compensation adjustments - to make developed and developing countries work together to invest in GHG's reduction projects, through a fair price. Another novelty is that the negotiation would not be made directly between companies but between governments. It would be the developing country's responsibility to guide investments to projects that best fit its own development project (such as reforestation, improvement of energy efficiency, development and implementation of renewable power plants, etc.) and not to the lowest cost projects as it is happening presently, rapidly exhausting these preferred sources, hindering a possible future use (LIU, 2008).

**H<sub>A,8</sub>: The market for carbon credits is improving. Even with the end of KP it will continue.**

The first stock exchange created to operate with carbon market was the Chicago Climate Exchange (CCX), an example of voluntary market created in December 2003 by 14 companies, which together account for half of the annual emissions of the United Kingdom.

The Brazilian Market for Emissions Reductions (MBRE) was created, which according to BM&F "[...] is a joint initiative of the BM&F and the Ministry of Development, Industry and Foreign Trade (MDIC). The MBRE (2007) "[...] aims to develop an efficient trading of environmental certificates in line with the principles underlying the KP. It is important to emphasize, however, that the negotiations on the BM&F may be extended to projects outside the Kyoto market, as is happening in the Chicago Climate Exchange (CCX). Some Brazilian companies, in the forestry industry, such as Aracruz, Suzano,

Veiga (2008) points out that the American Clean Air Act of 1970 required the 1975 car models to emit 90% less carbon dioxide and hydrocarbons, although the technology required achieving these goals did not exist at that time. The final date had to be postponed, but by 1980 the cars had already exceeded those goals. He also points out that the control of pollution in the United States is a 7 billion dollar a year business.

These two statements show that: i) the United States are concerned about the pollution despite not having signed the KP, and ii) a technology shock is feasible as an economic alternative. However, stringent measures to control pollution may discourage construction of new plants, and may encourage the continued status quo, to the extent that the marginal cost of non-polluting is higher than the punishments for polluters.

Klabin and Votorantim Celulose e Papel (VCP) have adopted voluntary targets (outside the KP) and are participating in the U.S. exchange.

Even with the lack of regulation on September 26, 2007 the first auction sale of Certified Emission Reductions (carbon credits), owned by the City of São Paulo, took place. Credits corresponding to 808,450 tons of carbon dioxide equivalent, generated under the Clean Development Mechanism (CDM) by the Landfill Gas and Energy Generating Bandeirantes Project, and issued by the CDM Executive Board - UN (MBRE, 2007) were auctioned. The auction began at 10 am and ended 5 hours later due to the purchase of all the lots offered by Fortis Bank NV/SA for 16.20 Euros, a much higher price than the average of five to six Euros charged in the European market at that time (ATA, 2007).

**H<sub>A,9</sub>: The price achieved at the BM&F auction was higher than expected, so prices should fall in the next auctions.**

**2.9 Discussing the Post-Kyoto solutions**

**• What is the fate of the Carbon Market?**

Ghoshal and Bhattacharyya (2009) developed an analysis using the Environmental Kuznets Curve

(EKC) which relates economic development to environmental degradation. Their conclusions suggest that this link is stronger in developed countries. The confirmation of these results may have two impor-

tant consequences: i) the results differ from the EKC, because no evidence has been found that the link between economic growth and CO<sub>2</sub> emissions gets weaker when the income level increases, ii) the results also strengthen the KP recommendations that developed countries should take proactive measures to reduce GHG, instead of condoning with the less developed countries.

The world is worried about what will occur after the end of KP on December 31, 2012. It took two years (1995-1997) to negotiate the KP, eight more years to

ratify it in order to enforce it from February 16, 2005 on. His term ends in 2012 and therefore there is little time to plan for a new project before January 1, 2013.

The vice-chairman of the IPCC, Mohan Munasinghe, said that he is confident that Post-Kyoto will adopt tougher goals, in order not to repeat the failure of KP, which fail to meet the pre-set targets. He noted that today the pressure by society on politicians is much stronger as this matter is concerned, and therefore he believes that the post-Kyoto will achieve more success (KYOTOa, 2007).

### **H<sub>A,10</sub> : A new agreement will be signed, with more ambitious goals.**

- *Forest aspects*

Another aspect that has to be considered is that Brazil is one of the main polluters due to the clearing of land by burning. Burning reduction would contribute significantly to reducing Brazil's emission of GHG's. To achieve this goal it is necessary to control and to monitor the vulnerable areas, huge task, when the forest area in Brazil, especially in the Amazon, is considered. The issue involved here is that fire prevention is not covered as a CDM project, and in turn it does not generate carbon credits, which rules out private investment in this area.

Overall there is substantial literature dealing with the economic value of forests. Most research deals with issues related to deforestation and to losses associated with it, for example, the use of natural wood in construction. The commercial reforestation involves many externalities and the careful consideration of costs becomes relevant.

Clinch (2006), in Ireland, shows that by taking into account various externalities, the financial aspect predominates, accounting for about 80% of the results. It should be noted that the cost-benefit analysis sought to harmonize financial and social objectives, such as the interest of keeping intact landscapes and important historical sites. It is worth mentioning that social benefits would amount to about 20% of the to-

tal investment, showing that the forest investment is more a choice of society, than an economic reason. A similar study, by Crabtree (2006), shows that the forest return on investment is around 3.5% per year - which would make the investment economically unfeasible - while emphasizing the concentration of risk in the price of wood.

Both Clinch (2006) and Crabtree (2006) demonstrate that forest investment is economically infeasible, although they emphasize the complexity of its evaluation due to the mobility of the interests involved. They emphasize that it is dangerous to over simplify forest investment analysis considering it as a mere investment project, ignoring the benefits of the role that keeping the forest might have in the future of mankind and other living species.

Dyllick and Hockerts (2002) also rely on the economic theory to affirm that not all factors of production can be transformed into monetary units, which would imply in their complete replacement. Even considering future scientific development, it would hardly be found substitutes for ecosystem services like the protection of the ozone layer or the climate stabilization by the Amazon forest. They point out that forests not only produce raw material for pulp, but they also protect the animals, regulate the flow of rain, absorb CO<sub>2</sub>, and they may contain plants of priceless pharmaceutical value.

### **H<sub>A,11</sub> : The preservation and conservation of forests can generate carbon credits.**

- *Nuclear Energy*

One must speak of electricity before talking about nuclear energy, the most common form of energy. Electricity is at the center of the global energy challenge. It is a necessity of modern life and a basic re-

quirement for development. The industry produces about 40% of global CO<sub>2</sub> emissions by burning fuel derived from oil and coal. At the same time, more than 1.5 billion people still do not have access to electricity (WBCSD, 2006).



According to the WBCSD (2006), the global fuel mix for power generation include coal (40%); gas, nuclear, and hydroelectric power (15-20% each); oil (7%), and other renewable (2%). The fuel mix depends on a number of factors including local availability of fuel, technology costs, market structure, policies and regulations, and other environmental considerations. It is true that electricity with low CO<sub>2</sub> emissions can make a positive contribution to mitigating climate change.

Considering the sources of low-carbon energy, nuclear energy is a proven, safe, efficient, and has a favorable cost-benefit ratio, that can ensure the production of electricity on large scale without emissions of GHG's. In countries that master the technology, it is possible to prevent significant emissions of GHG's. It is important to find an acceptable solution to the long-term storage of waste - nuclear waste (WBCSD, 2006).

The project known as the International Thermo-nuclear Experimental Reactor (ITER) was formally established in October 2007 by ratification of all its members: China, European Atomic Energy Community (via EURATOM), India, Japan, Korea, Rus-

sia and United States of America. The project aims to establish nuclear fusion as a new source of energy. The conceptual design was initiated in 1988 and due to the complexity of its details took about twenty years to be formalized. The estimated project costs are around ten billion Euros with a construction phase of ten years and twenty more for its operation. Currently, it is considered the most important nuclear power project being developed, and it has been in operation for two years (ITER, 2010).

In 2008, the Department of Energy of the United States (DOE, 2008) issued a report in which it reaffirmed the importance of nuclear power in energy portfolio for the U.S. and the world. It highlights the increasing energy demand and considers the possibility that demand double by the year 2050. At the same time, it recognizes the need to control global emissions of CO<sub>2</sub>. It states that nuclear energy is the only technology capable of further expansion which can simultaneously provide stability for the power plants, safety in fuel supply and assist in environmental management, avoiding the emission of GHG's and other pollutants. It emphasizes the importance of a clean energy source for the next hundred years or more (DOE, 2008).

### **H<sub>A, 12</sub>: Investment in nuclear energy will increase.**

## **3. METHODOLOGY**

This research was theoretical-empirical and primarily qualitative in nature. The hypotheses were determined based on the theoretical framework and they were used in the construction of a questionnaire. Marconi and Lakatos (2002) teach that hypothesis is a proposition that is made in an attempt to verify the validity of an existing answer for a known question. They also clarify that the hypothesis has a provisional formulation that has to be tested to determine its validity.

To carry out the interviews, after the definition of the script, we chose a sample by accessibility (RICHARDSON et al., 1999), composed of 9 executives linked to the environment. There were nine respondents, three from banks, five worked in consulting companies and one belonged to a NGO. The interviews took place after the script, the sample, and the respondents had been defined. The answers were faithfully transcribed in order not to lose any detail of the evidence. For the treatment of the data we used Content Analysis (Bardin, 1977) which considers the content of a text in which it is sought to understand the actual speech (communication) of the interview-

ees on the phenomenon, in this paper: their speech on investment in CDM projects.

All interviewees were at least managers. Two were PhD's, one had a master's degree, and the remaining six had bachelor's degrees. The average time in the position declared by them was six years with a median of 6.5 years. The average age reported by the respondents was 42 years with a median of 42.5. The instrument used was a semi-structured questionnaire, based on the formulated hypotheses. The technique used was the visual recorded interview, with an average duration of 45 minutes.

A Content Analysis Matrix (Bardin, 2007) was used for the data analysis, which considers the subject of a text, where it is sought to understand the actual speech (communication) of the respondents about the phenomenon under investigation. In this case: CDM projects.

After the transcripts of the interviews, the content analysis was done as follows: i) identification of units of analysis according to a determined coding, i.e., the source most frequently mentioned by the respondents,

ii) categorization of the sources cited. In this step, the sources identified were rearranged so that the answers of each interviewee were allocated according to common categories, and iii) construction of a summary table to allow quick reading and understanding. It should be noted that the issues raised were in accordance with the research hypotheses. Thus it was possible to analyze the degree of importance that the respondents assigned to the detached elements.

#### 4. RESULTS

Table 02. Content Analysis Matrix summarizes the content of the interviews. The table columns presents the questions, numbered 1 through 20, aligned with the specific objectives, and the lines show the responses of interviewees. Questions 01 to 07 sought to clarify the profitability of the CDM projects; questions 08 to 14 try to show the importance of CDM in reducing GHG's, and, finally, questions 15 to 20 contemplate the future of the Post-Kyoto - question 15 has been reversed to emphasize the problem of forest conservation.

The result analysis took a conservative position considering as positive only answers with frequency exceeding 5/9. For example, the answer to question 13, 'Carbon credits are not a commodity', due to the score 5/9 was considered inconclusive. The frequency of an answer can be considered as a score, with higher values corresponding to greater assertiveness or confidence in the answer. Considering the

number of respondents equal to nine, the maximum score that can be achieved is  $(9/9=1=100\%)$ .

In descending order of frequency, in the block related to the return of CDM projects, it can be seen that questions 01, 02 and 04 had a frequency (8/9), questions 03 and 05 frequency (7/9); question 07 frequency (6/9). Partial conclusion: considering that all the answers were positive, this confirms the recognition of the profitability of CDM projects. Considering also the average of the frequencies, we have that the level of assertiveness achieved was 88%.

Analyzing the block of answers concerning the importance of CDM in GHG reduction, it appears that question 08 reached the frequency (8/9), question 09, 11, 12 and 14 frequency (7/9), question 10 (6/9) and question 13 with frequency (5/9) was considered inconclusive. It can be seen that six questions were positive and only one was inconclusive. Partial conclusion: these results confirm the relevance of the CDM to reduce GHG. Using the same criterion used before, the assertiveness score was 75%.

The block that scrutinizes the future of the Carbon Credits after Kyoto found that questions 18 and 19 had a frequency of (7/9), questions 15, 16 and 17 a frequency of (6/9), and question 20 with a frequency (5/9) proved to be inconclusive. In this block, due to its characteristics, the answers have to be analyzed individually. The assertiveness score was the lowest, 68.5%, a fact which is not surprising considering that the questions try to scrutinize the future.

Table 02. Content Analysis Matrix																				
Interviewed	Profitability of CDM projects							CDM importance in reduction of greenhouse gases (GHG)							Future of the CC market in Post-Kyoto					
	01 - Environmental Certificates add value /create competitive advantage	02 - It is possible to perceive a change in the behavior of customers	03 - An environmentally correct attitude can increase market-share	04 - Projects related to sustainable development are good investments	05 - CDM projects are a good investment	06 - Results were positive in the BM&F first auction	07 - The price paid at the auction was high	08 - CDM projects help the environment	09 - The present measures in KP are effective	10 - Brazil already has a clean energy matrix	11 - China and India are more likely to have CDM projects	12 - Brazilian credits are profitable in reducing emissions	13 - Carbon credits are not a commodity	14 - BM&F's project database is an useful instrument	15 - Preservation and conservation of forests should not generate CC	16 - There will be initiatives to encourage the conservation of forests	17 - There should be investment in nuclear energy	18 - There are many controversies, atomic waste, political issues, etc.	19 - The market for carbon credits will continue after the end of KP	20 - Measures of post - KP could be more ambitious
A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	/	X	X	X	X	/
B	/	X	X	/	X	X	/	X	X	X	X	/	X	/	X	X	X	X	X	X
C	X	X	X	X	/	/	X	X	/	X	X	X	/	X	X	/	/	X	X	/
D	X	X	X	X	X	X	X	X	X	/	/	/	X	X	/	X	X	X	/	X
E	X	/	X	X	X	/	X	X	X	X	X	X	X	X	X	/	/	X	X	X
F	X	X	/	X	X	X	X	X	X	/	X	X	/	X	X	X	X	/	X	X
G	X	X	X	X	/	/	/	/	/	/	X	X	/	X	/	/	/	X	/	/
H	X	X	X	X	X	X	/	X	X	X	/	X	/	X	X	X	X	/	X	/
I	X	X	/	X	X	X	X	X	X	X	X	X	X	/	X	X	X	X	X	X
Freq.	8/9	8/9	7/9	8/9	7/9	6/9	6/9	8/9	7/9	6/9	7/9	7/9	5/9	7/9	6/9	6/9	6/9	7/9	7/9	5/9

## 5. FINAL CONSIDERATIONS

The main considerations are based on Table 03. which summarizes the acceptance/rejection of  $H_0$ . The analysis will be developed based on the pre-defined specific objectives.

Analyzing the hypotheses related to the first specific objective, which investigates the feasibility of CDM projects, we see that  $H_0$  was rejected for hypotheses ( $H_A$ ) 01, 02, 03, 04 and 05. The answers to questions no. 1 to 7 justify the rejection of  $H_0$  with the high level of assertiveness of 88%. This fact is corroborated by high foreign investments made in Brazil and the

signs of a global economic recovery. It would not be too daring to say that the FDI's tend to grow, as well as investment in CDM, due to the pressures of society, NGOs, companies looking for financial gain and political image, and government pressure.

Regarding the profitability of environmental projects, one of the respondents reported an experience of his institution:

*When the sustainability policy was implemented for real, many people asked the bank how many customers we lost. But no one remembered to ask how many we won. We won a lot*

*more customers than we lost. Companies need respectability, and need to build reputation. One way to achieve this is to be close to whom is a reference.*

Porter and Kramer (2006) and Laville (2009) reinforce the argument, stating that a symbiotic relationship is developed: the company's success and the success of the community are strengthened. The company is the biggest beneficiary, because it not only leverages its resources and capabilities, but it also benefits the community.

Table 03. Hypotheses Testing			
H <sub>A</sub>	Description of the Hypothesis	H <sub>0</sub> Status	Answer no. (*)
01.	Brazil will receive a large amount of foreign investment, which could be applied in environmentally responsible projects.	H <sub>0</sub> rejected	01 to 07
02.	Product or service environmentally correct and responsible can be a factor of competitiveness.	H <sub>0</sub> rejected	02 and 03
03.	Project that aims sustainable development can be considered as investments in competitive advantage.	H <sub>0</sub> rejected	01, 04, and 05
04.	Investing in green products, green services, and green marketing is important to increase market-share.	H <sub>0</sub> rejected	03
05.	Investing in CDM projects can improve the image of the company, even if it is just trying achieve its goals and/or make profit.	H <sub>0</sub> rejected	02, 03, and 05
06.	The CDM projects are of great importance in the KP, but their efficiency in reducing greenhouse gas is questioned.	H <sub>0</sub> not rejected	08, 09 and 12
07.	Brazil has significant potential to develop CDM projects and generate carbon credits.	H <sub>0</sub> rejected	05, 06, 07, 10, 12, and 14
08.	The market for carbon credits is successful. Even with the end of KP it will continue.	H <sub>0</sub> rejected	08, 11, 12, 14, and 19
09.	The price achieved at the BM&F auction was higher than expected, so prices should fall in the next auctions.	H <sub>0</sub> rejected	06 and 07
10.	A new agreement must be signed, with more ambitious targets.	Inconclusive	20
11.	Preservation and conservation of forests can generate carbon credits.	H <sub>0</sub> not rejected	15 and 16
12.	Investment in nuclear energy will increase.	H <sub>0</sub> rejected	17 and 18

(\*) The numbers in H<sub>0</sub> correspond to the answers given by the interviewees in Table 3 – Content Analysis Matrix

Porter and Kramer (2006) warn that governments and NGOs often forget this basic truth and when developing countries distort the rules, penalizing businesses, these business turn away. These countries remain poor, with low wages, and depending on the sale of their raw materials. They emphasize that large corporations have the technology and resources to change this state, and that goes for the developing world and the disadvantaged communities of the advanced economies.

Regarding the second specific objective, that sought to verify the role of Brazil in reducing GHG's, the fact that the hypothesis H<sub>0</sub> could not be rejected for H<sub>A,06</sub>, recognizing the effectiveness of CDM projects, added to the rejection of H<sub>0</sub> for H<sub>A,07</sub>, H<sub>A,08</sub> and H<sub>A,09</sub> shows that Brazil has a high potential for the development of CDM projects.

However, one should consider that China's and India's projects are favored by their more polluting energy matrix, which allows for more marginal gains in reducing GHG's. It was further observed that in the opinion of the respondents, the CER market is developing and will continue to grow even after the

KP, but the prices achieved in the first auction in Brazil should be reduced. The score of assertiveness that supports the evaluation of hypotheses 06 to 09 was 75%, relatively high.

The post-Kyoto future was discussed on the basis of the questions regarding the third specific goal. Significantly, this block was the one that had the lowest assertiveness score (68.5%) revealing the difficulty of the questions concerning the future control of GHG emissions, either through the CDM or any other operating mechanism.

Looking to the future market of carbon credits after 2012, the fact that the hypothesis H<sub>A,10</sub> (supported by question 20) was inconclusive may raise doubts about the success of the next steps in conducting this crucial issue for humanity. While Mohan Munasinghe, vice-chairman of the IPCC, show an optimistic note, Lomborg (2007), Sachs (2009), and Ghoshal and Bhattacharyya (2009) have criticized the shortcomings of the KP. Sachs (2009, p.255), had this to say:

*We have no time to lose to ward off the threat of climate change which has harmful and irreversible consequences. Reducing emissions of*



*greenhouse gas provided by the Kyoto Protocol, represents only one tenth of the effort that would be needed in the coming decades to stop the warming of our planet. I wonder if such an international agreement does not end up being counterproductive. A bridge only becomes a bridge when it connects the two riverbanks.*

The fact that it was not possible to reject  $H_0$  for  $H_{A,11}$  is particularly worrisome because it highlights the difficulty of the forest issues, which in the opinion of Clinch (2006), is more a matter of choice of society, than an economic reason. This is particularly sensitive to Brazil, given its immense forest reserve.

The lack of economic prospects in the forestry industry suggests environmental management measures, showing that avoiding fires contribute to the reduction of GHG's and is really a way of protecting the environment and therefore should generate CER equivalent. That decision, although controversial, finds support in Article 12 of the KP in the first paragraph, where it states that CDM projects are aimed at contributing to the countries not included in Annex 1 to achieve sustainable development (KYOTO<sup>b</sup>, 2007).

Finally, the rejection of  $H_0$  for  $H_{A,12}$  shows a more critical angle of this discussion, the growth of investment in nuclear energy. The center of this issue is the generation of electricity, noting that more than 1.5 billion people still lack access to electricity and the choice of energy requires trade-offs between cost, performance and environment impact (WBCSD, 2006).

Considering the sources of low-carbon energy, nuclear energy is a proven, safe, efficient, and has a favorable cost-benefit ratio that can ensure the production of electricity on a large scale without producing GHG emissions (WBCSD, 2006 and DOE, 2008). Despite the known risks in the operation of nuclear power plants, and the toxicity and difficulty of handling and storing nuclear waste, it seems that this issue is coming to a favorable convergence of opinions in important international organs such as the United States of America Department of Energy and the World Business Council for Sustainable Development both favorable to nuclear energy.

In this research it was found that the CDM projects, although they originate from measures aimed at improving environmental conditions, anchored in social responsibility practices, like any other business, will only be implemented if they are profitable. It was found that the CDM projects developed in Bra-

zil are economically and functionally feasible. The future post-Kyoto was also discussed. It was found that the implementation of stricter GHG emission goals as well as the application of measures aiming to preserve existing forests is still not clearly feasible. Regarding the generation of electricity by nuclear power plants, projects such as ITER (2010) indicate its growing importance.

It is possible to conclude that in fact everyone wants a healthier planet; everyone recognizes the effects of GHG emissions and is willing to cooperate, provided that they are not economically affected. Returning to the pragmatic line, Sachs (2009) and Lomborg (2007) suggest that countries invest 0.05% of their Gross National Product (GNP) in research on energy technologies that are non carbon emitting. This would provide a unique moment of universal social and technological development, with costs well below the \$ 25 billion of KP and the even more intense costs of Kyoto II.

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**Acknowledgment:** This paper is based on the academic research of Sobral et al. (2007), the authors thank these authors for the cession of the data for analysis.

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