The Clean Development Mechanism:

Mexico's Contribution to the Mitigation of Global Climate Change

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List of Abbreviations

CDM	Clean Development Mechanism
CER/CERs	Certified Emissions Reduction/Certified Emissions Reductions
CFCs	Chlorofluorocarbons
CH_4	Methane
CO_2	Carbon dioxide
COP	Conference of the Parties
DNA	Designated National Authority
DOE/DOEs	Designated Operational Entity/Designated Operational Entities
ERUs	Emission Reduction Credits
FOMECAR	Mexican Carbon Fund (*Fondo Mexicano de Carbono*)
GEF	Global Environment Facility
GHG/GHGs	Greenhouse gas/Greenhouse gases
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
NGOs	Non-Governmental Organizations
N_2O	Nitrous oxide
NO_x	Nitrogen oxides
O_3	Ozone
OECD	Organization for Economic Cooperation and Development
PFCs	Perfluorocarbons
PINs	Project Idea Notes
SF_6	Sulfur hexafluoride
SO_x	Sulfur oxides
SO_2	Sulfur dioxide
UN	United Nations
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
U.S.	United States

Introduction

Global climate change is the most urgent global environmental problem we face today. This phenomenon is no longer a distant and unknown possibility that might become a reality. On February 2007 the IPCC released its 4th Assessment Report on Climate Change and recognized, among other things, that “the scientific uncertainties of global warming are essentially resolved and that it is very likely man-made” (Borenstein 2007, 1; Maslin 2004, 1). In other words, there is no question that human activities and consumption patterns have accelerated the natural process of global warming, up to a point in which human and nonhuman worlds will not have enough time to adapt to the changes. The question now is which species will have the ability to adapt and survive; and more importantly, if human beings are among those species that have what it takes to survive in an altered and unbalanced environment.

Since global climate change is a very complex problem, its solutions require a wide variety of policy instruments that combine voluntary, mandatory, legal, political, economic, and social elements, and the active participation of every country in the world.

One of the many reasons why the environmental targets, established during the 1997 Kyoto Protocol, have not yet been implemented is the debate between developed and developing countries regarding their commitments and responsibilities. Developing countries argue that it is not fair for them to have to lower their GHG emissions by the same percentages as developed countries, since they emit very low volumes of GHGs and lowering them would halt their efforts for economic growth. On the other hand, developed countries argue that it is not fair for them to have to assume the entire burden of lowering their GHG emissions, since it will also be too costly for their economies. Both sides have valid arguments. However, since we are all part of the cause of global climate change and we have reached a critical point in time, we need to stop arguing and work together to implement the needed measures before it is too late.

Up until a few decades ago, the usual solution for environmental problems had been the implementation of rules and regulations. However, we can no longer continue relying exclusively on regulations. We cannot afford to continue resisting the idea that market-based mechanisms can be useful when dealing with environmental issues, just because we have traditionally thought of the market as environmentally unfriendly. Neoclassical Economic Theory tells us that GHG emissions are a negative externality (an activity that affects ‘others’, without those ‘others’ paying for it). In other words, they escape the control of the market’s normal process, since they do not have a price related to them. However, these externalities can be internalized by fixing a price for GHG emissions and allowing market forces to reach an equilibrium between the price and the quantity (emitted volume) of GHGs. Market-based mechanisms have great potential of being implemented as effective environmental policy instruments and they should be considered as a viable ally and not an enemy, when dealing with global environmental problems. One such market-based mechanism is the CDM, which provides a scheme in which developed and developing countries work together to mitigate climate change.

After describing the characteristics and effects of global climate change and reviewing the wide range of environmental policy instruments, focusing on the CDM, I propose that Mexico should continue using this instrument as part of its global climate change mitigating environmental policy structure. For this purpose, the paper is divided into the following sections:

In Chapter 1, I will talk about global climate change and describe its causes and main consequences, since the purpose of this paper is to find the most effective way in which Mexico can actively participate in the worldwide efforts to mitigate this environmental crisis.

In Chapter 2, I will describe the main characteristics and applications of the most commonly used voluntary and mandatory environmental policy instruments. Voluntary instruments such as eco-audits, eco-labels, and voluntary agreements, which allow certain discretion and flexibility; and mandatory instruments such as green taxes, emissions trading, joint implementation, and the clean development mechanism.

In Chapter 3, I will describe the elements involved in the design, organization, monitoring process, and implementation of projects using the clean development mechanism.

In Chapter 4, I focus my attention on the development of the clean development mechanism in Mexico. It is important to mention that the partnership between the Mexican government and the Mexican Carbon Fund (*FOMECAR*) is crucial for the productive implementation of this environmental policy instrument, especially in a country in which the government has not been 100% trustworthy.

Finally, I provide comments about the global climate crisis, about ways to address this issue, and about the promise offered by the clean development mechanism, for developing countries such as Mexico.

I hope that the information found in this paper will be useful for Mexican policymakers who want to have a better understanding of the clean development mechanism, as an effective environmental policy instrument, that can be used to address the global climate change issue.

Before I continue, I would like to explain that this paper's purpose was to obtain my MA in Global Environmental Policy, from The American University in Washington, D.C., in December 2007. That is why the information you are about to read has not been modified or updated since December 19, 2007.

It is my hope to write a follow up paper, where I will be able to update the information about the clean development mechanism and give a current account on the status of the CDM projects mentioned in this paper.

With hope for the future and the year 2050…

Literature Review

The following Literature Review has the objective of summarizing the most important characteristics and schools of thought regarding environmental policy instruments. The initial level of classification is between voluntary (eco-labels, eco-audits, and voluntary agreements) and mandatory (market-based taxes, tradable permits, and command-and-control regulation) policy instruments (Hatch 2005, 5-6). In the case of voluntary approaches, the main preoccupation is that they may not be enough to achieve the optimal level of environmental protection (Hatch 2005, 8). On the other hand, it is clear that when dealing with the choice of what is the best type of environmental policy instrument, the relevant debate lies within the mandatory policy instruments, specifically, between regulatory and market-based approaches.

The choice of policy instruments is shaped by a host of criteria, including certainty of results, cost and economic efficiency, administrative feasibility (enforcement and compatibility with existing laws), robustness (effectiveness under a variety of circumstances), timeliness (capacity to provide rapid results), dynamic efficiency (impact on incentives to innovate), public acceptance, and compatibility with normative values (Eisner 2007, 16).

In an ideal world, regulators would have exhaustive data on the full universe of pollutants, and the scientific knowledge necessary to set specific pollution thresholds. However, in reality, regulators work under conditions of profound information scarcity and uncertainty (Eisner 2007, 16).

Environmental policy instruments can be divided into three different schools of thought (Hansjürgens 2005, 1):

1) Those in favor of regulatory approaches.
2) Those in favor of market-based approaches.
3) Those in favor of a mix between traditional regulatory and market-based approaches, as well as, new policy instruments for climate protection (CDM and JI).

Regulatory instruments such as licensing, standards, and zoning can be described as institutional measures aimed at directly influencing the environmental performance of polluters, by regulating processes or products used, by abandoning or limiting the discharge of certain pollutants, and/or by restricting activities to certain times and areas (OECD 1994, 12). Command-and-control instruments have the quality of being more conventional, traditional, and direct approaches when dealing with environmental regulation (Freeman & Kolstad 2007, 21).

“Their main feature is that there is no other choice left to the polluter: he has to comply or face penalties in judicial and administrative procedures” (OECD 1994, 12).

In the case of command-and-control instruments, the government essentially commands businesses to follow particular forms of behavior by adopting specific standards (technology and/or performance-based) and then controls their behavior through the imposition of negative sanctions. Technology-based standards mandate the use of a particular technology and are usually presented in broad terms that reference the state-of-the-art at the time. Performance-based standards, such as ambient and emission standards, establish maximum levels of pollution compatible with regulator goals. Ambient standards define the maximum levels or concentration of key pollutants that are allowed in a given area. On the other hand, emission standards establish the maximum amounts of pollution that can be discharged from a specific source (Eisner 2007, 13).

This approach is based on specific limitations on the allowable discharges of polluting substances from each source, coupled with an administrative and legal system to monitor compliance with the limitations and to impose sanctions or penalties for violations. The pollution control authority must carry out a series of steps for each source: determine the rules and regulations that will achieve the given pollution control targets, establish penalties and sanctions for non-compliance, monitor them, and punish violations (Vig & Kraft 1994, 169).

As Jody Freeman and Charles Kolstad point out, “command-and-control approaches tend to force firms to take on similar shares of the pollution control burden, regardless of the cost, by setting uniform standards for firms” (Freeman & Kolstad 2007, 19).

The advantages of using command-and-control instruments include: direct and visible response to problems, clear policy goals or standards, uniform treatment of sources, and the satisfaction of knowing that each discharger is doing its share (or the most that can be expected) to reduce pollution to desired levels. Its most important weaknesses are: that the technology-based approach is considered simple; that there is a need to collect large amounts of data in order to make judgments about costs, control techniques, and production processes; that they are considered intrusive, inflexible, and inefficient; and that these instruments may discourage innovation, since there is no reward for doing better than directed (Vig & Kraft 1994, 171-176).

Market-based approaches include instruments based on economic incentives such as: pollution charges, tradable permits, market friction reductions, and government subsidy reductions (Freeman & Kolstad 2007, 21). These instruments provide, for the purpose of environmental improvement, monetary incentives for voluntary and non-coerced action by polluters (OECD 1994, 13).

Market-based approaches have the objective of solving the defects in the price system more directly, by putting a charge on the use of resources or on the pollution that imposes costs (environmental damage) (Vig & Kraft 1994, 177).

When they are working properly, incentive instruments induce companies to respond in different ways, depending on the costs of controls, the age of the facility, the nature of the product, and the degree of economic competitiveness in the regulated industry. The result is a system that equalizes the marginal costs of control across firms and lowers the overall costs of environmental protection to society (Vig & Kraft 1994, 185).

Market-based instruments encourage behavior through market signals, rather than through explicit directives regarding pollution control levels or methods. They are often described as 'harnessing market forces' because if they are well designed and implemented, they encourage firms (and/or individuals) to undertake pollution control efforts that are in their best interest and that collectively meet policy goals (Eisner 2007, 13). Furthermore, while market-based mechanisms do not offer a panacea, they frequently do offer a practical way to reach environmental goals, by allowing more flexibility. In other words, instead of relying on the regulatory authority to identify the best course of action, the individual agent can select the best way to meet the desired emissions reduction target. As Professor Thomas Tietenberg points out, "this flexibility achieves environmental goals at lower costs, which makes the goals easier to achieve and easier to establish" (Tietenberg 1994, 197-211).

The most common market-based instruments are:

1) Pollution taxes: tax charged to a firm based on the amount of pollution it generates.
2) Cap-and-trade programs: regulators determine the acceptable level of pollution (the cap) and issue credits allowing for pollution up to the prescribed level. These credits can be purchased, sold, or saved (the trade). The most relevant advantages of cap-and-trade systems are that regulators can specify a desired level of pollution in advance, and that they can promote greater incentives for firms with a comparative advantage in abatement,

to go beyond regulatory standards. “Cap-and-trade programs are the most flexible programs for emissions trading to date” (Sterner 2003, 90).

Market-based instruments provide a continuing incentive to reduce pollutants, they offer more flexibility for sources, they often complement direct regulation, and they are usually more cost-effective than direct regulation (Vig & Kraft 1994, 171). In spite of these advantages, market-based mechanisms are often surrounded by controversy. Critics may shudder at the thought of purchasing the right to pollute, assuming (incorrectly) that pollution is a completely avoidable act. They are also worried that trading may not be appropriate in some cases, because it could result in higher levels of pollution in certain areas, creating ‘hot spots’ (Eisner 2007, 14).

They should be used when the information needed to set source-specific standards is lacking; there is value in giving polluters incentives to develop new technologies or control methods; the marginal costs of complying with uniform standards vary greatly across polluters; the effects of the emissions do not depend much on the location of the sources; the relationship between the time of emission and the environmental effects is not very close; there is a fixed goal to be achieved; and when the number of sources involved is large enough to establish a well-functioning and competitive market with credits available to trade (Vig & Kraft 1994, 187).

Unfortunately, “it is common to view regulatory instruments as mutually exclusive – one must select command-and-control instruments or market-based instruments, for example” (Eisner 2007, 15). This characterization obscures the importance of various instrument mixes.

After reviewing the literature related to environmental policy instruments, it is clear that regulatory and market-based instruments need to be combined for environmental policies to achieve the desired results. It is not a question of having to choose one or the other. In other words, the most effective environmental policy will be designed using a mix of instruments (Freeman & Kolstad 2007, 28).

Regardless of their differences, both approaches agree on the fact that their goal is to have cost-effective environmental regulations (Hansjürgens 2005, 3). This performance can be measured by asking: is the policy meeting its goals in a cost-effective manner (Harrington, Morgenstern, & Sterner 2004, 1)?

Most authors agree that until recently, command-and-control instruments have predominated because risk-averse politicians and legislators prefer instruments that involve more certain effects.

The flexibility of market-based instruments creates uncertainty about distributional impacts and local levels of environmental quality. However, they also admit that this trend is changing (Freeman & Kolstad 2007, 30). “Market incentives are suited to a new generation of problems and are starting to be used more widely” (Vig & Kraft 1994, 170).

“The past three decades have seen a good deal of speculation and dispute over the differences between the two types of instruments” (Harrington, Morgenstern, & Sterner 2004, 10). Most authors and policymakers have agreed on the categories of such differences (Freeman & Kolstad 2007, 20-28; Harrington, Morgenstern, & Sterner 2004, 10-16; Hatch 2005, 1-9). This recognition can be the first step towards a path of mutual cooperation and combination of instruments in environmental policy design. That is, if they know what the differences are between the various policy instruments, they can decide what combination will be more effective to address diverse environmental issues. These differences are: economic efficiency, environmental effectiveness, information requirements, administrative burden, allocation, monitoring and enforcement requirements, adaptability, flexibility, cost revelation, costs of emissions control, pollution abatement costs, environmental targets, degree of pollutant mix, stimulation for technological innovation, effect on international competitiveness, source size and location, performance, and implementation and compliance.

“Environmental policy could be improved by paying more attention to the evaluation of the many policy instruments that may be used, their strengths and weaknesses, and the conditions in which they are likely to be most effective” (Vig & Kraft 1994, 188).

Now that we have a better understanding of the main characteristics of the available environmental policy instruments, I will now concentrate on my paper’s objective: to describe the potential areas in which the CDM can be used, in combination with other policy instruments, to reduce GHG emissions. And thus, make recommendations for Mexico to continue using the CDM to contribute to the worldwide efforts against global climate change.

1. Global Climate Change

1.1 What Is Global Climate Change?

There is no turning back. Global climate change is already happening and it will continue to have more drastic effects, unless we start cooperating and working together to try to reverse the damage we have caused. The most sensible approach would be to cut CO_2 emissions immediately. However, if the cost of significantly cutting fossil-fuel emissions is too expensive and would severely affect the global economy in the short term, maybe the response of the global economy should be trying to implement CO_2 reduction measures, while implementing measures to adapt to the effects caused by climate change (Maslin 2004, 2 & 136). In other words, we cannot pin all our hopes on clean energy and technological fixes (Maslin 2004, 2 & 136).

Climate change challenges the way we organize our society, the concept of nation-state vs. global responsibility, and our short-term vs. long-term vision, among others (Maslin 2004, 147).

There is every reason to worry about the impacts of the changes now underway in the Earth's climate system, since the rate of change is unprecedented in the history of human civilization (Barnett & Adger 2007, 640).

Climate change is the intensification of the 'natural' greenhouse effect from human activities (See 2001, 3). GHGs control the delicate balance between the amount of radiation that is trapped and the amount that is reflected, by creating a natural greenhouse (blanket). This blanket maintains Earth's average temperature at 35ºC making life on Earth possible (Maslin 2004, 4). The global average surface temperature is expected to increase between 1.5 and 4.5 ºC by 2100 (Frederick 2001, 61).

1.2 What Causes Global Climate Change?

There is strong scientific evidence that proves that GHG concentrations have been rising since the beginning of the Industrial Revolution; and that changes in the atmospheric concentrations of such gases, especially CO_2, are causing average global temperatures to increase faster than during the past one thousand years (Maslin 2004, 1, 10, & 21). In other words, if levels of GHGs continue to increase, the temperature in the atmosphere will also increase, altering the climate around the world (Maslin 2004, 7).

The main GHGs are (Maslin 2004, 1 & 11-17; See 2001, 4):

Water vapor – it is a naturally occurring GHG, expected to increase in the atmosphere, in response to warmer temperatures. It is entirely produced by natural processes and does not have an anthropogenic component. In other words, human activity does not directly affect its concentration.

CO_2 – burning fossil fuels, land use change, coal stoves, landfill sites, and deforestation. There is evidence that our actions have increased its atmospheric concentration to the highest level for the last half million years.

CH_4 – burning fossil fuels and agricultural wastes, rice paddies, waste dumps, land use change, and livestock.

N_2O – burning fossil fuels, use of fertilizers, refinery operations, and emissions from catalytic converters in transport vehicles.

HFCs – refrigerants, vehicle air conditioning, electrical switching gear, and halocarbons.

PFCs – aluminum, magnesium, and halocarbons.

SF_6 – electrical switching gear, aluminum, and magnesium industries.

CFC-12 – produced by the use of liquid coolants and foams.

O_3 – formed by the reaction of sunlight on air containing hydrocarbons and NO_x from car engines and industrial operations.

1.3 What Are the Consequences of Global Climate Change?

Global climate change will very likely produce negative and positive effects on human and nonhuman worlds. In this case, I will focus on the negative impacts, since the purpose of this paper is to make recommendations to improve Mexico's climate change mitigation measures. It is important to mention that all of these effects are estimations and predictions made by using the most advanced scientific models possible (Maslin 2004, 2). However, there is always the possibility of "potential surprises that the global climate system might have in store for us" (Maslin 2004, 2).

Whatever these economic and human losses might be, the unfortunate reality is that "the poorest people will suffer the most" (Maslin 2004, 3). In other words, those in the weakest economic or political positions will have to face the first effects of global warming: "faltering water supplies, damage to crops, new diseases, and encroaching oceans" (Struck 2007, A03).

Even though we accept the evidence, predicting climate change is complicated, because the global climate system has different response times and it encompasses many different factors, which respond differently when the atmosphere warms up (Maslin 2004, 21).

Some of the potentially devastating effects on human society and on our social, economic, and ecological systems include the following:

Global warming - the predicted increase in the global average surface temperature between 1.5 and 4.5 ºC by 2100 is expected to increase the number of fires and heat waves (Frederick 2001, 61).

Weather patterns - will become less predictable, causing an increase of extreme climate events such as *El Niño*, changes in precipitation and wind patterns, and an increase in the number, intensity, frequency, and pathways of storms, monsoons, hurricanes, tornadoes, cyclones, floods, and droughts (Maslin 2004, 91-94).

Water stress - it is estimated that approximately five billion people will experience shrinking water supplies and freshwater scarcity by 2025. The potential increase in water evaporation from plants and soil, plus the changes in rainfall, will lead to reduced runoff (Frederick 2001, 67). This will produce desertification of semi-arid lands and droughts, it will reduce crop productivity, and it may substantially affect hydroelectric power generation (Campbell & Weitz 2007, 107; Maslin 2004, 1, 2, & 94-96; Max 2007, 1; See 2001, 3).

Increase in the **global average ocean temperature** - resulting in thermal expansion, sea-level rise, and the release of CH_4 reserves (Maslin 2004, 2 & 55).

Alteration of the **global deep ocean circulation (Great Ocean Conveyor Belt)** - causing sea-level rise and extremely cold winters in Europe and a succession of weather repercussions of the same magnitude as the Little Ice Age (Lee 2007, 39; Maslin 2004, 2).

Rising **global average sea-level** - it is estimated that sea-level will increase between 20 and 88 cm. by 2100. This will cause small island nations to sink and become uninhabitable, coastal areas to erode and become unstable, and it will limit tourism (a very important source of income for island nations) (Campbell & Weitz 2007, 106; Maslin 2004, 1 & 84-85).

Expansion and contraction of **ice sheets** and **glaciers** - when polar ice caps melt and are replaced by vegetation or open water, the albedo effect is altered. In other words, the reflection of solar radiation will be reduced (since there is less ice) and more heat will be absorbed (Maslin 2004, 73).

Melting **permafrost** - will alter hydrologic processes, increase the release of CO_2 and CH_4, and trigger erosion, subsidence, avalanches, and sea-level rise (Maslin 2004, 57).

Threatened **forests** - an increase in the rate of deforestation will add CO_2 to the atmosphere and will reduce the forests' capacity to absorb existing atmospheric CO_2 (Maslin 2004, 2 & 114). The composition of the forests is likely to change and they will become more vulnerable to disease and insect predation (Sedjo & Sohngen 2001, 75-77). Their weak composition will prevent them from competing against stronger species and so tree species will be lost (Sedjo & Sohngen 2001, 77).

Threatened **natural habitats** - will result in loss of species and biodiversity, migration of species to accommodate warmer air and water, crash of global fish stocks, and the destruction of habitats such as coral reefs, mangroves, wetlands, and marine and mountain ecosystems, among others (Campbell & Weitz 2007, 104; Maslin 2004, 97-98). As a result, "a quarter of all species in these regions may become extinct by the middle of this century" (Maslin 2004, 99).

Changes and possible declines in **agricultural productivity** - will change planting seasons, reduce crop yields, and cause food scarcity and famine (Purvis & Busby 2004, 67).

Environmental refugees - the risk from sea-level rise will increase climate refugees fleeing their island nations. This will cause large shifts in human internal and cross-border migration patterns, conflict over resource scarcity in the 'host' country, and hostility towards the refugees (Campbell & Weitz 2007, 106; Purvis & Busby 2004, 68; See 2001, 3).

Human health - the absence of clean water and the extension of the ranges and seasons for mosquitoes and other tropical disease carriers will increase epidemics, outbreaks of infectious diseases such as cholera and malaria, and human mortality rates (Campbell & Weitz 2007, 106; Purvis & Busby 2004, 67; See 2001, 3).

2. Environmental Policy Instruments

Environmental policy instruments are divided into two groups: voluntary policy instruments, which include eco-audits, environmental labeling programs, and voluntary agreements; and mandatory policy instruments, which include command-and-control, emissions trading, green taxes, joint implementation, and the clean development mechanism, among others (Hatch 2005, 5-7).

Basically, the elements that differentiate these instruments from each other are: environmental effectiveness, economic and political efficiency, implementation and compliance, administrative efficacy, and their effect on technological innovation (Hatch 2005, 8-9).

The following tools represent a large mix of environmental policy instruments. Some of these instruments are already being used to design climate change policies and others are not currently linked to climate change policies. However, they may be used for this purpose sometime in the future.

Let me first describe this mix and in the following chapter, I will focus entirely on the clean development mechanism.

2.1 Voluntary Policy Instruments

"Voluntary policy instruments are most often non-binding and allow considerable flexibility or discretion" (Hatch 2005, 5). Furthermore, depending on the instrument involved, a different type of political dynamic might develop.

They include eco-audits, environmental labeling programs (also known as eco-labels), and voluntary agreements (Hatch 2005, 5).

2.1.1 Eco-Audits

Eco-audits are voluntary arrangements that provide consumers information about environmental management practices (Hatch 2005, 6).

"For firms that choose to adopt specified standards for environmental management, certified participation in such programs is designed to foster better relations with customers, suppliers, stakeholders, and employees" (Hatch 2005, 6). In other words, the firm's self-evaluation may help it reduce its ecological footprint by doing things more efficiently

(Hatch 2005, 6). From the public sector's perspective, this type of policy instrument offers environmental benefits without the high administrative costs of direct regulation (Hatch 2005, 6).

The adoption of ISO 14001 by Japanese corporations is a good example of this environmental management system. The ISO 14001 certification provides significant process and structural change that has positive results for long-term environmental performance (Hatch 2005, 247). "ISO firms are more environmentally active than non-ISO firms" (Hatch 2005, 247).

2.1.2 Environmental Labeling Programs

"Environmental labeling programs formulate a set of production or performance criteria products must meet if they desire to carry the eco-label" (Hatch 2005, 5). Products certified with eco-labels represent more environmentally benign production and consumption practices in comparison to non-certified products and offer consumers a choice based on environmental considerations (Hatch 2005, 5).

"Eco-labels create incentives for the innovation of more environmentally sound products or production practices, by providing information upon which the environmentally conscious consumer can act" (Hatch 2005, 5). Given their voluntary nature, eco-labels are relatively easy to introduce and implement, since they are "light in terms of the amount of public expenditure, management, and oversight" (Hatch 2005, 5).

Their use was recommended during the 1992 Earth Summit and have become very popular worldwide ever since (Hatch 2005, 17). Agenda 21 "explicitly states that governments should encourage the expansion of environmental labeling in order to change consumption patterns" (Hatch 2005, 17). "They seem to fit perfectly into the sustainability strategy, which has the goal of reconciling economic, social, and ecological objectives, by enabling and fostering innovation for more sustainable, resource efficient, and ecologically benign production and consumption patterns" (Hatch 2005, 17).

Furthermore, environmental labeling is included in several policy papers written by the Commission on Sustainable Development and the OECD, promoting sustainable consumption patterns (Hatch 2005, 17). They are also accepted around the world as an environmental management tool, within the ISO 14000 family, that "can help accelerate diffusion of technical improvements of products" (Hatch 2005, 18 & 41). The conclusion at the 1998 'Berlin

Conference Eco-labeling for a Sustainable Future' underlined their role as a policy tool to promote environmentally preferable products and services (Hatch 2005, 18).

Germany launched the Blue Angel program in 1978 to reduce the amount of household paint solvents (Hatch 2005, 19). This program is "a voluntary instrument managed in public-private partnership that has proven to be ecologically effective" and is considered the first environmental labeling program in the world (Hatch 2005, 21 & 246). Through the years it has improved products and promoted innovation and the diffusion of the best available technology to reduce product-related environmental problems (Hatch 2005, 40).

Today, Germany, Canada, the European Union, Scandinavia, Japan, South Africa, and the United States, among others, have successful eco-labeling programs (World Resources Institute, 2007). They even founded the Global Eco-labeling Network in 1994 to foster information exchange and to represent them in international forums (Hatch 2005, 25). For example: Europe's 'flower label', used by 135 manufacturers, retailers, and flower service providers; the Rainforest Alliance's Smart Wood program, which has the Forest Stewardship Council's certification, that the wood comes from a sustainable forest; and the Dolphin Safe label, which certifies that the tuna was caught following U.S. dolphin protection fishing methods and laws (World Resources Institute, 2007).

2.1.3 Voluntary Agreements

"Voluntary agreements take a variety of forms ranging from industry covenants that are legally binding to informal declarations of intent" (Hatch 2005, 6). A voluntary agreement is defined as "an agreement between government and industry to facilitate voluntary action with a desirable social outcome, which is encouraged by the government, to be undertaken by the participant based on the participant's self interest" (Hatch 2005, 6).

Since firms voluntarily agree to certain emissions targets, this instrument is more flexible in terms of method and timing, encourages greater efficiency and innovation, and helps achieve environmental objectives at lower costs and in less time (Hatch 2005, 6). Moreover, they further trust and understanding between the government and the industry, which promotes faster implementation and compliance (Hatch 2005, 99).

"The voluntary agreements between the German government and the electrical power generation industry have become a centerpiece of Germany's climate change policy"

(Hatch 2005, 118). The Netherlands has successfully used voluntary agreements to meet national environmental goals established in the National Environmental Policy Plan (Resource Renewal Institute 1995, 1). For example: the chemical industry negotiated a 90% reduction of SO_2 emissions by 2010 (Resource Renewal Institute 1995, 1). In the United States, the Environmental Protection Agency's (EPA) 33/50 Program uses the Toxic Release Inventory (TRI) data to identify potential participants to reduce 17 pollutants of the Toxic Release Inventory (TRI) (Resource Renewal Institute 1995, 1). Companies such as Intel, 3M, Dow Chemical, DuPont, Xerox, and Patagonia have also shown interest in using this mechanism to comply with environmental regulations and reach environmental goals (Resource Renewal Institute 1995, 3). After analyzing the increase in international energy efficiency due to voluntary agreements, China launched its Shandong Province Enterprise Energy-Efficiency Voluntary Agreement Pilot program in its industrial sector (Resource Renewal Institute 1995, 9).

2.2 Mandatory Policy Instruments

The most common mandatory policy instruments are command-and-control regulations, green taxes, emissions trading, joint implementation, and the clean development mechanism (Hatch 2005, 6).

Emissions trading, joint implementation, and the clean development mechanism are classified as 'flexible mechanisms' in the Kyoto Protocol and "offer market-based approaches for achieving emissions reductions across borders" (Danish 2007, 11). "The rationale for the flexible mechanisms is straightforward" (Danish 2007, 13). Since all emissions of GHGs have the same impact, regardless of their location, and the cost of achieving emissions reduction is quite varied, flexible mechanisms try to ensure that reductions will be implemented wherever they can be achieved at the lowest cost (Danish 2007, 13). It is important to mention that the acquisition of ERUs or CERs when using CDM or JI mechanisms respectively should be supplemental to domestic GHG reduction policies (Albrecht 2002, 17; Hatch 2005, 154).

Before describing the characteristics of each instrument, it is important to clarify what is meant by 'mandatory' when referring to such environmental policy instruments. For instance, except for green taxes, these instruments are in a sense both voluntary and mandatory. They are adopted voluntarily, but once they have been adopted, the firms must abide by the rules governing each mechanism. For example: developing countries enter clean development mechanism agreements voluntarily, but once they enter them, the agreements have the force of a contract that must be honored. In the case of emissions trading schemes, polluters have a choice whether to trade or not, but once they decide to participate in the market, their participation implies contractual and legal obligations.

2.2.1 Command-and-Control

Command-and-control policy instruments are divided into two groups: technology-based regulations, which "prescribe the use of specific equipment, processes, or procedures" (Hatch 2005, 7); and performance-based standards, which "specify the level of pollutant emissions allowed" (Hatch 2005, 7).

Both are effective in achieving their specified environmental objectives with considerable flexibility (Hatch 2005, 7). Technology-based regulations provide greater flexibility, through the incorporation of principles such as 'best available technology' (Hatch 2005, 7). On the other hand, performance-based standards are more flexible, since the regulated entities have considerable discretion to choose the most appropriate method to achieve the prescribed levels of emissions (Hatch 2005, 7).

On the other hand, technology-based regulations achieve compliance and oversight much easier than performance-based standards (Hatch 2005, 7).

Initially, the efforts to address acid rain pollution in the United States took advantage of the command-and-control regulatory approach. However, once the quality and reliability of the monitoring equipment provided more information regarding air pollution and analytical techniques and capabilities were improved, the use of emissions trading became more feasible (Hatch 2005, 253).

2.2.2 Green Taxes

"Green taxes are charges assessed on an amount of pollution that a firm or product generates" (Hatch 2005, 6). Since firms face the direct costs of their polluting activities, they have an incentive to control pollution and to choose the most technologically efficient reduction methods, in order to lower or to avoid the tax (Hatch 2005, 6). "Finding the proper level of taxation, however, is critical to the effectiveness of this instrument, because it is difficult to anticipate exactly how much pollution reduction will result from any given tax" (Hatch 2005, 6).

Environmental taxes could help achieve environmental goals, foster technological innovation, and internalize externalities even if they "cannot be quantified and environmental targets are set politically" (Hatch 2005, 126).

Studies in the United States and Europe have shown that taxes on energy use can improve the overall national economic performance, increase the level of employment, and clean the environment (Robertson 1996, 1). This type of tax is considered regressive, since it affects the poor in a higher degree than the rich. In other words, if the tax on household energy increases the cost of heating and lighting, the poor people would have a hard time finding ways to pay such a higher cost. However, this can be solved by equally distributing the revenue from energy taxes (Robertson 1996, 1).

"In Vermont, 98% of carbon emissions come from housing and transportation and only 2% come from fossil-fueled power plants" (Alex C. Walker Foundation 2002, 1). Since the Regional Greenhouse Gas Initiative, which relies on a cap-and-trade system, will not help to reduce Vermont's carbon emissions, it needs to use green taxes as a more effective environmental policy measure. "Carbon or fossil-fuel energy taxes can begin to effect a gradual reduction of fossil fuel use through increasing prices" (Alex C. Walker Foundation 2002, 1).

Germany's tax reform has an ecological component that includes raising existing taxes on petroleum products (gasoline, diesel fuel, heating oil, and natural gas) and introducing a tax on electricity, as an effort to reduce energy-related GHG emissions (Hatch 2005, 127-128).

The Czech Republic has started to design its green tax process in order to drive polluting businesses to switch to healthier energy sources (Bouc 2007, 1). It is hoped that the system will be in place and running by January 2008 (Bouc 2007, 1). The green tax "will affect companies with production or consumption that has a proven negative effect on the environment and health" (Bouc 2007, 1). A higher tax on coal-powered operations will be among the first green taxes implemented in the world (Bouc 2007, 1). This initial phase of the green tax will approximately increase electricity prices by 1%, natural gas prices by 3%, and raw material prices by 10% (Bouc 2007, 1).

2.2.3 Emissions Trading

This policy instrument "employs the price mechanism to internalize the costs of pollution, thus encouraging both the static and dynamic efficiencies that lead to ongoing pollution reduction" (Hatch 2005, 6-7).

In the case of tradable emissions permits, there is no need to predict the appropriate level of taxation required to reach emissions reduction goals (Hatch 2005, 7). Under this system, "policymakers establish an overall target of emissions allowed for an industry, area, or country" (Hatch 2005, 7). "Permits representing allowable shares of the total emissions are then allocated to each company" (Hatch 2005, 7). If firms reduce their emissions below the allotted levels, they can sell their unused permits to firms whose emissions exceed their permits or save (bank) them for future use (Hatch 2005, 7). Thus, if firms exceed their allotted levels, they must purchase permits from other firms or face legal sanctions (Hatch 2005, 7).

There are two main approaches or regimes to emissions trading: cap-and-trade and baseline-and-credit.

1- The cap-and-trade (absolute target) approach sets a total cap (absolute quantity of emissions) measured over a specific period of time, on all emissions from the sources covered by the regime. This total is allocated between the sources either freely or by auction, in the form of a right to emit a specific quantity, usually as an allowance. After the initial allocation, sources can choose to reduce their emissions and sell their allowances, maintain their emissions, or increase their emissions, through the purchase of additional allowances. The choice to buy and sell depends on the market price of the allowances and the marginal costs of reducing emissions at the source. At the end of the trading or compliance period, the actual emissions have to be equal to the number of allowances for each source. If the emissions are greater than the allowances, they have to buy more allowances. On the other hand, if emissions are less than the allowances, they can sell their excess allowances.

This approach is attractive to both policymakers and environmental groups, since they provide certainty on the environmental outcome of the trading system. The regime's cap determines the total amount of emissions from the sectors covered by the regime, while the market determines where the necessary reductions in emissions will take place (Yamin 2005, 87).

2- The baseline-and-credit (relative target) approach does not set a fixed absolute cap on the emissions from the sectors covered by the regime. The relative target is usually set through defining a baseline, which is expressed in the efficiency of emissions in relation to the activity of the source. The same baseline can be set across a wide range of similar installations. When installations can reduce the emissions more cheaply than the market price of allowances, they will reduce their emissions and obtain allowances, which they can sell. If, on the other hand, the reduction of emissions is more expensive than the market price of allowances, they will maintain or increase their emissions, through the purchase of additional allowances on the market. In this regime, allowances are not allocated up front. Rather, they are allocated when a source demonstrates that it performs better than its baseline.

This regime is usually more attractive for regulated sources, as the absolute effects of most abatement techniques are usually dependent on the activity of the installation. Any reduction in emissions caused by the installation of new technology can often easily be outdone by an increase in activity. Industry usually argues that production growth itself should not be punished, but that its efficiency should be increased. Relative targets do exactly this (Yamin 2005, 87).

The 1990 Amendments to the 1970 Clean Air Act allowed the first formal public cap-and-trade of acid rain producing SO_2 emissions in the United States (May 1992), between three coal-fired power plants: Wisconsin Power and Light Company (one of the cleanest utilities at the time), the Tennessee Valley Authority (one of the dirtiest utilities at the time), and Duquesne Light Co. (utility in Pittsburg) (Hatch 2005, 175). Wisconsin Power and Light Company reduced its emissions of SO_2 by 10,000 pounds and sold its emissions permits to the other two utilities, who could not afford to reduce their volume of emissions lower than the legally required level (Allen 1992, A-12). This trade was beneficial because it controlled the production of acid rain and it allowed the polluting utilities to continue generating electricity, while giving them the needed time to install non-polluting technology in their production plants (Allen 1992, A-12).

Emissions trading examples around the world include: the Regional Clean Air Incentives Market (RECLAIM) program for trading SO_x and NO_x emissions from stationary sources in the Los Angeles area, established by Southern California's South Coast Air Quality Management District (Hatch 2005, 12 & 171); the Stratospheric Ozone Protection Program's marketable permit system for U.S. producers and importers of CFCs (Hatch 2005, 174); Oregon Energy's program to reduce and trade CO_2 emissions in energy generating and non-generating facilities (Philibert & Reinaud 2004, 16); the program in Massachusetts that limits CO_2, SO_2, and NO_x emissions from its largest fossil-fired power plants (Philibert & Reinaud 2004, 16); Chile's emissions trading permits from industrial point sources of particulate matter in Santiago since 1992 (Sterner 2003, 91); Denmark's CO_2 emissions trading from electricity generators (Philibert & Reinaud 2004, 14); the New South Wales GHG Abatement Scheme (Philibert & Reinaud 2004, 14); the BP Emissions Trading Scheme and the Royal Dutch Shell Tradable Emission Permit System, which regulate internal CO_2 and CH_4 emissions trading schemes (Philibert & Reinaud 2004, 17); the Chicago Climate Exchange's voluntary GHG emissions trading program, targeting emissions and offsets in the United States, Canada, Mexico, and Brazil from 2003-2006 (Philibert & Reinaud 2004, 17); the United Kingdom's Emissions Trading Scheme, considered the world's first legislative-backed national GHG market, in which emissions from industrial energy users and electricity generators have been voluntarily traded since 2002 (Maslin 2004, 131); and the European Union's Emissions Trading System, the largest multi-country and multi-sector GHG emissions trading system in the world, in which emissions from electricity generation and from the production of iron, steel, lime, cement, glass, ceramics, pulp, and paper have been traded since 2005 (Mufson 2007, A01).

2.2.4 Joint Implementation

International JI projects received attention since the early 1990s (Kuik, Peters, & Schrijver 1994, 73 & 161). This attention increased after the signing of the UNFCCC and the recognition that they can be valuable instruments for cooperation for the reduction of GHG emissions (Kuik, Peters, & Schrijver 1994, 73 & 161).

JI is a project-based emissions trading mechanism among countries with Kyoto commitments (Albrecht 2002, 17). In a JI transaction, an Annex I Party (investing country) invests in a project in another Annex I Party (host country) to reduce its GHG emissions, "presumably because the cost of achieving such reduction is lower in the host country than in the investing country" (Danish 2007, 13). In other words, two or more developed countries implement certain policies and measures 'jointly' and in agreement for the purpose of reducing GHG emissions with increasing efficiency, cost-effectiveness, and equitability between the participating countries (Kuik, Peters, & Schrijver 1994, 161-162). Furthermore, it is very important that the criteria for JI take into account economic, social, and environmental concerns (Kuik, Peters, & Schrijver 1994, 162).

In both countries, the government and the State or a privately-owned company within the country is willing to participate in the project (Kuik, Peters, & Schrijver 1994, 73).

The ‘receiving country’ transfers a corresponding portion of its assigned amount of ERUs to the ‘investing country’, which adds them to its originally assigned amount. The additionality requirement must be achieved in order for the transaction to be legally valid. This means that ERUs should not be credited to reductions that would have occurred even without the intervention of an investing Annex I Party (Danish 2007, 13).

Denmark’s JI program will launch three to five pilot projects in the Baltic States (Hatch 2005, 165). The Swedish Program for an Environmentally Adapted Energy System finances projects on energy efficiency and use of renewable energy in the Baltic Region and Eastern Europe (Hatch 2005, 165). Norway’s business sector is interested in establishing a domestic permit trading system in Eastern Europe (Hatch 2005, 165).

Even though ERUs have been obtained since 2000, this mechanism’s official starting date is 2008 (Hatch 2005, 155).

2.2.5 Clean Development Mechanism

In the following chapter, there is an extensive review of the CDM’s history and a more detailed explanation of this flexible market-based environmental policy instrument.

3. The Clean Development Mechanism

Now that we have become familiar with the mix of environmental policy instruments, we can focus our attention on the CDM, since this is the environmental policy scheme that I am proposing, as an excellent tool for Mexico to contribute to the mitigation of global climate change.

3.1 Historical Background

The UNEP and the World Meteorological Organization set up the UNFCCC, regarded as the foundation for the international climate change regime (Danish 2007, 10). The UNFCCC, which was adopted in 1992 and entered into force in 1994, set an overall global framework (objectives, guiding principles, commitments, and institutional provisions) for intergovernmental efforts to tackle the challenge posed by climate change; recognized that the climate system is a shared resource whose stability can be affected by GHG emissions; and established guiding principles to balance environmental protection, economic development, and the general divisions of burdens between developed and developing countries (Danish 2007, 10; See 2001, 7).

Under the Convention, governments gather and share information on national policies and best practices regarding GHG emissions; launch national strategies for addressing GHG emissions and for adapting to expected impacts, including the provision of financial and technical support for developing countries; and cooperate to find ways to cope with the inevitable effects of climate change (See 2001, 7).

The countries, which have ratified the UNFCCC, are divided into three groups: Annex I Parties (developed countries that have been members of the OECD since 1992 and countries with economies in transition); Annex II Parties (Annex I Parties except countries with economies in transition); and non-Annex I Parties (developing countries, including the 'least developed' countries) (Danish 2007, 10-11; Echegoyen 2007, 5-6; See 2001, 7). See the Appendix for a detailed list of countries.

The COP is the Convention's main policy-making body (Yamin 2005, xxxix). It meets annually and provides the chief forum for international discussions about climate change (Yamin 2005, xxxix).

The Kyoto Protocol, which was drafted during COP-3 in Kyoto (1997) and entered into force in 2005, is the most ambitious UNFCCC legally binding international treaty for the limitation of GHG emissions (Hatch 2005, 153; Maslin 2004, 118).

The Protocol established differentiated commitments for the Parties (Yamin 2005, xxxix). Annex I Parties are legally bound to adopt quantitative reduction targets for GHG emissions (Albrecht 2002, 1). Specifically, they are required to reduce (cap) the emitted volume of six GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) by an average of 5.2% below 1990 emissions levels (1995 for the last three gases) during the 2008-2012 budget period (Maslin 2004, 118; See 2001, 8). Annex I Parties can meet such targets by reducing domestic emissions from the industrial, energy, services, transportation, household, and agricultural sectors, through technological innovations; by taking action through domestic forest actions such as afforestation (planting trees for commercial purposes on land that is not a forest or has not been one for a long time) and reforestation (reestablishment of existing forests and woodlands which have been depleted); and by using the newly proposed flexible market-based mechanisms: emissions trading, joint implementation, and the clean development mechanism (Albrecht 2002, 1-2; Echegoyen 2007, 7-10).

It also established that non-Annex I Parties were not obligated to adopt quantitative commitments for the reduction of GHG emissions (Wiener 2001, 205). However, they must comply with the general commitments of every Party: registration of the inventory of national emissions, the adoption of climate change policies, the development of research projects, and the establishment of global climate change education campaigns (Echegoyen 2007, 7-10).

"The negotiation of the Kyoto Protocol to the UNFCCC represented a significant development in international environmental policy" (Toman 2001, 216). Annex I Parties agreed to numerical GHG emissions targets and participants also agreed that the development and implementation of flexibility mechanisms provided an excellent opportunity for reducing overall compliance costs, by investing in cost-effective emissions reduction or sequestration projects in other countries (Danish 2007, 13; See 2001, 7; Toman 2001, 216).

Concrete rules and guidelines on the CDM were laid out in 2001 during COP-7 in Marrakesh (Hatch 2005, 151).

3.2 Definition

The CDM has attracted worldwide interest "since it has become the most globalized element of the Kyoto Protocol" (Baumert & Petkova 2000, 1) to address the reduction and mitigation of global climate change. It is known as the 'Kyoto surprise' because the consensus on the final proposal text was reached with unprecedented speed and because it was central for the final outcome of the Kyoto Protocol (Werksman 2000, 218).

The CDM, defined in Article 12 of the Kyoto Protocol, is a project-based mechanism that creates CERs through the reduction of GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) against a project baseline of a business-as-usual scenario (Hatch 2005, 153). It allows Annex I Parties to invest in and implement projects that reduce GHG emissions in non-Annex I Parties, creating CERs that are transferred to Annex I Parties, which use them to comply with emissions limits established by the Kyoto Protocol (See 2001, 8; Toman 2001, 216-217).

The CDM allows developed and developing countries to become partners and work together to reduce GHG emissions (Echegoyen 2007, 11). Developed countries contribute by investing resources in GHG mitigation projects and developing countries contribute by hosting such projects.

CDM projects started in 2000 and are carried out in sectors of great demand and consumption, such as: energy production (improving its efficiency in use and consumption), solid waste management (burning of biogas in the landfills), management of animal manure (capture and burning of methane), and in the destruction of by-product gases from industrial chemical processes (HFC_{23}), among others (Echegoyen 2007, iii; Toman 2001, 217).

3.3 Requirements for CDM Projects

The main requirements are the reduction of GHG emissions and the achievement of sustainable development goals in the host Party.

The implementation of CDM projects requires the establishment of an appropriate international legal framework with regulations for operating the mechanism. Article 12 of the Kyoto Protocol, the Marrakesh Accords, and the CDM Executive Board have established such a framework, that includes rules for defining, measuring, and certifying CERs; compliance mechanisms and sanctions for the misuse of CERs; and a clear definition of the benefit distribution and the authority of the developing countries (Toman 2001, 218; Wilder 2005, 246).

In order for CDM projects to be successful, they require public-private partnerships, active participation of local communities, and cooperation with governments (Baumert & Petkova 2000, 1). Additionally, they need to embrace emerging global norms, hold decision makers accountable, include safeguards against corruption, and ensure transparency (Baumert & Petkova 2000, 1).

Even before the proper beginning of CDM projects, they must comply with the following requirements (Hatch 2005, 155-156; Toman 2001, 217-218; Werksman 2000, 218, 224, & 225):

1. Participation cannot be forced on any country (Michaelowa 2005, 291). In other words, the degree of participation is voluntary and approved by each Party involved (Danish 2007, 14; Michaelowa 2005, 291).
2. Project participants are encouraged to use pre-approved, transparent, efficient, accountable, and practicable methodologies (Danish 2007, 14). If new methodologies are proposed, the Methodology Panel must review and approve them prior to their implementation (Danish 2007, 14). Moreover, they are required to provide written clarification of their respective roles and of the distribution of CERs arising from the project (Yamin 2005, 31).
3. Host Parties must ratify the Kyoto Protocol, establish an effective institutional and legal framework for approving the projects, and must give affirmation that the project activity meets its own sustainable development goals (Kenber 2005, 265-266).
4. Host Parties must also undertake an environmental impact assessment, if project participants consider it necessary (Kenber 2005, 266). This assessment is needed to guarantee that a basic set of environmental and social serious adverse impacts and major threats to sustainable development will be avoided (Kenber 2005, 266). Usually, NGOs safeguard the environmental and social integrity of the CDM process (Michaelowa 2005, 309).
5. There must be a mandatory process of public consultation (Kenber 2005, 266). This consultation is an opportunity for the public to comment on CDM projects at various stages of the project cycle (Kenber 2005, 267). This way, local communities can influence project design and ensure that their priorities will be met (Kenber 2005, 267). And, at the same time, project developers will be able to recognize community needs and

gain public support early in the project cycle, avoiding delays and public opposition in the future (Kenber 2005, 267).

6. An equitable geographical spread of projects must be guaranteed (Kenber 2005, 266). In other words, CDM projects must not be concentrated in a few developing countries, with relatively more developed economies, excluding the smaller ones (Kenber 2005, 266).
7. Operation must be supervised by an intergovernment body that includes representatives of the Conference of the Parties (the ultimate authority), an Executive Board, independent auditors, and a DNA (Wilder 2005, 247; Yamin 2005, 33). These institutions should be credible, internally efficient, and adaptable. They should also ensure that the projects do not degenerate into rent-seeking or cater to special interests, without achieving real environmental protection and sustainable development.
8. The Executive Board is the main entity responsible for authorizing validated projects and project participants (Yamin 2005, 34). It must oversee the effective application of the additionality concept, approve new baseline and monitoring methodologies, certify independent auditors, provide information about distribution, financing, technical reports, and norms, monitor procedure compliance, and maintain an updated registration log and project data base (Echegoyen 2007, 17). The Executive Board meets approximately once every two months (at least three times a year) and it is integrated by 10 members from Parties to the Kyoto Protocol (one member from each of the five UN regional groups, two representatives from Annex I and two from non-Annex I Parties, and one member from the developing small island nations) (Echegoyen 2007, 17; Yamin 2005, 35-36). The members must be impartial during the decision making process (Yamin 2005, 35). Decisions are taken by consensus when possible and by a 75% majority in the absence of consensus (Yamin 2005, 38).
9. In order to facilitate and expedite the project cycle, the Executive Board has accredited a number of DOEs and has built a library of standard emissions baseline methodologies for certain types of commonly-implemented projects (Danish 2007, 14).
10. DOEs are private companies that serve as independent project auditors (Echegoyen 2007, 18). They have the responsibility of validating that a proposed CDM project meets all relevant requirements and of verifying that the project has generated reductions on an annual basis (Yamin 2005, 39). They maintain a publicly available list of projects, submit

annual activity reports to the Executive Board, and provide non-confidential information from CDM projects (Yamin 2005, 41). DOEs specialize in the different sectors in which CDM projects can be developed, such as: renewable energy, hydroelectric, chemical industry, and agriculture, among others (Echegoyen 2007, 18).

11. The DNA is the governmental authority of the Parties participating in the project. It is the entity responsible for issuing the written approval that guarantees the voluntary participation of the Parties in the proposed project and for evaluating the project's contribution to the host Party's sustainable development efforts (Yamin 2005, 39).
12. A registry must be established by the Executive Board to ensure the accurate accounting of the issuance, holdings, transfer, and acquisition of CERs by the non-Annex I Parties (Yamin 2005, 31).
13. Since recipient Parties will not have quantified commitments, CERs will be issued when the environmental additionality principle is achieved (Hatch 2005, 155). Additionality is crucial, since "it creates the unit of the transaction for the utilization of the CDM" (Yamin 2005, 38). Thus, "CDM projects must produce real emissions reductions that would not have occurred in the absence of the project". Moreover, they provide real, measurable, and long-term benefits related to the mitigation of climate change.
14. CERs issued between 2000 and 2008 can be used to achieve compliance during the Kyoto Protocol's first commitment period.
15. There is no obligation for the COP or governments to provide any financing for the CDM. In other words, any financing is voluntary and may be supplemented by financing from the private sector and development banks in the case of large projects (See 2001, 8). In OECD countries, such financing is limited, since they have quotas on grants for overseas projects (See 2001, 8).
16. Financial and development additionality must be achieved. Financial resources, provided by the investor Party, complement and do not replace existing official development aid and funding through the GEF (operating financial entity responsible for matching eligible projects in developing countries with funds provided by developed countries). (Kenber 2005, 266-267). Furthermore, non-Annex I Parties must be encouraged to follow long-term GHG emissions reduction paths without unacceptably restricting their development path (Kenber 2005, 266-267).

17. Parties in non-compliance with these requirements will not be eligible to take advantage of the flexibility mechanisms provided by the Kyoto Protocol.

Additionally, non-Annex I Parties must consider the project's contributions to their countries, before deciding to host a specific CDM project. Such contributions include: global climate change mitigation, sustainability of the local environment, durability of the balance of payments and the macroeconomic plan, development of national technology and technological autonomy, poverty mitigation, and regional, social, and economic development (Kenber 2005, 271; Wilder 2005, 255).

3.4 CDM Project Activity Cycle

Each CDM project must go through the following operational stages, defined by the COP (Toman 2001, 216):

1. Identification – identification of a viable project, assessment of its potential net GHG emissions reduction and its economic and social effects, and the determination of its financing source.
2. Development of the Project Design Document – there is a specific template which contains critical information about the project (Danish 2007, 14). This document includes a general description of the project activity; it describes the application of the project's baseline methodology (the estimated allowable CERs); it specifies the duration of the project activity and its crediting period; it describes the type of monitoring methodology and plan that will be used; it verifies the project's approval by the receiving Party; it estimates the reduction of GHG emissions by sources and the environmental impacts associated with such reductions; and finally, it contains comments from the participating stakeholders (Echegoyen 2007, Annex F). Project developers are in charge of understanding the technical options for reductions of GHGs and their costs (Echegoyen 2007, 18; Michaelowa 2005, 308). Moreover, they should be able to apply a monitoring methodology once the project starts operating (Echegoyen 2007, 18; Michaelowa 2005, 308).
3. Accreditation and Validation – a DOE independently reviews and evaluates the Project Design Document in order to verify its compliance with CDM requirements and start the

validation process (Yamin 2005, 31). The DOE must verify that the host Party has ratified the Kyoto Protocol and that the proposed project has the approval of the host Party, that it is voluntary, and that it is aimed at sustainable development goals (Echegoyen 2007, 18). If the project fulfills all the requirements, the DNA formally approves the project by issuing a 'Host Country Project Approval Letter', given to the Executive Board (Wilder 2005, 247).

4. Registration – once the Executive Board approves the DOE's recommendations, it registers the project as a CDM project activity (Danish 2007, 14). This formal acceptance of the validated project ensures that all CDM projects meet the requirements, that they are subject to international scrutiny, and that they have been officially approved by the government in the host and investor countries (Kenber 2005, 270; Yamin 2005, 31).
5. Monitoring – it consists on the identification, collection, and archiving of information necessary to design and implement a monitoring plan (Yamin 2005, 32). The project participant must deliver an annual Monitoring Report quantifying the reduction in GHG emissions generated by the project (Danish 2007, 14). The implementation of the monitoring plan is a condition for the project's verification and the issuance and certification of CERs (Yamin 2005, 32).
6. Verification – a second DOE (independent from the one that validated the project) delivers a Verification Report to the Executive Board, verifying that the registered project activity has reduced the monitored GHG emissions during the specified time period (Yamin 2005, 33).
7. Issuance and Certification of CERs – once the Executive Board accepts the DOE's verification that the project has achieved the reduction in GHG emissions, it instructs the CDM Registry Administrator to issue the corresponding CERs into the national registry of the Annex I Party within a 15-day period (Yamin 2005, 33). CERs are calculated by comparing emissions of the CDM project with emissions of a hypothetical 'baseline scenario', that reflects the business-as-usual scenario. Baselines can be project specific or standardized and are determined by using three different approaches: actual or historical emissions, emissions of an 'economically attractive' course of action, and/or average emissions of similar projects and circumstances undertaken in the previous five years (Michaelowa 2005, 290-291).

8. Negotiation – once the project has been validated, lawyers draft the CER Purchase Agreement, in order to certify the transactions of CERs (Michaelowa 2005, 309). CDM projects may obtain CERs for three seven-year periods or for one single ten-year period (Michaelowa 2005, 309).

3.5 CDM Project Activity Status

As of December 9, 2007, there were 864 registered Project Activities, 97,699,935 issued CERs, with an annual average of 185,473,153 CERs, and it is expected that approximately 1,130,000,000 CERs will be issued by the end of 2012 (UNFCCC).

According to their status, CDM projects are classified into the following groups:

1. Registered (864)
2. Requesting Registration (50)
3. Requesting Review (57)
4. Requesting Corrections (39)
5. Under Review (8)
6. Rejected (46)
7. Withdrawn (8)

Table 1 Registered Project Activities by Scale

Scale	**Total Number**	**Percentage**
Large	458	53.01%
Small	406	46.99%
Total	**864**	**100%**

Source: http://cdm.unfccc.int/index.html; December 9, 2007.

The Bonn Agreement of 2001 defines the distinction between large-scale and small-scale CDM projects according to the maximum output capacity of the project (UNFCCC). Industrial projects are considered large-scale and community projects are considered small-scale (Department of Sustainable Development 2007, 3).

Large-scale CDM projects are defined as activities with output capacities greater than 15 megawatts in renewable energy projects; activities with 15 gigawatt hours per year in energy efficiency; or other project activities that both reduce anthropogenic emissions by sources and directly emit 15 or more kilotons of CO_2 equivalent annually (Department of Sustainable Development 2007, 3).

Small-scale CDM projects are defined as activities with output capacity equivalent up to 15 megawatts (or an appropriate equivalent); activities which reduce energy consumption on the supply and/or demand side, by up to the equivalent of 15 gigawatt hours per year; and other project activities that both reduce anthropogenic emissions by sources and directly emit less than 15 kilotons of CO_2 equivalent annually (Thorne 2002, 6).

Table 2 Expected Average Annual CERs from Registered Project Activities

Host Party	**Percentage**
China	48.22%
India	15.11%
Brazil	9.39%
Republic of Korea	7.74%
Mexico	**3.58%**
Chile	2.13%
Others	13.83%
Total	**100%**

Source: http://cdm.unfccc.int/index.html; December 9, 2007.

3.6 CDM Host Parties

The countries (Parties) that host CDM projects around the world are: Argentina, Armenia, Bangladesh, Bhutan, Bolivia, Brazil, Cambodia, Chile, China, Colombia, Costa Rica, Cuba, Cyprus, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Georgia, Guatemala, Honduras, India, Indonesia, Israel, Jamaica, Lao People's Democratic Republic, Malaysia, Mexico, Mongolia, Morocco, Nepal, Nicaragua, Nigeria, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Qatar, Republic of Korea, Republic of Moldova, South Africa, Sri Lanka, Thailand, Tunisia, Uganda, United Republic of Tanzania, Uruguay, and Vietnam (UNFCCC).

Table 3 Registered Project Activities by Host Party

Host Party	Total Number	Percentage
India	296	34.26%
China	137	15.86%
Brazil	113	13.08%
Mexico	**98**	**11.34%**
Chile	21	2.43%
Others	199	23.03%
Total	**864**	**100%**

Source: http://cdm.unfccc.int/index.html; December 9, 2007.

Table 4 CERs Issued by Host Party

Host Party	CERs (Percentage)
India	32.86%
China	25.77%
Republic of Korea	18.16%
Brazil	15.55%
Chile	2.14%
Mexico	**1.97%**
Others	3.55%
Total	**100%**

Source: http://cdm.unfccc.int/index.html; December 9, 2007.

Table 5 Registered Project Activities by Region

Region	Total Number	Percentage
non-Annex I Asia and the Pacific	529	61.23%
non-Annex I Latin America and the Caribbean	**305**	**35.30%**
non-Annex I Africa	23	2.66%
Other	7	0.81%
Total	**864**	**100%**

Source: http://cdm.unfccc.int/index.html; December 9, 2007.

3.7 Type of CDM Projects

If we classify the Registered Project Activities according to the type of economic activity or industry, we observe that about 50% of the projects are related to the energy industry (renewable and non-renewable); followed by projects aimed at reducing CH_4 emissions from biomass used to generate electricity, animal waste disposal, and landfill chemical reactions with approximately 24%; 11% of the projects are related to fugitive emissions from fuels and agriculture; and the remaining 15% are projects related to activities such as energy demand, manufacturing and chemical industries, transport, and mining and metal production (Echegoyen 2007, 27).

We can also classify CDM projects according to the type of GHG that is targeted (Echegoyen 2007, 24-25):

CO_2 emissions - renewable energy, industrial and household energy efficiency, carbon capture, and use of biomass to generate electricity.

CH_4 emissions - biogas capture from landfills and animal waste and reduction of natural gas leaks.

N_2O emissions - modification of chemical processes in textile production.

HFCs and PFCs emissions - manufacture of coolants, fire extinguishers, and air conditioning units.

SF_6 emissions - manufacture of heat conductors and coolants.

3.8 Advantages of CDM Projects

The most important advantages of CDM projects are (Albrecht 2002, 17-19; Danish 2007, 13; Michaelowa 2005, 305-306; Painuly 2002, 192; See 2001, 8 & 182; Werksman 2000, 226-227; and Wiener 2001, 212 & 218-219):

1. Only flexible mechanism that involves developed and developing countries.
2. Considered as the primary mechanism for involvement of developing countries during the Kyoto Protocol's first commitment period.
3. Facilitate new market penetration or expansion for the investor company and the diversification of domestic risk in overseas markets.

4. Reductions of GHG emissions in the host Party can be traded for money or used by the investor Party to meet its own target emissions, at a lower cost, in case its companies are not successful in bidding for CDM projects or cannot afford carbon taxes or permits.
5. The investment needed to reduce GHG emissions in non-Annex I Parties may be smaller than in Annex I Parties, through the installation of advanced pollution reduction technologies.
6. Non-Annex I Parties are beneficiaries of lower fiscal expenditure, inward investments, and transfer of technology.
7. Promotion of foreign investments from Annex I to non-Annex I Parties, specifically for energy efficiency improvement and use of renewable sources of energy.
8. Effective and efficient transfer of technology, capital, and resources, without compromising aid programs to non-energy sectors and sustainability.
9. Annex I Parties can achieve compliance with their quantified emissions limitation and reduction of GHGs without actually reducing their own emissions.
10. Non-Annex I Parties will be able to contribute to the ultimate objective of the UNFCCC (stabilization of GHG concentrations in the atmosphere) through the assistance received from Annex I Parties.
11. In addition to climate change mitigation, these projects assist non-Annex I Parties to achieve sustainable development and adapt to the adverse effects of climate change (Wilder 2005, 247).
12. Provide a meaningful source for adaptation funding. In this case, adaptation is a positive spillover effect from the CDM project.
13. Promote sustainable development in developing countries, while assisting developed countries to reduce their compliance costs, by investing in emissions reduction projects in developing countries.
14. Provide financial and technological assistance, so developing countries will be able to leapfrog dirty technologies.
15. Emerging brokers, accredited monitoring agents, information exchanges, mutual funds, and other means of risk diversification are helping to reduce transaction costs.
16. Developed countries can achieve their commitments to limit or reduce their GHG emissions through cost-effective and flexible means.

17. Its innovative aspects have the potential to transform international environmental laws and the climate regime (Danish 2007, 14).
18. Non-compliance will be punished through the imposition of financial penalties, which could provide an additional source of revenue for development assistance for non-Annex I Parties (Danish 2007, 15).
19. Many experts believe that Annex I Parties are likely to rely on CDM projects as a significant strategy for compliance with their Kyoto Protocol commitments, since there is a perception of abundance of low-cost mitigation project opportunities in developing countries.
20. Since CERs are being generated in countries without a quantitative emissions limit, it would seem very possible for such countries to artificially inflate the amount of CERs (Michaelowa 2005, 305). However, this perverse incentive was addressed in the COP-7 where "a stringent body of rules was established and agreed upon to protect the CDM's environmental credibility" (Michaelowa 2005, 305-306).

3.9 Disadvantages of CDM Projects

The most important disadvantages of CDM projects are (Hatch 2005, 152 & 164; Wiener 2001, 212):

1. Potential barriers to participation because of the provisions in agreements under the World Trade Organization. Basically, they must decide if projects can be regarded as additional, even if they are incompatible with the World Trade Organization.
2. Complexity of the procedures for receiving approval by the CDM Executive Board (Kenber 2005, 264).
3. Lack of capital for developing projects in poor rural areas.
4. Lack of management skills among local people.
5. Lack of guidance on how the sustainable components should be assessed (Kenber 2005, 264).

6. To preserve environmental integrity, the CDM project cycle inevitably causes transaction costs that are higher than with JI or emissions trading (Michaelowa 2005, 306). In other words, since partners are hard to identify, each negotiation is novel, each project must be approved by both Parties, and each investor needs to monitor its own projects, transaction costs will be high.
7. Do not address the needs of areas of poverty in developing countries.
8. Do not necessarily guarantee environmental and economic prosperity at a global scale.
9. Uncertainty in the development and assessment of baselines.
10. Difficulty in formulating an operational definition of additionality.
11. The fact that host countries need to build competence to master all the steps of the project cycle, in order to be a competitive provider of CERs and avoid costly outsourcing to service providers from developed countries, represents a great challenge for many of them (Michaelowa 2005, 306).

4. The Clean Development Mechanism in Mexico

Mexico, classified as a non-Annex I Party, signed the UNFCCC in 1992 and ratified it one year later (Echegoyen 2007, 7). Even though Mexico signed the Kyoto Protocol in 1998 and ratified it two years later, the fulfillment of the objectives of the UNFCCC and the development of CDM projects gained importance since February 2005, when the Protocol finally came into force (Echegoyen 2007, iii).

The CDM offers developing countries, such as Mexico, a great challenge and opportunity to actively participate in climate change mitigation efforts, while taking advantage of economic, social, and environmental benefits (Echegoyen 2007, ii). Mexico has a great potential to develop CDM projects, in lieu of the fact that the environmental impact of its productive sector is still quite low (compared to developed countries) (Echegoyen 2007, iii).

It is important to point out that most projects hosted by Mexico are aimed at mitigating or recovering GHG emissions, CH_4 in particular (Echegoyen 2007, 45). Moreover, Mexico has the potential for developing CDM projects in areas such as: reforestation and afforestation, capture of biogas from landfills, waste water treatment, energy efficiency in industrial processes, renewable sources of energy (wind and hydropower), cogeneration of electricity, and conversion to natural gas, among others (Echegoyen 2007, 46).

After analyzing the country's political status, number of developed projects, participation in the CDM Executive Board, and the amount of generated CERs, among other characteristics, Point Carbon (a world-leading provider of consulting services for carbon markets) determined that India, China, Chile, Brazil, and Mexico are the top five non-Annex I Parties with the highest potential for developing CDM projects (Echegoyen 2007, 28).

In the words of Miguel Cervantes, the Head of the Climate Change Projects at the Mexican Ministry of Environment and Natural Resources, "Mexico has an important potential, since it can take advantage of the opportunity provided by CDM projects in the oil sector and in electricity cogeneration in the private industry" (Sánchez 2007, 1). Mexico's registered projects in 2007 have the potential of reducing 6.2 million tons of CO_2 (Sánchez 2007, 1). This is 50% more than last year's reduction and it is estimated to double during the next couple of years, with the participation of companies such as *PEMEX*, *Cydsa*, *Alfa*, *Minera Antlán*, and Mexico's Federal Electricity Commission (Sánchez 2007, 1).

4.1 The Mexican Carbon Fund (*FOMECAR*)

FOMECAR was born from a joint initiative between the Mexican Ministry of Environment and Natural Resources (*SEMARNAT*), the Mario Molina Center, and the Mexican Bank for Foreign Trade (Bancomext, 2007).

FOMECAR's main goal is to provide national companies and public entities with technical and financial support to implement CDM projects and enjoy the additional income offered by the carbon market (Bancomext, 2007). It also aims at taking advantage of the opportunity for sustainable development and environmental benefits to society (Bancomext, 2007).

Considering the eligibility of CDM projects, the Mexican Bank for Foreign Trade and *Nafin* (a Mexican development bank that promotes modernization projects) provide financial resources through lines of credit established with development banks in developed countries, in order to provide the best possible conditions to support CDM projects (Bancomext, 2007). Such conditions include: medium and long term financing, floating and fixed interest rates, loan repayment, according to the project's specific needs, and maximum financing amount, according to the project's structure and particular requirements (Bancomext, 2007).

In the following sections, I will mention the Mexican Carbon Fund's objectives, potential participants, and advantages (Bancomext, 2007).

4.1.1 Objectives

1. Develop a culture of reduction of GHG emissions among Mexican businesses and local and state governments.
2. Identify, develop, and promote viable projects to operate under the CDM principles.
3. Encourage the participation of Mexican and foreign financial institutions to support competitive and equitable carbon projects.
4. Organize and carry out seminars, workshops, and training courses to develop PINs.
5. Provide the needed assistance in document preparation during the registration and certification process before the CDM Executive Board.
6. Provide technical assistance on the feasibility of CDM projects.
7. Enhance the country's capacity to take advantage of the carbon market potential in Mexico.

8. Promote new investments in more efficient and cleaner technologies in Mexico, both from domestic and foreign sources.
9. Provide trade advice on carbon internal markets and identify potential CER buyers, in order to maximize the benefits of CDM projects generated in Mexico.
10. Promote national and international investment in sustainable projects and proper environmental management.
11. Work with the Mexican Bank for Foreign Trade, the World Bank, and other commercial banks and international financial institutions, to provide the needed financial resources to fund CDM projects and cover all the expenses related to the development and operation of such projects.

4.1.2 Potential Participants

The potential participants in the Mexican Carbon Market can be divided into four groups:

1. Buyers: foreign public and private funds, commercial and institutional funds, multilateral organizations, and companies in Annex I Parties.
2. Sellers: public sector entities (*PEMEX* and the Federal Electricity Commission), local and state governments, and private companies.
3. Promoters: project developers, suppliers of technology, legal consultants, insurance companies, and DOEs.
4. Financial support: Mexican and foreign financial institutions, the World Bank, export credit agencies, and national and international development banks.

4.1.3 Advantages

1. Increase in the profitability and economic viability of CDM projects.
2. CERs will provide a source of additional income.
3. Direct support for environmental protection policies.
4. *FOMECAR* is the first North American initiative to achieve the collaboration of an environmental regulatory government entity and a first class financial institution.

4.2 CDM Projects in Mexico

Even though Mexico currently has 98 registered projects, it needs to better coordinate the CDM culture and implement well organized mechanisms, in order to promote more projects to the Mexican public and private sectors (Bancomext, 2007). Fortunately, *FOMECAR* has the support of the World Bank's Carbon Unit to develop methodologies to increase the establishment of CDM projects (Bancomext, 2007). On a similar note, the Mexican Ministry of Environment and Natural Resources has international cooperation agreements with Japan, Spain, Italy, Denmark, France, the Netherlands, Austria, Germany, Portugal, and Canada for the promotion and establishment of CDM projects in Mexico (Bancomext, 2007).

For Mexico to obtain the Letter of Approval for CDM projects, the project's environmental, economic, and social performance must be reviewed (Echegoyen 2007, 43). Among other requirements, the project must prove that it will protect biodiversity and reduce the negative impacts on land use, water use, and of waste management and GHG emissions (Echegoyen 2007, 43). Additionally, it must improve the country's economy, its competitive status, and the population's quality of life, by promoting profitable investments, generating wealth and employment opportunities, and transferring technology to improve the local infrastructure (Echegoyen 2007, 43).

Mexico's CDM projects can be classified in the following groups (UNFCCC):

Animal Waste Management System (AWMS) GHG Mitigation Projects

Objective: mitigate animal effluent related GHG emissions and recover CH_4 and N_2O emissions, resulting from aerobic and anaerobic decomposition processes, in an economically sustainable manner. Benefits: improvements in AWMS practices, improved water quality in and around the site, and reduction in odor.

1) *Estado de México* - registered on December 2005; other Party: United Kingdom of Great Britain and Northern Ireland.
2) *Sonora* - registered on December 2005, January 2006, February 2006, March 2006 (3), May 2006, and September 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
3) *Baja California* - registered on January 2006; other Party: United Kingdom of Great Britain and Northern Ireland.

4) *Nuevo León* - registered on February 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
5) *Aguascalientes*, *Guanajuato*, and *Querétaro* - registered on March 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
6) *Jalisco* - registered on February 2006 (2), March 2006 (2), and September 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
7) *Sinaloa* - registered on July 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
8) *Sinaloa* and *Sonora* - registered on September 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
9) *Aguascalientes* and *Guanajuato* - registered on September 2006; other Party: none.
10) *Nuevo León* and *Tamaulipas* - registered on September 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
11) *Jalisco* and *San Luis Potosí* - registered on September 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
12) *Aguascalientes*, *Michoacán*, and *Querétaro* - registered in 2007; other Party: none.

Animal Waste Management System (AWMS) Methane Recovery Projects

Objective: mitigate and recover animal effluent related GHGs by improving AWMS practices. Benefit: reduction of CH_4 emissions.

1) *Sinaloa* and *Sonora* - registered on October 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
2) *Oaxaca* and *Puebla* - registered on October 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
3) *Tamaulipas* - registered on October 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
4) *Guanajuato* - registered on November 2006 (2); other Party: United Kingdom of Great Britain and Northern Ireland.
5) *Jalisco* and *Michoacán* - registered on December 2006; other Party: United Kingdom of Great Britain and Northern Ireland.

6) *Guanajuato*, *Michoacán*, and *Querétaro* - registered on December 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
7) *Coahuila*, *Durango*, and *Nuevo León* - registered on December 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
8) *Veracruz* - registered on December 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
9) *Coahuila* - registered on November 2006 (5) and December 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
10) *Puebla* - registered on October 2006, December 2006, and March 2007; other Party: United Kingdom of Great Britain and Northern Ireland.
11) *Sonora* - registered on October 2006, November 2006, March 2007 (2), June 2007, and July 2007; other Party: United Kingdom of Great Britain and Northern Ireland.
12) *Durango* - registered on November 2006 and June 2007 (2); other Party: United Kingdom of Great Britain and Northern Ireland.
13) *Chiapas* - registered on March 2007; other Party: United Kingdom of Great Britain and Northern Ireland.
14) *Estado de México* and *Puebla* - registered on June 2007; other Party: none.
15) *Chihuahua* - registered on June 2007; other Party: none.
16) *Coahuila* and *Durango* - registered on June 2007 and July 2007; other Party: none.
17) *Nuevo León* - registered on July 2007; other Party: none.
18) *Aguascalientes*, *Michoacán*, and *Querétaro* - registered on July 2007; other Party: none.
19) *Yucatán* - registered on September 2007; other Party: none.

EcoMethane Landfill Gas to Energy Projects

Objective: capture and destruction of CH_4 from sanitary landfills, feed it to a landfill gas flare and a modular electricity generation plant, and dispose of CH_4 safely and control the odor nuisance, health risks, and adverse environmental impacts. Benefits: reduction of solid municipal waste and the reduction of CH_4 in the atmosphere.

1) *Aguascalientes* - registered on May 2006 and July 2006; other Party: United Kingdom of Great Britain and Northern Ireland.

2) *Ecatepec* - registered on July 2006; other Party: United Kingdom of Great Britain and Northern Ireland.
3) *Tultitlán* – registered on May 2007; other Party: none.
4) *Durango* - registered on November 2007; other Party: United Kingdom of Great Britain and Northern Ireland.

Methane Recovery and Electricity Generation Project

Objective: construction of a covered in-ground anaerobic reactor that will use the organic material produced in the pig farm currently treated in the wastewater ponds, to produce biogas. Benefits: reduction of CO_2 and CH_4 emissions.

1) *Altotonga* - registered on September 2006, October 2006 (11), November 2006 (10), December 2006 (3), and April 2007 (4); other Parties: United Kingdom of Great Britain and Northern Ireland and Switzerland.

***La Venta* II Project**

Objective: construction and use of a wind power plant to generate renewable electricity, which will be supplied to the Interconnected Mexican National Grid. Benefit: reduction of CO_2 emissions.

1) *Oaxaca* - registered on April 2007 and June 2007; other Party: Spain.

Eurus Wind Farm

Objective: take advantage of the available wind resources to provide renewable energy. Benefits: reduction of CO_2 emissions and the reduction in the utilization of fossil fuel-fired power plants.

1) *Oaxaca* – registered on October 2006 and January 2007; other Party: none.

Bii Nee Stipa I, II, and III Project

Objective: generate renewable energy coming from wind resources. Benefits: reduction of CO_2 emissions and the reduction in the utilization of fossil fuel-fired power plants. Registered on December 2005, March 2006, and February 2007; other Party: Spain.

***La Ventosa* Wind Energy Project**

Objective: generate electricity from wind. Benefits: increased percentage of renewable sourced power in Mexico's electricity grid and the reduction in GHG emissions.

1) *Oaxaca* - registered on June 2007 and October 2007; other Party: Spain.

***El Gallo* Hydroelectric Project**

Objective: generate renewable electricity using hydroelectric resources. Benefits: reduction of CO_2 emissions and the reduction in the utilization of fossil fuel-fired power plants. Registered on April 2006 and July 2006; other Party: France.

***Trojes* Hydroelectric Project**

Objective: generate renewable electricity using hydroelectric resources. Benefits: reduction of CO_2 emissions and the reduction in the utilization of fossil fuel-fired power plants.

1) *Trojes* - registered on April 2006; other Party: none.

***Chilatán* Hydroelectric Project**

Objective: generate renewable electricity using hydroelectric resources. Benefits: reduction of CO_2 emissions and the reduction in the utilization of fossil fuel-fired power plants.

1) *Chilatán* - registered on May 2007 and September 2007; other Party: United Kingdom of Great Britain and Northern Ireland.

HFC-23 Recovery and Decomposition Project

Objective: reduction of HFC-23 emissions by recovering and decomposing this gas. Benefit: reduction of HFC-23 emissions, which is a powerful GHG.

1) *Monterrey* - registered on May 2006 and June 2006; other Parties: United Kingdom of Great Britain and Northern Ireland, Netherlands, and Japan.

Joint Venture Project of Cogeneration of Electricity and Hot Water

Objective: utilization of the natural gas and biogas produced from the on-site wastewater biodigesters to produce clean and renewable energy. Benefits: reduction in the use of natural gas, conservation of non-renewable resources, and reduction in GHG emissions. Registered on June 2006 and August 2006; other Party: none.

Hasars Landfill Gas Project

Objective: capture and flare the landfill gas generated through the decomposition of the organic waste disposed at the landfill site. Benefit: reduction in GHG emissions (CH_4 and CO_2). Registered on April 2007, July 2007, and October 2007; other Party: none.

Reduction of the Average Clinker Content in Cement at the CEMEX Operations Project in Mexico

Objective: reduction of the average clinker content in cement. Benefits: reduction of GHG emissions, thermal and electrical energy conservation, and industrial waste utilization. Registered on June 2007 and November 2007; other Party: none.

It is estimated that by 2020 municipal solid waste and the CH_4 emissions associated with it will have increased by 86% (Bancomext, 2007). Mexico could take advantage of CDM projects to reduce CH_4 emissions, by attracting investment opportunities and developing new techniques to use recovered energy for further development (Bancomext, 2007). Moreover, it could take advantage of projects that reduce negative environmental and health effects and the amount of sanitary landfills (Bancomext, 2007).

Fortunately, as we can observe from the prior list of CDM projects in Mexico, its current CDM projects are mostly related to GHG (CH_4, N_2O, and CO_2) mitigation projects, that are generated from animal waste and landfills.

It is also worth mentioning that Mexico's main partner (investor Party) is the United Kingdom of Great Britain and Northern Ireland.

Hopefully, Mexico will continue expanding its municipal solid waste management in an environmentally friendly way and will expand its scope by accepting CDM projects aimed at other types of objectives and goals.

Final Comments

Scientific research on the relationship between CO_2 and the climate began in the 19th century, when J. Tyndall established that CO_2 is a GHG (Oreskes 2007, A15). Then, in the 20th century, S. Arrhenius began to suspect that CO_2 could alter the Earth's climate (Oreskes 2007, A15). This effect was proven by G. Callendar in the 1930s and by C. Keeling and R. Revelle by the 1960s, when they used the Keeling Curve to demonstrate that atmospheric CO_2 was steadily rising (Oreskes 2007, A15). As early as 1965, warnings were being reported to governments by the scientific community: "we will modify the heat balance of the atmosphere to such an extent that marked changes in climate … could occur" (Oreskes 2007, A15).

The IPCC was formed by the UN in 1988 to determine the state and implications of climate change. It predicted that global warming will trigger enormous physical and social changes, including scientific, environmental, and socio-economic impacts (Maslin 2004, 13; Purvis & Busby 2004, 67; Struck 2007, A03).

The IPCC has issued four Assessment Reports: the first (1990) and second (1995) reports "laid the groundwork for the Kyoto Protocol" (Borenstein 2007, 1; Smith, Lennon, & Mix 2007, 96). The third report (2001) provided much stronger evidence of a warming Earth, highlighting the role of GHG emissions, and stating that global warming was "likely caused by human activity" (Borenstein 2007, 1; Smith, Lennon, & Mix 2007, 96). This report predicted that if current trends continued, the concentration of GHGs in the atmosphere would double by the end of the century (Yamin 2005, xxxvi). The fourth report (2007) confirmed that global warming is "very likely man-made" (Borenstein 2007, 1). There is more than 90% certainty that climate change is being caused by an anthropogenic enhanced greenhouse effect (Maslin 2004, 15; Smith, Lennon, & Mix 2007, 96).

From this brief historic review, we can conclude that we live in a moment in time when the need to regulate and reduce GHG emissions, especially CO_2, has become an urgent task. Global climate change is real and is happening right now.

Despite all the scientific evidence collected to support the global warming hypothesis, there is still a great deal of uncertainty regarding the consequences. The degree of uncertainty is enhanced even further since it is not just a scientific issue, but an issue that involves Economics, Sociology, Geopolitics, local Politics, and our choices as consumers and inhabitants of the Earth (Maslin 2004, 1).

Since global climate change is such a complex issue and it involves the participation of every country, every industry, and every individual in the world, it also needs a varied set of environmental policy instruments. Global climate change will not be solved or mitigated by a single type of policy instrument. We need to use different instruments for different situations and sometimes what is needed is a combination of instruments. That is why it is so important to have a broad view and a wide range of instruments from which to choose.

As we have seen throughout this paper, voluntary and mandatory environmental policy instruments have positive and negative characteristics. It is impossible to find an environmental policy instrument that does not have at least one disadvantage. The challenge here is to try to solve as many obstacles as possible and, at the same time, harness the positive elements and start working on their application. It is also important to point out that mandatory and voluntary policy instruments are not exclusive, rather, they complement each other.

One of the most immediate issues that must be negotiated and resolved involves the international distribution of responsibility for reducing GHGs and its associated costs (Shogren & Toman 2001, 40). It is generally accepted that developed and developing countries have differentiated responsibilities and capabilities.

Developing countries are relatively more vulnerable to global climate change and will generally suffer more from its adverse impacts; have less financial and technical capacity (limited response capacities) for mitigating GHGs; and have more pressing needs (potable water and food supplies) than developed countries (Campbell & Weitz 2007, 106; Shogren & Toman 2001, 40). In short, "developing countries will be most affected by the struggle for food, energy, and water as they lack the resources and capacity to quickly adapt to climate change" (Lee 2007, 39).

On the other hand, developed countries - which have historically emitted most of the man-made GHGs causing global climate change - "appear better positioned to cope with at least the early consequences of modest climate change" (Campbell & Weitz 2007, 106; Maslin 2004, 13). Thus, since developed countries bear a greater historical responsibility for the emission of GHGs and have greater capacity to take action, they are expected to take the lead in combating global climate change (Danish 2007, 10). That is why if developed countries want developing countries to share the burden of reducing GHG emissions, they have the moral and ethical responsibility of assisting them, by providing scientific and technological assistance, so they can manage the climate change challenge in an effective and affordable way (Campbell & Weitz 2007, 106).

Having said that, it is also true that "even if anthropogenic emissions of CO_2 are stabilized or even reduced, the CO_2 content in the atmosphere is still expected to increase over the next 100 years" (Maslin 2004, 75).

Unfortunately, many countries use this statement as an excuse to avoid taking action, instead of realizing that it underlines the reality that we do not have the luxury of waiting to see the full implication of climate change before taking action (Shogren & Toman 2001, 37). We must put uncertainty aside and act now to do everything possible to reduce GHG emissions and try to lessen the burden of the consequences and the effects on future generations (Maslin 2004, 36).

In the words of British economist Sir Nicholas Stern, "the cost of taking tough measures to curb pollution will be repaid in the long run" (Struck 2007, A03).

While it is true that industrialized countries are responsible for the greatest share of past and current emissions, increased contributions from developing countries are projected to match the industrialized countries' current levels somewhere around 2020 (Yamin 2005, xxxvi).

The CDM is already being implemented in over 50 developing countries under the legal authority of the COP (Yamin 2005, xxix).

Despite the fact that the scale of the CDM market is considerably smaller than originally hoped and expected, it seems likely that the CDM will have an important role in international climate regimes aimed at reducing GHGs emissions in the future (Kenber 2005, 264).

Mexico is ranked as the 14^{th} global emitter of GHGs and it has a significant potential for developing policies and using environmental policy instruments to reduce such emissions (Bancomext, 2007).

According to the Kyoto Protocol, non-Annex I Parties are not responsible for reducing their GHG emissions during the first period of operation (2008-2012) (Bancomext, 2007). However, it could greatly help the global climate change mitigation efforts if such Parties began taking steps towards reducing their GHG emissions in a voluntary way or through a partnership with Annex I and Annex II Parties.

I believe that it is in the best interest of the worldwide efforts to mitigate global climate change, for Mexico to continue using the CDM as an environmental policy instrument that will help the country attract foreign investment for development purposes and, at the same time, contribute to the reduction of GHGs. Even though Mexico is a non-Annex I Party and thus is not required to comply with quantitative obligations, it has demonstrated an interest in CDM projects (Echegoyen 2007, 49). Furthermore, it has the political will and the needed financial and governmental institutions to pursue this task (Bancomext, 2007). For instance, Mexico is the first non-Annex I Party that will turn in its Third National Report to the UNFCCC; it is responsible for granting letters of approval for CDM activity projects; the Mexican Bank for Foreign Trade is the first Mexican financial institution to open a line of credit with Japan for the sole purpose of financing CDM projects; and it has the ability of using its business strategy component to identify CDM projects easily and offer solutions for its financing component (Bancomext, 2007).

Such positive results in management and promotion of CDM projects provide excellent proof that this mechanism has great potential and promise (Echegoyen 2007, 49). However, Mexico must work hard to improve its institutional deficiencies. While I have not spent time describing Mexico's institutional deficiencies, I should mention that Mexico needs to address and resolve such deficiencies, for the country to move forward. For instance, it needs to develop specific sustainability criteria for CDM projects (Echegoyen 2007, 49). Additionally, it must also continue to work to remove legal obstacles and diversify the type of projects and partners in CDM projects (Echegoyen 2007, 49).

The Mexican Ministry of Environment and Natural Resources (*SEMARNAT*) is directing resources for policies in the Ministries of Energy, Economics, and Social Development in support of the goals of the Climate Change Commission (Echegoyen 2007, 49). This proves Mexico's commitment to increase the establishment of CDM projects (Echegoyen 2007, 49). It is important to mention that there are many countries that have ratified Kyoto and still have not been able to enjoy the benefits offered by flexible mechanisms, because they lack the structural organization needed for CDM projects to begin operations (Echegoyen 2007, 49). Fortunately, this is not true in Mexico.

FOMECAR represents a trustworthy and legitimate entity, since it closely monitors operations to avoid trade offs and special interests to permeate. It coordinates and links the objectives and goals of the Mexican government, Mexican businesses, and international businesses, with those of the Mexican Ministry of Environment and Natural Resources (*SEMARNAT*) and the country's involvement in CDM projects, ensuring honesty and lack of corruption. That is precisely why the partnership between the Mexican government and *FOMECAR* is crucial for the successful and effective development of CDM projects in Mexico. This partnership will help Mexico become a regional leader of CDM projects, achieve economic growth, reduce unemployment, and provide businesses with the structural and financial investment incentives they need to be willing to participate.

As I write my final comments, I am cautiously optimistic about the agreements reached on the final day of COP-13 in Bali. Among other things, representatives from 187 countries have agreed to launch negotiations towards a crucial and strengthened international climate change deal by 2009. This new deal will enter into force in 2013, once the first phase of the Kyoto Protocol expires. However, as a friend of mine pointed out, Bali's agreements are not that impressive, since countries agreed to continue 'talking' about the possible commitments, instead of formally accepting them. In other words, the current climate crisis needs more commitments and fewer conversations!

Bali produced a road map, an agenda, a deadline, and the realization that there is a huge task ahead and that time is running out. According to Yvo de Boer, the UNFCCC's Executive Secretary, "this is a real breakthrough, parties have recognized the urgency of action on climate change and have now provided the political response to what scientists have been telling us in needed" (UNFCCC).

The recent UN Climate Change Conference in Bali resulted in agreements that reinforce the importance of the CDM. For example (UNFCCC):

- Governments decided that CDM funding for adaptation projects in developing countries would begin under the management of the GEF. This ensures that the Adaptation Fund will become operational in an early stage of the first commitment period of the Kyoto Protocol (2008-2012).
- Parties agreed to double the limit in size of small-scale afforestation and reforestation project activities. Expanding the number and geographical reach of the CDM to countries that have been unable to participate in the CDM for this category of project activities.

Our relationship with the planet “has been utterly transformed in a short period of time” (Gore 2007b, 51). “It is wrong to destroy the habitability of our planet and ruin the prospects of every generation that follows ours” (Gore 2007a, 1). “What is at stake is our ability to live on planet Earth and have a future as a civilization. I believe this is a moral issue” (Gore 2006, 298).

Appendix

Parties to the United Nations Framework Convention on Climate Change

1) Annex I Parties (41).

2) Annex II Parties (25).

3) Non-Annex I Parties (150).

Annex I Parties to the United Nations Framework Convention on Climate Change

Australia	Estonia	Italy	Norway	Switzerland
Austria	European Community	Japan	Poland	Turkey
Belarus	Finland	Latvia	Portugal	Ukraine
Belgium	France	Liechtenstein	Romania	United Kingdom of Great Britain and Northern Ireland
Bulgaria	Germany	Lithuania	Russian Federation	United States
Canada	Greece	Luxembourg	Slovakia	
Croatia	Hungary	Monaco	Slovenia	
Czech Republic	Iceland	Netherlands	Spain	
Denmark	Ireland	New Zealand	Sweden	

Source: http://unfccc.int/parties_and_observers/items/2704.php

Annex II Parties to the United Nations Framework Convention on Climate Change

Australia	European Community	Iceland	Netherlands	Sweden
Austria	Finland	Ireland	New Zealand	Switzerland
Belgium	France	Italy	Norway	Turkey
Canada	Germany	Japan	Portugal	United Kingdom of Great Britain and Northern Ireland
Denmark	Greece	Luxembourg	Spain	United States

Source: Echegoyen López, Mónica Paola. *La "Convención Marco de las Naciones Unidas sobre el Cambio Climático" de 1992 y la participación de México*. Mexico: *UNAM*, 2007.

Non-Annex I Parties to the United Nations Framework Convention on Climate Change

Afghanistan	Congo	India	Mozambique	Seychelles
Albania	Cook Islands	Indonesia	Myanmar	Sierra Leone
Algeria	Costa Rica	Iran	Namibia	Singapore
Angola	Cuba	Israel	Nauru	Solomon Islands
Antigua and Barbuda	Cyprus	Jamaica	Nepal	South Africa
Argentina	Cote d'Ivoire	Jordan	Nicaragua	Sri Lanka
Armenia	Democratic People's Republic of Korea	Kazakhstan	Niger	Sudan
Azerbaijan	Dem. Rep. of Congo	Kenya	Nigeria	Suriname
Bahamas	Djibouti	Kiribati	Niue	Swaziland
Bahrain	Dominica	Kuwait	Oman	Syria
Bangladesh	Dominican Republic	Kyrgyzstan	Pakistan	Tajikistan
Barbados	Ecuador	Lao People's Democratic Republic	Palau	Thailand
Belize	Egypt	Lebanon	Panama	Timor-Leste
Benin	El Salvador	Lesotho	Papua New Guinea	Togo
Bhutan	Equatorial Guinea	Liberia	Paraguay	Tonga
Bolivia	Eritrea	Libya	Peru	Trinidad and Tobago
Bosnia and Herzegovina	Ethiopia	Madagascar	Philippines	Tunisia
Botswana	Fiji	Malawi	Qatar	Turkmenistan
Brazil	Former Yugoslav Rep. of Macedonia	Malaysia	Republic of Korea	Tuvalu
Burkina Faso	Gabon	Maldives	Republic of Moldova	Uganda
Burundi	Gambia	Mali	Rwanda	U. Arab Emirates
Cambodia	Georgia	Malta	Saint Kitts and Nevis	U. Republic of Tanzania
Cameroon	Ghana	Marshall Islands	Saint Lucia	Uruguay
Cape Verde	Grenada	Mauritania	St. Vincent and Grenadines	Uzbekistan
Central African Republic	Guatemala	Mauritius	Samoa	Vanuatu
Chad	Guinea	Mexico	San Marino	Venezuela
Chile	Guinea-Bissau	Micronesia	Sao Tome and Principe	Viet Nam
China	Guyana	Mongolia	Saudi Arabia	Yemen
Colombia	Haiti	Montenegro	Senegal	Zambia
Comoros	Honduras	Morocco	Serbia	Zimbabwe

Source: http://unfccc.int/parties_and_observers/items/2704.php

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