The Clean Development Mechanism, an Analysis of the Implementation in Ecuador

Juan Carlos Parreño de la Torre

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Thesis supervisor: Jan van Tatenhove
Environmental Policy Group
Social Science Group
Wageningen University

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Acronyms

AN-MDL	Autoridad Nacional para el Mecanismo de Desarrollo Limpio del Ecuador (National Ecuadorian Authority for CDM)
BCE	Banco Central del Ecuador (Ecuador Central Bank)
CAF	Corporacion Andina de Fomento (Andean Development Corporation)
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CENACE	Centro Nacional de Control de Energía (National Centre of Energy Control)
CER	Certified emissions reduction
CIT	Contextual Interaction Theory
CNC	Comité Nacional del Clima (National Climate Committee)
CNDS	Consejo Nacional de Desarrollo Sustentable (Sustainable Development National Council)
CONAM	Consejo Nacional de Modernización del Estado (National Council for the State Modernization)
CONELEC	Consejo Nacional de Electricidad (National Council of Electricity)
COP	Conference of the Parties
CORDELIM	Corporación para la Promoción del Mecanismo de Desarrollo Limpio del Ecuador (Ecuadorian CDM Corporation for CDM Promotion)
COSUDE	Cooperacion Suiza para el Desarrollo (Swiss Agency for Development and Cooperation)
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EIA	Environmental Impact Assesment
ERPA	Emission Reduction Purchase Agreement
EU	European Union
GHG	Greenhouse gas
INAMHI	Instituto Nacional de Meteorología e Hidrologia (National Meteorology and Hydrology Institute)
INEC	Instituto Nacional de Estadísticas y Censos (National Institute of Statistics and Census)
LoA	Letter of Approval
LoS	Letter of Support
M&P CDM	Modalities and Procedures for CDM 17/CP.7
MAE	Ministerio del Ambiente (Ministry of Environment)
MEM	Ministerio de Energía (Ministry of Energy)
MOP	Meeting of the Parties
NCDMF	Netherlands Clean Development Mechanism
ODA	Official Development Aid
OE	Operational Entity
PDD	Project Design Document
PIN	Project Idea Note
PROMEC	Proyecto de Modernizacion de los Sectores Electrico, Telecomunicaciones y Servicios Rurales (Rural Services, Telecommunications and Electric Sector Modernization Project)
SICA-MAG	Servicio de Información y Censo Agropecuario del Ministerio de Agricultura y Ganadería del Ecuador (Agricultural Census and Information Service of the Ministry of Agriculture and Livestock of Ecuador)
UNFCCC	United Nations Framework Convention on Climate Change

SUMMARY

The present study aims to analyze how the Clean Development Mechanism is implemented in Ecuador and the factors determining its course of events. In order to achieve this, an effectiveness evaluation and an analysis of the actors and how they affect the implementation were proposed. The analytical framework developed is based on the concepts of Policy Evaluation and Intervention Theories for the effectiveness evaluation and the Contextual Interaction Theory and Policy Networks for the role of actors and their effect on implementation. Since the CDM is in an initial stage of implementation and its final effects will be observable in a long term, the evaluation framework will have an ex-ante perspective. Additionally, with the use of the intervention theory, a set of prerequisite for effectiveness was identified. Consequently, the effectiveness evaluation consisted in gathering information in order to verify whether or not these prerequisites were occurring. Regarding the effect of actors over implementation, the implementation of CDM is viewed as a social process in which the interaction among actors determines its outcomes. The interaction among actors was defined as the network dimensions of structure, rules of the game, motivation, distribution of power and resources and access to information. The study was focused on the implementation of CDM in Ecuador at the national level, directed at the renewable energy and municipal solid waste sectors.

It was concluded that CDM implementation in Ecuador has contributed to the achievement of the objectives of the mechanism at the host country level. In this case, it means a contribution to the country's sustainable development and its participation in the carbon market. In general, the largest share of emissions reductions are achieved from projects in the renewable energy and landfill gas sectors, whose effects contribute to the country's expectation of sustainable development. Additionally, the CDM regime has been adopted in the country and the necessary regulatory and institutional frameworks are in place and performing acceptably. However, there are also several barriers due to the complex investment situation for project development in the country and the high dependency from foreign resources of the main regulatory and promotional institutions of CDM in Ecuador. Additionally, the social dimension of sustainable development is overlooked partly because of the requirements of the national approval process and partly of the inherent characteristics of the technologies used in the current CDM projects. It was found that the differences in the outcomes of the implementation among the renewable energy and the municipal waste management sector is mainly due a more complex rule system, less access to information and more difficulties in the mobilizations of resources for project developers in the municipal solid waste sector.

1. INTRODUCTION

1.1. Problem description

The Clean Development Mechanism (CDM) is one of the three flexible mechanisms of the Kyoto Protocol. The objectives of the CDM are "to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3"(UNFCCC, 1997). Because of its characteristics, the Clean Development Mechanism is expected to have considerable effects in the climate change regime. Some of these effects are to assist developed nations in reducing their cost of climate change mitigation and at the same time allowing developing nations to contribute to their sustainable development. Within the logical change of events necessary to achieve these objectives, several other intermediate effects are expected. For example, in the case of developing nations, the execution of CDM project activities are expected to generate employment, technology transfer, environmental improvement, generation of income, attraction of foreign investment, de-carbonization of the economy, involvement of developing countries in the climate change regime, etc. However, the CDM was faced with several complications during its development, and still deals with limited resources and complaints of being too bureaucratic or politically driven. Additionally, since the nonparticipation of the USA (which represents around 30 to 40% of the greenhouse gases (GHG) emissions globally), CDM did not become fully operational until 2005, after Russian ratification. Since then, the CDM has been developing fast, already surpassing the 1 billion tones mark by June 2006 and with 210 registered projects (UNFCCC, 2006).

On the other hand, it has been argued that the dual objective of the mechanism is contradictory. Since it is a market based instrument, it has favored low cost and end of pipe technologies from large volume projects, diminishing the sustainability component of the mechanism. Moreover, since developing nations do not have abatement objectives under the Kyoto Protocol and CDM is voluntary in nature, a geographical polarization of projects to countries with high GHG reduction potential and lower costs has been observed. However, certain exceptions exist as proof that not only high potentiality, but other criteria also affect the development of the mechanism. Additionally, since projects are to be executed during a period of 7 to 21 years and due to the long-term nature of the climate change problem, the effects of the contribution to the climate change regime will be only observable in the long term. Consequently, due to the recent introduction, innovation, relevance, magnitude and expected effects of CDM, the analysis of how this instrument is being implemented is relevant for research.

Ecuador ratified the Kyoto Protocol in 2000 and is among the countries not included in the Annex I. Thus, Ecuador can be a host country for CDM project activities. Although Ecuador, by volume, is not one of the big players in the CDM market, the mechanism has been implemented in the country through the adoption of the international regime and the actual execution of projects. The highest concentration of projects is in the renewable energy and municipal solid waste sectors and several national and international actors have entered into the implementation process. Consequently, the same discussions regarding the effects of CDM mentioned above can be observed from the country's perspective and how it is interacting with the global carbon market and the climate change regime.

Based on these facts, this study aims to gather information of how CDM is being implemented at this early stage based in a study in Ecuador. The research will try to identify how the CDM regime was adapted in the country, how CDM projects are being executed, and whether these activities are achieving the expected objectives of CDM. Furthermore, it will analyze how the actors involved in CDM in Ecuador and their interactions have affected the observed implementation.

1.2. Objectives

This research aims to analyze the implementation of the Clean Development Mechanism in Ecuador as an example of a Non-Annex 1 country in the Kyoto Protocol Parties. In order achieve this the following secondary objectives are formulated:

- *To evaluate the implementation of CDM in Ecuador by analyzing the actual effects and implementation processes of CDM against defined criteria of effectiveness*
- *To analyze the role of actors and their influence on CDM implementation by exploring the nature and typology of their interactions*

1.2.1. Research questions

The effectiveness evaluation will require an analysis of how the mechanism has been implemented so far in the country. This will include the analysis of the institutional and regulatory frameworks, the execution and characterization of projects, and the definition of effectiveness criteria. The end result will be an assessment of the degree to which the CDM implementation in Ecuador is achieving its expected effects. This in considered in research question number 1.

1. *What is the effectiveness of CDM implementation in Ecuador?*

Furthermore, the research will not only aim to determine how the mechanism has been implemented, but will also try to explain why such outcomes have occurred. This is addressed in research question number 2, which aims to determine which actors are involved in CDM implementation in Ecuador and how they interact. Using the perspective of implementation as a social process, it will aim to explain that actors and their interactions within the form of networks, determine the outcomes of such implementation and consequently its effectiveness.

2. *What is the role of actors in CDM implementation and how they influence the process?*

In order to answer the first question, detailed information on the implementation of CDM in Ecuador will be obtained and compared to the objectives of the mechanism. The following questions are considered:

- What are the main objectives of CDM?
- What are the main outputs of CDM in Ecuador?
- What are the implementation processes for CDM in Ecuador?
- What are the main outcomes of CDM implementation in Ecuador?
- What perception do actors have of the implementation processes of CDM in Ecuador?
- To what degree do the obtained outcomes meet the effectiveness criteria?

Regarding question number two, the main actors and their interactions will be explored. Once determined it will be use as an explanatory argument of why CDM has been implemented as it is in Ecuador:

- Who are the main actors involved in CDM implementation in Ecuador?
- What networks have been changed or modified by CDM in Ecuador?
- How do networks characteristics determine the observed outcomes of CDM implementation in Ecuador?

1.3. Material and methods

As described by Patton (1988), Implementation Evaluation requires rich case data with the details of program content and context, thus creating conditions for a naturalistic inquiry research approach. This means that the program or its actors are not manipulated like they are in the case of experimental designs. In fact, the naturalistic approach is more focused on capturing the program processes, documentation variations and individual differences between participant's experiences and outcomes.

Under this guideline, as no manipulation of the research object is expected, this research will follow a naturalistic inquiry approach. This means that the research methods to be applied will obtain the information regarding the implementation of CDM as it is occurring in Ecuador. Furthermore, it will make use of a combination of qualitative and quantitative methods for data collection and analysis with a triangulation perspective. Thus, it will search for a variation in methods and data sources to support a conclusion in order to reduce bias regarding a single source or method. As indicated in Figure 1, the main methods used were: literature review, statistical analysis, case studies and semi structured interviews; and the main data sources were relevant actors involved in CDM implementation in Ecuador, specific CDM projects and quantitative data regarding the mechanism implementation.

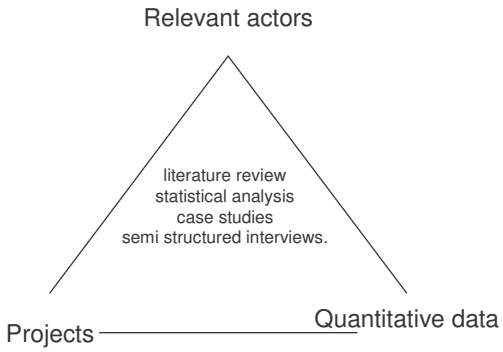


Figure 1 Triangulation of sources and methods

- The literature review was focused on the analysis of written documents. It was used in the conditional, institutional and target group effectiveness evaluations; and also in the characterization of networks. It consisted of a review of the national information regarding the last GHG inventory conducted in Ecuador in 1994, the statistical and financial information from Ecuador that determine the investment environment, different studies regarding CDM implementation and evaluation, documents produced by both AN-MDL, Cordelim and other related organizations, and also the relevant procedures and regulatory framework affecting CDM and project implementation.

- Statistical analysis was used to determine the conditional and institutional effectiveness. Descriptive statistics were mainly used to analyze different sources of quantitative data as the global GHG emissions data base from World Resources Institute (WRI, 2006), the UNEP/RISOE CDM pipeline data base (Fenhann, 2006), etc. The main techniques used were frequency analysis, quartiles composition and graphical analysis (Annex 4).

- Semi-structured interviews were conducted for a set of relevant actors involved in CDM implementation in Ecuador. Actors in different sectors (Annex 1) were faced with a similar open questions questionnaire, either recorded personally or via email. Actors in specific sectors were offered certain variations of the questionnaire, mostly to obtain specific information about their organizations. For the study 60 different actors where contacted and

40 interviews were obtained. (Annex 1). The sampling approach was *elite interview* Kim (2004) in which people with a particular knowledge or influence on the process are interviewed. Additionally, snow-ball sampling was applied to the original set of interviewees when more relevant actors were mentioned. The main objective of the interviews was to obtain the actors perception of the implementation process of CDM, the instrument itself and the interaction they have had with other actors during implementation. The basic questionnaire is shown in Annex 2.

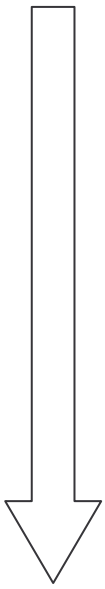
- Case studies were based on a criterion sampling approach (Patton, 1988). Thus selecting cases in which certain criteria is met. In this case, in order to asses the initial effects of CDM implementation and the networks and the effect over implementation, 2 CDM projects with implications to the broader sectors where they are implemented were selected as case studies. The cases are a project in the renewable energy and in the municipal solid waste management sectors.
- The results of the research will integrate both the general country level information with the in-depth and more specific results of the case studies in order to generate a more comprehensive assessment of the implementation of CDM in the country.

1.4. Scope and limitations

It should be noticed that the time and resource restrictions of this Masters thesis have limited the scope of this research. Mainly, this is due to the detail that a complete analysis requires. For example, the CDM potential in a country is specific to different sectors, projects and also methodological issues; as it is reflected in the scarcity and accuracy of such information in the CDM market. Additionally, due to the project and market orientations of CDM, the potential actors who can implement CDM projects in a country are as varied as the sectors covered by the Kyoto Protocol. This not only depends on the possibility of a project to be applicable for CDM, but also on the resources and other project microeconomics factors. Additionally, CDM is a market mechanism that is applied on a project by project basis with the aim to generate local and global effects. Thus, it could be evaluated at each of these levels. Consequently, this study is mainly focused on the implementation, effects and actors at the Ecuadorian level and in the two sectors mentioned before. Finally, the methodological approach of this research is mostly qualitative and it should be considered as indicative because it does not aim to provide information that is statically representative of the whole CDM implementation in Ecuador, but rather examples of it.

1.5. Thesis structure

This thesis is divided in 7 main chapters. A description of the problem and the methodological and conceptual frameworks are given in chapter 1. Chapter 2 provides a basic description of CDM, the actors involved and the implementation procedures Chapter 3 describes the analytical framework developed for this research, which includes the theoretical model developed for analyzing CDM implementation, a description of the policy evaluation framework, interventions theories, policy networks, the contextual interaction theory and the operationalization of such concepts for their further application. Based on the criteria defined in the theoretical chapter, the implementation of CDM in Ecuador is evaluated in chapter 4. This chapter further describes the conditional, institutional, target group and impact effectiveness. In chapter 5, the main actors and their functions of CDM implementation in Ecuador are analyzed. It aims to explain how actors and their interaction determine the observed outcomes of the implementation. Finally, it also identifies which networks have been changed or modified by CDM. In chapter six, the main findings regarding CDM implementation and the concepts used in the theoretical framework will be discussed. The final chapter, number seven, presents the conclusions and recommendations based on the findings of the study. The relation between the work flow and chapter distribution is shown in Table 1.



Description	Chapter
1. Introduction	1
2. General description of CDM	2
3. Definition of analytical framework	3
4. Application of framework in the selected sectors in Ecuador. As a result the actual state of implementation will be obtained and how it is related to the objectives of CDM	4
5. Description of the actors, who they are, what they do and how they interact; using the network variables: structure, rules of the game, information access, independence of resources and convergence of motivations	5
6. Correlate the actual implementation observed in chapter 4 to the network analysis and the analytical framework in order to explain how implementation has occurred in such way	5
7. Based on network description determine if new networks have appeared due to CDM	5
8. Discussion of the theoretical framework	6
9. Conclusions and recommendation	7

Table 1 Research work flow

2. THE CLEAN DEVELOPMENT MECHANISM

2.1. The development of the CDM

The United Nations Framework Convention on Climate Change (UNFCCC) was signed at the Rio Earth summit of 1992. Its main aim was to "stabilize greenhouse gas concentrations in the atmosphere at such levels that would prevent dangerous anthropogenic interference with the climate system"(Art. 2.). The Convention also reinforces that the main responsibilities of the climate change problem correspond to industrialized countries. However, it was not until December 1997 on COP-3 at Kyoto that legally binding targets and time tables where laid down, referred to as the Kyoto Protocol (UNFCCC, 1992; Sijm, Ormel et al., 2000)

The main target of the Kyoto Protocol is to reduce the overall emissions from industrialized countries (referred as Annex I countries) of 6 selected greenhouse gases (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) by at least 5% below the levels recorded in 1990 during the commitment period 2008-2015. In order to reach this objective, the Kyoto Protocol allows the use of three flexible mechanisms: Emissions Trading (ET), Joint Implementation (JI) and the Clean Development Mechanism. (UNFCCC, 1997)

Each type of mechanism has a different way in which GHG emissions can be reduced and what countries can participate in it. Emissions trading mechanism can occur only between Annex I countries, which have an objective of reduction under the protocol. Countries that are below their limits can sell the excess right of allowances to Annex 1 countries that have exceeded their limits and whose cost of reduction are higher. Joint Implementation can be also be implemented between Annex I countries. However, one of the parties implements an emission reduction or removal project in another country, which commonly has lower abatements costs. These other countries are usually countries with economies in transition. Finally, the CDM is the only mechanism that can be implemented between an Annex I party and a non-Annex 1 country - commonly a developing country. The CDM mechanism is also project-based and the project will generate emission reductions that have a lower cost and that could be traded with Annex I parties for use in their Kyoto Protocol commitments.

Interestingly, the emissions trading system perspective of the Kyoto Protocol started in the United States of America (USA) and were opposite to the regulatory approach from the EU. However, the USA Senate disagreed with the way in which developing countries were engaged in the protocol and the Kyoto Protocol did not satisfy their concerns about future emissions from developing countries. At the end, the USA withdrew from all Kyoto Protocol participation in March 2001 (Damro and Luaces-Méndez, 2003; Painuly, 2003). On the other hand, the EU adopted these ideas and assumed a leadership position in climate change and continued further with the Kyoto Protocol. (Damro and Luaces-Méndez, 2003)

Already at the UNFCCC, on article 4.2 (a) it was considered that Parties can collaborate in the achievement of their objectives, although the Parties were not defined as developed or developing nations (Figueres, 2006). On the other hand, Parties from developing countries worried about CDM not being beneficial for them, unless certain amount of funds were directed to their climate change adaptation needs (Foot, 2004). Specifically Brazil, proposed a "Clean Development Fund" as a part of the Kyoto Protocol. Such a fund would have obtained its resources from penalizing developed nations that did not comply with their Kyoto Protocol commitment and would have helped to conduct mitigation activities in developing nations. Since this proposal was not accepted, the CDM was developed as an alternative compromise. (Kill and Pearson, 2003; Figueres, 2006).

However, the CDM was developed at the end of the Kyoto negotiations, and several issues remained undefined. Only at the COP7 (Conference of the Parties) in 2001 were the Marrakech accords developed. This created the CDM Executive Board and provided guidelines and modalities for implementation of CDM (UNFCCC, 2002), which have been continuously changing with the increasingly number of projects under development.

Since the Kyoto Protocol would only become legally binding after country ratification (Sijm, Ormel et al., 2000), the Kyoto Protocol only entered into force on February 16th 2005 after Russian ratification and the withdrawal of the United States and Australia. Currently, 163 (April 18th 2006) Parties have ratified the protocol (UNFCCC, 2006).

2.2. CDM fundaments

Based on the evidence of global warming due to anthropogenic causes (IPCC, 2001), the Kyoto Protocol, with its three flexible mechanisms, aims to mitigate the emission of GHG to the atmosphere (UNFCCC, 1997).

From an economic perspective, air can be classified as a common resource with non defined property rights. Thus, overuse and free-riding is possible, leading to several social impacts and costs as in the case of climate change and its several consequences for society. In this case, an ideal solution would be to distribute the right of emissions among the users. However, the amount of emissions to be assigned to each user should be placed within an optimum interaction of economic, ecological and equitable social distribution factors. Consequently, once the equitable social distribution and environmental factors are determined, the economic considerations can be used as a tool to achieve the set objectives via economic instruments. Nevertheless, the kind of instrument necessary to achieve this is quite complex, since the receivers of the emissions rights (allocations) can vary largely and in different aspects (Blignaut, 2004).

A tradable emissions permit system has been proposed as the most cost-effective instrument that can combine the economical efficiency with the social and environmental constraints. The system is based on the marginal abatement cost for each user. In a tradable emissions permit systems, users are allowed to have a certain amount of emissions. When two users have different marginal abatement costs, the users with a lower cost can profit from selling their allowances when their emissions are under the assigned limit. Users with higher abatement costs can comply with their limits and profit by buying cheaper allowances.. Both users can benefit from the trade until they reach the point when their marginal abatements costs are equal for both of them (Blignaut, 2004).

According to the rationale of CDM, since emissions of GHG from different global sources mix in the atmosphere, the mitigation activities could take place regardless of the source and consequently where it is more cost effective. This is in line with the tradable emissions permit theory mentioned above. In fact, CDM and JI correspond to the baseline and credit system type of tradable emissions trading. This type is based on the issuance of credits to polluters that reduce their emissions below a pre-defined baseline. These credits can then be traded with other emitters that have an emissions compliance target, thus searching for a reduction of cost and equalizing the marginal abatement costs worldwide (Foot, 2004; Krey, 2004).

2.3. CDM Objectives and conditions

The objective of CDM is defined in article 12 of the Kyoto Protocol as: “to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3” (UNFCCC, 1997).

The CDM allows for the implementation of emission reduction projects in the Non Annex I countries, which do not have commitments for this Kyoto Protocol period, making them as the host Parties. The amount of emissions reduced will be obtained from the difference of the emissions of the project and the emission of a selected baseline. These emissions reductions, once certified by the Executive Board of CDM, can be traded with the Annex I Country, which it will use to fulfill its Kyoto Protocol commitments, as seen in Figure 2. The Non Annex I Country will use the benefits of the CDM projects and the trade of CERs to promote its sustainable development. The Annex I Country will use a cost effective option to achieve their Kyoto Protocol commitments and consequently to achieve the Kyoto Protocol objectives.

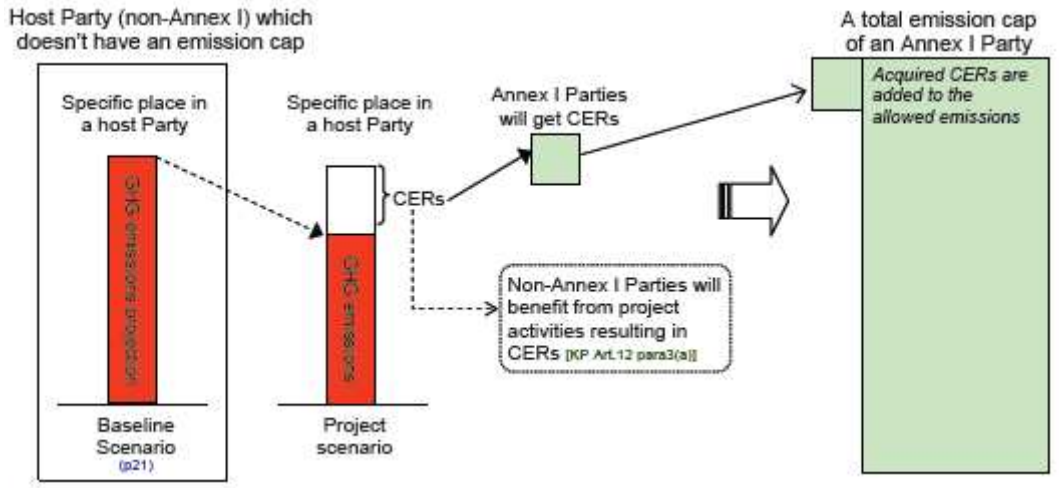


Figure 2 CDM description
Source: (Ministry of the Environment of Japan and Institute for Global Environmental Strategies, 2005)

The CDM is a market mechanism created from political efforts. Thus, the regulatory frameworks at the international and national level regulate the market created. The same can be applied to the objectives of CDM, since they are determined both at the national and international levels, especially because the host countries are the ones specifying how the instrument contributes to their sustainable development. Consequently, the general objective of CDM regarding the contribution to sustainable development of the host country becomes more specific when the national authorities make it operational in the procedures for national approval.

2.3.1. CDM Conditions

On Article 12 (5) the Kyoto Protocol indicates that the emissions reductions to be obtained from a project activity should be:

- Voluntary participation approved by each Party involved;
- Real, measurable, and long-term benefits related to the mitigation of climate change; and
- Reductions in emissions that are additional to any that would occur in the absence of the certified project activity (UNFCCC, 1997).

2.3.1.1. Additionality and Baselines

The additionality of a CDM project activity is outlined in the Marrakech Accords, i.e. "A CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity"(UNFCCC, 2002). In order to describe what would have occurred in the absence of the CDM project, the baseline concept is introduced. A baseline is: "the scenario that reasonably represents the

anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity"(UNFCCC, 2002). Thus, when the emissions of a CDM project activity are below the ones of the baseline; an additional emission reduction has occurred, as shown in Figure 3.

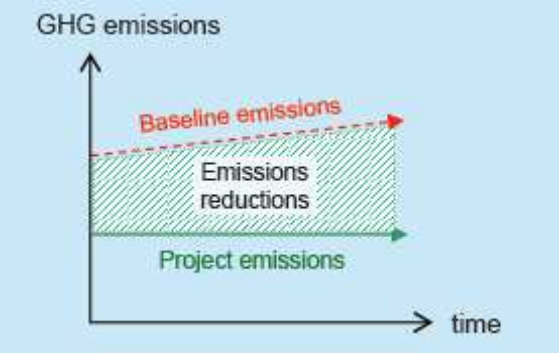


Figure 3: Baseline scenario of a CDM project activity
Source (Ministry of the Environment of Japan and Institute for Global Environmental Strategies, 2005)

A baseline scenario is expected to be project specific, transparent and conservative regarding the methods and assumptions used. It accounts for relevant national and or sectoral policies and circumstances, considers uncertainties, avoids the earning of CERs by events outside the project activity and is based on a comprehensive methodology (UNFCCC, 2002). However, a baseline is a counterfactual scenario of the emissions without the CDM project activity (Krey, 2004) and is hypothetical in nature (Shrestha, Sharma et al., 2005) because several possible scenarios can occur in the baseline without the CDM project activity (Begg and Horst, 2004).

This creates a link between the additionality of a CDM project and the selection of baseline (Krey, 2004). The additionality of the project will be reflected (or assessed) on what is done by the project activity over the baseline scenario. Efforts to integrate both assessments have been included in the development of different methods for baseline selection and additionality assessment. In fact, the Methodology Panel has proposed a draft tool for the selection of a baselines scenario and the CDM Executive Board has already approved the use of the tool for the demonstration and assessment of additionality (UNFCCC, 2005).

Finally, the establishment of a baseline scenario by a project participant should be either in accordance with the steps indicated in an existing and approved methodology or by the proposal of a new methodology (UNFCCC, 2002). Methodologies generally refer to baseline and monitoring methodologies. A baseline methodology explains how the baseline scenario has been selected and how the additionality of the project will be assessed. It also explains how to calculate the emissions reductions and the definition of the boundary of the project (CDM Executive Board, 2003). Monitoring methodologies detail the methods and data used to implement a monitoring plan for the project. The monitoring plan details the methods that will be used to collect and archive the data and information necessary to determine the baseline and measuring of the emissions and leakage of GHG within the project boundary and the quality control procedures for the monitoring process. In the case that no methodology exists for the specific project, a new methodology can be proposed (CDM Executive Board, 2005). New methodologies will be assessed by the Methodology Panel, and if approved, made available by the UNFCCC so it can be used in other projects.

2.3.1.2. Contribution to sustainable development of the host country

The assessment of the contribution to sustainable development indicated in the objective of CDM has been delegated to the host countries (UNFCCC, 2002). Assessment is one of the principal functions assigned to the Designated National Authorities and thus, can vary according to each country's own objectives and definition for the contribution of CDM to its sustainable development. Consequently, the possible contributions of CDM to sustainable development can also significantly vary. For

example, the following can be considered a list of contributions to sustainable development (Sutter, 2003; Kim, 2004; Sutter and Parreño, 2005) :

- Empowerment of poor people
- Creation of employment
- Poverty eradication
- Environmental performance: decrease in emissions, decrease in fossil fuel use, air, solid and water quality improvement
- Enforcement of environmental regulation
- Rural development
- Technology transfer
- Stakeholder participation
- Capacity development
- Increase of revenues in the project region
- Etc.

2.3.2. Participation requirements

The main requirements for participation in CDM are:

- Participation should be voluntary
- A national authority for CDM should be designated in each Party
- Parties that are not included in Annex 1 can participate in CDM as long as they are signatories of the Kyoto Protocol
- Annex 1 Parties that want to use CER should: be part of the Kyoto Protocol, defined its reductions objectives (as stated in Article 3 of the Kyoto Protocol), have a national system for estimation of emissions and removals of GHG, have a national registry of GHG and supplied the latest inventory of GHG and additional information required by the protocol.
- When private or public entities participate in CDM activities, the Party authorizing such involvement will be responsible and will verify the consistency of the participation of these entities according to the Kyoto Protocol (UNFCCC, 2002)

2.3.3. Sectors and gases covered

The sectors and gases covered by the Kyoto Protocol, and thus by the CDM, are the following: Carbon dioxide (CO_2,) Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6). The main sectors are described in Table 2. (UNFCCC, 1997)

Energy	**Industrial processes**	**Agriculture**	**Waste**
Fuel combustion Energy industries Manufacturing industries and construction Transport Other sectors Other Fugitive emissions from fuels Solid fuels Oil and natural gas Others	Mineral products Chemical industry Metal production Other production Production of halocarbons and sulphur hexafluoride Consumption of halocarbons and sulphur hexafluoride Other	Enteric fermentation Manure management Rice cultivation Agricultural soils Prescribed burning of savannas Field burning of agricultural residues Other	Solid waste disposal on land Wastewater handling Waste incineration Other
Solvent and other product use			

Table 2: Sectors and categories of sources of the Kyoto Protocol
Source:(UNFCCC, 1997)

Based on he previous mentioned sectors, a set of sectoral scopes was developed by the Accreditation Panel of the CDM. This sectoral scopes are mainly used to correlate the Operational Entities according to their expertise and the type of projects they can asses. Besides, since the CDM methodological procedures has a bottom-up project approach (which means that project developers can propose new methodologies for new kind of projects in existing or new sectoral scopes), the existing sectoral scopes may increase. However, these sectoral scopes could be used as an indication of the sectors in which CDM can be implemented.

The main sectoral scopes for CDM are (UNFCCC, 2006):

1. Energy industries (renewable - / non-renewable sources)
2. Energy distribution
3. Energy demand
4. Manufacturing industries
5. Chemical industry
6. Construction
7. Transport
8. Mining/Mineral production
9. Metal production
10. Fugitive emissions from fuels (solid, oil and gas)
11. Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride
12. Solvents use
13. Waste handling and disposal
14. Afforestation and reforestation
15. Agriculture

These sectoral scopes determine that the main CDM activities may be either a reduction in emissions (mostly sectoral scopes from 1 to 13 and some projects in the agricultural sector), where due to increase of the efficiency, change towards less carbon intensive fuels or by displacing power generation with power fuels among others, decrease the amount of GHG emitted to the atmosphere. On the other hand, capture (sink) projects, as the case of forestry projects or the management of carbon in the soils (sectors 14 and 15), in general terms aim to capture through biological process carbon that is in the atmosphere. It should be noticed that in the forestry sector, no conservation of the carbon stored in existing forest was considered in the Kyoto Protocol.

2.3.4. Scales

The CDM involves a different range of activities that can fit in the categories mentioned below. However, in order to differentiate the type of projects a categorization according to the scales of the CDM project activities has been made. The projects that are equal or inferior to 15MW on energy output, 15GWh/year of energy efficiency improvements and other projects that will reduce less than 15 ktCO2 per year are considered small scale CDM project activities. These projects will be under a set of simplified modalities and procedures for CDM implementation and also have a smaller certification fee (UNFCCC, 2002).

2.4. CDM Institutional framework

2.4.1. Conference of the Parties

The Conference of the Parties serves as the Meeting of the Parties of the Kyoto Protocol (COP/MOP). It is the ultimate decision-making body of the UNFCCC. The COP/MOP will decide and provide guidance over the Executive Board of the CDM and its recommendations. It will also designate the

operational entities (designate operational entities, Designated Operational Entity) accredited by the executive board and the accreditation standards. It will review the annual reports of the CDM Executive Board (EB); observe the distribution of Designated Operational Entities and CDM project activities at regional and sub-regional level and will promote the accreditation of these entities in developing countries and the equitable distribution of CDM project activities; and finally to assist in the arrangement of funding for the CDM project activities (UNFCCC, 2002).(Ministry of the Environment of Japan and Institute for Global Environmental Strategies, 2005).

2.4.2. The Executive Board of CDM

The Executive Board (EB) supervises the CDM under the authority and guidance of the COP/MOP, it is responsible mainly for:

- Recommendations to the COP/MOP on modalities and procedures for CDM and modifications to the procedures of the 123
- Report to the COP/MOP about its activities
- Approval of new methodologies (baselines, monitoring plans and project boundaries)
- Review of provision regarding simplified modalities, procedures and definitions of small scale project activities and to make recommendations to the COP/MOP if necessary
- To be responsible for accrediting operational entities and accreditation standards, and to recommend to the COP/MOP for the designation of operational entities
- Report to the COP/MOP the regional and sub-regional distribution of CDM project activities and identify barrier to its equitable distribution
- Make publicly available information regarding to CDM project activities in need on funding or looking for investment opportunities
- Make any technical reports to the public and provide a period of at least 8 weeks for public comments on draft methodologies and guidance
- Develop, maintain and make publicly available all the approved rules, procedures, methodologies and standards
- Develop and maintain a CDM registry and also a CDM publicly available database which should contain the project activities, project design documents (PDD), comments received, verification reports, decision and information related to CERs issued.
- Address and mediate to the COP/MOP issues presented by project participants or Designated Operational Entities regarding the modalities and procedures for CDM
- Elaborate and recommend to the COP/MOP for adoption as its next session procedures for conducting the reviews for the registration and issuance of CERs
- To accept a project that has been formally validates as a CDM project activity, referred as registration of a CDM project.
- To instruct the CDM registry administrator to issue CERs for a project activity.

(UNFCCC, 2002; Ministry of the Environment of Japan and Institute for Global Environmental Strategies, 2005)

2.4.2.1. Panels and Working Groups

The CDM Executive Board can establish committees, panels and working groups to assist it in its functions and make use of expertise knowledge from the UNFCCC expert group and other external sources, maintaining a perspective of regional balance (UNFCCC, 2002). The existing panels and working groups so far are (UNFCCC, 2006):

- ***Accreditation Panel (AP)***

  The Accreditation Panel will recommend to the CDM Executive Board regarding the accreditation, suspension, withdraw and re-accreditation of Operational Entities. Additionally will select and interact with the CDM accreditation assessment team (CDM-AT) (CDM Executive Board, 2002).

- ***Methodology Panel***

  The Methodologies Panel is to deal with the assessment of proposed new methodologies and to recommend and assist the CDM Executive Board in several aspects. Regarding the proposed new methodologies, the Methodology Panel will: provide recommendation to the CDM Executive Board on proposed new baseline and monitoring methodologies, provide recommendations for the selection among similar methodologies, recommend in options regarding the expansion of the applicability of methodologies and to maintain a group of experts that will review and evaluate proposed methodologies. With respect to the recommendation to the CDM Executive Board (EB), the Methodology Panel will conduct revisions of the existing PDD format especially in the baseline and monitoring sections, development of methodological tools for the selection of methodologies and further guidance in the development of new methodologies (CDM Executive Board, 2004).

- ***Afforestation and reforestation (AR WG)***

  The Afforestation and Reforestation Working Group has a function similar to the Methodology Panel, but is specified to the afforestation and reforestation project activities. Consequently, it will also provide recommendation of new afforestation and reforestation proposed methodologies, methodological tool, etc. The ARWG is to work in collaboration with the Methodology Panel (CDM Executive Board, 2004).

- ***Small Scale Working Group (SSC WG)***

  The Small Scale Working Group function is to provide the CDM Executive Board with recommendations regarding new proposed baseline and monitoring methodologies and project categories for small-scale project activities(CDM Executive Board, 2004).

2.4.3. Designated Operational Entities

A Designated Operational Entity (Designated Operational Entity) is generally a private organization or legal entity, either domestic or international that is capable of conducting credible and independent assessments of emissions reductions and that has been accredited and designated by the CDM Executive Board and confirmed by the COP/MOP. The main functions of the Designated Operational Entity are to: validate proposed CDM project activities and request registration for CDM project activities; and to verify and certify emission reductions of registered CDM project activities and to request to the CDM Executive Board the issuance of the respective Certified Emission Reductions (CERs). According to CDM Executive Board decision one or many Designated Operational Entities can perform one or all the activities mentioned (Fenhann, Halsnæs et al., 2003; UNFCCC, 2006).

2.4.4. Designated National Authorities

To designate a National Authority is a requisite for any Party participating in CDM. The approval from both Parties' national authorities is necessary for the submission of a validated CDM project activity to the Executive Board. In the case of the host country, it is their prerogative to evaluate and confirm the contribution of a CDM project activity to its sustainable development objectives (UNFCCC, 2002).

National Authorities are to elaborate and manage the guidelines and procedures for the approval of CDM project activities at the host country level. Within this guidelines and procedures, National Authorities should develop the criteria and requirements to asses the compliance of CDM project activities with relevant national policies and regulation and the contribution to the country's

sustainable development (Fenhann, Halsnæs et al., 2003). Additionally, National Authorities also lead other activities related to CDM development as: raising awareness and capacity building events, assist in project identification and development at an initial phase, development of the supply side of the CDM market, etc. (Castro, 2005).

2.4.5. Project Participants

A CDM project participant could be either a Party (country) involved or a Private/Public entity which takes part with the authorization of the Party, and whose participation is voluntary. Approved project participants are the only ones that can decide the used of the obtained CERs (CDM Executive Board, 2005).

Project participants are the individual actors that will be involved in the development of the project activity. As mentioned above, in order to participate private and public entities need to obtain authorization from their respective National Authority (CDM Executive Board, 2005).

2.4.5.1. Actors involved in CDM

CDM allows for a wide variety of actors to participate in several different arrangements. Actors in Annex I countries will want to buy CERs in order to achieve in a cost effective way their Kyoto Protocol commitments. Actors in Non-Annex I countries will conduct CDM projects in order to generate CERs that will be traded with Annex I actors and ultimately obtain a profit. Additionally, several other actors interact around this group. These intermediate groups correspond mainly to actors that will mediate the transaction between the buyers and seller of CERs or that will provide them with goods and services necessary for the transaction or finally as societal pressure groups. The interactions and interest of these groups varies widely and is explained below based in the works of: (Stewart, Anderson et al., 2000; Krey, 2004; Streck, 2004; Laseur, 2005)

In Annex I countries, both the government and the private sector have GHG reduction objectives and can participate in CDM. Consequently they will aim to use CERs from CDM projects to do so. In order to achieve this, they could follow several paths: they could buy CERs directly from project participants in Non-Annex I countries, either on an agreement before the project has started via an ERPA or once the project has obtained its CERs. They may also like to secure their provision of CERs and participate directly investing and implementing the project, thus sharing the risk with the Non-Annex I actor in exchange of a part of the CERs. This is called the bilateral arrangement.

In Non-Annex I countries, also private companies and the government can develop CDM projects. In the case of a shared investment of an Annex I country in a CDM project they will benefit from the capital, technology and knowledge the investor may bring. On the other hand, they may also want to directly profit from bringing the CERs of their project to the market, in which case they should be able to provide all the investment and access to the necessary technology. This arrangement is denominated unilateral.

Another type of arrangement is the development of funds or utilities. Both Annex I and Non-Annex I countries can develop funds. In the case of Annex I funds, they aim to integrate a project portfolio of different CDM projects. The fund collects resources from the Annex I countries that will be used to fund the portfolio of projects. Through this way the Annex I actors reduce the risks by increasing the volume and diversity of projects they get CERs from. Non-Annex I actors will benefit from the resources provided by the fund. However, the CERs from the project will be directed to the fund. In the case of a Non-Annex I actors fund, generally a government will try to collect resources that may be used to develop CDM projects. Consequently, once obtained project participants or the country fund will have control of the CERs and may obtain a higher profit in the market. Generally funds are

founded by governments and executed via regional or unilateral development banks or by joint ventures with consultancy companies.

Additionally, the CDM has promoted the development of a variety of companies that provide goods and services to the market. One of this is the intermediation or brokerage of CERs, in which private companies (generally from Annex I countries) intermediate between the producer and the buyer. In this case they manage a portfolio with a volume and diversity that enables them to profit from the transaction and thus reducing risks to the buyers. Generally brokerage companies do not invest in projects. Regarding the rest of goods and services companies, the consultancy sector and the technology providers have an active participation in CDM. Due to the complexity of the process, it is common for project developers to contract consultancy companies, which will develop all the necessary documentation and assist the developers throughout the process. As mentioned above, consultancy companies can also participate in project investment and trading of CERs, not only within the fund arrangement, but also with their on resources. The consultancy sector can be mainly placed in the Annex I countries. However, lately more Non-Annex I companies have entered the market. Finally, since the CDM carbon reduction objective demands in most cases a change in technology, technology providers also have an important role in CDM and have a possibility to profit from an increase in the demand of their products. Also based in Annex I countries, technology providers have also started to participate more in project development, including investment, implementation and also the creation of joint ventures with intermediaries and consultancy companies. The intervention of brokerage companies, funds and other intermediaries corresponds to the intermediation arrangement.

Table 3 and Figure 4 provide a description of the functions that the different actors have and the arrangements they form in CDM implementation.

Region	Actors	Functions							
		Project Implementation	Intermediation	Goods and services	Project Investment	Project Funding	Social pressure	CERs Buyer	CERs Seller
Annex I	Government (Party) Annex I Country	X			X	X		X	
	Private/public entity Annex I Country	X			X			X	
Global	Consultancy companies	X	X	X	X			X	X
	Brokerage companies		X	X				X	X
	Technology providers	X		X	X			X	X
	Carbon Funds and Utilities	X	X		X	X		X	X
	Banks			X		X			
	Regional and Unilateral Development banks	X	X	X	X	X			X
	Verifying agencies			X					
	NGOs	X		X	X	X	X	X	X
Non-Annex I	Government (Party) Non Annex I Country	X			X	X			X
	Private/public entity Non Annex I Country	X			X				X

Table 3 CDM actors and their functions
Source: Based on (Stewart, Anderson et al., 2000; Krey, 2004; Streck, 2004; Laseur, 2005)

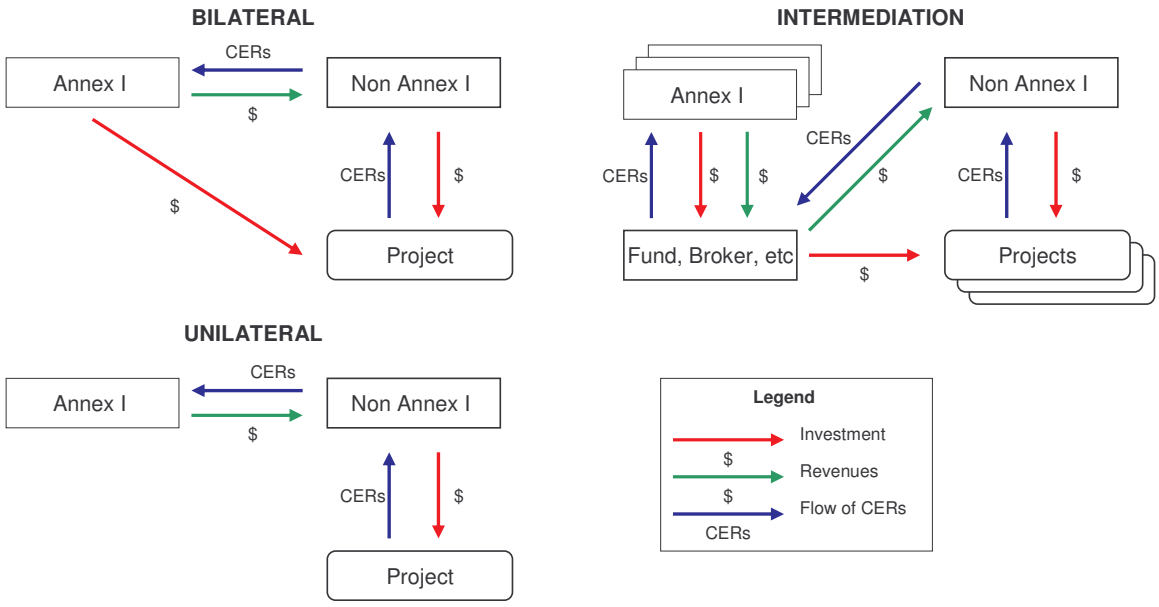


Figure 4 Actors arrangements in CDM implementation
Source: Based on (Stewart, Anderson et al., 2000; Krey, 2004; Streck, 2004; Laseur, 2005)

2.4.6. CDM project cycle

The CDM project cycle comprehends the following phases (Laseur, 2005):

- Proposal Phase
- Preparation Phase
- Execution Phase

2.4.6.1. Proposal phase

During the proposal phase a preliminary evaluation of the project is conducted. In general project participants would like to know if the project meets the requirements of CDM, the amount of CERs that the project may generate, the technical and financial feasibility and what commercial and financial considerations the project will demand.

The common procedure is the development of a PIN, which is usually assessed by the Host Country National Authority. This initial evaluation is oriented to provide a "non objection" letter, thus indicating to the project participants that the project may be applicable to CDM and that fulfills the requirements of the host country.

It is also common during this phase, but not mandatory, using the PIN for the development of trading agreements of CERs. This is commonly done trough the signature of emissions reductions purchase agreements (ERPA). The signature of an ERPA at the proposal phase is usually related to provide the project participant with an initial cash flow to start the project and to the secure the provision to CERs for the buyer. Since the risks related to the execution of a CDM project decrease according to the state of the process, is common that ERPA prices will absorb the higher risk of a project on a proposal stage. Additionally, at this stage project participants may look for financial sources and also technical or consultancy services.

Once project participants have decided that the project will be implemented as a CDM project activity, they proceed to the preparation phase (Laseur, 2005).

2.4.6.2. Preparation Phase

On the preparation phase, project participants will elaborate a PDD, which will be used for the national approval of the host country, the validation and the registration processes. During this phase is common the contracting of consultancy services providers that will assist the company through the process.

1. Elaboration of PDD

Once the project is selected, the project participants should develop a Project Design Document (PDD). A project PDD should contain all the information regarding (UNFCCC, 2002):

- Project description, regarding location, technology and the project boundary
- Description of baseline methodology
- Timeline of the project and credit period
- Additionality
- Environmental impacts of the project
- Information regarding use of Official Development Aid (ODA)
- Stakeholders comments
- Monitoring plan
- Calculations of the different emission sources

The PDD will be the input document for the several following steps in the cycle as validation, registration and verification of the project (CDM Executive Board, 2005).

2. Approval from involved Parties

In order to participate in a CDM project activity, the project participants (entities) must obtain a letter of approval from their specific National Authorities. The National Authority letter of approval should state that each Party has ratified the Kyoto Protocol, voluntary participation of each Party and in the case of Host Parties that the CDM project will contribute to sustainable development of the country. The letter of approval is necessary for the submission of the validation report. It is up to each Party to develop its own approval requirements (UNFCCC, 2002; CDM Executive Board, 2005)

3. Validation

Validation is the process conducted by an independent designated operational entity (Designated Operational Entity) which evaluates if the PDD and other project information comply with the regulations of the CDM. This implies evaluating the fulfillment of all the participation requirements, invitation to local stakeholder comments, EIA, additionality, baseline and monitoring methodologies, and other requirements stipulated in the M&P CDM and from the COP/MOP. The Designated Operational Entity must make publicly available the PDD for comments for a period of 30 days. After comments have been received and once the decision of validate the project has been taken and the letters of approval received the Designated Operational Entity will submit the validation report to the CDM Executive Board for the respective registration (UNFCCC, 2002).

4. Registration

Once a validated project is submitted to the CDM Executive Board (EB), it must pay the respective registration fees and request for registration. The request involves making publicly available the project on the UNFCCC web site for a period of 8 weeks. If not request of reviews are required (from any of the Parties involved or at least 3 CDM Executive Board members) at the end of the request for registration period the project is registered (UNFCCC, 2002).

2.4.6.3. Execution Phase

During this phase the CDM project activity will be actually executed and the emission reductions that where estimated in the PDD will be actually monitored. In time periods that are chosen by the project participants, and with the respective information, the emission reductions will be verified and certified, which will lead to the issuance of the CERs by the CDM Executive Board (EB).

5. Monitoring

When the project has been registered, project participants should start to measure the amount of emission reduction that the project will obtain. Such activity is determined by the monitoring plan included in the monitoring methodology of the PDD. Thus, the monitoring phase will consist of collecting and archiving all the relevant data necessary for the determination of the emissions reductions of the project (UNFCCC, 2002; CDM Executive Board, 2005).

6. Verification and certification

The verification of a CDM project activity refers to the ex post review by a Designated Operational Entity, selected by the project developer, of the emissions reductions obtained from the project and reflected in the monitoring plan. The result of such process will be a verification report, which will be made publicly available and communicated to the project developers, countries and to the EB.

The certification of a project activity is the writing statement from a Designated Operational Entity of the verified emission reduction in the form of a verification report. The certification report will constitute the request for issuance of CERs to the CDM EB, and should also be made publicly available and communicated by writing to the relevant actors mentioned above (UNFCCC, 2002).

7. Issuance of CERs

After the reception of the certification report, if no reviews are requested from the relevant Parties or at least 3 member of the CDM Executive Board, the Board will issue the certified emission reductions (CERs) that correspond to the emission reductions achieved by the project and indicated in the certification report (UNFCCC, 2002).

8. Distribution of CERs

Once the CERs have been issued, they will be transferred to the CDM registry. From there a certain amount will be deducted for the respective administrative fees ($0.20 per CER issued) and to the adaptation fund (2% of CERs issued). After that it will be transferred to the accounts of the respective project participant who have the right to decide the future use of the CERs (UNFCCC, 2002; CDM Executive Board, 2005).

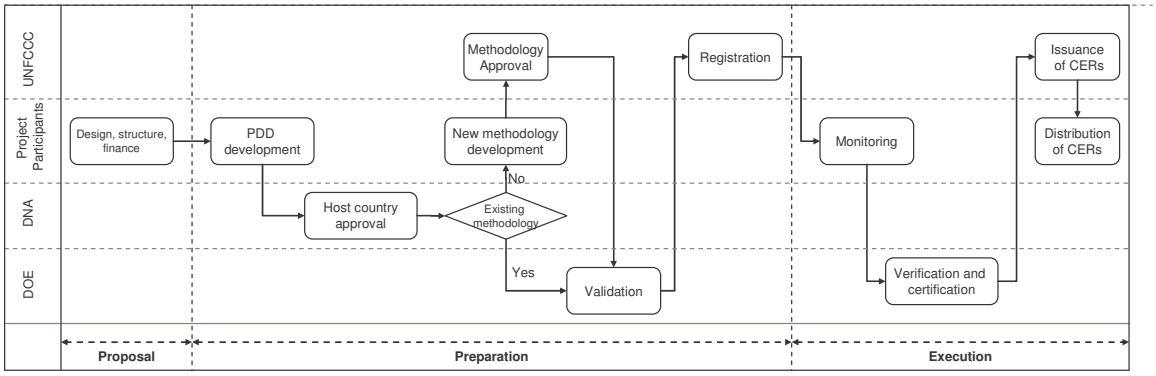


Figure 5 CDM Project Cycle
Source: Based on information UNFCCC documentation

2.4.7. Expected and actual effects of CDM

Based on the formal objectives of CDM, which are discussed in section 2.3, the basic expected effects of CDM are to assist Non Annex I parties in achieving sustainable development and to assist Annex I countries in reducing their mitigation costs. However, as indicated by Matland (1995), ambiguity is often a prerequisite in the case of new policies becoming legitimate among a diverse set of interests. This seems to apply to the CDM objectives, which in the document itself (article 12) are quite broad. After the Marrakesh Accords, they were specified to a certain degree. Nevertheless, the freedom for interpretation and what should be expected from CDM is still quite open and depends on the perspectives of the different actors.

For example, some of the expectations from CDM, as described by Egenhofer, Schaik et al (2005) are:

- Achieve real reductions of greenhouse gases in developing countries
- Extend low-cost abatement options (cost-effectiveness); both for Parties needing to fulfill their Kyoto commitment and for the legal entities covered by the EU emissions trading scheme
- Create one of the pillars of the international emissions trading market; a considerable pillar in terms of volumes
- Involve developing countries in climate change mitigation
- Increase awareness of climate change and of opportunities for the use of clean technologies
- Involve the private sector in the climate change regime
- Make new investments (e.g. in the energy sector) more environmentally friendly
- Stimulate the transfer of low and zero carbon technologies
- Attract FDI to developing countries

Figueres (2006) also indicates that the CDM has also faced problems in generating observable changes in the carbon intensity of developing countries. She argues that since it is project-based and surrounded by high costs and market uncertainties, the CDM projects executed at the current company or facility level are not leading to drastic or sectoral changes in developing countries.

The contribution to sustainable development has been one of the most analyzed and questioned effects of CDM. According to several authors, the CDM has underperformed in this subject. For example, Figueres (2006) indicates that the CDM regulations do not define how the contribution to sustainable development to the host country should be achieved, even though this was requested by developing countries themselves as a defense of their sovereignty. Consequently, this diminishes the contribution that could be achieved. In this matter, several actors coincide. It indicates that the CDM contribution to sustainable development is uncertain and that it has turned in to a market mechanism focused on the cost effectiveness of high-volume, but low-cost projects decreasing the environmental awareness of developing countries. This leads to a race to the bottom phenomenon that actually subsidizes business-as-usual projects instead of supporting really sustainable projects (Kläy, 2000; Olsen and Painuly, 2002; Greiner and Michaelowa, 2003; Sutter, 2003; Foot, 2004; Gundimeda, 2004; Kim, 2004; Egenhofer, Schaik et al., 2005; Laseur, 2005; Sutter and Parreño, 2005; Accion Ecologica, 2006; Figueres, 2006; Schlup, 20005).

3. THEORETICAL FRAMEWORK

In this section an analytical framework is developed in order to understand how CDM is implemented in Ecuador, the effectiveness of this implementation, the networks involved and their effect on the observed outcomes.

The first step in developing the analytical framework is to define a structure that allows for the understanding of the implementation process of CDM in Ecuador. Matland (1995) and Pülzl and Treib (2006) indicate that several perspectives have been developed for this purpose, ranging from the bottom-up, hybrid and top-down theories of policy implementation. For this research, the systems approach of the intervention theory and its use of the public intervention cycle model will be used. This fits the implementation of policy instruments into a black box system with inputs, process and outputs structure. However, CDM has a complex structure and implementation requires several steps at different levels. This is because the main regulations are developed at the global level at the UNFCCC and a policy making process at the host country level is required before actual projects can be implemented.. In order to capture this characteristic, Bressers and Dinica's definition of policy implementation, which subdivides implementation into overlapping policy making and policy operationalization activities, will be used.

Then, once implementation can be defined, it has to be determined whether CDM is being implemented accordingly to its design. Thus, a theory based evaluation framework will be used to assess the effectiveness of CDM implementation in Ecuador. The intervention theory of CDM implementation in Ecuador will be determined to describe how the mechanism should have been implemented. This will be compared to the actual implementation observed and used to determine the effectiveness of the implementation in the country.

Finally, the actors involved in CDM implementation in Ecuador and how they affect the process should be analyzed. The Contextual Interaction Theory of Bressers defines the implementation of policy instruments as social processes in which mainly actors and their interactions define the outcomes to be obtained. Based on this theory, the effects of actors on the implementation will be observed. In order to understand these interactions, the policy networks concept will be used to analyze the different actors and their interactions. This will allow for the correlation of network characteristics with the outcome obtained and also the identification of existing networks created by CDM implementation in Ecuador.

The mentioned concepts will be described in the following sections.

3.1. Intervention theory

An intervention theory is understood as "All empirical and normative suppositions that public interventions rest upon" (Vedung, 1997). Thus the role of the intervention theory is to describe how the policy should be implemented to work instead of how it actually works (Mickwitz, 2004). Intervention theories can be used in evaluation and monitoring to develop the expected objectives and the logical causal links that lead to the achievement of such objectives of a policy intervention. This could be used to determine how the policy should be working according to its design which may differ from the actual implementation. Additionally, from this theory of how the policy should be working, areas of data collection could be better identified. (Mickwitz, 2003).

Intervention theories are based on the use of the public intervention cycle model, where the policy process is seen in a systemic perspective with inputs, an administration entity, outputs and the outcomes of these outputs.(Vedung and Román, 2002; Kautto and Similä, 2005)
Figure 6.

Figure 6 Public intervention cycle model
Source: Based on Vedung and Roman (2002)

Based on the work of Mickwitzs (2002), Kautto and Similä (2005), (Vedung and Román, 2002) and Hildén, Lepola et al (2002), intervention theories have the following elements:

Actors: comprehend basically the administration and the target group.
Inputs: the means used by the administration in order to generate the outputs.
Outputs: the situation created by the administration and that the target group is faced with.
Outcomes: the actions taken by the target group when faced with the outputs, and the consequences of such actions. Consequently some authors differentiate between outcomes and impacts, where the first are the actions taken, and the impacts the consequences of the actions.

3.2. CDM Implementation

The approach to understand implementation in this study is developed from the perspectives offered by Bressers, in which implementation is seen as an actor centered process. It differentiates policy formation from policy implementation as: "policy formation processes are the transformation of diffuse inputs into a more focused output, and policy implementation processes are processes that involve turning a more or less focused input (the "policy") into a number of diffuse outputs". This creates an understanding of implementation of CDM at different levels and scales, since what may be implementation at one level, can be policy formulation at other levels (Bressers, 2001; , 2004).

Additionally, Dinica and Bressers (2004) extend the concept of policy implementation by differentiating between two phases in the implementation process: policy making and policy operationalization activities which may occur sequentially or in parallel, as shown in Figure 7. They conceive "policy operationalization as being the implementation activities performed when the policy goals, means and schemes are specified in a way that implementing actors are able to work with them either directly, or by means of applying them for the local context (or lower levels in the chain) in which they have to operate, or for types of target groups, or types of industrial/social/economic activities, types of technologies/resources eligible, as envisaged in the policy program, etc."

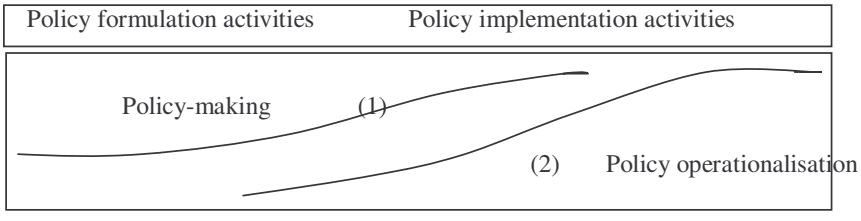


Figure 7 Activities included in the implementation process
Source: (Dinica and Bressers, 2004)

Bressers (2004) indicates in the Contextual Interaction Theory (CIT) that policy outcomes do not depend merely on the inputs and characteristics of the policy instrument, but mainly on the characteristics of the actors involved in implementation. Consequently, when condensed and used for this study, CDM implementation in Ecuador includes the policy making and policy operationalization

activities of the implementation process, as defined above. The policy making activities correspond to the adoption of the international regime at the national level by the administration, which in this case is the Ecuadorian government. The main result of these activities will be the development and the actual application of the regulatory and institutional framework of CDM at the national level. These are the outputs that actors have to face when implementing CDM in Ecuador. Additionally, the administration will require certain inputs as financial and human resources in order to develop and execute the policy making activities. The policy operationalization activities correspond to the actual execution of CDM projects by the actors in the target group and the effects that this may bring up. For the actual execution of CDM projects, the target group actors are also exposed to the outputs generated at the UNFCCC. However, these are not considered within the scope of this study. Consequently, CDM implementation in Ecuador will be understood as the outcomes, which are the actions taken by the actors and the consequences of such actions, when the actors are faced with the outputs of CDM. Since the model sees implementation as a social process, the interaction that occurs among the actors and how the context influences these interactions will be the main determinant of the obtained outcomes, as seen in Figure 8. Outcomes will be understood as the actions taken by the actors, and the consequences of such actions will be seen as impacts. However, other authors also differentiate these events as impact, results and effects (Hildén, Lepola et al., 2002) or initial and ultimate outcomes (Mickwitz, 2004).

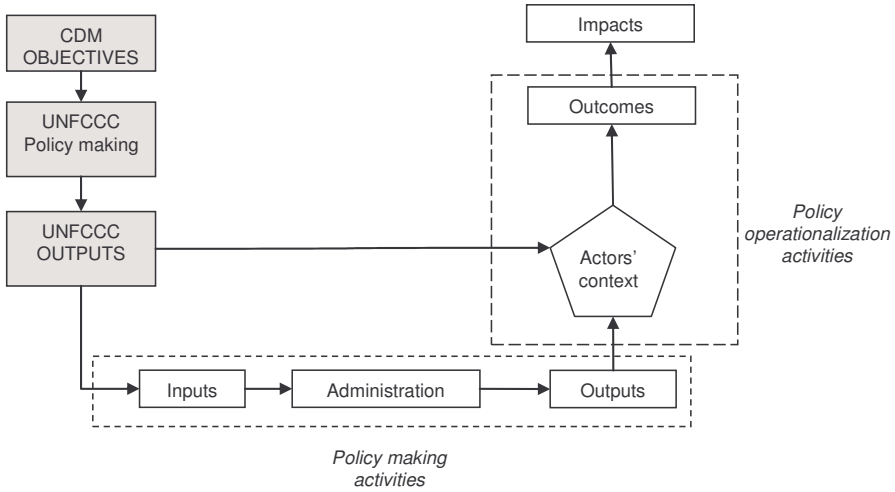


Figure 8 Implementation model of CDM in Ecuador

3.3. CDM and sustainable development

As it has been explained in the description of the mechanism, one of the objectives of CDM is the contribution to sustainable development of the host country. This means that each country will determine how CDM is contributing to its sustainable development. This is reflected in the several different approaches each DNA and other CDM organizations have developed for this purpose. These approaches may range from descriptive guidelines, checklists, negotiated targets and multi-criteria methodologies (Sutter, 2003). The complexity of this different assessment will directly affect the transactions cost of CDM,. Thus, DNAs are pressured on the one hand to assure sustainability and on the other hand not to hinder the benefits that the country can obtain from CDM (Sutter, 2003; Krey, 2004).

However, at the United Nations Conference on Environment and Development held in Rio in 1992, one of the main outcomes was the development of a widely accepted sustainable development concept. In addition, the conference was the forum for the creation of the United Nations Framework Convention for Climate Change (UNFCCC) and Agenda 21.. This definition is based on the concepts of the Brundtland Commission, which defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own

needs."1 This concept has been further operationalized under the understanding that economic development is linked to environmental and social circumstances. Consequently, at the 3rd session of the Commission on Sustainable Development, a set of guidelines and methodologies for sustainable development indicators were developed. These indicators are divided among four dimensions: social, economic, environmental and institutional2. Lately, based also on UN processes, the Millennium Development Goals (MDG) were developed in 2000 with the objective of achieving several sustainable development targets by 2015, as indicated in Table 43.

1. **Eradicate extreme poverty and hunger**
   - Reduce by half the proportion of people living on less than a dollar a day
   - Reduce by half the proportion of people who suffer from hunger
2. **Achieve universal primary education**
   - Ensure that all boys and girls complete a full course of primary schooling
3. **Promote gender equality and empower women**
   - Eliminate gender disparity in primary and secondary education preferably by 2005, and at all levels by 2015
4. **Reduce child mortality**
   - Reduce by two thirds the mortality rate among children under five
5. **Improve maternal health**
   - Reduce by three quarters the maternal mortality ratio
6. **Combat HIV/AIDS, malaria and other diseases**
   - Halt and begin to reverse the spread of HIV/AIDS
   - Halt and begin to reverse the incidence of malaria and other major diseases
7. **Ensure environmentally sustainability**
   - Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources
   - Reduce by half the proportion of people without sustainable access to safe drinking water
   - Achieve significant improvement in lives of at least 100 million slum dwellers, by 2020
8. **Develop a global partnership for development**
   - Develop further an open trading and financial system that is rule-based, predictable and non-discriminatory, includes a commitment to good governance, development and poverty reduction— nationally and internationally
   - Address the least developed countries' special needs. This includes tariff- and quota-free access for their exports; enhanced debt relief for heavily indebted poor countries; cancellation of official bilateral debt; and more generous official development assistance for countries committed to poverty reduction
   - Address the special needs of landlocked and small island developing States
   - Deal comprehensively with developing countries' debt problems through national and international measures to make debt sustainable in the long term
   - In cooperation with the developing countries, develop decent and productive work for youth
   - In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries
   - In cooperation with the private sector, make available the benefits of new technologies— especially information and communications technologies

Table 4 Millennium Development goals and its indicators
Source: UN Department of Economic and Social Affairs (2005)

[1] 114. UN Department of Economic and Social Affairs Division for Sustainable Development. (2002). "UNCED. United Nations Conference on Environment and Development " Retrieved Aug-10, 2006, from http://www.un.org/jsummit/html/basic_info/unced.html.
[2] 113. UN Department of Economic and Social Affairs Division for Sustainable Development (2001). Indicators of sustainable development: Guidelines and methodologies. 2006: 315.
[3] 115. UN Department of Economic and Social Affairs Division for Sustainable Development (2005). UN Millenium Development Goals. 2006.

Based on the mentioned concepts, the sustainability of CDM projects may be assessed through the use of indicators. Consequently, based on several sources of literature related to CDM sustainability assessment, a set of indicators for the assessment of sustainable development of CDM projects for this research was developed (Thorne and Raubenheimer, ; Kolshus, Vevatne et al., 2001; UN Department of Economic and Social Affairs Division for Sustainable Development, 2001; Sutter, 2003; Kim, 2004; Kumbaroğlu, Arikan et al., 2004; Sutter and Parreño, 2005).

Within the environmental dimension, the impacts observed mainly relate to the addition and subtraction of material to or from the environment and the disruption of the environment. Additions will be the mainly the increase or decrease of polluting substances emissions observed in the indicators: water quality, air quality[4], soil contamination and the avoidance of these substances by the utilization of waste streams. Subtractions refer to the use of environmental resources expressed in the effect over water availability, land use and use of renewable sources as raw materials. Finally, disruptions will consider the degradation of soil and the effect over biodiversity.

The economic impacts refer mainly to the generation of profit and economic growth expressed in the generation of profit for the project developer and the generation of employment. It also refers to the attraction of FDI as capital cost for CDM implementation, the development of service providers at the local level (e.g. consultancy companies, technology providers, certification, etc.) and the development of human capital due to technological transfer

Finally, social indicators consider the distribution of the profits to be generated based on the ownership of the projects. If the projects are owned by national or multinational companies, it indicates that the profits will remain in the country. The participation of local authorities and communities is also regarded as an indicator.

DIMENSION	INDICATORS
Environment	Water resources availability
	Water resources quality
	Air quality, non carbon effects
	Soil Erosion
	Soil contamination
	Biodiversity protection
	Land use
	Use of renewable sources as input or use of waste streams
Economic	Economic effects, generation of profit, employment
	Attraction of foreign direct investment
	Development of local related services
	Human capital, technology transfer
Social	Income distribution, ownership
	Participation of local authorities and local communities

Table 5 Sustainable development indicators
Source: (Thorne and Raubenheimer, ; Kolshus, Vevatne et al., 2001; UN Department of Economic and Social Affairs Division for Sustainable Development, 2001; Sutter, 2003; Kim, 2004; Kumbaroğlu, Arikan et al., 2004; Sutter and Parreño, 2005)

[4] The carbon effects are excluded since are already considered by the CDM component and without them the project will not apply under the framework

3.4. CDM Effectiveness Evaluation

The evaluation approach of this research is theory based (Davies, 2003) with an ex ante perspective (Kautto and Similä, 2005; Harmelink, Voogt et al., 2006). A theory based approach means that the logical sequence or theory through which a policy or intervention was expected to achieve its objectives will be developed. Thus, an ideal implementation scenario will be created, determining how the policy should work. Effectiveness will be consider in this research as the degree to which the obtained effects of a policy intervention correspond to the intended ones (Hildén, Lepola et al., 2002). Thus a CDM effectiveness evaluation will require the observation of the actual effects of the intervention and the comparison of them to the respective objectives. However, CDM formally started in 2005 and most of the projects have a life span of 7 to 21 years. The expected effects as certain contributions to sustainable development of the host country or the abatement of climate change may require a long time period to be observable. Nevertheless, CDM demands evaluation and monitoring processes that should not wait for excessively long periods of time. This is where the ex ante perspective is used in this research.

In fact, CDM implementation in Ecuador could be evaluated with an ex ante perspective Harmelinh, Voogt et al., (2006) or with a recently introduced policy instrument evaluation (Kautto and Similä, 2005). These authors propose that in an initial phase based on research, literature and similar previous interventions, pre-conditions for an effectiveness evaluation can be developed to compare the intervention Harmelink, Voogt et al.(2006) with its initial outcomes(Kautto and Similä, 2005). Mickwitz (2004) and Kautto and Similä (2005,) specify that with the construction of the theory of the intervention, which will indicated the logical steps and the expected effects and conditions necessary for the implementation, these preconditions for effectiveness and how they should be evaluated and monitored could be developed.

Gysen, Bachus et al.(2002), Hildén, Lepola et al. (2002), Mickwitz (2004), Kautto and Similä (2005) indicate that intervention theories can be developed from different approaches, mainly: deductive, based on literature; inductive, based on field work and user-focused, based on the implicit theory of actions of the intended users. Additionally, a crucial factor in effectiveness evaluation is the definition of the objectives against which it should be compared, which are also determined in the intervention theory of the mechanism. However, these objectives may not be clearly stated in the policy documents and could also include objectives of several different actors. For the purpose of this study, the objectives of CDM in general will be considered as those expressed in the legal documents, mainly the Kyoto Protocol and the Marrakesh Accords (UNFCCC, 1997; Gysen, Bachus et al., 2002; UNFCCC, 2002; Mickwitz, 2004). However, it should be noted, as indicated in section 2.3, that CDM is implemented at different scales which also specify the objectives of the mechanism. This is the case in the contribution of sustainable development objective, which has been left to be defined by the host country. Consequently, each country may develop a different intervention theory regarding the sustainable development effects of CDM. Consequently, the intervention theory that represents the implementation of CDM in Ecuador will be drawn from the global CDM guidelines and then combined with the national requirements for national approval. Since the evaluation is focused to the national level, the focus of the research will be on the effects of the mechanism at this level. Additionally, it could be argued that host countries are also affected by a larger and competitive market in which they have to compete to generate and attractive supply of CDM projects. Thus, a third source for the development of the intervention theory will be literature related to the contribution to sustainable development and other expected effects of CDM in host countries. The approach for the development of the intervention theory will be mainly deductive.

A general intervention theory of CDM has been developed in Figure 9, where the main logical steps for CDM general implementation are described. This intervention theory is based on the description of CDM provided in chapter 2. Based on the implementation model of this research, the intervention theory includes the policy making and the policy operationalization activities of the policy implementation process. However, this theory is still too broad for the level required for this research. Consequently, a more defined theory, where the ex ante perspective and pre conditions for

effectiveness are able to be translated into actual indicators, has been developed integrating these general perspectives and the national approval processes of CDM in Ecuador.

3.4.1. Intervention theory for CDM evaluation in Ecuador

First the conditions for CDM project execution should be present. This means that the country should have an investment environment that is conductive for project development and that the level and nature of GHG emissions have some potential for CDM projects. Since Non Annex I countries do not have a target under the Kyoto Protocol, the country should adopt the Kyoto Protocol and CDM regime into its own legal and political systems and create all the conditions for this organization to work effectively. However, this will be complemented by the performance of such organizations in the implementation of CDM project that fulfill all the requirements. At a Non Annex I country level this will be the promotion and development of CDM capacities and the development of a national approval process that allows the execution of CDM projects. At the same time, it should verify that projects are contributing to the sustainable development of the country. Finally, once the institutional and regulatory frameworks have been developed and are conductive to the implementation of CDM projects and considered the outputs of the policy making activities, the target group should be able to react to the outputs. This is expressed by the actions taken by the actors in the target group, specifically the implementation of CDM projects and the implications of doing so. This means the utilization of less carbon intensive technologies, the actual execution of the CDM projects and the trading of the CERs generated by them. Additionally, it will require that the target group actors are informed and understand how this should be done. Finally, once CDM projects are executed, the impacts of the implementation can be observed. In the final stage this will mean that the CDM projects will contribute to sustainable development of the host country and that cost effective CERs are generated for Annex I countries. A graphical description of this intervention theory of CDM can be seen in Figure 10.

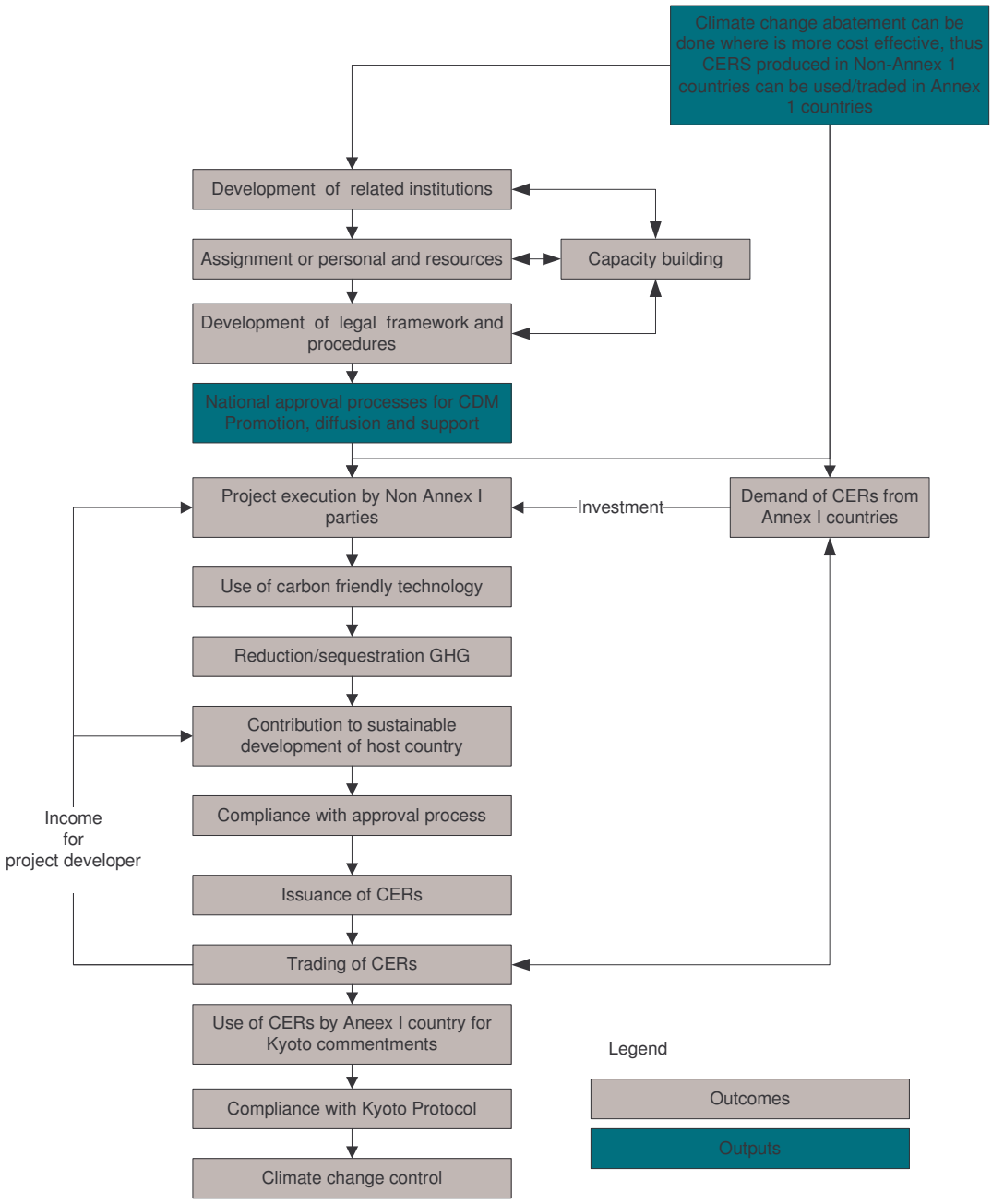


Figure 9 General intervention theory of CDM

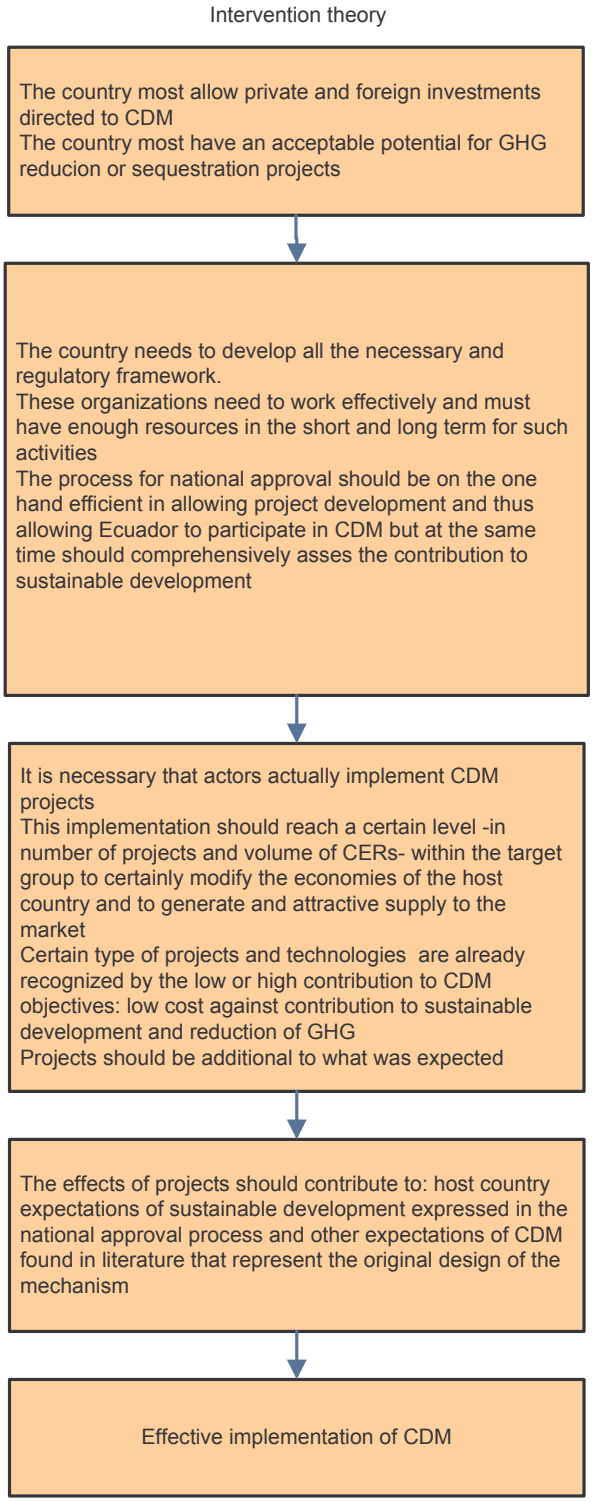


Figure 10 Intervention theory for the evaluation of CDM implementation in Ecuador

According to the description of the intervention theory, the following components have been identified:

- ***Actors***: In the case of CDM, the administration will be the UNFCCC itself and acting through the Designated Operational Entities and the Ecuadorian National Authority when regarding the processes at national level. The target groups are the project participants in Ecuador that execute the CDM project activities. However, as detailed later in the networks section, the implementation of CDM has a more complex structure. In the Ecuadorian case, for example,

the national approval processes for a CDM project involve the participation of other governmental bodies, which also become part of the administration because they may determine whether a project can be executed or not.

- ***Conditions***: Conditions for CDM implementations are considered as the characteristics of the host country in relation to the implementation of CDM projects. For CDM implementation in Ecuador, the conditions that are considered necessary are the investment environment and that the country CDM potential.

- ***Inputs***: For CDM implementation inputs used by the administration in order to generate the outputs. This will be the financial and human resources expressed in the budget and number of personal available allocated for the functioning of the CDM administration entities in Ecuador. Connected to the human resources will be the conducting of capacity building activities that are aimed to develop the administration capacities.

- ***Outputs***: This will be the creation of the entire institutional and regulatory framework that will rule the implementation of projects and that creates the circumstances that the target group has to face in order to execute CDM projects at the national level. The output, or the situation created by CDM, is that CERs generated from CDM projects can be traded among Annex I and Non-Annex I countries. This reduces the cost of compliance with the Kyoto Protocol for the Annex I party, generates profits, and contributes to the sustainable development of the Non-Annex I party. In the case of CDM implementation, these outputs are generated at two scales: UNFCCC and Host Country level. The UNFCCC outputs lead the execution of CDM projects through the CDM project cycle, and the Host Country outputs guide the Host Country's approval process and are a product of the Policy Making activities described in the implementation model above and leading to the national approval of projects. It also includes the execution of promotion and diffusion activities by the National Authority of the Host Country.

- ***Outcomes***: For CDM implementation outcomes will be the actions taken by the target group when faced to the outputs generated at the UNFCCC and National Authority level, which is mostly included in the CDM project cycle phases. In Addition, outcomes require that the actors in the target group have acquired knowledge about CDM and understand it.

- **Impacts:** Impacts will be understood as the consequences of the actions taken by the target group actors. In this case, they are the consequences of going through the CDM project cycle and the execution of projects.

3.4.2. Categorization and effectiveness indicators

The present evaluations will asses the prerequisites for effectiveness and the outputs and initial outcomes of CDM implementation in Ecuador. This means that within the logical chain of events and the conditions necessary for CDM to be effectively implemented, different aspects will be observed. Consequently, it is proper to use a classification of effectiveness according to the section of the intervention theory in which these aspects are observed. The division of effectiveness in this study is proposed as follows: conditional, institutional, target group and outcome effectiveness (Gysen, Bachus et al., 2002; Vedung and Román, 2002; Harmelink, Voogt et al., 2006). Each of these categories is linked to the steps of the intervention theory, as indicated in Figure 11

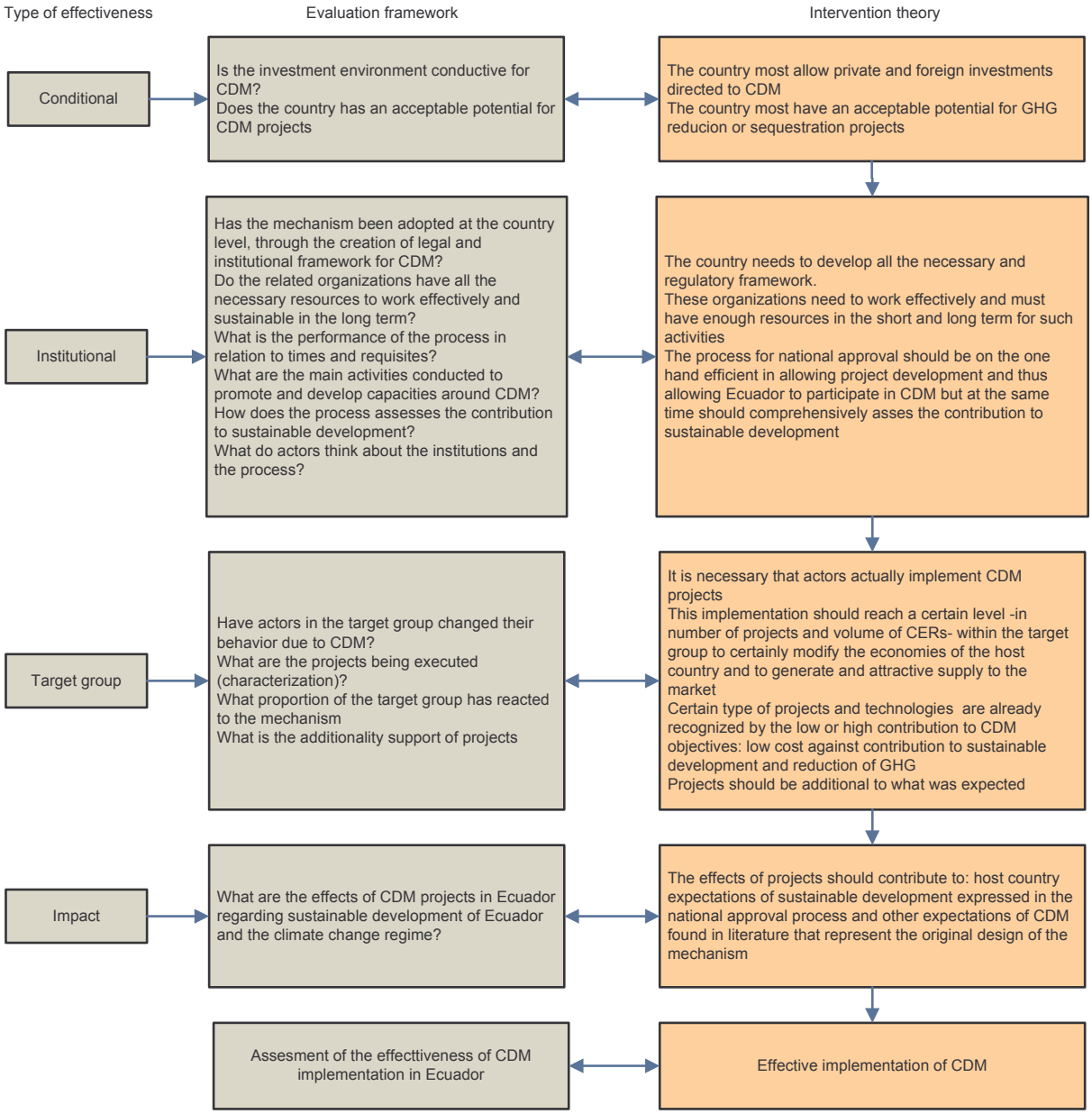


Figure 11 Evaluation framework and intervention theory of CDM implementation in Ecuador

3.4.2.1. Conditional effectiveness Indicators

Conditional effectiveness describes the basic situations that should be in place for the implementation of CDM. In the case of CDM implementation, this will consider the potential of the country for GHG reduction and the investment environment for project execution (Harmelink, Voogt et al., 2006).

1. **Country GHG potential**

Potential for CDM projects is a necessary condition for a significant CDM development (Jung, 2006). This will be obtained by analyzing the information indicated in the last 1994 GHG Inventory of Ecuador and the Climate Analysis Indicators Tool of the World Resource Institute[5]. This is based on the assumption that projects with a high carbon intensity or a large volume of potential emission

[5] http://cait.wri.org

reductions. Countries, in their baseline, can lead to high increase in the IRR due to CDM revenues Bishop (2004) and it is likely that more CDM projects can be implemented in such context.

2. **Investment environment**

Since CDM is a project-based and market-oriented mechanism, CDM implementation is exposed to influence from the investment environment in which these projects are executed. The investment environment can be explained in the governance stability and in the macroeconomic context (Jung, 2006; Point Carbon, 2006). In order to determine how conductive the Ecuadorian environment is for investments, the following factors will be assessed:

- Political stability
- State of corruption
- Macroeconomic situation

3.4.2.2. Institutional effectiveness Indicators

As indicated by Gysen, Bachus et al.(2002), institutional or administrative effectiveness relates the outputs with the objectives of the policy. In the case of CDM implementation in Ecuador, it will refer to the degree to which the development and performance of the regulatory and institutional framework is necessary for CDM development and how this contributes to the achievement of the CDM objectives. The development of a National Authority is a requisite for CDM participation of any host country. This National Authority needs to function properly, to develop efficient and transparent processes that will lead the execution of CDM projects and to promote, support and diffuse CDM in the country. In order to achieve this, it will require a certain allocation of resources, human, financial and capacities that will allow it to be sustainable in the long term and efficient (Fenhann, Halsnæs et al., 2003; Zhang, 2005; Jung, 2006; Point Carbon, 2006). This will be assessed through the analysis of the inputs directed to the administration entities for CDM in Ecuador. Additionally, the way in which the CDM regime has been adopted in the country and the performance of these entities and their actions based in comparisons with other National Authorities will also considered. Finally, it will analyze the perception that actors have about the processes and the organizations.

3. **Inputs to the administration in Ecuador**

The inputs considered will be:

- Financial: represented in the budget available and its source for Cordelim and the AN-MDL
- Human: amount of personal available for Cordelim and AN-MDL
- Capacity building: Indicated in the capacity building activities conducted by Cordelim and the AN-MDL

4. **Development of regulatory and institutional framework**

This indicator refers to the degree that the outputs of the UNFCCC process have been adopted at the Ecuadorian level. It is represented by the characteristics of the laws and procedures that regulate the implementation and all the institutions created for the implementation of CDM in Ecuador.

5. **Comparison of CDM National Authority (AN-MDL) procedures with other CDM countries**

The indicator is based on two sub-indicators obtained from the UNEP/RISOE CDM pipeline. The first sub-indicator represents the overall time that requires obtaining the letter of approval by a host

country. This is expressed in the time between the start of public comments, which is an indication of the start of the validation process, and the issuance of the Letter of Approval by the National Authority of the Host Country. Even though several factors may be behind this time lag, under ideal conditions a CDM project should be very close or have already obtained the letter of approval when entering validation. The validation report, which is necessary for registration, cannot be obtained without the Letter of approval. Thus, it is taken as an indication of the bureaucracy within the national approval processes of a host country. The second sub-indicator is the ratio between the number of projects that have entered the validation stage and the number of letters of approval issued from those projects. These indicate the administrative performance of the CDM institutions in Ecuador.

6. **Diffusion, promotion and education**

The number and characteristics of the diffusion, promotion and education activities will also be considered as an indicator for the institutional effectives of CDM in Ecuador since they reflect part of the situation that the target group is faced with in Ecuador. Information and knowledge about the practices in a market will tend to decrease the transaction costs since actors do not have to invest in searching for information and expertise to implement CDM (Blignaut, 2004).

7. **Actors' perception of processes and organizations**

Actor perception of the process and the institutions will be also seen as an indication of institutional effectiveness.

3.4.2.3. Target group effectiveness Indicators

The target group effectiveness refers to the actual change in behavior of the actors in the target group due to the policy. It covers the section of the outcomes referring to the actions taken by the actors. In the case of CDM it will consider the engagement of actors from the target group in the different phases of the CDM project cycle and the characterization of such interventions.

8. **Quantification and analysis of actions taken within the CDM project cycle** is defined by the change in behavior in the target group due to the mechanism. This will be reflected in the proportion of the target group that reacts to the mechanism by actually implementing projects from observation at the national and sectoral levels. It will focus on the characterization of the CDM projects in the Ecuadorian pipeline and also comparing the country situation with the global CDM market. At the national level it will include an analysis of the indicative portfolios of CDM project of Cordelim and UNEP Risoe, regarding the number of projects and the volumes of CERs per state, type and the technology used. It will also compare how the characterization of these projects relates the to global CDM trend, especially in time evolution of the number of projects, type and technological use and distribution of the CERs per project type. Then, it will focus on the implementation of CDM in the renewable energy and municipal solid waste management sectors through an analysis of the projects in execution, following the characterization variables mentioned above, and the type of ownership structure; and contrasting with the proportion of the target group that is actually implementing the mechanism. Finally, it will use the perception that relevant actors involved in CDM implementation in Ecuador think about the mechanism.

3.4.2.4. Impact effectiveness Indicators

Impact effectiveness refers to the final achievement of the policy objectives. It considers the consequences of the actions taken by the actors in the target group defined above (Gysen, Bachus et al., 2002). It follows the definition of the intervention theory that for the achievement of the ultimate objectives of CDM a series of intermediate actions and effects are necessary. Consequently, following

the definitions of prerequisites for effectiveness and the causal links necessary for the achievement of the objectives of CDM, certain impacts could be evaluated as indicative for the achievement of the objectives (Kautto and Similä, 2005). In the case of CDM, and under this study, these will be mainly factors indicating that the implementation of CDM in the country is contributing to the sustainable development of Ecuador.

9. Analysis of main effects (consequences) of the actions taken in a selection of CDM projects that are in an advanced stage in the project cycle

The effects of CDM in Ecuador will be observed mainly from the renewable energy and municipal solid waste management sectors. However, the research also included the opinion of other relevant actors in CDM in Ecuador. It will use a case study perspective on two selected projects in the mentioned sectors where, based on the information exposed in the documents held at the UNFCCC (PDD), interviews and other related sources, the projects will be described and combined with the sectoral findings. This description will include the characteristics of the project as location, technology, etc., the project developer's statement of contribution to sustainable development of the host country and the additionality argument as stated in the PDD, the financial structure of the project, the environmental impacts, the interaction local authorities and local communities and the perception of the project developers of the process and the administration entities. This will allow gathering information regarding the effects of the project, which will be rated based on indicators and CDM assessment procedures described in section 3.3. These indicators will be rated qualitatively with a scale that defines the effects as positive or negative, as shown in Table 6.

SCALE
Very positive ++
Positive +
Neutral +/-
Negative -
Very Negative --
Not applicable NA

Table 6 Qualitative scale for the assessment of sustainable development contribution of CDM projects

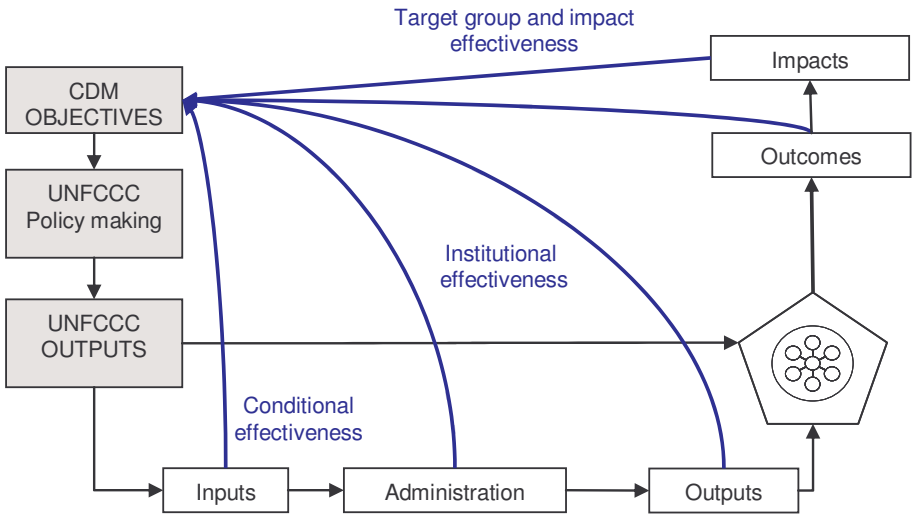


Figure 12 Model of effectiveness evaluation for CDM implementation in Ecuador

3.5. Actors and their role in CDM

The second objective of this research is to analyze the role that actors play in CDM implementation in Ecuador and how they have affected it. This will be based on the way actors interact within networks, mainly in the arrangements created by the distribution and interaction of their motivations, resources, information, the structure of the network and the rules of the game. Consequently, these interactions could be used as explanatory arguments of why the implementation has followed its actual course. Additionally, it would be interesting to determine if the CDM has been a driver for the creation of new networks in the Ecuadorian context.

3.5.1. Contextual Interaction Theory

The Contextual Interaction Theory (CIT), developed by Bressers (2004), aims to analyze policy implementation from a theoretical perspective and in a deductive approach. This is introduced in order to overcome the high variability of ad-hoc implementation studies that try to explain the outcomes of a policy, thus developing a theory with explanatory power. The theory sees implementation of environmental policy instruments as a social process in which actors are the main concern. The basic assumption of the theory is that "the course and outcomes of the policy process depend not only on inputs (in this case the characteristics of the policy instruments), but more crucially on the characteristics of the actors involved, particularly their motivation, information and power"(Bressers, 2004).

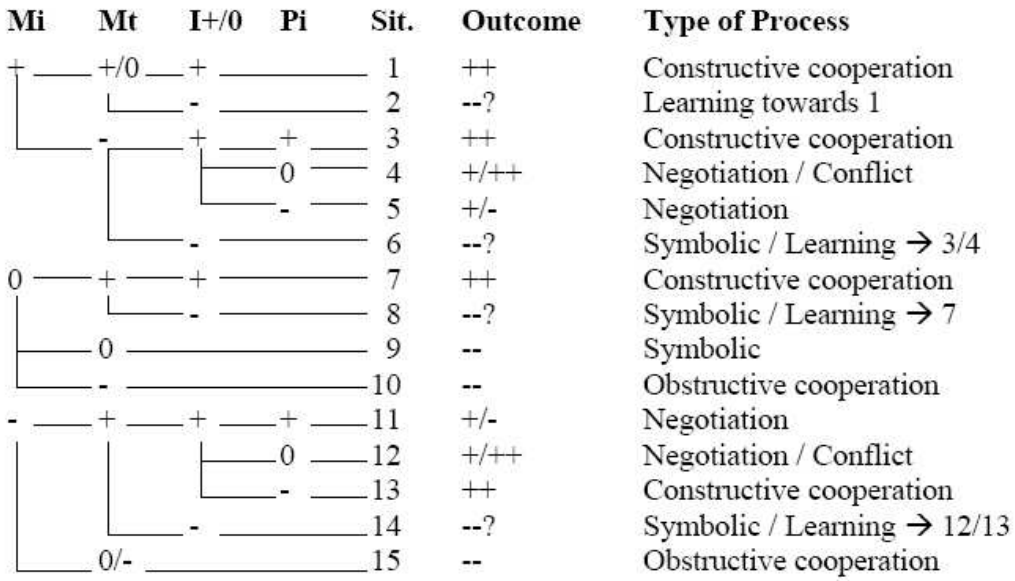
The actor's configuration is divided among policy makers, also referred to as the administration, and target group. It is foreseen that when multiple organizations participate in the implementation process, they may try to form coalitions, (where usually they share objectives, values, cognitions and resources), allowing to still use the two-actor approach of the theory (Bressers and Dinica, 2003). Even more, Dinica and Bressers (2004) indicate indicate that, especially during the policy operationalization activities, the relationship between these two groups may even evolve to the development of public-private partnerships, which has already been mentioned in CDM cases by (Streck, 2004) and (Stewart, Anderson et al., 2000).

Another aspect of the theory is how the complexity of the real world is captured by these three variables. In fact, the theory sees motivation, information and power as the three main core variables that determine the deductive and predictive part of the theory. This is based on the assumption that other variables affect the actors through these core variables, thus creating two sets: "core circumstances" and "external circumstances" (Bressers, 2004). Otherwise, an attempt to capture the real world in a larger set of variables could have extremely complex and unpractical results. O'Toole (2004) indicates that if, for example, 15 variables were used, a number of 32768 combinations may be obtained.

The theory has two modules. One indicates the likelihood of application and the degree of adequate application of a policy instrument (Bressers, 2004).

Interaction of the three core variables in the likelihood of adequate application module

The basic interaction among the three variables in this module are that for a policy instrument to be adequately implemented, the actors most agree on their motivations, they should have all the necessary information and also the power and resources necessary to do so. However, a few more complex interactions are actually considered, as indicated in figure Figure 13.



Key: Mi = motivation implementer; Mt = motivation target group, I+/0 = information active actor(s), Pi = balance of power viewed from position implementer.

Figure 13 Likelihood of adequate implementation interactions according to the CIT
Source: Bressers (2004)

Under this module, the motivation of the actors is seen as positive either for the implementer or for the target group. Regarding information, the variable considered refers to the availability and access of information of the active actor regarding implementation. Finally, the power variable indicates the balance of power from the position of the implementer.

Consequently, the module combines different configurations of these variables leading to a type of implementation. The main types of implementation are: constructive cooperation, symbolic interaction, symbolic leading to learning, learning, obstructive cooperation and negotiation.

- ***Constructive cooperation*** will occur if the adequate application of the instrument contributes positively to the objectives of both actors, and positive to one and neutral to the other, and both have enough access to information (situations 1 and 7).

- A ***symbolic interaction*** will occur if the adequate application of the instrument will contribute neutrally to the objectives of both actors (situation 9)

- An ***initial symbolic interaction*** leading to learning will happen if an adequate application of the instrument contributes positively to objectives of at least one actor but information may be scarce (situations 6, 8 and 14). However this may soon shift towards other types as constructive cooperation or negotiation and conflict. In the case that both actor objectives are achieved though an adequate implementation or if the implementer is positive and the target is positive or neutral, then it is most likely that they will evolve into a joint ***learning*** process indicated in situation 2.

- ***Obstructive cooperation*** will occur when the correct application of the instrument contributes negatively to the objectives of one of the actors and negatively or neutral to the other (situations 10 and 15). In the case that the positive actor has enough information, the process of interaction will depend on the balance of power among the actors. If the positive actor dominates, it will lead to a ***forced constructive cooperation*** (situations 3 and 13) in the case of dominance by the negative actor, ***negotiation*** will

occur (situations 5 and 11), and if the distribution of power is balanced then ***negotiation or conflict*** will occur (situations 4 and 12).

Based on the concepts of the Contextual Interaction Theory (CIT), Dinica and Bressers (2004), indicate that a set of interactions an interdependencies occurs within the variables of the CIT. One is between the events in the implementation process and the variables. For example, failed cases can decrease actors' motivation. The development of experience from other actors increases the general information available. Alternately, the accesses to resources may increase or decrease the motivations of actors. The other interdependency is among the variables themselves. Changes in one of the variables will be perceived in the other two. For example, positive motivation will allow a redirection of attention toward the mechanism. This motivation, however, will be affected by the reading of reality or access to information that actors may have. Resources are necessary for gathering additional information, and then information can become a strategic asset that increases the power balance of certain actors. Finally, a motivation could also be necessary to direct the necessary resources towards an intentional action as the implementation or to gather more information. On the other hand, without enough resources motivation cannot be turned into action.

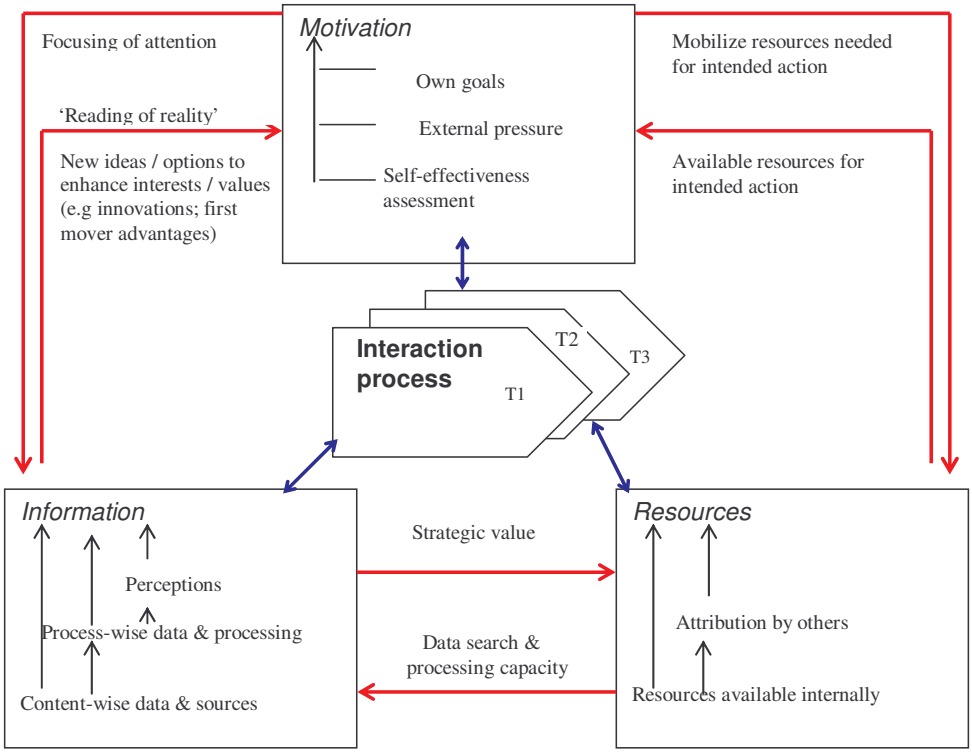


Figure 14 Dynamic interactions between the three core variables of the Contextual Interaction Theory and the implementation process
Source: (Dinica and Bressers, 2004)

3.5.2. Policy Networks

The concept of policy networks is based on the fact that "policy making involves a large number and wide variety of public and private actors from the different levels and functional areas of government and society". Hanf, 1978, quoted by (Goverde and Tatenhove, 2000).

Börzel (1998) indicates that a broad variety of definitions and uses of the policy networks concept has been developed, thus leading to confusion. She identifies two clear schools of thought around the network concept. The first is the use of the networks concept as a "typology of interest intermediation" and the other one sees networks as "specific forms of governance". The school of

typology of interest uses the concept of networks in a generic way and that applies it to several kinds of relations between public and private actors. Although, the governance school sees policy networks as a specific form of interaction between public and private actors in the policy field (governance), both schools are not mutually exclusive (Börzel, 1998).

The typology school aims to characterize the power dependency relations among public and private actors in function of a set of dimensions, thus generating different types of policy networks (Börzel, 1998). Among literature, several types of policy networks have been identified, as in the case of the Rhodes, Jordan and Richardson, Wilks and Wright, etc. models (Dowding, 1994). The governance school shifts the focus from individual actors towards inter-organizational networks as the unit of analysis and focuses on the structure and processes by which joint policy making is organized. It , refers to this as governance because the current policy making scenario has led to a diminishment of the central role of governments and created the need for an inter-dependence among private and public actors. This has resulted in the creation of networks (Börzel, 1998) where consensus among the participants could try to solve the policy problem (Goverde and Tatenhove, 2000). This dynamic approach is also considered by Dinica and Bressers (2004), who state that when multiple organizations are involved in the implementation of policies, they may evolve even beyond the network perspective and increase the tendency for actors to create partnerships.

Additionally, the concept of networks has also been used to try to explain the results of policy implementation. This is the case of the Contextual Interaction Theory (Bressers and Klok, 1988; Bressers, 2001; , 2004), which tries to explain policy outcomes based on the interaction of actors and their motivations, resource availability and access to information. Another example is the model proposed by Matland (1995) which determines implementation based on the degree of conflict and ambiguity with the implementation environment. Furthermore, Marsh and Smith's (2000) Dialectical model indicates that policy outcomes reflect the interaction between the network structure and the network interaction.

3.5.3. Dimensions of policy networks

Several networks are characterized by the actors that constitute them or the interactions between these actors have been used for in the analysis of policy networks. For example, Waarden (1992) identifies 7 major dimensions of policy networks: actors, function, structure, institutionalization, and rules of conduct, power relations, and actor's strategies. Mol (1995) mentions 4: rules of the game, resources used, strategies used and the appreciative system. These dimensions are commonly used to categorize and identify the type of policy network under study and from there used as explanatory arguments for policy processes. The dimensions to be used in this research are the following:

Motivation: In parallel to concepts used by Ligteringen (1999) who sees convergence and divergence of goals among the policy makers and the target group as a major factor explaining, for example, the results of policy making processes. Additionally, Matland (1995) indicates policy conflict as the situation where more than one actor, within an interdependent relationship with other actors in the implementation of a policy, sees a policy as directly relevant for themselves and this view is non congruent with the views of the other actors in the network. Finally, Bressers (2004) highlights that the central focus should be on the degree the application of a policy instrument contributes to the goals and interests of the actors involved. Consequently, the degree to which actors can agree on their goals from the implementation of the instrument will be a determinant of a more effective implementation. In this research the motivation of actors towards adequate implementation will be seen as the degree of convergence between the interests of the actors in the target group and the administration bodies, which will lead to a certain type of implementation of the project under the CDM and national requirements.

Power Relations and resource distribution: According to Waarden (1992) policy networks are power relationships. Thus, how power is distributed among the different actors of the network, based on their resources and the ability to mobilize them and their needs, will categorize the network itself (Arts, Tatenhove et al., 2000). Bressers (2004) indicates that power is also a core variable for determining policy implementation since it determines, for example, who is empowered to implement the policy or to actually avoid its implementation. Consequently, how power and resources are distributed among actors is also another factor determinant for implementation. The case of CDM as a policy instrument is particularly different since the mechanism is voluntary for project developers. This shifts the power balance to that section of the network leaving the administration bodies as regulators. Without project developers there would not be any CDM. However, different project developers have different access to resources, which may, on one hand, create dependency relationships among project developers and financial or commercialization institutions, or on the other hand, create a very low access to resources. It may even prevent the actual implementation of the project. Thus, the distribution of power and resources will be seen as the availability of resources for the project developers and the interdependence relationships that different degrees of such availability create.

Information: How information is distributed and available for different actors is another network variable considered relevant for policy implementation to Bressers (2004). For correct implementation, both actors and the administration agencies should have access and to understand the requirements of the policy in order to implemented correctly. In fact, even though actors maybe agree on their goals and have the all the necessary resources for implementing the mechanism, an understanding of the necessary process and enough access to information are determinant for an effective implementation. Consequently, this variable will be operationalized as the project developers' degree of access to information and understanding of the mechanism's implementation

Rules of the game: The rules of the game are the set of guidelines governing the network (Waarden, 1992). They define the possibilities and constrains under which the different actors can operate in that domain (Arts, Tatenhove et al., 2000). Thus, rules of the game refer to the formal institutional regulations that govern the implementation as much as the actors own principles that guide their behavior when implementing the policy. Even though the CIT determines that this variable will be affecting the actor's interaction through their context, it will be used here in order to reinforce the characterization of the networks. For example unclear rules of the game may decrease the power and information relationships, thus affecting implementation. Additionally, this concept may be linked to the ambiguity of goals and means indicated by Matland (1995), which could be the outcome of policy processes where several actors have different interests as it could be the policy making process of CDM. For the purpose of this research the rules of the game will be seen as the formal and informal rules for actors' behavior in the implementation of CDM in Ecuador.

Structure: the structure defines the pattern of interactions between actors, observed as the size of the network, boundaries, type of membership, intensity of relations, density, clustering, linking patterns, nature of relations and stability (Waarden, 1992). The structure variable is also used more as a determinant of the network type. The focus will be in the characterization of the interactions among actors, mainly the type of interaction among actors.

3.6. Networks and their effect over CDM implementation in Ecuador

Following the concepts of the CIT and policy networks and examples as the model developed by Ligteringen (1999), which correlated the characteristics of policy networks with the type of policy instruments that they implement[6], a framework that will relate then networks interactions and the type of implementation of CDM in Ecuador has been developed.

[6] The variables used where convergence of goals, accessibility of the target group and distribution of resources, intensity of interactions. A similar approach, but based in the interconnectedness and cohesion variables of policy networks as determinants for policy instruments choice was developed by Bressers and O'Toole 17.

The main assumption of the framework will be that different type of networks, which are based of different arrangements among their variables, lead to different types of implementation outcomes. In this case a set of network dimensions will be used. These dimensions are the three core variables of the CIT resources, motivations, information and the addition of rules of the game and network structure described above. With this combination, the network characteristics could be on one side correlated to the degrees of adequate implementation of the CIT and also used to identify the type of network involved in the implementation. Finally, in order to determine the final effect of the networks on implementation, the networks dimensions, the expected outcome of the CIT and the effectiveness evaluation will be integrated. Considering the general implementation model used for this research shown in Figure 8, the detail of how networks dimensions affect the implementation is shown in Figure 16 and Figure 15.

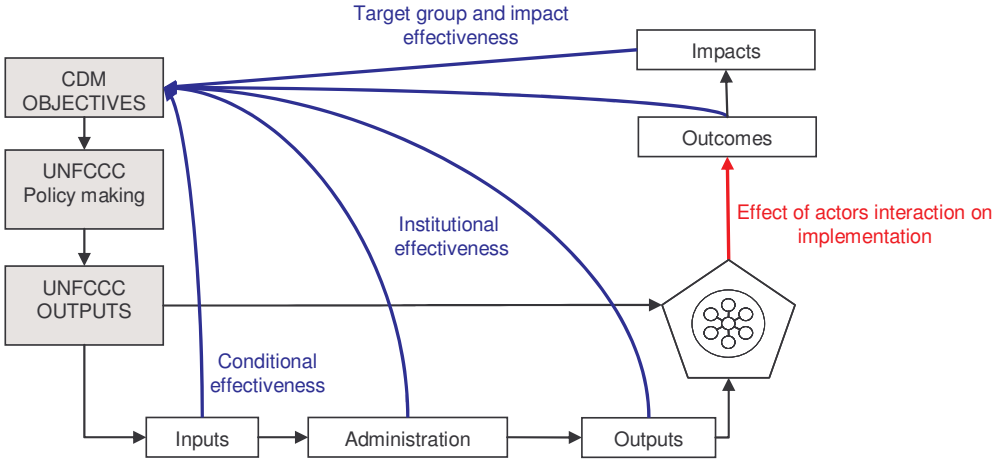


Figure 15 Complete analytical framework of CDM implementation for this research

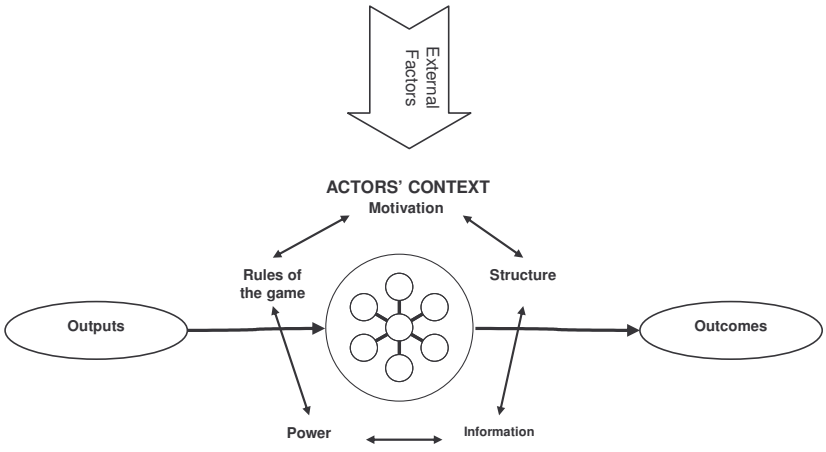


Figure 16 Detail of effect of actors over implementation

Bressers, H. and L. J. O'Toole (1998). "The Selection of Policy Instruments: a Network-based Perspective." Journal of Public Policy 18(3): 213-239.

4. EVALUATION OF CDM IMPLEMENTATION IN ECUADOR

Based on the considerations of the theoretical framework and the CDM objectives considered for the study, an effective implementation in Ecuador will be considered to the degree to which the conditions, inputs, outputs, outcomes and impacts contribute to the achievement of the mentioned objectives. The main objectives of CDM are the contribution to the sustainable development to the host country and to assist Annex I countries with a cost effective alternative to comply with their Kyoto Protocol commitments. However, since these objectives cannot be observed completely at this moment in time, factors considered as prerequisites for the achievement of the objectives can be evaluated, as described in section 3.

4.1. Conditional effectiveness

Conditional effectiveness refers to the basic factors that will determine the implementation of CDM in a country. This is represented in the potential of GHG reduction in the country and the investment environment for project execution.

4.1.1. Ecuador, general information

Official Name	Republica del Ecuador
Population	13,363,593 (July 2005 est.)
Population growth	1.24% (2005 est.)
Area	283,560 sq km
GDP	$52.66 billion (2005 est.)
GDP per capita	$3,900 (2005 est.)
GDP real growth rate	3% (2005 est.)
Currency	US dollar
External debt	$17.01 billion (31 December 2004 est.)
Agriculture	bananas, coffee, cocoa, rice, potatoes, manioc (tapioca), plantains, sugarcane; cattle, sheep, pigs, beef, pork, dairy products; balsa wood; fish, shrimp
Industry	petroleum, food processing, textiles, wood products, chemicals
Electricity production	12,825,820 Mwh (2004)
Oil Exports	129,409,544 barrels (2004)
Oil Produced	192,516,655 barrels (2004)

Table 7: Basic data for Ecuador
Source: CIA, The World Fact Book (CIA, 2006), Petroecuador (Petroecuador, 2004), Ministerio de Energia (MEM, 2004)

4.1.2. Political stability

On the last ten years, Ecuador had 7 presidents, non of them stayed in power the 4 years mandated by law (Oña, 2006). For different reasons all of them were removed or forced to quit from power by social movements, thus affecting Ecuador's external image and the stability of democratic institutions in the country. Based from the WB governance indicators, Ecuador is placed in the lowest quartile (0-25%) of the political stability index, which represents the likelihood of violent threats or changes in the government, including terrorism. Another study from the BCE, highlights how from September 2004 to September 2005 Ecuador had 3 ministers of economy. The same source indicates that, besides rare exceptions, almost all government periods have had at least 2 ministers of economy per year.

4.1.3. Corruption

According to Transparency International, Ecuador scored 2,5 in the corruption perception index, ranking in position 117. Iceland, ranked first scored with 9,7 and the last ranking countries Bangladesh and Chad scored 1,7, ranking 158 (Transparency_International, 2005). The world bank index also classifies Ecuador just above the first percentile (26,6%) of corruption control, which refers to the exercise of public power over corruption cases (The World Bank, 2006).

4.1.4. Macroeconomic context

Dubious financial management, large debts and corruption led to a financial crash on 1999, where 17 Ecuadorian banks went broke (Pauker, 2002). Since then the country economic situation worsened and reached a inflation of 96,8% in 2000 (Proyecto SICA MAG, 2001). As a solution, the government changed its former currency to American dollars in 2001, which has been the currency of Ecuador so far (Alemán, 2003). However, this change and other financial measures have lead to several macro economic improvements, Ecuador financial situation is still not completely stable since the production sector growth is slow, the balance of payments is negative for the non oil products and interest are still high (BCE, 2006).

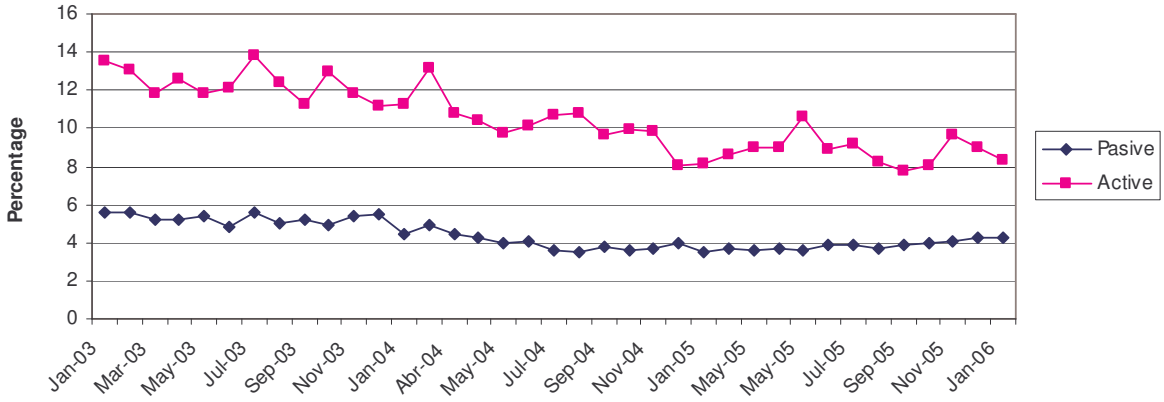


Figure 17 Passive and active interest rates in Ecuador
Source: BCE (2006)

Additionally, the country risk index is still high. The country risk has a decrease tendency, going from an EMBI7 of 2650 in 1999 (IMF, 2003; CBonds, 2006; LatinFocus, 2006) to 550 at the beginning of 2006 (BCE, 2006). However, is still high when compared to other Latin American countries.

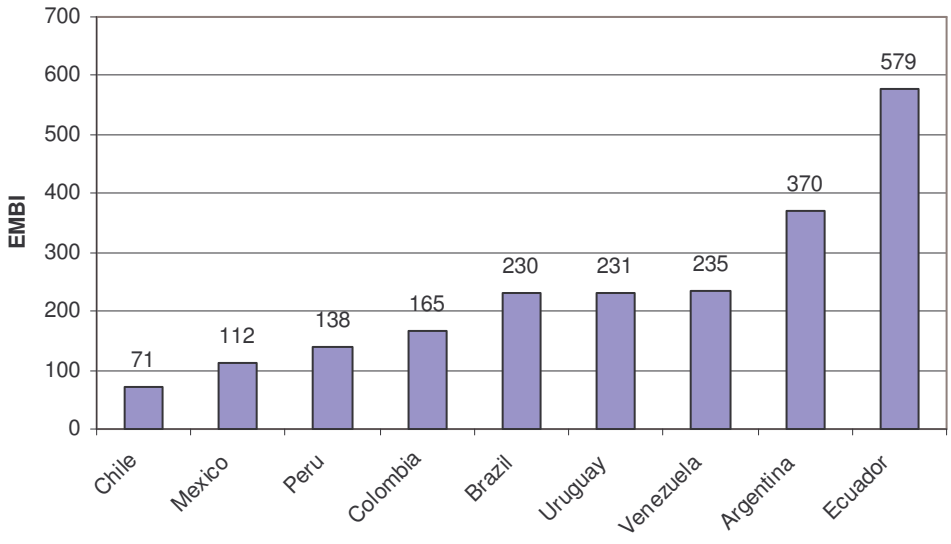


Figure 18 Comparison of country risk (EMBI) of several countries in Latin America in 2006
Source: BCE, LatinFocus (2006)

[7] JP Morgan Emerging markets bond index

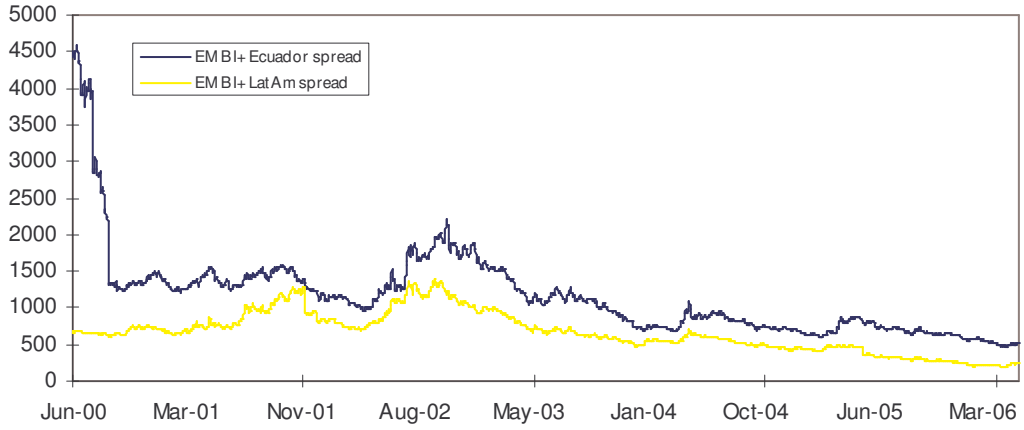


Figure 19 Evolution of EMBI+ index of Ecuador and Latin America
Source: CBonds

Finally, foreign direst investment is basically directed to the oil industry, with an average of 74% since 2002 of the total amount invested in Ecuador. For the second trimester of 2005 it was 91%, within the remaining 9%, it was distributed between agriculture, manufacturing and commerce (BCE, 2006)

4.1.5. Overview of CDM Potential in Ecuador

Since no specific CDM potential study has been conducted in Ecuador, the approach for this research will combine the figures of the indicators from the Climate Analysis Indicators Tool (CAIT) of the World Research Institute (WRI, 2006) and the last GHG inventory conducted in the country in 1994

In order to asses to potential for CDM projects in Ecuador the initial step will be to correlate the amount of GHG that are produced in Ecuador as an indicative of volume with the carbon intensity of the economy, as an indication of the relative generation of carbon in the country. Ecuador generated in 2000 41,9 $MtCO_2$ Eq, and the carbon intensity was 1006.8 tCO_2 Eq./Mill. Intl $[8]. Based on this information, it can be noticed that within South America the Ecuadorian emissions form GHG are low in volume and are in the medium range of carbon intensity as seen in Figure 20.

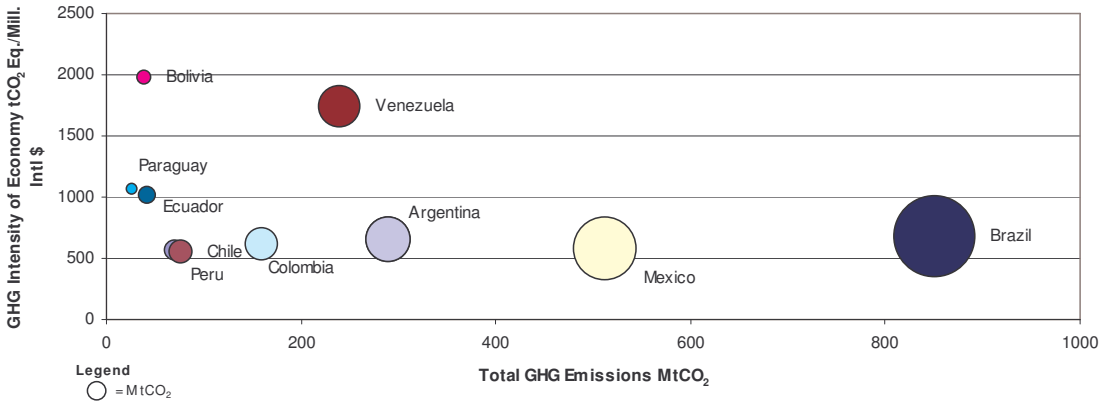


Figure 20 Comparison of total GHG emissions and GHG intensity of economy for several South American countries for the year 2000
Source: WRI/CAIT (2006)

[8] Tons of carbon dioxide per million international dollars

To compliment this information, the emissions of GHG in Ecuador will be analyzed in its different sources, in order to determine what sectors contribute more to the whole of emissions.

Based on the last GHG inventory (1994[9]) the most relevant CO_2 emission in Ecuador are from the forestry sector 76% and use of fossil fuels 20%, from a total of 69.4 $MtCO_2$, as described in Table 8. Within the forestry sector the largest share of emission is from forest conversion and pastures generating 41.7 $MtCO_2$ (60%). From the fossil fuel component transportation has the largest share 7.6 $MtCO_2$ (11%) and energy production and manufacturing industries 3% respectively (+/- 2 $MtCO_2$)(Cornejo and Fernández, 2000; Guerra and Velez, 2001; Ministerio de Energia del Ecuador, 2001; Vargas and Beltran, 2001)

Source	**$MtCO_2$**	**Percentage**
Forestry		
Changes in the biomass and other woody vegetation	9.1	13%
Forest conversion and pastures coming from the biomass	41.7	60%
Emission or absorbing of CO_2 in soils due to management and change in the land use	2.0	3%
Total Forestry	**52.9**	**76%**
Consumption of fossil fuels		
Energy industries	1.9	3%
Manufacturing and construction	2.2	3%
Transportation	7.6	11%
Others	2.2	3%
Total consumption of fossil fuels	**13.9**	**20%**
Others		
Biomass burned for energy purposes	1.1	2%
Cement production	1.2	2%
Limestone use	0.3	0%
Total Others	**2.6**	**4%**
TOTAL	**69.4**	**100%**
TOTAL with out forestry	**16.5**	

Table 8: Main CO_2 Emissions from Ecuador, national inventory 1994
Source: MAE (2001)

Regarding the CH4 emissions, the largest source is domestic waste water with 770.89 ktCH4 (57%), followed by solid waste 88,1 ktCH4. As indicated in Table 9. (Cornejo and Fernández, 2000; Guerra and Velez, 2001; Ministerio de Energia del Ecuador, 2001; Vargas and Beltran, 2001)

Source	**$ktCH_4$**	**Percentage**
Methane flaring	17.17	1%
Fugitive emissions oil, gas	18.68	1%
Solid Waste	88.1	6%
Industrial Waster Water	26.28	2%
Domestic Waste Water	770.89	57%
Enteric fermentation	281.57	21%
Manure management	13.09	1%
Rice production	147.4	11%
TOTAL CH_4	**1,363.2**	**100%**
TOTAL CO_{2eq}	**28,627**	

Table 9: Main CH_4 Emissions from Ecuador, national inventory 1994
Source: (MAE 2001)

[9] This is the last inventory of GHG emissions conducted in Ecuador.

Regarding the conditional effectiveness for CDM implementation in Ecuador, it can be said that the investment environment in Ecuador is not the most optimal for CDM projects. There is very high political instability and corruption. These two factors are reflected in the country risk factor, which is one of the highest in Latin America. Additionally, Ecuadorian interest rates are still quite high, which affects the availability and accessibility to credit for investment. Also, most of exports revenues are still from the oil sector. This will create a more difficult situation for conducting or attracting foreign investment to projects that already have a certain degree of complication and that require long term investments as CDM projects (I29,33,6,8,1,9).

"*The political instability has been fatal for project financing*" (I 27). "*Political instability and high country risk decrease the attractiveness for investment*" (I13) "*Lack of support for investment is one the barriers for CDM development*" (I 11)

Based on the GHG information it can be concluded that Ecuador's volume and intensity of GHG place the country in a medium to low range of possibilities for emission reductions projects at a regional and global level, thus making a marginal contribution to the carbon market (I6,8) and facing the problem of a low economy of scale in the supply side (I25). However, within the country there are considerable emissions from the energy sector (due to the use of fossil fuels for electricity generation), from the urban residues sector, oil sector and agricultural sector which are the most common CDM projects under execution now days.

"*Ecuador has too small projects*" (I7)

Finally, it can be concluded that the even though the conditions for CDM investment in Ecuador could be used as support for the additionality of the existing CDM projects, they contribute partially to the achievement of the CDM objectives. This is because the conditions decrease the confidence of investors, both from national and international, and also decrease the reliability that a CERs provider could have in medium term contracts, as is in the case of CDM. Additionally, the cost-effectiveness and market orientation of CDM focus the market on low cost and high volume projects, as is seen in global carbon market trends. Nevertheless, the carbon intensity and the source of GHG emissions in Ecuador have allowed the country to develop a certain number of CDM projects in sectors that are currently in demand by the market.

4.2. Institutional effectiveness

The institutional effectiveness refers to the degree in which the Kyoto Protocol regime has been adopted by Ecuador, represented in the development of the respective institutional and regulatory framework. It also refers to the performance of such entities in promoting the development and execution of CDM projects and assessing how this project contributes to the sustainable development of the country. Finally, it also considers the inputs that both the CDM National Authority (AN-MDL) and Cordelim have available, thus affecting its performance and long term sustainability.

4.2.1. CDM Institutional Framework in Ecuador

Regarding the international climate change regime, Ecuador signed the UNFCCC in 1992, and ratify it in 1993 and signed the Kyoto Protocol in January of 1999, and then ratified it in January of 2000 (UNFCCC, 2006). The initial institutional setting after the adoption of the UNFCCC integrated the UNFCCC National Focus Point that was the Ministry of Foreign Affairs, the National Meteorology and Hydrology Institute (INAMHI) and after its creation the Ministry of Environment. On this stage, the Ecuadorian government managed to attract resources for implementing several related projects as: Ecuador Climate Change Country Study, Netherlands Climate Change Studies Assistance Program,

CC:TRAIN-ECUADOR, Economics of GHG Limitations Country Study Series, EC and UNEP-RISØ, and the ECU/99/G31 Project on Climate Change. These projects in addition to other activities conducted by these institutions aim to fulfill the following objectives: assessment of the country's situation regarding climate change, the effects and vulnerability, mitigation and response alternatives, develop the necessary capacities and to comply with the international commitments made. Under the CC: TRAIN-ECUADOR project in 1997, the National Climate Committee (CNC) was established, however unofficially (Caceres 2000).

4.2.1.1. The National Climate Committee

Ecuador's National Climate Committee was created on 1997 and officially registered in 1999. The CNC is composed of a political and an operational entity. The political entity is constituted by: The Ministry of Environment as the presidency of the committee, the Higher Education National Council (CONUEP), the main regional Production Chambers from the Highlands and from the Coast, The Ecuadorian Committee for the Environment and Nature Defense (CEDENMA, which congregates the national environmental NGOs) and the INAMHI as the permanent technical secretary. The operational entity is formed by the following working groups which are organized thematically: energy, transportation, industry, oil, forestry, agriculture, shore-marine, hydro resources, capacity development and institutional strengthening, science and climate change evidence, health, cooperation, politics and international negotiation, three IPCC groups (climate change science; impacts, adaptation and vulnerability; mitigation). Each working group has a leader organization and several member organizations from the public and private sector (Ministerio del Ambiente del Ecuador, 2001; , 2001).

Among the main functions of the CNC are:

- To propose and design policies and strategies related to the climate in order to allow the country to participate in the international context and to develop its own position.
- To provide political support to the application of policies and strategies designed to face the climatic change processes
- To develop national capacities that will allow to deal with the climate change processes
- To coordinate the compliance with international agreements regarding climate change
- To the develop the institutional means to apply the CDM as contemplated in the Kyoto Protocol (Ministerio del Ambiente del Ecuador, 2001)

The CNC is an organism that has not a physical instance; this means that has no budget and not a physical office (I 25)

In order to specifically address the CDM, the CNC has created a double entity institutional framework dividing the functions of regulation and promotion into two independent organizations, in order to avoid potential conflict of interests and to promote the development of capacities and institutions. The regulatory functions have been assigned to the Ministry of Environment, acting as the CDM National Authority (AN-MDL). The promotion function has been assigned to a mixed constitution corporation, Cordelim.

4.2.1.2. The Sustainable Development National Council

The Sustainable Development National Council (CNDS[10]) is the main advisory entity to the Ecuadorian Presidency in sustainable development maters. It was created on 2001, but it only operated for 6 months. On 2005 and with cooperation from the Inter-American Development Bank, it is being reestablished and it is expected to work again in 2006. Among its main members are: the

[10] Consejo Nacional de Desarrollo Sustentable

Presidency, Ministry of Environment, Ministry of Economy, Presidency National Planning Secretariat, Production Chambers from the Coast and the Highlands, CEDENMA. The main role of the CNDS in CDM implementation will be the monitoring of the contribution to sustainable development of CDM projects.

4.2.1.3. Cordelim

The Ecuadorian Corporation for CDM Promotion (CORDELIM) was created on January 2001. Its main objective is to provide information and to build local capacities in technical, financial and socio-economic terms, towards the development of CDM and other GHG reduction projects. Cordelim aims to support and assist CDM Ecuadorian projects through their formulation, negotiation, registration and implementation (CORDELIM, 2005).

Cordelim is a non profit organization with a combined structure, thus it Designated Operational Entities not belong to the Ministry of Environment or any other governmental body (I 13). Cordelim is structured in the following way: on the directory the Ministry of Environment (as the presidency), the Ministry of Energy, the National Federation of Industry Chambers, the National Federation of Small Scale Industry Chambers, the National Federation of Agricultural Chambers and CEDNMA (CORDELIM, 2005).

Under this structure Cordelim scope includes:

- Information and diffusion, to become a source of technical, socio-economic and political information for national and international actors
- Promotion and capacity building, to develop an efficient system of diffusion and socialization of knowledge and to support local capacity and institutional development,
- Technical and commercial assistance, to provide basic support and specialized services for local development and international trading under CDM. Specifically, for project development according to national and international requirement, identification of sources of financing, CERs negotiation, etc.
- Planning and political assistance, to assist and participate in the development of policies and strategies related to climate change in the national context, and the treatment of drivers and barriers for the national participation in the carbon market.
- Support to project development, guidance to the development of an official portfolio of projects that will be eligible under the CDM criteria and that contribute to the sustainable development national requirements (CORDELIM, 2005).

4.2.1.4. The Ecuadorian CDM National Authority

On April 2003, the CNC assigned the Ministry of Environment as the CDM National Authority (AN-MDL). The CDM National Authority (AN-MDL) presidency relies on the Minister of Environment as the representative instance and the operative instance conformed by the Coordinator of the CDM National Authority (AN-MDL) and the Evaluation Group, which is formed in a project basis (AN-MDL, 2003). The CDM National Authority (AN-MDL) fulfills a regulatory function with the main objective of evaluating, approving and monitoring CDM projects.

As indicated in the Marrakesh Accords, all counties willing to participate in CDM have to develop a National Authority. The National Authority will be responsible for designing the national approval processes and in a final instance to provide the Host Country approval for a CDM project, which mainly indicates that the project contributes to the sustainable development of the country (UNFCCC, 2002).

The main tasks of the CDM National Authority (AN-MDL) are: .

- The national and international representation
- Development of CDM approval procedures that project will need to follow for the achievement of the Host Country Approval. The Ecuadorian CDM National Authority (AN-MDL) has developed three main processes: CDM National Authority Process for the issuance of the Support Letter to CDM project (AN-MDL/CR/2003), CDM National Authority Process for the issuance of the Letter of Approval to CDM projects (AN-MDL/CA/2003), CDM National Authority Process for the issuance of the Letter of Approval to Small Scale CDM projects (AN-MDL/PPE/CA/2003)
- Project evaluation, which is guided by the mentioned procedures and conducted by the Evaluation Group and the issuance of the Letter of Endorsement and Letter of Approval, which indicates that the CDM project contributes to the sustainable development of Ecuador.
- National registry and follow up of projects, through the follow up it will be verified that the projects are complying with the approval criteria and the National Registry will allow international accounting and management of the issuance, ownership, transference and acquisition of CERs from projects executed in Ecuador by local actors (Ministerio del Ambiente del Ecuador, 2005).
- The development of a legal framework for carbon trading
- Incorporation of CDM in sectoral plans (Castro, 2006).

4.2.2. Capacity building activities

Besides the projects conducted after the adoption of the UNFCCC described in section 4.2.1, for the specific adoption and implementation of CDM, two considerable technical cooperation capacity buildings events have been developed. These are the Technical Cooperation PNUMA/RISOE – CORDELIM: Capacity Development for CDM in Ecuador and the Technical Cooperation CAF/PLAC-MAE: Cordelim institutional strengthening program. The aim of these activities was to provide support to immediate activities of basic support, institutional strengthening, capacity building as a base for the expansion and specialization of Cordelim.(CORDELIM, 2005). Additionally, another support program is developed with The Modernization National Council (CONAM) under the Rural Services. Telecommunications and Electric Sector Modernization Project (PROMEC) which provides a consultant through the Ministry of Environment for the CDM promotion program (Castro, 2006).

Regarding technical cooperation in very specific activities several organizations have collaborated either with the CDM National Authority (AN-MDL) or Cordelim: Undesa/e7, FONAM/World Mechanism, JOFCA from Japan, World Bank, FAO, GTZ, Swiss Agency for Development and Cooperation (COSUDE), CDM Canada, Inter-American Development Bank (Castro, 2006).

- **Technical Cooperation PNUMA/RISOE –CORDELIM: Capacity Development for CDM in Ecuador**

The PNUMA/RISOE Cordelim cooperation is an initiative of the Dutch government and the United Nations Environment Program (UNEP, PNUMA in Spanish) and executed by the UNEP/RISOE Research Center. The UNEP/RISOE Research Center and the Fundación Bariloche from Argentina, provide the technical support, the Ministry of Environment is the responsible for the implementation of the project. The main objective of the project is to strengthen the national environment for CDM implementation, to develop an efficient and clear regulatory framework and the development of a national portfolio of CDM projects and the involvement of the private sector in CDM project execution. The central processes of the activity are the following:

- Support to the CDM National Authority (AN-MDL) in the management and monitoring of projects

- Analysis of the regulatory framework for CDM investments
- Criteria and tools for evaluation and national approval of projects
- National guidelines for national project developers
- Management of an information and resource center
- Formulation and implementation of an strategy for investing and marketing of CDM projects
- Formulation and implementation of an strategy for developing local technical expertise in CDM
- Technical support to the climatic change negotiation group
- Technical support to the indicative project portfolio (CORDELIM, 2005)

- **Technical Cooperation CAF/PLAC-MAE: Cordelim institutional strengthening program**

This cooperation, conducted through the Ministry of Environment of Ecuador, has the objective to provide support to the initial development activities and main process of Cordelim. The main Cordelim's processes to be supported were:

- Development of a diffusion and information system
- Development of local CDM capacity. To strengthen the availability of human resources for both the Ecuadorian CDM National Authority (AN-MDL) and Cordelim and to develop a national understanding of the opportunities, barriers and challenges of the carbon market
- To assist the initial development of local CDM projects by providing knowledge regarding methodological issues within the national context and direct support in the preliminary phases of identification and articulation
- To develop planning tools that allow the use of the potential benefits of the carbon market and to define the Cordelim's activities in the medium and long term (CORDELIM, 2005).

4.2.3. Diffusion, promotion and education activities

Cordelim has conducted several efforts in order to promote and diffuse CDM. It manages the website www.cordelim.net where abundant information about CDM and the carbon market can be found. Among others it holds information about the organization and how is structured; general information regarding climate change, the Kyoto Protocol, CDM projects and the CDM cycle and the CDM National Authority (AN-MDL) approval processes; an indicative CDM project database; a service central where information regarding financial sources and a data base of local CDM experts is kept; information about workshops and events related to CDM at international and national level and also a library containing documents as the Kyoto Protocol, templates, CDM methodologies and the documents of the national approval process.

The indicative project portfolio displays basic project information as the project developer, the type of project, the CERs to be generated, contact information, the state of project development in the CDM cycle, the documentation that is available about the project as PINs, PDDs or briefings, the state of trading of the project (if has already closed an trading agreement for its CERs), among others. This portfolio is continuously updated and it actually shows the most current information for each project. It is considered indicative since not all project developers want their projects to be publicly exposed through the development phase or they have not contacted Cordelim during this phase[11].

[11] This indicates that some projects can not be identify until later stages of development, which can be appreciated in other worldwide held pipelines and the criteria they use to include projects: as for May 2006 the UNEP/RISOE pipeline (http://cd4cdm.org/) that holds 744 CDM projects (this pipeline considers projects since their presentation to validation). On the other hand the Point Carbon (http://www.pointcarbon.com/) pipeline which considers projects since its proposal phase indicates the existence also for May 2006 of 1139 projects on a PDD stage and 729 that had started the validation process.

Regarding the events, Cordelim has participated in the organization of the following ones:

- International Course of Carbon Certification Project Development (PLAC/CAF). Quito, Nov-02.
- National Dialogue Workshop: Guidelines to Promote the National Insertion in the Emerging Carbon Market. Quito, Feb-02
- International Course: Reforestation and Bio-energy Project Development under CDM (CD4CDM/ENCOFOR). Quito, Mar-04
- International Workshop: Electric Generation Projects under the Clean Development Mechanism (e7/UNDESA&CD4CDM). Guayaquil, Sep-04.
- Opportunities in the Carbon Market. Climate Change and Natural Recourse Management Capacity Building Workshop (FAO/COSUDE). Quito, Nov-05
- National Workshop: Ecuador in the Carbon Market, Opportunities and Challenges. Quito, Mar-05.
- Latin American Carbon Forum. Quito, Mar-05 (CORDELIM, 2006)

Additionally Cordelim has conducted several small scale capacity building and diffusion events at sectoral and municipal scales (16 basic capacity building and information workshops and seminars (Castro, 2006)

According to Cordelim around 1000 persons among the public and private sector, NGOs and international organizations have participated in these events (Castro, 2006)

4.2.4. Finance and human resources for the CDM National Authority (AN-MDL) and Cordelim

The basic infrastructure for both the CDM National Authority (AN-MDL) and Cordelim has been provided by the Ministry of Environment: communications, IT and office infrastructure. The CD4CDM UNEP/RISOE project has provided support for the development of the web site, international communications and equipment (Castro, 2006).

Regarding human resources, at the moment of the study the CDM National Authority (AN-MDL) had 3 and Cordelim 6 persons working on each respectively. However, from all these personnel only one of the CDM National Authority (AN-MDL) employees is under the Ministry of Environment's payroll. Within this group are also included 2 consultants paid by the CD4CDM project, the director of Cordelim position is financed by a collaboration with CONAM and there is also a UNEP voluntary (Castro, 2006; Neira, 2006).

In line with the human resources, both the CDM National Authority (AN-MDL) and Cordelim were designed to be financially sustainable. In the CDM National Authority (AN-MDL) case from the evaluation fees of CDM projects and Cordelim from the services that will provide. However, due to the volume of CDM projects in Ecuador and also by the political setting, these two organizations financial resources have been originated from the international cooperation projects mentioned above. Currently, due to the proximity of the end of these projects, new sources of financing are being searched (Neira, 2006).

4.2.5. Regulatory Framework

The regulatory framework for CDM implementation in Ecuador will include on one hand the regulations that determine the activities of the CNC, CDM National Authority (AN-MDL) and Cordelim and the CDM project approval processes determined by the AN-MDL. On the oth50er hand, the general regulations of the UNFCCC direct several other steps of the CDM implementation process as validation, registration, verification and so on. Since the study focus on the implementation

at the Ecuadorian level, this chapter will describe mainly the regulations in the Ecuadorian context, which are in control of the local administration according to the definition given in section 3.1.

As mentioned above the Ecuadorian CDM National Authority (AN-MDL) has elaborated several processes for the approval of CDM projects, which are listed below:

- Guide for obtaining the Letter of Support (LoS) and/or Approval (LoA) for Clean Development Mechanism Projects (AN-MDL/GUIA/2003)
- CDM National Authority Process for the issuance of the Support Letter to CDM project (AN-MDL/CR/2003)
- CDM National Authority Process for the issuance of the Letter of Approval to CDM projects (AN-MDL/CA/2003)
- CDM National Authority Process for the issuance of the Letter of Approval to Small Scale CDM projects (AN-MDL/PPE/CA/2003)

Depending on the stage of project development, project participants can apply to the CDM National Authority (AN-MDL) either for a Letter of Endorsement or a Letter of Approval. A Letter of Approval is commonly required when the project is in its initial development stage, in the search of financial sources or in the hiring of consultancy or other services. The procedures for the emission of the LoS are described in the document AN-MDL/GUIA/2003, which includes the steps to follow for the analysis and the information that should be provided by the project developer, and that will be called the Project Idea Note (PIN). However, this initial LoS Designated Operational Entities not certify that the country has approved the project. The only document for that purpose is the LoA, either for CDM projects of normal scale or small scale and it will be issued once the project developers have complied with all the established requirements. The procedures for obtaining the LoA are described in the documents AN-MDL/CA/2003 for normal scale and AN-MDL/PPE/CA/2003 for small scale. These documents detail the steps to follow and the criteria to be fulfilled by the project developer in order to obtain the national approval, which is referred as phase I. Under phase II, the requirements to be followed once the project is in execution for its monitoring and verification are detailed.

The document AN-MDL/GUIA/2003, provides general and background information about the procedures, project categories, and important contacts and documents necessary for the other parts of the process.

Since obtaining the letter of approval is a indispensable requisite for CDM project in order to continue thorough the CDM project cycle, this process will be detailed in the following section.

CDM National Authority Process for the issuance of the Letter of Approval to CDM projects

This process is divided in the following phases:

- Phase I: presentation, evaluation and national letter of approval issuance, described in Figure 21
- Phase 2: follow-up and official registration of projects (AN-MDL, 2003)

Phase I

The submission of the letter of approval starts with the presentation of the PDD and the payment of the preliminary evaluation fees. Then the PDD will be subject to a preliminary technical review by the *CDM National Authority (AN-MDL) Coordinator*, checking mainly the basic structure and

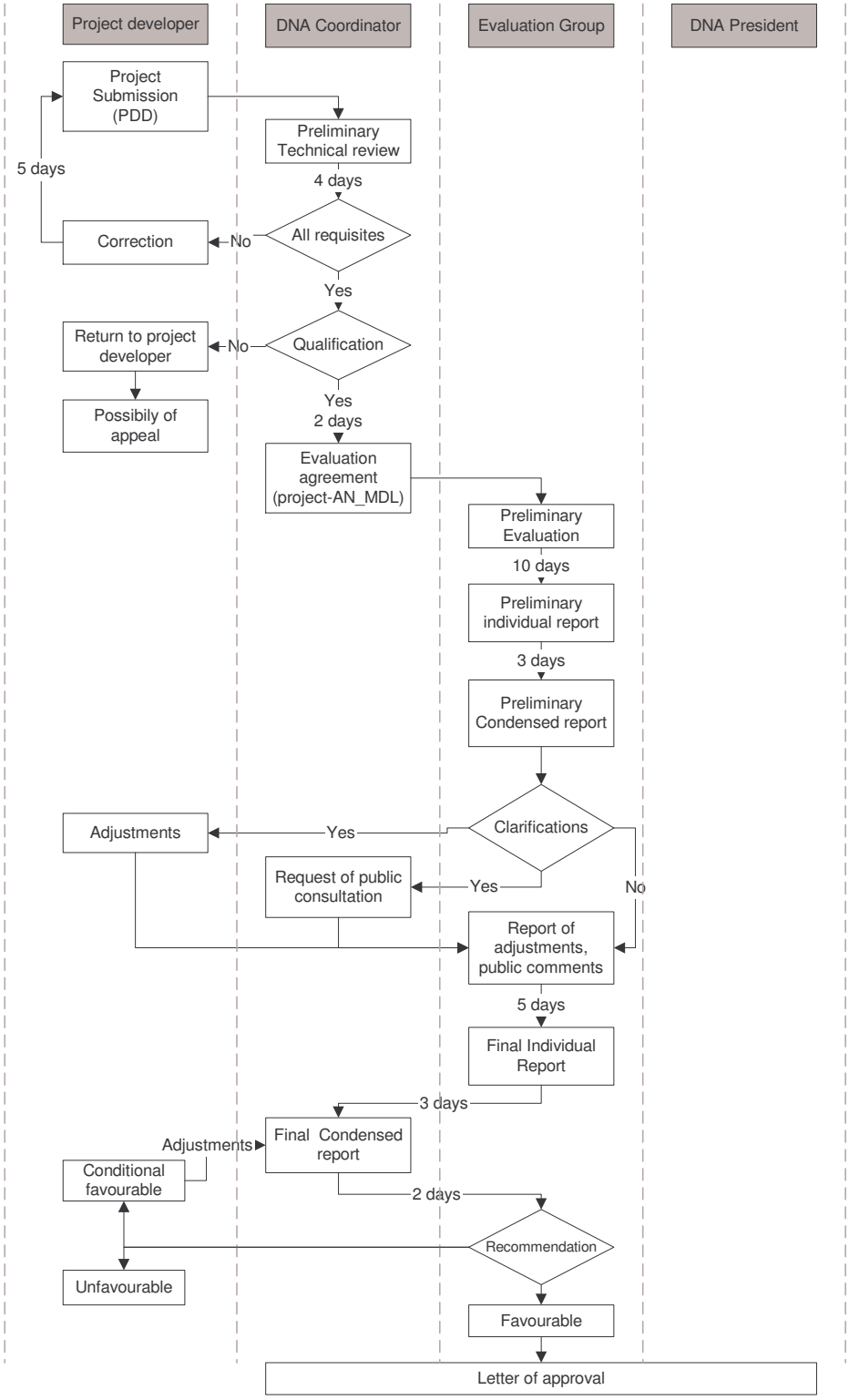
composition. There is a 4 days limit for this activity. In case of any irregularity the *Coordinator* will notify the developer, who has 5 working days to correct the PDD. If the PDD Designated Operational Entities not comply at all with the requisites then it will be submitted back to the project developer, who has the possibility to appeal.

In case of compliance with the basic requisites, in a period of 2 days a "specific agreement for project evaluation" will be signed. It will describe the terms and conditions of the evaluation and should be accompanied by the payment of the final evaluation fees. Then the *CDM National Authority (AN-MDL) Coordinator* will proceed to form the respective *Evaluation Group*, depending on the characteristics of the project, submitting to public disclosure (unless confidentiality is asked by the *Project Developer*) and asking for public comments on the project.

Following, the *Evaluation Group* will have 10 days to elaborate a preliminary evaluation report (it should be noted that all the cost regarding mobilization, allowances and other expenses of the *Evaluation Group* should be covered by the project developer) and in 3 days to elaborate a preliminary condensed report.

In case of clarifications of the condensed report, these may be asked to be answered by the *Project Developers*, consult to related actors or call for public consultation. Once these adjustments have been collected, the evaluation group has 5 days to present a final individual report. Next, the *CDM National Authority (AN-MDL) Coordinator* will compile these reports and will elaborate a final condensed report, which will be analyzed for the *Evaluation Group* in a period of 2 days after which it will recommend the project as: favorable, conditional favorable and unfavorable.

In case on being conditional favorable the PDD will be submitted to the *Developer* so it can be re adjusted. If it is unfavorable the *Developer* will be communicated. In case of revision, and previous the necessary justification, a revision procedure will be processed in a period of 10 days. Finally, if recommendation if favorable, it will be analyzed in a period of 5 days with the participation of the *CDM National Authority (AN-MDL) President, Coordinator and Evaluation Group.* In case of no existing appeals or comments, the letter of approval will be issued (AN-MDL, 2003).



Source: AN-MDL, 2006

Figure 21 Process for submission of letter of approval

Phase II

The phase II process has two components: the follow up and the official registration of CDM projects. These components are executed once the project has obtained the LoA form the Ecuadorian AN-MDL.

The follow up process aims to verify that once the project continues through the next steps in the CDM project cycle, it Designated Operational Entities it according to the terms under which obtained the national approval. Additionally, it will generate valuable information in order to optimize the CDM activities in Ecuador.

The follow up will be executed during the validation and registration activities of the project and during the execution of the project. At the validation of the project, the proponents should inform the CDM National Authority (AN-MDL) about the start and end of the validation process, it should indicate that the information provided to the Designated Operational Entity is the same that the one presented to the CDM National Authority (AN-MDL) when obtaining the LoA providing all the respective information. The CDM National Authority (AN-MDL) will observe the process and in case of irregularities it will proceed to communicate it to the UNFCCC. Additionally, the CDM National Authority (AN-MDL) will verify that the Designated Operational Entity selected is in compliance with all the national regulations and will also interact in matters related to the project it self.

During registration, the project developer will provide the CDM National Authority (AN-MDL) with a copy of the Registration requirement, which will be registered by the AN-MDL. The CDM National Authority (AN-MDL) is in the obligation to communicate the UNFCCC of any considerations or observations (if any) regarding the registration of the project. Otherwise, when the project has been registered it will update the file of the project.

During the actual execution of the process, the CDM National Authority (AN-MDL) will also verify that project is being executed according to the terms of national approval and also aims to generate information resources that could be useful for the positioning of the country towards the carbon market. This activity will include the analysis of the annual reports of project execution, in situ inspections (that could be with or with out notice), revision of (re)validation, verification and certification provided by a Designated Operational Entity and the registration process.

The registration process objective is to monitor and control at national level of the issuance, ownership, transference and acquisition of CERs from CDM projects that are executed by local actors or within the country. It involves the development of a CDM National Registry so the CERs transactions can be registered and the creation of the respective accounts for such transactions. (Ministerio del Ambiente del Ecuador, 2005)

4.2.5.1. Main national requirements for project approval

The requirements for the issuance of the Letter of Approval for a CDM project in Ecuador are described in the Annex A (AN-MDL/DP/2003) of the Processes for the Issuance of the Letter of Approval. The requirements for the national approval of a CDM project activity are:

- Contribution to national and regional level development objectives, policies and priorities
- Compliance with the national, provincial and cantonal legal framework
- Environmental, socio-economic and technological impacts

Contribution to national and regional level development objectives, policies and priorities

At a national level, concordance with objectives, policies and priorities that have been officially adopted at such level and represented in plans, strategies, laws and similar instruments, mainly: Environmental Law, Environmental Strategy for Sustainable Development, the Priorities of Ministry

of Environment and CNC for the carbon market[12] and others according to the case. It should be noted that the CNC contemplated the creation and action of the Ecuadorian Sustainable Council, which is the organization called to the creation of Sustainable Development Strategies in Ecuador. However created in 1997, the council worked for a short period on 2001 and currently efforts are being done to re-install it for the end of 2006 or beginning of 2007.

Sector	Framework	Priorities
Power generation	Electrification National Plan	Re-conversion of thermally produced energy Conservation and rational use of electricity Decrease in energy losses Use of non conventional resources Clean and more efficient technologies Fuel with lower carbon intensity Expansion of electric generation, mainly medium and small scale projects in: hydro and by products of oil extraction and refining Ex Electrification National Institute (INECEL) projects
Energy Efficiency	National Plan of Energy Efficiency and Law of Energy Efficiency (on preparation)	Cleaner technology Conservation of non renewable energy resources Energy offer diversification Use optimization of gas and electricity Invoice decrease in fuels and electricity Production cost reduction on the industrial sector Rational and efficient energy use on the oil extraction and processing sector
Transportation	Sector governments plans	Efficient massive transportation systems Use of less carbon intensive fuels Fuel use reduction Ethanol use
Waste management	National Policy of Solid Waste, from the unified text of the secondary legislation	Promotion and development of the use and re-valorization of solid waste Waste management in sanitary landfill, waste dumping and waste water in order to obtain methane for energy/heat purposes Promotion of cogeneration processes
Hydrocarbons	Hydrocarbons law, and the Environmental Regulations for Hydrocarbon Operations	Re-injection of natural gas Use of waste gas for energy/heat Fugitive emissions control
Forestry	National Plan of Forestation and Reforestation	Waster Bodies Basins Areas in need of protection and recovery of vegetable cover

Table 10: Preliminary Priorities from the CNC and MAE for the carbon market
Source: Caceres, 2004

The project developers will present a discussion of how the project contributes to such framework and the CDM National Authority (AN-MDL) through the Evaluation group will analyze the approval or not of the project (Castro, 2006).

[12] Still under development, but can be used as guidance

The project developers most provide evidence of the consulted documents (specially at the regional level) and they could also indicate the contribution to development that is not stated in official documents (Autoridad Nacional del MDL del Ecuador, 2003)

Compliance with the national, provincial and cantonal legal framework

Project developers most indicate the legal requisites at each respective level that are affecting project execution. All the documents that certify such compliance should be provided. The CDM National Authority (AN-MDL) will verify the integrity and consistency of the presented documentation and if necessary the relevant entities will be consulted (Autoridad Nacional del MDL del Ecuador, 2003; Castro, 2006).

Environmental, socio-economic and technological impacts

In order to support the environmental impacts the procedures states that the presentation of the EIA is mandatory, which is represented in the presentation of the Environmental License or a certification of the approval of the EIA by the relevant national authority in the category of the project.

Regarding the socio-economic impacts, project developers most provide information that the project is improving the quality of life on the community where is being executed. It should indicate the positive and negative effects and how negatives effects will be abated. Specify the contribution to the improvement of the quality of life of the community through the decrease of unemployment when using local human recourses, capacity development and training, etc.

For the technological impacts, the project developers most describe what kind of technology is going to be used, contrasting it against the technology commonly used in the area of the project. Such technology should be framed in the current guidelines of environmentally sound technologies that may consider if necessary ancestral knowledge (Autoridad Nacional del MDL del Ecuador, 2003).

The project developers most provide in general terms the description of the achievement of positive impacts and the mitigations efforts directed to negative impacts (Castro, 2006).

All the approval requirements, which determine the contribution to sustainable development of CDM projects, detailed above are of qualitative nature. This is supported by the Ecuadorian CDM National Authority (AN-MDL) due to the high diversity and characteristics of CDM projects. Thus, efforts to homogenize or unify the contribution to sustainable development by using specific values or parameters are not justified under the current circumstances. However, the CDM National Authority (AN-MDL) will analyze according to the evolution of national initiatives and of the rules and the CDM market, the possibility of developing a set of sustainable development indicators for such purposes (CORDELIM, 2006).

4.2.6. Comparison of CDM National Authority (AN-MDL) procedures with other CDM countries

So far the Ecuadorian CDM National Authority (AN-MDL) has issued 3 letters of approval and 11 endorsement letters, as shown in Table 11.

Detail	Number
Letter of approval issued	3
Letters of endorsement issued	14

Table 11: Detail of Ecuadorian CDM National Authority (AN-MDL) performance
Sources: Cordelim, UNFCCC, Interviews

An assessment of the national approval processes was performed with the development of a process performance index. This index includes the average and the maximum time since the start of public

comments [13] and the issuance of the letter of approval by the National Authority of the Host Country. It also includes a ratio between the number of projects in the validation phase and the letters of approval that have been issued by the Host Country National Authority. The information for the creation of the index was obtained from the UNEP/RISOE database, which considers CDM projects since the moment they start public comments. The total of the sample was 744 projects. In order to create a more accurate sample the population was divided in quartiles based on the number of projects. Thus, Ecuador was located in the 4th quartile with the following countries:

Country	Letter of approval issued	Number of projects	Letter of approval/Projects ratio	Average time lag (months)	Maximum time lag (months)
Argentina	4	9	0.44	5.21	11.10
Brazil	48	135	0.36	6.88	25.27
Chile	12	20	0.60	7.93	28.30
China	14	61	0.23	2.63	9.27
Ecuador	3	10	0.30	3.70	6.37
Honduras	9	16	0.56	3.92	8.50
India	73	283	0.26	4.57	27.13
Malaysia	4	15	0.27	6.14	24.87
Mexico	19	43	0.44	3.99	24.27
Philippines	0	21	0	7.97	15.23
South Africa	3	9	0.33	5.32	11.90
South Korea	5	10	0.50	3.98	6.67
Thailand	0	12	0	6.64	15.03
Average			0.33	5.30	16.45

Table 12 Host countries information used to develop a process index
Source: UNEP/RISO (2006)

The countries were given a rating based on the mentioned indicators, thus receiving a value from 1 to 13. In the case of the Letter of approval/Projects ratio, the country with the higher ratio received a rating of one, indicating that countries that have managed to issue letters of approval for most of their projects are better than those who have not, which receive a rating of 13. For the time lag indicators, countries with the shortest average and maximum time lag for the issuance of the letter of approval received a rating of 1, and the ones with the longest 13, indicating that projects that are already moving forward in the CDM cycle (validation), and have not received yet the letter of approval are less likely to be completely implemented as CDM projects. Consequently, the lower the rating, the better will be the performance of a country's National Authority. Finally, the three ratings were averaged without the assignation of relative weights and a final process index per country was obtained.

This process index is an indicative representation of the national approval processes effectiveness. This is because even though the issuance of the letter of approval process is determined by the National Authority, it may be affected by the own characteristics of the projects, as compliance with local regulations or other national policies, lack of resources for fulfilling certain requisites or a general complex or bureaucratic regulatory framework in the Host Country, which are factors outside the control of the National Authority. However, the process index can be used under the assumption that it is in the interest of the National Authority that potential CDM projects (as long as they fulfill the CDM requirements) obtain the letter of approval.

[13] Considered as start of the validation phase

Country	Letter of approval/Projects ratio rating	Average time lag rating	Maximum time lag rating	Process index
Honduras	2	3	3	2.7
South Korea	3	4	2	3.0
Ecuador	8	2	1	3.7
Argentina	4	7	5	5.3
China	11	1	4	5.3
Mexico	5	5	9	6.3
South Africa	7	8	6	7.0
Chile	1	12	13	8.7
Brazil	6	11	11	9.3
India	10	6	12	9.3
Malaysia	9	9	10	9.3
Thailand	13	10	7	10.0
Philippines	12	13	8	11.0

Table 13 National Approval process index for selected Host countries
Source: UNEP/RISO (2006)

The institutional framework developed for the climate change regime and specifically for CDM implementation in Ecuador involves several organizations as the National Climate Committee (CNC), The National Sustainable Development Council (CNDS), Cordelim and the AN-MDL. All these organization with the exception of the CNDS are currently in operation. Thus, the country has created the basic operational structure for the implementation of CDM projects.

The CDM National Authority (AN-MDL) is the regulatory entity for the approval of CDM projects. This organization has developed all the necessary processes for the issuance of letters of support and approval, reflected in the documents described in section 4.2.5. Regarding the requirements for approval the CDM National Authority (AN-MDL) has defined a set of qualitative indicators in order to asses the contribution of CDM projects to the sustainable development of Ecuador.

The magnitude of the inputs for the CDM administration entities in Ecuador has been positive in the capacity development aspects. Several programmatic and punctual cooperation programs and activities have been implemented with several international CDM organizations worldwide, which have been crucial for the development and even the operation of the CDM National Authority (AN-MDL) and Cordelim. However, in the matter of financial resources and political support the image is not so positive (I28, 38). Both organizations have not achieved yet an acceptable financial stability. This can be clearly observed in the proportion of resources that are originated from external sources and the ones from the own entities, in this case by the evaluations fees and budget assigned by the Ministry of Environment for the CDM National Authority (AN-MDL) and in the case of Cordelim that is not charging for its services (I25). Even more, most of the personnel on both organizations are provided by external entities as the UNEP/RISO and CONAM programs (I 4).

Regarding the execution of diffusion, promotion and education activities, especially by Cordelim has been remarkable. As mentioned in section 4.2.1.3, Cordelim has organized several events at national and international level and at different scales.

The processes for national approval are well defined and the CDM National Authority (AN-MDL) conducts the evaluation in a project specific basis. At the moment the volume of projects Designated Operational Entities not justify the implementation of a permanent evaluation team, thus the evaluation team is created based on the characteristics of each project (I25). The requirements for project approval are clearly stated. They asses the contribution to sustainable development in a qualitative perspective, basically focusing in the compliance with all the environmental and sectoral regulations specific to the project and the support to national, regional and local development policies, strategies and plans. However, most of the sustainable development documents, policies, plans and

strategies in Ecuador are not legally binding and neither integrated in the political agenda of Ecuador. This can be clearly observed in the lack of global national development strategies for the long term. One of the main organizations related to the development and integration of sustainable development strategies in Ecuador, and also considered within the institutional framework for CDM, the CNDS is not fully implemented yet. (I 34). Thus on one side the process will create an incentive to adopt such development plans, it also creates uncertainty in the specific assessment of such contributions.

Based on the process index, the approval processes in Ecuador have an acceptable effectiveness, placed 3rd among the 13 countries analyzed (Table 13). The time lag from start of public comments to issuance of letter of approval in average is short (3,7 months), and the longest project that still haven't obtained the letter of approval has a time lag of 6,37 months. However, the ratio of letter of approvals to projects is still low 0,3. These values compare well to the average of the sample shown in Table 12
.
From the comments of the interviewees, the Ecuadorian CDM National Authority (AN-MDL) besides having a defined process, that are considered clear and defined by some actors (I 1, 2, 5,15) and that Ecuador highlights because it has developed one of the most rigorous and detailed procedures (I9), is still considered very bureaucratic in the issuance of the letter of approval, especially in the opinion of project participants and consultancy companies (I14,19,22,26,30,3,6). According to the AN-MDL, the problem arises when project participants do not know all the regulations that they have to comply under the scope of their project, and that project participants take too long when they are requested to make corrections to the documentation, consequently, increasing the time that is defined on the approval processes, normally 25 to 35 days (I 25). Additionally, there is confusion to the degree of compliance with the national and local environmental regulations, especially if it applies only to the CDM project, which can be only one process within a company for example, or the whole organization that is implementing it (I19). Project developers also indicate that these environmental regulations are not clear and the performance of the related governmental organizations is not efficient (I26). Additionally, regarding the compliance with the national environmental regulation (deadline until 2008), companies are in the intermediate step of this process, thus facing problems when the CDM project have to face this requirement (I21) or the process with the local or regional authorities becomes long and complex (I15).

Even more, other actors still see a need for improvement from the AN-MDL. These improvements include the understanding of the background of CDM and climate change science (I 4) and an adequate coordination and diffusion of the activities related to the national approval of projects (I 14,21,29,19). In the specific forestry sector, the CDM National Authority (AN-MDL) has still not defined the minimum values for forest (A/R projects), which are necessary for the implementation of forestry projects (I 28,26) (UNFCCC, 2006). In the same forestry sector, the amount of permits and regulations that any forestry project has to obtain in Ecuador are considered quite complex and bureaucratic, thus increasing the transactions cost considerably (I 10, 26).

Most of the interviewees considered that Cordelim has played a very important role in the development of CDM in Ecuador and even at the Latin American level (I9,4,19,1). Actors recognize that they have received support in several different forms, as technical support, provision of information, guidance in project development, the execution of different diffusion and education activities, interest and receptiveness for projects, etc. (I17,31,5,27,30,15,16,35,21,2,35,28,30,38) However, some positions believe that Cordelim is not fulfilling its objective and that it should be focused more in diffusion and development of projects rather than international promotion (I 19, 24). Also, interviewees mention that Cordelim's performance is too weak, that it is only known by experts (I 38), that people interested need to DO research by its own means (I24) and that the low number of CDM projects in Ecuador is an indication of Cordelim's low effectiveness (I 10). Even more, they will also like to see more participation from Cordelim is the specific support for project and PDD development. To this Cordelim implies that Designated Operational Entities not get involved in those activities to avoid a conflict of interest (I13).

"*Cordelim is one of the best CDM promoting agencies in the American continent*" (I 9)

"*Cordelim has a small but very efficient staff* " (I 4)
"*There should be less traveling….*" (I 19)
"*Cordelim highlights in South America*" (I 1)

The division of functions among the CDM National Authority (AN-MDL) and Cordelim is also considered as positive and innovative (I 33) and as a model that should be replicated (I 8).

A criticism of both Cordelim and the CDM National Authority (AN-MDL) is that the assistance to project participants in legal issues, especially related to contracting and trade of CERs, is not undertaken at all (I 19). A lack of coordination among the CDM National Authority (AN-MDL) and Cordelim was also observed (I21). Another issue regarding the institutional development of the climate change regime in Ecuador and thus for CDM, is that the CDM National Authority (AN-MDL) will depend on the professionalism and support within the Ministry of Environment, which lacks institutionalism (I 10).

Concluding, the implementation of CDM in Ecuador at the institutional level has been quite effective and clearly contributes to the execution of CDM projects in the country. The actions of Cordelim are widely recognized as positive and the process of approval by the National Authority is considered clear and its performances is acceptable when compared to other CDM host countries, even though has some criticism from the related actors. However the lack of political support and availability of financial resources may endanger the long term development of both organizations. Additionally, the processes and actions of the CDM National Authority (AN-MDL) provide an adequate assessment of how projects contribute to the sustainable development of the country. However, this is determined by the national regulations that the project has to specifically fulfill and that in this case may overweight the economic and environmental aspects over the social considerations of sustainability and also be undermined by the non binding effect of most of the sustainable policies and strategies in the country. Finally, since what the CDM National Authority (AN-MDL) approval process is based on the compliance of the requirements of different governmental institutions, the complexity, bureaucracy or inefficiencies of such process will affect the national approval process as well and finally the image of the AN-MDL.

4.3. Target group effectiveness

The target group effectiveness correlates the actions taken by the target group, the degree in which they change their behavior when faced to the outputs of CDM and how they do it. In the Ecuadorian context this is represented in the consideration and the execution of CDM projects, that otherwise it would not have occurred, based on the definition of additionality. This will be appreciated from the perspective of two sectors at the national level in which CDM projects are being developed: renewable energies and municipal waste management.

4.3.1. Ecuador CDM portfolio

As January 2006 there were 36 CDM projects in different stages of development in the indicative CDM portfolio hold by Cordelim. Regarding the number of projects and the state, 2 hydro energy projects and 1 project of cogeneration with bagasse (March 2006) are registered. There are 6 validated projects which include 3 project of swine manure management from the same company, 1 landfill gas project and 2 hydro projects. 7 projects are developing a PDD, 9 on a PIN state and 4 on an assessment stage, as shown in Table 14. A detailed description of the portfolio can be seen on Annex 3.

From the projects in the pipeline an absolute volume of 12,815,703.39 tCO_2 can be expected for 2012. Regarding the distribution, there are 22 project of renewable energy with 7,194,356 tCO_2/2012; 3 landfill gas projects with 5,355,815 tCO_2/2012; 3 project of animal waste management with 216,469 tCO_2/2012 and 1 project of agricultural wastes with 49,063 tCO_2/2012 and 7 forestry projects. The forestry projects emissions reductions where not available at the moment of study Table 15.

State	Technology	Number	tCO_2 2012
Registered	Run off hydro	2	1,501,710
	Bagasse cogeneration	1	349,848
Total registered		**2**	**1,851,558**
At validation	Animal waste treatment	3	216,469.39
	Landfill Gas	1	587,762
	Run off hydro	2	530,867
Total at validated		**6**	**1,335,098.39**
PDD	Hydro	2	925,302
	Landfill Gas	1	4,680,000
	Methane recovery	1	49,063
	Run off hydro	2	856,303
	Wind energy	1	139,500
	Forestry	1	NA
Total PDD		**7**	**6,650,168**
PIN	Bagasse cogeneration	1	263,860
	Hydro	3	439,950
	Landfill Gas	1	88,053
	Run off hydro	2	820,426
	Wind energy	2	416,140
	Forestry	3	NA
Total PIN		**9**	**2,028,429**
Assessment	Hydro	4	950,450
	Forestry	3	NA
Total assessment		**4**	**950,450**
TOTAL		**36**	**12,815,703**

Table 14: Number of CDM projects and tCO_2 by state and type, Ecuador pipeline
Sources: Cordelim, UNFCCC (2006)

Project type	Technology	Number	Volume tCO_2 2012
Renewable energy	Bagasse cogeneration	2	613,708
	Hydro	9	2,315,702
	Run off hydro	8	3,709,306
	Wind energy	3	555,640
Agricultural Waste	Methane recovery	1	49,063
Animal Waste	Animal waste treatment	3	216,469.39
Forestry	Forestry	7	NA
Landfill Gas	Landfill Gas	3	5,355,815
Total		**36**	**12,815,703.39**

Table 15: Number of CDM projects and tCO_2 by type, Ecuador pipeline
Sources: Cordelim, UNFCCC (2006)

Referring to the UNEP/RISO pipeline of projects that have entered the validation stage, Ecuador has 10 projects, 7 in validation and 3 registered, thus representing 1.3% of the global CDM projects considered and 3% within Latin America (Fenhann, 2006).

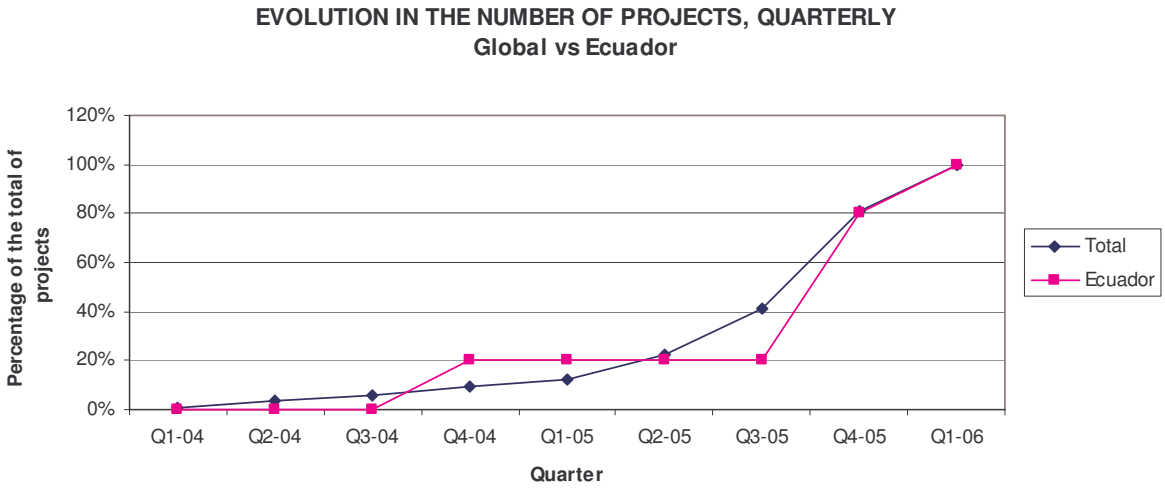


Figure 22 Evolution in the number of projects in Ecuador and worldwide (quarterly)
Source: UNEP/RISOE (2006)

Regarding the evolution over time of the implementation of projects, the Ecuadorian tendency has been following the world wide trend. However, it is clearly noticeable a stagnation of project development between the last quarter of 2004 and the three first quarters of 2005. At the end of 2005 it is observable a dramatic increase in the number of projects, from 20 to 80%. This was mainly because at the end of this year the possibility to register projects that have been already generating emission reductions was going to be over. Thus, several project developers pushed their projects to meet this deadline that at the end was delayed.

By June 14-2006, the projects described in the indicative portfolio of Cordelim (collected in January 2006) 15 out of the 36 projects are indicated as having already closed their negotiations of emissions reductions. From this projects two indicate that an ERPA has already been signed (CORDELIM, 2006).

From the total projects exposed in the Cordelim's indicative portfolio, Table 14 and Table 15, from the 29 projects[14], 76% are in the renewable energy field and 10% in the landfill gas one. The remaining 2.1% is distributed among agricultural and animal waste management projects. Regarding the amount of CERs that these projects generate, 98% is distributed among the two first mentioned fields. It should be noticed that while the high number of renewable energy projects, 22 (76%), they generate 56% of the CERs, while the 3 landfill gas projects, that are only the 10% of the projects, generate almost a similar amount of CERs (41,8%), as shown in Figure 23.

[14] From which CERs information is available

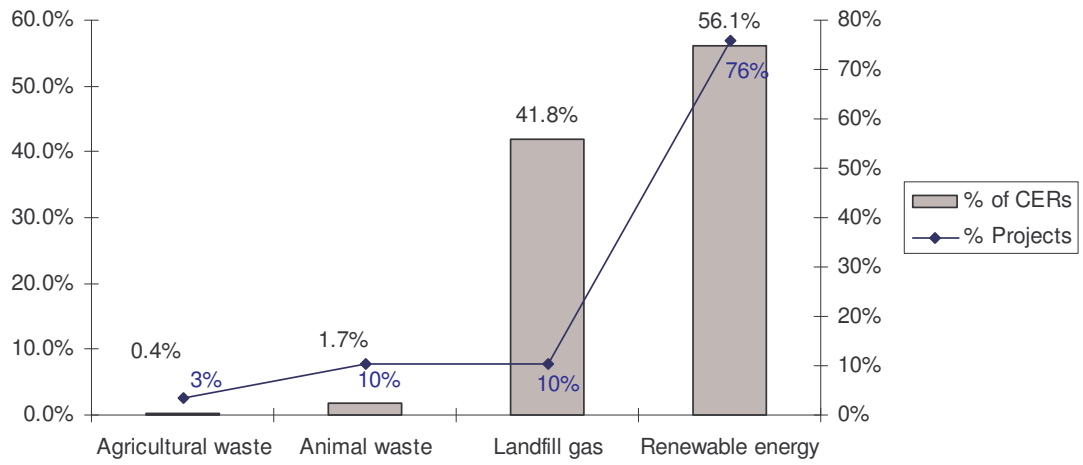
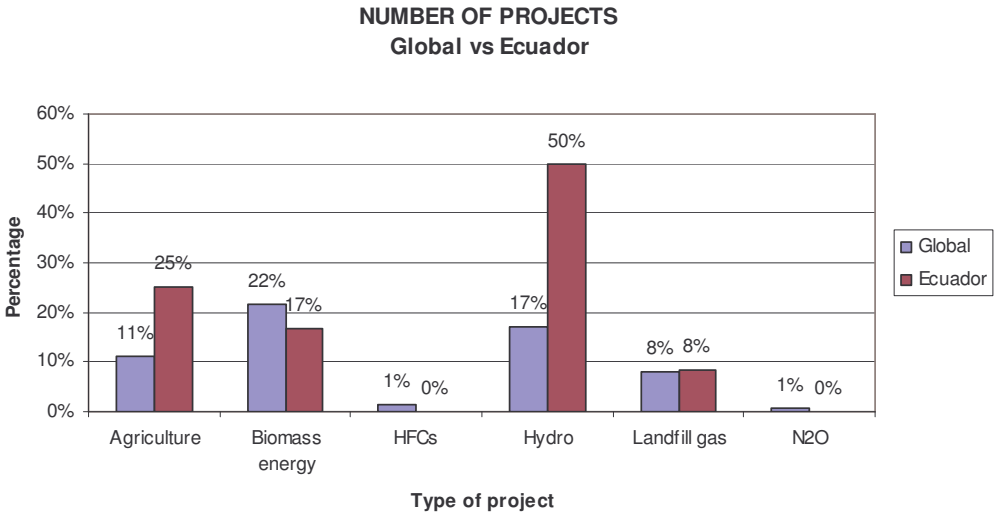


Figure 23 Proportional relation between CERs generated and number of projects in the Ecuadorian CDM pipeline
Source: Cordelim (2006)

When compared to the tendencies worldwide, the distribution of the number of projects in Ecuador is remarkably concentrated on the renewable energy sector 50% of the projects, compared to 17% of the projects worldwide. It should be also noticed that projects related to gases with a large global warming potential, especially HFC and N_2O are not present in the country, simply because there is not a significant presence of these industries. Consequently, the volume of emission reductions is also largely concentrated in the renewable energy sector, 77% compared to 14% at the global level. Figure 24.



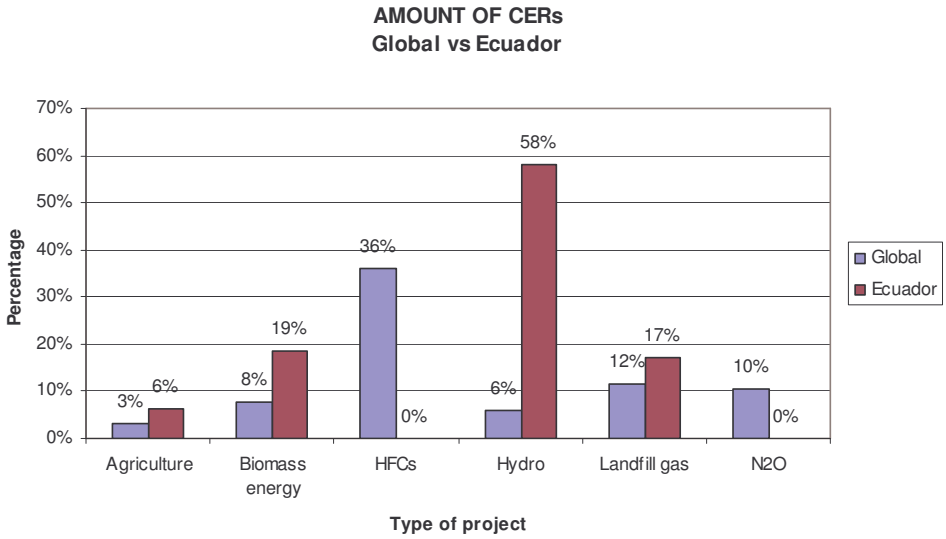


Figure 24 Comparison of the proportional distribution of projects and emission reductions between Ecuadorian and Global CDM projects
Source: UNEP/Risoe (2006)

4.3.2. CDM and the renewable energy sector in Ecuador

Renewable energy is one of the sectoral scopes of CDM, since the implementation of this type of projects aims to increase the amount of energy generated with renewable sources and thus decreasing generation with fossil fuels. Ecuador has a large potential for power generation from renewable sources, for example: a total hydro power installable capacity of 10,378 MW in the Pacific and Amazon basins (Consejo Nacional de Electricidad CONELEC, 2004), a national average solar radiation of 3-4 kWh/m^2, even though geographically is not the best location, for wind generation, there are several potential sites with wind velocity over 5m/s, from the few studies conducted there is also a known geothermal potential of 534 MW and a considerable stock in biomass (Ortiz, 2005; Proyecto OPET Latin America (OLA), 2005).

However, due to several factors including the role of oil prices and financial resources, the country's power generation has a considerable percentage of its generation originated from fossil sources. For example, for the year 2005, from the total energy generation in Ecuador (13 million MWh), 45,5% was hydraulic, 43,11% thermal and 11,39% imported(Consejo Nacional de Electricidad CONELEC, 2006), which has also been the trend in the last years.

In Ecuador the Law governing the electric sector was drastically reformed in 1996 (Consejo Nacional de Electricidad CONELEC, 2000), which transferred the initiative for investment in generation from the state to private investors. However, as for 2005, more that 60% of the electricity generation in Ecuador was still from state owned companies (Consejo Nacional de Electricidad CONELEC, 2006) and the indicative CONELEC'S 2004-2013 expansion plan considers only 37% of new hydro projects compared to 62% from imports and thermal generation (Consejo Nacional de Electricidad CONELEC, 2004) that will enter in to the national system. Additionally, it should be considered that the government has developed incentives for renewable energy and small scale generation as preferential prices and dispatch order under CONELEC'S regulation (El Comercio, 2005)or the Fund for Rural and Marginal Urban Electrification (FERUM) (Fondo de Solidaridad, 2006). However, these efforts have not been effective enough or lacked the necessary resources to really develop renewable energy in the country.

One of the reasons for this development is the already mentioned political and economical instability of the country, which really decreases the availability of financial resources and the possibilities for

investment in projects with high risks and long term perspective. Other reasons are that renewable energy sources are usually dependant of climatic variations and the necessary know-how and experience are not present in the country. Additionally, projects that are actually implemented face the risk of partial or non payment from the distribution companies that buy the electricity in the spot market, distribution companies that face losses up to 23%, from which 50% are non-technical reasons (Consejo Nacional de Electricidad CONELEC, 2006).

Since CDM is a voluntary agreement and it represents and additional effort and investment for project developers, it is possible that even if the government has adopted the international Kyoto regime, no projects are executed. This means that the mechanism should modify the behavior of the target group, and this is represented in the actual execution of projects under the CDM. Thus, the presence of CDM projects and the proportion these projects represent from the target group may indicate the effectiveness of the mechanism at the target group level. In fact, from the indicative portfolio of Cordelim 7 renewable energy projects that are within different phases of the CDM cycle are either already generating or will start soon to generation electricity to the Ecuadorian system. From the 22 renewable energy projects in the portfolio, Perlabi, San Carlos and Hidroabanico are already producing energy and during the year Simbimbe, Rio Calope, Poza Honda and La Esperanza project will be integrated into the system. From these projects, Abanico, Sibimbe and San Carlos are already registered as CDM projects and Poza Honda, La Esperanza, Calope and Perlabi are under validation. It is also significant that technologies as small scale diversion hydro (5 projects), cogeneration from bagasse (2 projects) and wind energy (3 projects, from which 2 are small scale), are being developed in contrast with the mostly thermal, import and large scale hydro projects expected. Table 16.

Technology	**Project Name**	**MW**	**Ownership**		**Expected CDM start**[15]	**CERs 2012**
Bagasse cogeneration	San Carlos	28	Private	Ecuador	2005	349,848
	Valdez	15	Private	Ecuador	2008	263,860
Diversion Hydro	Abanico	37.5	Private	Ecuador	2006	1,096,620
	Llanganates	27.6	Public, under private management	Ecuador	2008	641,440
	Rio Calope	16.6	Private	Ecuador	2006	463,295
	Saloya	23	Private	Ecuador	2008	560,000
	Sibimbe	15	Private	Ecuador	2006	405,090
	Sigchos 1	18	Private	Italy	2007	566,898
Diversion Hydro (small scale)	Jondachi	12	Private with public part	Ecuador	2008	282,835
	La Delicia	5.8	Private	Ecuador	2008	153,500
	Perlabi	2.8	Private	Ecuador	2004	67,572
	Pilaton San Carlos	8	Private	Ecuador	2008	212,550
	San Jose de Minas	5	Private	Ecuador	2007	178,986
Hydro	Hidromundo	34	Private	Ecuador	2008	24400
	Hydro Sabanilla	20	Private	Ecuador	2007	573468
Hydro (small scale)	Chorrillos	4	Mixed	Ecuador	2006	84000
	Pilalo 3	11.8	Private	Ecuador	2007	358404
	San Jose del Tambo	7.4	Private	Ecuador	2008	150285
	Victoria	10	NA	NA	2008	205665
Wind energy	Huascachaca	30	Public	Ecuador	2008	216580
Wind energy (small scale)	Salinas Wind Farm	15	Private	Ecuador	2007	139500
	Villonaco	15	Public	Ecuador	2008	199560

Table 16 CDM in the renewable energy sector in Ecuador
Source: Cordelim (2006)

[15] Adjusted from stated star date accordingly to project development status

From Table 16 it could also be appreciated that most of the project are developed by private Ecuadorian organizations (>70%).

Regarding the distribution of CERs among technologies, while representing 50% of the projects, small scale projects generate 28% of the CERs and the other 72% is by large scale projects, as shown in Figure 25.

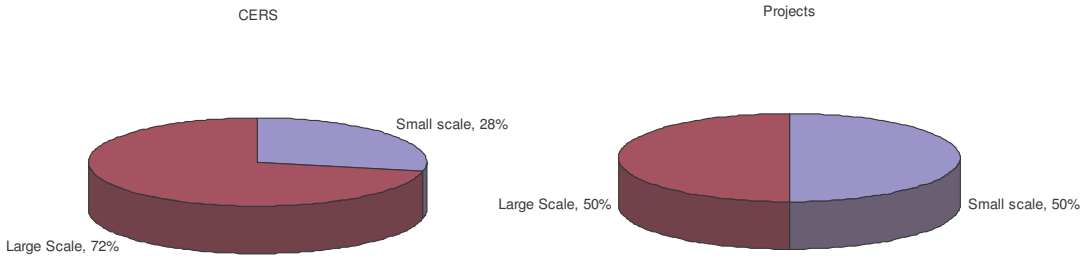


Figure 25 CERs and number of project according to the scale of the project
Source: Cordelim (2006)

Analyzing among the categories, 52% of the CERs are originated from the 6 large scale diversion hydro 6 projects (the average size of these projects is only 23 MW). The rest of CERs is more evenly distributed among the other technologies. However, it could be noticed the small scale technologies generate less CERs per project. Figure 26

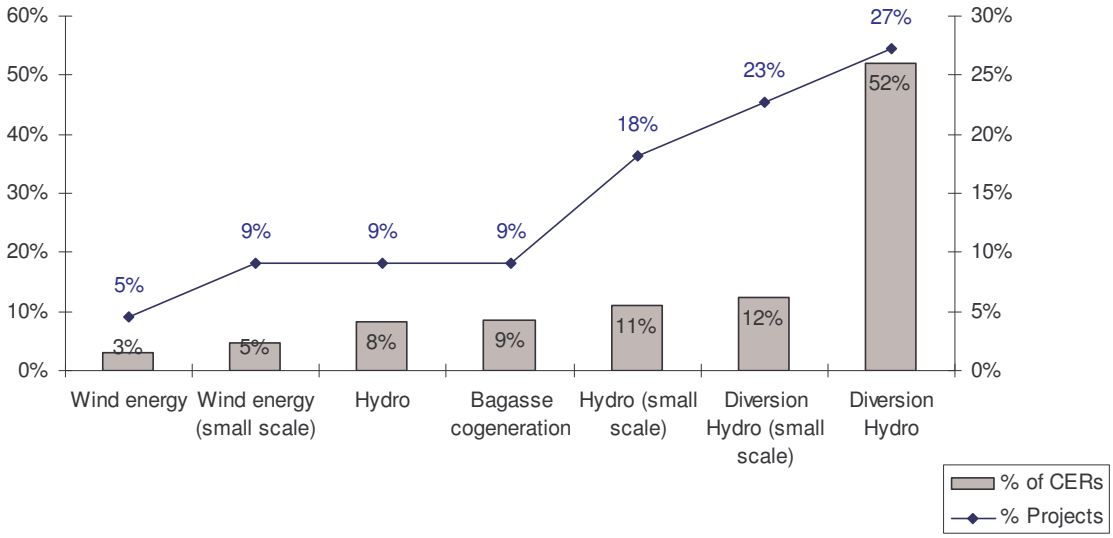


Figure 26 Proportional relation between CERs and projects in the renewable energy sector in Ecuador
Source: Cordelim (2006)

4.3.3. CDM and the municipal solid waste management sector

The final destination for municipal solid waste, either as open dumping or controlled landfill, are sources of GHG emissions, especially methane. Consequently, the reduction of methane emissions from municipal solid waste is also considered within the CDM scope.

Ecuador population according to the last census (2001) was 12.1 million people. The population distribution has shifted from a 29% of urban population in 1950 to 61% in 2001 (Instituto Ecuatoriano de Estadisticas y Censos, 2006) and an average waste generation per capita of 0.52 kg/person/day is estimated (Organización Panamericana de la Salud, 2002). However, 51% from this population has a

waste recollection rate from the total number of households between 30% and 50% , 47% a rate between 50% and 70% and only 2% has a recollection rate higher than 70%(Secretaría Técnica del Frente Social, 2004). In fact from the 19 cities in Ecuador with a population over 100,000 inhabitants, only 37% (7) have a landfill, while the rest have open dumpsites as a final treatment. From these 19 cities, 54% have heard about CDM and how it could be applied to solid waste management. To this it should be added that the 4 biggest cities are already implementing CDM projects.

Regarding the specific management of methane form this facilities, the legal framework applicable is the Unified Text of Secondary Environmental Legislation (TULAS[16]). This regulation mandates the passive venting of methane from new and operational landfills. However, besides the actual CDM projects, this regulation is not implemented in Ecuador. Additionally, since most of landfills or dumpsites are managed by municipalities that usually have to prioritize the spent of their budget, and since methane control has no profit by itself, they are not willing to invest in this kind of projects.

Consequently, a clear effect of the CDM over the execution of landfill gas capture and destruction projects can be argued. The mechanism will allow project developers to first turn profitable the activity and second to overcome the barriers of introducing a new technology and the already mentioned investment restrictions in Ecuador. In fact 3 of these projects are already considered under the CDM in Ecuador.

Project Name	**Ownership**		**Starting date as CDM**	**CERs 2012**
Ambato Landfill Gas Project, Ambato Municipality	State	Ecuador	2006	88,053
Las Iguanas Landfill, Guayaquil Municipality	State	Ecuador	2007	4,680,000
Zambiza Landfill Gas Project, Quito Municipality	Private	Ecuador	2006	587,762

Table 17 CDM in the solid waste management sector in Ecuador
Source: Cordelim (2006)

As shown in Table 17, there are already 3 landfill gas projects CDM projects in Ecuador. The Zambiza project is the most advanced one; it is already under validation and waiting for the national approval. The Las Iguanas Project is at the feasibility assessment stage and the Ambato project is at the pre-assessment stage. Both the Zambiza and Ambato projects contemplate the generation of power from the methane captured. Regarding the ownership, only the Zambiza project is private. However, the other two cases the municipality is going to manage the landfill and the CDM project. In the Zambiza case, the project developer is only executing the methane capture and destruction since the Zambiza dumpsite is already closed.

4.3.4. Additionality discussion

As mentioned before, the effect of CDM changing the behavior of the target group actor is represented in the concept of additionality. The additionality concept indicates that CDM are projects that are occurring beyond what it was considered as the most likely scenario of future events, thus CDM projects are projects that without the mechanism would not occur, at least in theory. It is interesting to notice that most of project developers indicate that their own projects were adapted to CDM, which may contradict with the concept of additionality. This may indicate that in one way or another these project developers where planning to financially close their projects with or without the mechanism, and there is the possibility that they would have been implemented anyway. However, it was also indicated that even though adapted or not, the projects fulfilled the requisites for being implemented as CDM and also they faced several barriers. As indicated in previous sections, investment risks in Ecuador are considerable. For example for the electricity generation sector in Ecuador, even though the contribution of CDM revenues to the whole project revenues is marginal, these projects are faced

[16] Texto Unificado de Legislación Ambiental Secundaria

with weather related risks, political instability, uncertainty in payment from the power distribution companies, almost no foreign and private investment in the electricity Ecuadorian sector, etc. thus, having a strong argument for additionality because of prohibitive barriers. In the case of projects in the waste management sector, specifically landfill gas management. The Ecuadorian law demands the passive venting on 10 to 15% of the methane in order to avoid explosions. However, this is hardly done and only few cities have actual landfill facilities for waste management, which additionally work under very limited financial conditions. This means that no capture and destruction of methane at large scale was expected at the national context. Thus, this kind of projects depend largely on the CDM revenues and could argue that besides the barriers, which are also related to investment and political risks, they would not have occurred without the mechanism and consequently becoming additional.

These positions will fit in to the discussion of strictly financial or a more broad definition of additionality. Some authors see additionally only in financial terms, thus projects in which CDM revenues are only marginal, as in the case of most of energy projects, it could be assumed that the project were expected to be developed anyway (Sutter and Parreño, 2005). However, some other perspectives see it as not only regarding the financial revenues, but the barriers that projects have to face –even if in theory they are profitable, the barriers are prohibitive for implementation- or even as only environmentally additional, which means that if the project has a real reduction in emissions is additional even if it is profitable (Shrestha and Timilsina, 2002; Greiner and Michaelowa, 2003). The approach of the UNFCCC additionality tool leaves the option to choose among financial support of additionality, thus indicating that the project will not be profitable without CDM revenues; or by demonstrating that the project faces technological, investment and prevailing practice barriers for implementation. The discussion here will be if on one side projects are not additional and they would have occurred anyway if they received CDM resources or not, they are receiving unnecessary additional revenue –seen as a subsidy for busyness as usual- and most of all they will affect the real effect of the Kyoto Protocol. This is because when an Annex I government or company buys a CER from a CDM project, this will allow them to emit one ton of CO_2 which will not be reduced in their own facilities, thus if the CER was not additional there wont be a net effect in the reduction of atmospheric CO_2 and not mitigation of climate change. On the other side, due to market dynamics, highly additional projects usually face higher costs or generate smaller volumes of CERs per project, which may restrict the development of the carbon market and thus the development of the whole mechanism.

4.3.5. Actor's perception about CDM in Ecuador

From the project developers' opinion about CDM, they consider that it is an new and interesting mechanism. However, it is still affected by uncertainties in the market and the complexity of the process it self, which may specially affect small scale projects and project developers (I 26,36,14,19), who are left put because they can not cope with the high transactional costs. It is considered as an important element in the financial closure of projects that otherwise would not have been implemented due to the complicated investment situation in the country (I 5,29) or because they are not demanded by the current regulations (I 15), consequently, bringing resources to the country (I 17). Additionally, project developers indicate that it has provided support in the solving of environmental problems that the companies or municipalities face (I 12,13) and that it could be used to improve their environmental management systems and overall image (I 31). It is also considered to be useful for the development on conservation and development projects (I 20,16) and finally to produce benefits for developed and developing countries (I 35).

However, some perspectives see it as a merely commercial instrument (I22), which favors end of pipe cost effective solutions (I6) and that may even disregard the environmental or sustainable aspects of projects (I17). Even more, it is seen as quite rigid and with too many conditions, thus not becoming an incentive strong enough for certain types of projects that are needed in the country (I 11) and that has created false expectations about its real benefits (I 34,25). Additionally, some positions see it as a very

bureaucratic process at a global scale, where the United Nations and the networks that have access to it determine the success of projects. Even more, some positions see it as a the cause of a unbalanced power relation, where the lack of resources leads to association with financers and brokers that leads to lost in the ownership of the CERs, it depends who one is associated with. "*It has turned in to a process of proving things*" (I21)

Finally, it can be concluded that the CDM has affected the behavior of the target group in Ecuador, which is represented in the execution of several projects in both, renewable energy and landfill management sectors. This is supported by the fact that several of the projects that are currently been executed or considered as CDM projects face either barriers for implementation or are actually not profitable without CDM revenues. Consequently, and under the considerations of the additionally concept, they would not have occurred without the mechanism incentive. However, something to be considered is the proportion of the target group that is actually implementing the projects, which indicates the overall effect of CDM in the whole sector. First, most of the renewable energy projects correspond to private companies, from which 4 are part or developed by companies that are among the largest and most powerful in Ecuador. There are no renewable energy projects implemented at the community level or other kind of social organizations, which may involve a different ownership structure and consequently a more likely distribution of profits among the most needed sectors. In the case of the solid waste management the same reflection could be applied. Only the largest cities and with more access to resources in Ecuador are implementing CDM projects for landfill management. The Zambiza and Iguanas projects are located in the two largest cities in the country, and the Ambato landfill is the forth largest. Here again, regardless of the type of ownership of the project (private or public), there are no small or medium cities developing landfill gas CDM projects, and even more several potential cities do not know about the mechanism. Consequently, the effectiveness of CDM implementation in Ecuador at the target group level could be considered as partially effective. However, the proportion of the target group reached is still small and a polarization to actors who have the necessary resources is noticed in the kind and size of projects implemented and the ownership structure. The distribution of project types differs from the global percentages due to a large concentration of renewable energy projects in the Ecuadorian case, 58% of all the CERs expected. It has a similar proportion of landfill projects and no presence of high volume projects like HFC destruction or N_2O abatement. The evolution of projects over time also follows the global tendency over time. Actors indicate that the instrument could be beneficial for the country and that its characteristics are interesting for financial supporting the development of projects with several environmental benefits. However, more diffusion and incentives are necessary to overcome the transaction costs and the investment risks that Ecuador faces.

4.4. Impact effectiveness

The following section will describe the effects that have been observed in the target area due to CDM and how these effects are related to the expected objectives of CDM. It will start by a case study perspective from a renewable and waste management projects. Then it will be combined with the target group effectiveness and interviews to relevant actors in order to draw general conclusions of both sectors and CDM implementation.

The description of the case studies is based on interviews with the project developers and public available information as the project design document (PDD), environmental impact assessment studies, and others. It will present a description of the project, the statement provided by the project developers of how they contribute to the sustainable development of Ecuador, the financial structure of the project, the additionality statement provided under the UNFCCC procedures and the perception of the process performance from the project developer's perspective. Regarding the effects of the project, these will be mainly focused on the contribution to sustainable development of the host country represented in a series of indicators developed form literature and interviews to relevant CDM actors. These indicators will cover environmental, development/economic and equity/social impacts.

Due to the stage of projects some of the effects are already observed and some others are expected to occur.

4.4.1. Case study. The Abanico Hydroelectric Project

4.4.1.1. Project description

The Abanico Project is one of the first CDM projects implemented in Ecuador. Its objective is the generation of electricity from hydrological resources, using diversion or "run of hydro" technology. The project is located in the southeastern region on Ecuador, near the city of Macas on the Morona Santiago province. The project will be developed in two phases completing an installed capacity of 37.5 MW in total. The first phase will have an installed capacity of 14.88 MW and the second 22.66 MW. The project participants (as defined in section 2.4.5) are the private entities: Hidroabanico S.A. and the Netherlands Clean Development Mechanism Facility (NCDMF) with the World Bank as trustee. The project developer is the Ecuadorian company Hidroabanico S.A. and the World Bank will be the purchaser of the CERs in name of the Netherlands government, which has been formalized through an emissions reduction purchase agreement (ERPA). Consequently, the project fits the multilateral modality of CDM.

The project is a diversion hydro power plant, which means that a dam will not be used and the generation of power relies solely on the actual water flow of the river. The project will capture the waters of the Abanico River in a 600m 3 reservoir and then it will be conducted for around 2.5 km to a generation facility after which it will be released to the Balapeque River.

The reduction in GHG emission from the project will occur from the replacement in the grid of electricity generated from fossil fuels. In the Ecuadorian case, at the time of the project documentation, the percentage of fossil fuel or thermal electricity generation was 45,2%, mainly generated with fuel oil, diesel and natural gas. The project Designated Operational Entities not fit within the small scale category for CDM and uses the methodology ACM0002 "Consolidated Baseline methodology for grid connected electricity generation from renewable resources "The project is expected to reduce around 2,2 million tons of CO_2 equivalents during a 14 year crediting period.

4.4.1.2. Statement of sustainable development contribution

The contribution to sustainable development of the project is stated as generation of clean power, generation of employment in an economically depressed zone; decrease the use of fossil fuel generated power and to improve the efficiency and competitiveness of some Ecuadorian industries.

4.4.1.3. Financial structure

The Hidroabanico S.A. company includes 100% Ecuadorian capital. The financing of the project was arranged from 33% of its own capital, 33% from a loan from a local financial organization and the remaining 33% from a loan from the Inter-American Development Corporation (IIC). The income from the sell of CERs will be used as a guarantee for the IIC loan.

4.4.1.4. Additionality

The project additionality was proven using the tool for demonstration additionally from UNFCCC. The barrier analysis was selected for this purpose. The statement was that the project faces several

barriers for implementation as high country risk and a high risk of not being paid by the distribution companies in the Ecuadorian energy system. However, since the CDM component helped secure 33% of the financial resources necessary for the project and thus addressing the barriers mentioned in the additionally test it could be assumed that the instrument has had a considerable effect in the behavior of the project developers and that the project is additional.

4.4.1.5. Process performance and relation with the administration entities

The project developer considered that the process has been quite long. They indicated that the CDM process has taken around one year and nine months until registration which occurred in February 2006. However, they did not find considerable complications, either on obtaining of the national approval letter as the UNFCCC process.

4.4.1.6. Effects of the Abanico project and their relation to the CDM objectives

According to the national requirements for CDM approval the project has contributed to the sustainable development of the host country and since it produces additional emissions reductions, it also complies with the objectives of CDM, thus the project has been already registered at the UNFCCC.

Regarding the already observable effects of the project the following could be mentioned, as summarized in Table 18.

The region where the Morona Santiago province is located has an average income from agricultural activities (which is the most common activity in the project's area of influence) of $124 per month and a net unemployment rate of 10.6%, actually the highest in the country (Instituto Ecuatoriano de Estadisticas y Censos, 2002). The project at its peak generated almost 300 working positions, in which local population had a considerable fraction. Once in operation the project will require approximately 15 working positions. However, the contribution of local labor to these positions is marginal since most of them have technical skills requirements which are low in the surroundings of the project.

Even though the Ecuadorian Electricity Law approved in 1996 allows the possibility of private investment in generation and distribution of power, several projects are still own by the government, several represent thermal generation and regarding potential hydro projects very few have reached financial closure (UNFCCC, 2006). The Abanico project is actually one of the few and first private power generation project to be executed in Ecuador since the approval of this law. Thus, the project has stimulated private investment in the generation of power from renewal sources in the country, and even more attract local and international financial institutions to finance this investment.

The project has complied with the required national and local regulation. Nevertheless, this could not be arguable explicitly to the CDM component since in order to generate and be able to sell energy the project should have complied with these requisites even without CDM. After the period where it was open for public comments, held by the validator Det Norske Veritas (DNV), no comments were received[17].

The project will contribute also to the generation of profit and thus contributing to economic sustainability of the country. Since the project is 100% owned by an Ecuadorian company it could be assumed that the resources will remain in the country.

[17] http://www.dnv.com/certification/climatechange/Projects/ProjectDetails.asp?ProjectId=107

From the Annex I country perspective, the CERs that will be produced by the project have been already sold to the Netherlands CMD Facility, agreed through the ERPA, with the intermediation of the WB. These CERs are thus contributing to the achievement of the Dutch government commitments under the Kyoto Protocol. Even more, considering the abatement costs and the cost of non compliance under the European Union Emissions Trading System (EU-ETS) for the country, it could be assumed that the CERs from the Abanico project have provided a cost effective alternative.

Regarding environmental impacts, the main effect will be decrease in emissions from power generation with fossil fuels. The studies do not reveal any considerable negative environmental impact in the surrounding areas. However, any local environmental improvements may also be seen from it. Additionally, some sections of the local community especially the ones in the direct area of influence of the project and some NGOs consider that the diversion of the water flow from the Abanico River to another basin will affect their availability of water and for the environment.

At the local community level, the project also has conducted several activities to reinforce this relationship. Specifically it has provided support and resources for the reparation of the local church, the donation of a valve for the drinking water system and possibilities for collaboration in other local construction activities are in process. Regarding this last point, the company has been clear that is willing to provide assistance to the local community as long as they also participate in these activities. An example will be that the company will provide the necessary machinery for a certain work, while the community should provide the labor. Another effect of the project is related to the water diversion from the Abanico to the Balaquepe River. The Macas' Municipality drinking water plans contemplated the use of the Abanico's waters. However, they lacked the resources to bring the water to a location where it could be treated. The diversion of the project to the Balapeque River, will save this effort to the local authorities which may represent several millions of US dollars. However, some inhabitants of the Abanico's basin are worried to a decrease in the flow of the river (the project is expect to capture $12m^3/s$ when complete) and thus affecting their production systems. This vision is shared by some NGOs and organizations as Accion Ecologica (Granda and Accion Ecologica, 2005; Accion Ecologica, 2006; , 2006) and the Yukuankas Community in the Yuganza county (Morona Santiago.com, 2006). These organizations are completely opposite to the execution of projects of this type, because of the negative environmental impacts it may generate, the possible association with a mining company (Corriente Resources Inc., 2006) and their perspective of the inadequacy of the Clean Development Mechanism it self as a solution to climate change mitigation and sustainable development.

4.4.2. Case Study, The Zambiza Landfill Gas Project

4.4.2.1. Project description

The Zambiza Landfill Gas Project is also the first project to be developed under CDM within the waste management sector in Ecuador. The objective of the project is to efficiently capture and destroy the methane emissions from the Zambiza dumpsite in Ecuador's capital Quito. The Zambiza dumpsite has been the main destination for most of Quito's (the second largest city in Ecuador with a current population of 1,5 million inh.) from around 25 years until it was definitively closed in 2002. Consequently, the dumpsite, which actually is a ravine, it did not have any technical or environmental considerations for several years, turning it in to a source of soil, water and air pollution. Even more, during this whole period and due to the continuous growth of the city the Zambiza dumpsite ended up within the city boundaries and surrounded by populated areas, covering a surface of 20 ha and a depth that varies between 20 and 50 meters. The only project participant and developer is the Ecuadorian company Alquimiatec S.A., thus fitting the unilateral modality of CDM. At the time of the research the project had not negotiated its emission reductions. However, negotiations had occurred with several buyers including the Austrian, Dutch and Japanese carbon facilities among others. However, as for July 2006, the project is shown at the indicative CDM portfolio of Cordelim as closed negotiations of its CERs. The project developers worked in conjunction with the German consultancy

company Ara Carbon Finance and the German technology provider G.A.S. Energietechnologie GmbH.

The project will consist of a network of approximately 50 gas extractions wells with a depth of 30 m, from where the gas will be extracted by a suction system. The recovered gas will be combusted in a high temperature controlled flare. Additionally, since no drainage infrastructure was considered at the star of the dumpsite and because is a normal rain water course, high water levels existed in the whole dumpsite. This could destabilize the whole structure with considerable consequences and also affected the gas extraction. Consequently, the project developers also implemented a de-watering system as part of the project.

The project reduces GHG because it captures the methane emissions that are generated due to the decomposition of organic waste under anaerobic conditions. This project is also under the large scale categories of CDM and used the ACM0001 "Consolidated baseline methodology for landfill gas project activities". The emission reductions expected from the project during the 10 year crediting period are 840.000 tons of CO_2 equivalents.

4.4.2.2. Statement of sustainable development contribution

The project developers state that the main contribution to sustainable development from the project are the development of technical standards in Ecuador and the improvement of the local environmental conditions due to the decrease in the emission of different pollutant gases and odors and the reduction of possible explosion risks due to the high methane content in the dumpsite.
It will also contribute to generation of local employment, but is a relatively small proportion. It also supports the plans of the city's municipality of managing the dumpsite in a more technical way and lately to convert some areas of the former dumpsite into a recreational park. Finally, the project would also be seen as an example for integrated and environmental sound waste management, because it is one of the first projects in Ecuador that is implementing such technology.

4.4.2.3. Financial structure

The project developer company Alquimiatec S.A. is an Ecuadorian company formed by the association among Alquimiatec, and individual natural person partner and G.A.S. Energietechnologie GmbH. The capital used for the development of the project is from its associates.

4.4.2.4. Additionality

The case for the additionality of the Zambiza project is based in the facts that active methane extraction combustion in Ecuador is not common practice; since it was closed by 2002 no regulation determines the flaring of gases in dumpsites of landfills. The new regulations demanding passive venting was approved in 2003. Additionally, the project by it self is non profitable and consequently without the CDM incentive the release of methane as a baseline scenario will continue. Based on the additionality test and the evidence that project was not been implemented for almost 6 years until 2004 under the CDM. Consequently, it could be argued that the change in behavior of the project developers was considerably affected by the mechanism. Additionally, the 100% of the project revenues are from the commercialization of CERs, thus linking directly the execution of the project with CDM.

4.4.2.5. Process performance and relation with the administration entities

The Zambiza project developers were expecting to receive their National Approval around February or March 2006. However, until July 2006 this has not happened. Even more, the project has already started the validation process in December 2005. Since the national approval is one of the basic requisites to continue in the CDM cycle, the project will not be able to finish the validation stage and move on to registration until it is approved by the national authority. Additionally, the project developers indicates that to obtain all the necessary environmental permits was a bureaucratic and complex process, requiring 5 different sub-steps in order to approve the EIA. Due to the location of the project
The project received no comments at the public comments period, held by the validator TÜV SÜD[18].

4.4.2.6. Effects of the Zambiza project and their relation to the CDM objectives

As indicated before the Zambiza project has not received yet the national approval and consequently can not be validated and registered as a CDM project activity, thus the formal confirmation of compliance with the CDM requirements has not been obtained.

However, several effects that can be related to the objectives CDM can be mentioned (Table 18):

The Zambiza dumpsite represented in several ways an environmental and even a safety threat for the city and specially the populated areas surrounding the dumpsite. With the implementation of the project this situation will be considerably improved. This is achieved by the capturing and combusting the methane in a controlled way and by providing and adequate management to the liquid that was been held in the dumpsite it self. Thus, besides the actual emissions reductions, the project will also improve the local air quality and it will also reduce the danger of explosions and the danger the whole dumpsite collapsing due to water movements accumulated underneath the dumpsite. This in backed up by the respective EIA, in which the project is considered highly positive and with very few, low magnitude and controllable negative impacts. All these contributes to the efforts of the Municipality of providing and more technical and environmentally sound management to the Zambiza dumpsite and at a later stage convert parts of it into a recreational park.

Even though the employment generation of the project is not high, it Designated Operational Entities generate around 16 working positions, including guards, technicians and operational personal. However this is determined by the technology used and the state of the dumpsite.

The management of municipal waste in Ecuador is commonly done by the municipalities and local governments and the first and most common option is the open dumping as final treatment. Consequently, because of the CDM incentive, the Zambiza project is an example of private investment in a new and environmentally sound technology.

As indicated above, the project will compliment with the planning of the Quito Municipality and it fits within several legal frameworks in the country that aim to a more sustainable management of solid waste in Ecuador. The project developers mention the contribution to the Solid Waste National Policy (Unified Text of Ecuadorian Environmental Policy), the Environmental Strategy for Sustainable Development, both of which are considered also in the priorities of the CNC for CDM projects, as indicated in section 4.2.5.1.

The project will allow the generation of profit for the project developer, which as mentioned before is a national company. The indication of the project as closed for negotiations indicates that the CERs have been traded already. However, the final destination can not be indicated based on this study.

[18] http://www.netinform.de/KE/Wegweiser/Guide2.aspx?ID=1515&Ebene1_ID=26&Ebene2_ID=371&mode=1

At the community level the project is seen as positive by the surrounding communities and the at the city level in general. The project developers have established contact with the community board (junta parroquial) in order to contribute to the construction of a school. However, they also indicated that these interactions are in general complex, since the communities tend to generate exaggerated expectations about the benefits of the project.

Indicators	Projects	
	Abanico diversion hydro	**Zambiza landfill gas**
Environmental impacts		
Water resources availability	- and + (relative)	NA
Water resources quality	+	+
Air quality, non carbon effects	+, not local	++
Soil Erosion	+	NA
Soil contamination	NA	++
Noise level	NA	NA
Ozone depleting substances	NA	NA
Biodiversity protection	+/- to +(indirect)	NA
Land use	+/-	+/-
Economic impacts		
Employment generation	+/- to slightly +	+/- to slightly +
Generation of profit	++	+
Attraction of foreign direct investment	+/-	+/- to +
Development of local related services	+/-	+/- to slightly +
Human capital, technology transfer	+/- to slightly +	++
Social impacts		
Income distribution, ownership	+/-	+/-
Participation of local authorities and local communities	+ and -, conflicting	+/- to +

SCALE
Very positive ++
Positive +
Neutral +/-
Negative -
Very Negative --
Not applicable NA

Table 18 Effects of two selected CDM projects in Ecuador

4.4.3. Effects of CDM projects in the renewable energy and the municipal solid waste sectors

Under this section, based on the information presented on previous sections, a more general conclusion will be developed regarding CDM effects in the renewable energy and municipal waste management sectors in Ecuador.

4.4.3.1. Increase in energy supply and independence from renewable sources

The CDM renewable energy projects that started to operate will add 109 MW to the national power generation from renewable sources. From the other projects in the pipeline another 250 MW could be achieved. This contribution is relevant for Ecuador since it is faced with the dependency of most of its power on one single large hydro facility and the rest from fossil fuels and imports. In fact, the situation of the power generation sector in Ecuador is quite complex and the law reforms have not been able to attract enough private investment to sustain the continuous demand for power generation.

One of the most feasible options for the government in these cases is to subsidize fossil fuels for power generation in order to satisfy the demand. The incentive of CDM for new renewable and diverse energy projects will contribute positively to the solution of this problem.

4.4.3.2. Environmental impacts

Regarding the state of the environment, at the stage in which the projects are, it can not be accurately assessed. However, in the renewable energy projects -due to the characteristics of the projects- the main environmental benefit will be the decrease in GHG emissions, which in the case of reduction of fossil fuel combustion will not only reduce CO_2 , but also pollutants as VOC, particulate matter and SOx. However significant, no other considerable environmental improvements from the project activity itself will be achieved and even worst at the local and community level were the projects are being executed. For example, a conventional technology hydro plant, a wind farm or even a diversion hydro plant, very unlikely will have positive –and rather negative but manageable in most cases- environmental impacts in the places where they are being implemented. In the case of cogeneration with bagasse, since biomass use as a fuel is carbon neutral, it may decrease the amount of waste that was being disposed of after sugarcane harvest. However, the impacts also depend on the technology and design of the process to be used.

For the case of methane reduction from municipal waste, besides the GHG reductions, project may have a few more benefits to the environment. Furthermore, the installation of a landfill gas capture system demands certain characteristics in the landfill or managed dumpsite that will improve its environmental performance. For example, it will require that the surface is covered so the methane can be collected, thus reducing emission on pollutants to the air. In the case of liquid emissions, depending on the type of facility, it will either be adequately isolated so water intake is very low or in the case of managed dumpsites it will require a pumping system to remove accumulated water, thus reducing the possibilities of runoffs. Finally, since the revenues of methane capture projects are considerable, it may be a driver to actually develop adequate waste management strategies and the installation of landfills in cities that did not have it before.

The national approval process of CDM projects demands the compliance with the respective environmental regulation, thus is unlikely that projects that have adverse effects on the environment will be approved.

4.4.3.3. Trade of CERs and generation of revenue

The demand for CERs in the global market is high, and the Ecuadorian case is not the exception. Two projects, Abanico and Sibimbe have already signed specific ERPAs, specifically with the Netherlands CDM Facility through the World Bank. Additionally, the Calope project is also in a similar process through the Andean Development Corporation (CAF). Additionally, other eight projects have closed their CERs negotiations already. These projects will generate approximately 1,318,561 CERs per year, which depending on the price arranged may represent an income between $6 and $19 million per year (at $5 and $15 per CER respectively) that will be directed to Ecuador. This is also an indication that Annex I countries are interested and using CERs generated from Ecuadorian projects, and that those CERs are actually going to be used in the fulfillment of their Kyoto Protocol commitments. It should be noticed that the preparation phase of CDM, which ends with the registration of the project at the UNFCCC and the amount of CERs that are indicated in such documents may be seen as indicative. During the project execution phase several factors will affect the actual performance of projects and their delivery of CERs. This could be for example, unexpected change in climate factors as wind, solar radiation and precipitation that will directly affect renewable energy project as wind farms, hydro projects and bagasse cogeneration. In the case of landfills, the models and the composition of waste include relatively high degrees of uncertainty, and the project may also generate a different amount of

CERs. Even more, projects in developing countries face several risk factors as strikes, changes in governments, policies, etc. that also may alter their planned execution. This will affect then, the actual number of CERS that will be actually traded, the revenue that project developers will obtain from CDM and the amount of CERs that Annex I countries will have available.

It is important to highlight that these negotiations are executed under a market with a high demand and a supply that, even though it can not satisfy the current demand, is extremely competitive and where access to information as CERs prices is limited. This is expressed in the actual CER prices and the negotiation schemes that are developed, most likely benefiting buyers and intermediaries, and at the same time determining the type of projects that are developed. As shown in the target group effectiveness, renewable energy projects and landfill gas projects represent most of the CERs portfolio, and in fact they represent an accessible way to generate CERs at an acceptable cost.

4.4.3.4. Development of a market for service related companies both international and national

The development of CDM and the carbon market has led to the development of whole market of services related to implementation of the mechanism. In Ecuador this has also occurred and it could be appreciated by the presences of different consulting companies –more foreign than local-, intermediaries, financing agencies, multilateral development agencies, etc. For example, in the mentioned sectors the World Bank Carbon Facility acted as consultant and intermediary for the Abanico and Sibimbe projects. Econergy from Brazil consulted for the San Carlos project. The Perlabi project worked with Deuman from Chile, Cordelim and a national expert. The Galapagos wind Project with the Kfw carbon fund. The Zambiza project developed its project with the German company Ara Carbon Facility and has as partner and technology provider the also German company GAS. Even though is not within the scope used for this research, in the other sectors of CDM implementation in Ecuador as clean industrial processes and forestry projects, also other international consultancy companies participate as: CO_2e.com and EcoSecurities. At the national level, a few organizations have engaged in the consultancy for CDM projects as the case of Eficacitas, Aqualimpia, CEMDES in collaboration with the Colombian Andean Center for Economics in the Environment (CAEMA) and individual consultants. However, most of these local actors consider that the market is rather marginal, long and complex and project developers rather to rely on international companies or multilateral organizations that have more resources and political power in the CDM procedure.

Additionally, memorandums of understanding have been developed with the Canada's Clean Development Mechanism & Joint implementation Office (Richardson, 2006) and the Dutch government (VROM, 2006). The Bilateral Cooperation Agreement between Ecuador and Spain that involves CDM projects as debt exchange and with collaboration of CAF (Castillo, 2006) was also developed.

From some actor's perspective, these interactions –if not clearly based on legal terms- are in detriment of the profits for the project developers and the contribution to sustainable development of the host country. Intermediaries and multilateral funds search for the most cost effective options, thus preferring projects with high volume and low costs that have a lower contribution to sustainable development.

4.4.3.5. Generation of employment, distribution of profit and poverty decrease

Because of the characteristics of the projects a considerable generation of employment can not be expected. Besides the construction period, which is relatively small compared to the whole lifetime of a project, CDM projects in the renewable sector and the landfill sector will generate few direct and indirect working positions, and even worst of unskilled local labor. This is, however, directly related

to the technology used. Small scale diversion hydro plants, wind farms and landfills do not need a large amount or personal to operate in relation to the amount of CERs that they produce.

Regarding the distribution of profit, most of the projects are executed by Ecuadorian companies, which indicate that the CDM revenues will stay in Ecuador as a host country. However, it is very unlikely that these resources will get at the most needed sectors or that they will have any direct effect on poverty reduction. Most of the projects are executed by independent private companies and there are no projects executed at the community level or by small municipalities. This is reinforced by the type of project and scales of investment, which even for small scale projects are not reachable for the mentioned actors. Another factor that affects the participation of these actors is the current transaction cost for CDM projects and the prices that are paid for CERs. For example both the Zambiza and the Abanico project indicate to have paid between $30,000 and $50,000 for the development of the CDM preparation phase. This means that projects should have enough resources to bare this costs and the project should generate a certain amount of CERs that allows covering this costs. In the case of small scale projects at the community level in Ecuador this is very unlikely.

4.4.3.6. Support to national policies

The CDM National Authority (AN-MDL) has defined clear an indicative set of national policies and plans that CDM project most contribute to. In the case of renewable energy projects already registered under CDM and the others in the pipeline completely fulfill these requirements. For example; their execution supports the National Electrification Plan objectives of use of non renewable resources, use of fuels with less carbon content, decrease in thermo electric generation, expansion of the generation capacity prioritizing small and medium scale projects and use of clean technologies, especially hydro.

In the case of the landfill projects also fit within the National Policies for Solid Waste, from the unified text of the secondary legislation, which declare as a national priority the integrated management of solid wastes . Additionally, since projects will be executed at the municipality level, they will reinforce the local policies too.

Another effect is the compliance with environmental regulation. It is expected that all companies comply with the national environmental regulations for 2008. In the case of renewable energy projects this will occur anyway since all electric projects have to obtain an environmental license. In the case of landfill projects, due to their scale and relation to the municipalities it will also be expected to happen. However, in other sectors at a more disperse scale like specific animal waste or agricultural waste projects, the CDM could have a positive effect in forcing these companies in complying with the regulations.

4.4.3.7. Increase of foreign direct investment

From the project portfolio and the ownership structure of projects it has also been observed that most of the investment is from Ecuadorian private parties. Thus, there is an increase in the investment from private actors in sectors that were normally under the responsibility of the government. On the other hand, the expectation that CDM will bring foreign resources is not been achieved. Annex I parties rather wait until projects are developed and then engage in commercialization activities, transferring most of the operational risks and financial burden to the project developer.

4.4.3.8. Development of human capital and technology transfer

The effect of CDM in the transfer of technology to Ecuador from developing countries in the two mentioned sectors can be appreciated in the type of technologies used and its presence before the CDM projects. In the case of renewable energy, the cases of diversion hydro, hydro and cogeneration are technologies already in use in the country. However, due to the mechanism a larger diffusion of these technologies towards potential actors may be increased or in the case that state of the art technology is used a technology transfer effect will be observable. A considerable effect is seen in for example in wind power generation. There is no wind generation in Ecuador, at most likely the first projects will be under the CDM. Even more, the presence of wind generation in the whole Pacific coast of Central and South America is low, reinforcing the effect of CDM as a driver for the adoption of this technology.

In the case of landfill gas capture and destruction, there were no projects of this type in Ecuador and CDM has been the main driver for its adoption. For example in the Zambiza project , methane was formerly destructed by the use of passive combustion devices that were only old oil drums were the methane released from the landfill was burned. Fortunately, during the use of this technology the pressure of the methane was positive; otherwise the flames would have entered the whole dumpsite with disastrous consequences. The same applies to the other CDM projects in this sector as the Iguanas Landfill in Guayaquil, Ambato and Cuenca; all of which were not using any methane destruction technology at this level before CDM.

Additionally, several projects liaise with international technology providers and climate change consultants in order to develop their projects. Thus, the technological requirements of each project and the CDM process are transferred to Ecuadorian parties.

4.4.3.9. Participation of local authorities and communities

The participation of local communities and authorities in CDM is also linked to the kind of project. From the projects observed in both sectors, most of them are executed by private companies or municipalities. In the case of project from private investors, the decisions are managed at the shareholders level of the company. Local communities interact through expectations that they have from the developers and the degree in which they may pressure the developers. This may be seen as an attempt to benefit from the project, as in the case of the dinking water works in the Abanico Project. Several other examples are known; the Sibimbe project also had to provide some “services” to the communities were the project is being developed. The Zambiza project also provided support to the construction of a local church, etc. Certain kind of projects are held within large industrial complexes, where local participation in even lower or null, as in the case of the cogeneration projects that are executed within the sugar mills which belong to private actors. Additionally, the framework for the execution of power generation projects in Ecuador, involve more the authorities at the national level, as CONELEC and Ministries, thus the level of participation with local authorities is low too.

In the case of landfill projects the situation may differ, especially if it is implemented by the municipality. In this case the project developer has to forcedly interact with the community and the local authorities and then with the national authorities. It is also common that municipalities have several channels for interaction with the community and are more susceptible to pressure from this group.

In conclusion, to what degree do the effects of CDM implementation in Ecuador support the objectives of the mechanism? The contribution to Annex I countries with cost effective emission reductions is clearly observed by the signature of different CER negotiation agreements among actors. Additionally, there is a considerable presence of intermediation, consultancy, brokerage and other kind of service companies and governments that indicate an interest from external agents in the Ecuadorian CDM supply.

Regarding the contribution to sustainable development, according to the requirements established by the CDM National Authority (AN-MDL) the projects observed in the portfolio most likely will comply which such terms, and consequently contribute to the sustainable development of the country required in the legal framework. It should be highlighted the impact of CDM on the renewable energy sector, thus supporting the country's energy balance with own sources and from private investment.

However, the contribution to sustainable development is discussable when considering that projects benefits are not being used for specific development terms besides the ones from the project developers, that small and community level projects are not being developed, that the mechanism has drawn very little foreign investment to the country, moderate and low generation of employment over the life time of the project and compared to the amount of CERs generated and certain projects have very little environmental benefits (besides GHG reduction) and certain negotiations schemes are transferring the benefit of the mechanism to the intermediation sector of the market.

4.4.4. Epilogue

Under this section, the effectiveness of the implementation of CDM was evaluated based on the national and sectoral level and using projects as examples. The national level corresponds to the country's characteristics affecting project implementations and the adoption of the international CDM regime. At the sectoral level it is based on the renewable energy and municipal solid waste sectors since most of the projects are developed in these two sectors. The projects selected as examples correspond to these two sectors. Summarizing, the evaluation resulted were:

Ecuador has low potential for CDM implementation in volume terms. However, it has an acceptable carbon intensity and project potential fits the type of project that the market demands. Thus, there is potential for the development of several CDM projects in different sectors, especially renewable energy, municipal solid waste sector, petrochemical industry (upstream and downstream), agricultural residues and forestry. The investment environment of the country, on the other hand, represents a barrier for CDM implementation and thus its effectiveness. Ecuador is considered as a country with high risk for investments, where credit access is limited and political and financial instability are still present.

The CDM regime has also been effectively adopted in the country, been Ecuador considered as one of the most remarkable institutional arrangements for CDM. The division of tasks, regulation and diffusion, between the National Authority (AN-MDL) and Cordelim is seen as adequate and beneficial. A clear and defined regulatory process has also been defined, and when compared to other DNAs in the region the results are acceptable. There are certain problems when the process involves the interaction with other government organizations, which may delay the process. Additionally, in certain sectors –forestry- the AN-MDL has not defined yet certain parameters that are necessary for project implementation. Both organizations face resources problems, currently and in the long term. They are both largely dependant on international cooperation resources, which are limited in time. In additional with the little support from the Ecuadorian government, both organizations function is endangered in the future and in the range of services that they can currently provide.

A clear effect of the target group is visible through the execution and continuous increase in the number of CMD projects in different phases of the CDM cycle. There are projects ranging from registered, under validation to initial assessment. However, there is still a large fraction of the target group that is not reached yet, and mostly projects are developed by privates companies with access to resources and large municipalities. Actors perceive the instrument as beneficial, but troubled with high complexity and transactions costs. Regarding the project type, is largely marked towards renewable energy, followed by landfill gas destruction. The percentage of CERs from renewable energy projects is quite high 58% compared with the global 6%. Additionally, there are no HFC or

N_2O projects in Ecuador. There is also evidence of trading with Annex I parties. 2 ERPAS have been already signed, and several projects have already closed their CERs negotiations.

Finally, the initial effects that can be appreciated from the implementation indicated that projects do contribute to the sustainable development requirements defined by the National Authority. However, when compared to a set of sustainable development criteria based on CDM sustainability assessment, several comments could be made. First, the contribution to sustainable development from CDM in Ecuador is clearly marked by the potential for certain kind of projects. The renewable energy projects, for example, have a quite significant effect in increasing the country's energy supply from renewable sources and the diffusion of certain generation technologies (wind generation) which are quite new at the national and regional level. The landfill projects have also a significant contribution regarding the use of technology that was not been used in Ecuador before, and even more promoting the use of managed landfill when most of the cities in the country still use uncontrolled dumping. Project in both sectors, have also environmental effects (besides the decrease of GHG) as the reduction of local air pollution, mainly due to reduction in emissions of VOC, NOx and SOx from combustion of fossil fuels and odor and hygienic conditions form landfill projects. Another effect is the support to national policies and the compliance with all the required regulation, as required by the regulatory processes. Generation of profit is also observable, depending on the CERs price it may generate an income of ($US 6 to 20 million per year). There is a very small contribution to the development of the local service sector, especially consulting and technology providers. These services are mostly provided by international companies and multilateral organizations. It is also observable the development of different interaction arrangements in which different resources are exchanged between project developers and other actors for project implementation, as the case of the World Bank, CAF and several consulting and brokerage companies as CO2e.com and Ecoenergy, etc. Employment generation is also marginal. However, it is also determined by the technology, which in the case of renewable energy from diversion hydro, wind or landfill gas is not too high. The distribution of profits is mainly among Ecuadorian companies, but mostly the effect on poverty reduction is marginal since this group has small access to CDM. Finally, CDM has driven private investment from Ecuadorian project developers, but there is very little increase in foreign direct investment for projects as capital resources.

5. ROLE OF ACTORS IN CDM IMPLEMENTATION AND THEIR INFLUENCE IN THE PROCESS

The analytical framework indicates that the outcomes of the implementation, which correspond to the results of the effectiveness evaluation from the previous chapter, depend on the interaction among actors within the implementation network of CDM in Ecuador. These interactions correspond mainly to the distribution of information, power and resources and the convergence or divergence of the actors' motivations towards the implementation. It also considers the rules of the game and the structure of the network as complementary variables that are also useful to characterize and describe the network.

From the previous section it was obtained that the implementation of CDM in Ecuador, even though it is in development, its effectiveness is not completely satisfactory. Consequently, the implementation network of CDM in Ecuador will be analyzed in order to generate explanatory arguments of the current situation.

5.1. The implementation network of CDM in Ecuador

In order to generate a general conclusion of the implementation network of CDM in Ecuador, the implementation networks of two selected projects in the sectors studied in the previous section will be analyzed. From these two projects and in combination with the results of the previous chapters and actors interviews the implementation networks in the renewable energy sector and municipal solid waste sectors will be developed. The dimensions of ***structure, rules of the game, distribution of power and access to information for the target group and the congruence in the motivation among the target group and the administration bodies,*** as defined in the theoretical framework, will be used as an explanatory argument for the outcomes of CDM implementation in Ecuador

5.1.1. Implementation network of the Abanico Project

In the case of the Abanico project, the implementation network involves actors at the international, national and local levels. The target group in this case is the project developer Hidroabanico S.A. and the administration entities are, at the local level, the Ecuadorian CDM National Authority and, at the international level, the UNFCCC and the validation agency DNV. However, in order to function properly these actors interact with several others, thus developing clusters or sub-networks mainly based on the function these networks have in the implementation of the project. Consequently the administration entities, marked with a blue line in the figure, are grouped in two sub-networks of national and international approval. Within the target group, marked with a red line, the actual execution sub-network includes the project developer, the technology provider and the consultants, in this case a private consultant and the World Bank. The World Bank also is part of the trade sub-network, who are actually the final users of the CERs and includes the Netherlands CDM Facility and the Dutch Ministry of Environment. The finance sub-network includes a local bank and the Inter-American Investments Corporation. Finally, and not included as a part of the interactions of the Contextual Interaction Theory there is a social interest sub-network, which includes the local NGOs, the local community at the Macas Province and other actors that may participate in the project implementation and are not considered in the other sub-networks. The project developers interact differently with each of the actors in these networks, and these interactions are the one affecting the implementation of the project.

At the center of the implementation network is the project developer. Their main motivation, as in the case of any private company, is the generation of profits through the implementation of the project.

Furthermore, the project developer is also interested in the project as a source of renewable energy and is understood that the project must be applicable to CDM requirements in order to be applicable.

The project developer interacts with a German technology provider, a private consultant and the WB in the actual execution sub-network of the project. This sub-network has a lower level of interaction among the actors; actually most of it is through the project developer. There is no interaction for example, among the WB and the technology provider. At a later state Cordelim entered the sub-network, mostly providing more information to the project developer. The World Bank acts also as a link to the trading sub-network, which is constituted by the Netherlands Carbon Facility and the Dutch Ministry of Environment. Finally, the motivation among all these actors could be placed more in the commercial side, which means that they try to profit from the implementation of the project.

For national approval, the project developers had to interact with the national approval sub-network. The main actor in this sub-network is the National CDM Authority. However, since the approval process requires the compliance with all the required regulations in the sector where the project is developed other actors are included. These are the National Electricity Council (CONELEC), the Ministry of Environment and the local authorities. Among CONELEC's functions are to regulate the Ecuadorian electricity market, to elaborate the National Electrification Plan, regulate energy prices, to issue generation permits and contracts, it also regulates the technical and environmental performance of generation facilities and thus requires an environmental impact assessment study, etc. One of the objectives of CONELEC is also to promote the generation from renewable sources. In fact, on 2005 CONELEC approved a regulation in which generation of electricity from renewable sources will have preferential prices, for example the price per kWh of photovoltaic generation should be 28,37 $US cents while the one for small scale hydro 5,8, and preferential dispatch order. The main interactions under the scope of this project for CONELEC are with the project developer, who has to comply with the requirements of the organization in order to have all the necessary permits, this means basically the technical issues and the approval of the environmental impact assessment. Additionally, as a regulator of the electricity market, Hidroabanico and CONELEC will interact in a daily basis regarding the trading of power to the national grid. Lately, CONELEC is in the process of conducting joint activities with Cordelim for specific promotion of renewable energy through CDM. The Ministry of Environment is the main regulatory body of environmental issues in Ecuador. Among its functions are to regulate the environmental performance of power generation facilities as Abanico. Within its Strategy for Environmental Sustainable Development of Ecuador, the Ministry clearly states its support for the generation of electricity form renewable sources and furthermore, the support to the modernization of the whole energy sector as a whole and CDM. The Ministry of Environment also approved the environmental impact assessment of the Abanico project, which is basically an overlapping with the functions of CONELEC. Other actors in this sub-network are the local authorities, mainly at the state of Morona Santiago and the city of Macas. As mentioned before, the deviation of the Abanico river flow to the Balapeque River will improve the accessibility to water for the construction of the drinking water facility of the city. Thus, the municipal authorities are interested to interact with the project developers as they can benefit from the project. Finally, the CDM National Authority function is to asses if the project contributes to the sustainable development of the country. In order to do this, it will verify that the project developer has complied with the requirements of the other mentioned institutions in this sub-network, among other requirements. As motivations, the National Authority, on the one hand aims to assure that projects have a significant contribution to the sustainable development of the country and on the other hand is also expected that projects are implemented, consequently supporting project execution and avoiding incorporating very strict requirements. The interactions among the sub-network are clearly defined and tend to be stable in the long term, denoting a clear set of rules of the game, which is affected by the general bureaucracy observable in the public sector in Ecuador.

From the description of the implementation network it can be implied that the power relation among project developer and the national approval sub-network favors the project developer. Without the developer, no projects will be implemented and the government itself avoids participating in the

development of power generation projects, which is also mandated by law. Thus, it is very unlikely that the Ecuadorian government will implement a CDM project of this type. However, to actually execute the project, the developer has to mobilize a set of financial and technical resources, which will be determinant in the success of the project. In the case of the Abanico project, the developer was able to gather almost 70% of the financial resources by it self. At this point, the interaction with the World Bank Carbon Facility complimented the availability of power and resources for the developer. With an ERPA signed and with the support of the WB, the IIC decided to provide the credit for the remaining 30% of the found necessary for the project.

Regarding the congruence in the motivation of the administration bodies and the project developer, the governmental entities that are involved in the national approval process and the National Authority itself are oriented towards the effective implementation of the project. This is represented in the support for renewable energy by CONELEC and the Ministry of Environment and by the benefits that the local authorities can obtain from the projects.

The access of information for the project developer was considered adequate. Interactions as the one with the WB, Cordelim and the private consultant allowed the project developers to understand the whole process. The project developer considered that the availability of information regarding CDM implementation is quite abundant. However, it requires additional efforts to be understood. For example, some of the project development activities, as the writing of the project design document (PDD) were shared among the project developer and the consultant, not without having to develop more than 10 different versions of the document upon its approval.

In conclusion, in the implementation network of the Abanico project the regulatory entities for CDM approval and the project developers converge in their motivations for an adequate implementation of the project. The project developers had and adequate access to the information necessary for an adequate implementation. Their balance of power towards the regulatory entities was positive and they managed to achieve all the necessary resources for the implementation of the project. According to the configurations of the Contextual Interaction Theory, the type of implementation process should be *Cooperation*. Such affirmation seems to fit the actual outcomes observed in the project implementation.

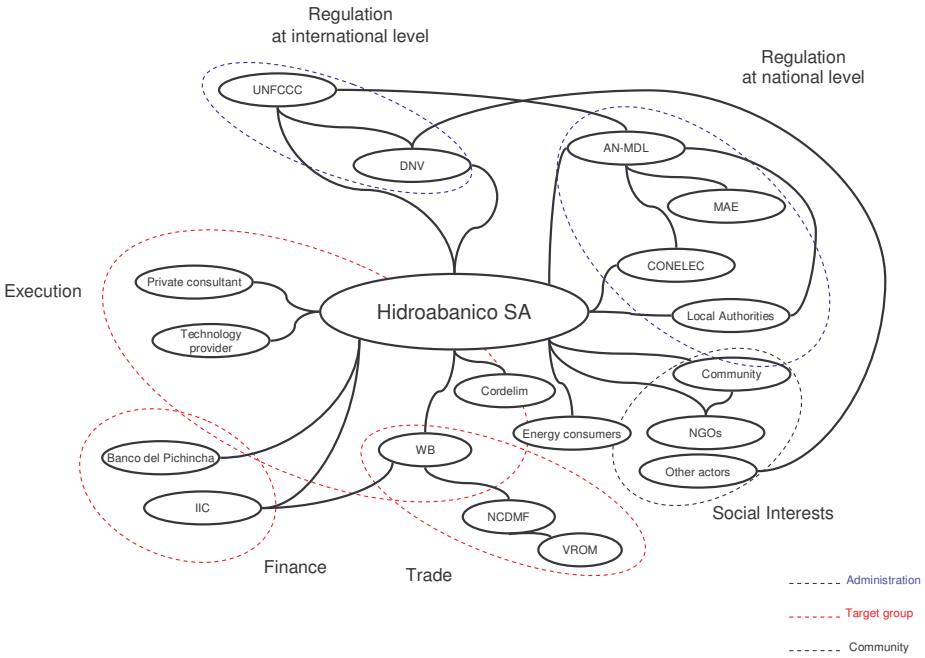


Figure 27 Implementation network of the Abanico project

5.1.2. Implementation network of the Zanbiza Project

The implementation network of the Zambiza also includes actors at the international, national and local levels. The central actor of the target group is the project developer Alquimiatec S.A. The administration entities include at the international level the UNFCCC and the operational entity TUV. The network of this project also presents a group of sub-networks involved. However, these networks do have a lower density in actors and interactions than the Abanico project. The main groups: target group, administration and community are also present and identified respectively in Figure 28 with red, blue and black interrupted lines. In the administration group, the sub-networks are the ones for international and national approval. Within the target group one sub-network is identified in addition to one individual group of actors. In the actual execution sub-network the project developer Alquimiatec interacts with the German consultancy company Ara CO2, Cordelim and the technology provider GAS. This technology provider also acts as a provider of financial resources, investing in the project. Additionally, the potential buyers appear more as an independent group of actors that are part of the whole network, but to not interact in specific term with any of the other actors. In the community group the social interest sub-network includes the community of Quito, especially at the Zambiza zone and other actors that may have a stake in the project.

The center of the network is also occupied by the project developer Alquimiatec, whose motivation is the generation of profit from the implementation of the project, which actually is completely dependant on CDM resources.

In the execution sub-network, the project developers have had a closer interaction with Cordelim. Also the interaction with the technology provider GAS is stronger since they participate in the project as investors. Additionally, the project developers also interact with the German consultant company ARA CO_2. The motivations of these actors towards the implementation of the project are positive since all of them aim to profit from the CDM revenues.

The national approval network is composed by the National CDM Authority, the Municipality of Quito, the Ministry of Environment and the Municipal Company of Hygiene (EMASEO). The Zambiza dumpsite is owned by the Municipality of Quito and managed by EMASEO. The Municipality of Quito and the National Environmental Direction from the Ministry of Environment are in charge of the approval of the environmental impact assessment. Additionally, the execution of this project required the approval from the Municipality, specifically EMASEO. The motivation of the Municipal actors is mainly to improve to provide a service to the community while managing the waste in the most technical ways possible and protecting the environment. The Municipality of Quito has been proactive regarding the management of the Zambiza dumpsite. Thus, several technical modifications in the management of the site were applied in 1996 and in 2002 it was permanently closed. Since then it as also executed woks towards turning the site into a recreational park. Additionally, the Municipal actors are also interested in reducing their costs for such services as most public companies do in Ecuador, because they work under restricted budget. The motivation of the Environmental Direction, and thus from the Ministry of Environment, is to assure that the project complies with the required regulations regarding environmental protection. Furthermore, the ministry's Strategy for Environmental Sustainable Development of Ecuador supports the adequate management of solid waste. The way in which these actors interact is clearly defined, thus denoting clarity in the rules of the game. However, Municipalities then to involve several actors and this tends to increase the number of intermediate steps and interactions necessary for the flow of a project. Finally, the potential buyers, identified as an individual group because the Zambiza project opted for a unilateral CDM modality, act independently in the network and their main motivation is to obtain CERs at the most cost effective way possible.

It could be argued that the motivations from the project developers and the target group converge towards project implementation. With the project as CDM, the project developers will obtain the expected financial revenues, and administration will be able to improve the environmental performance of the Zambiza dumpsite.

In the same way that of the Abanico project, the implementation of the Zambiza project transfer all power to the project developer for implementation. Regarding their balance of power and dependency form other actors, the Alquimiatec Company has been able to gather all the financial resources necessary for implementing their project from its own sources. Additionally, the association with the technology provider enhances their position and provided also investment capital. This arrangement has increased also the power position of the project developer towards the market, because they are in completely control of their CERs. However, when negotiating these CERs in the market an additional share of resources and information are necessary in order to completely benefit from the possible benefits.

The project developers consider that the access to information was adequate, and that Cordelim played an important role in this matter.

Finally, form the implementation network of the Zambiza project it was observed that project developers and administration converge in their motivation for project development, the project developer has been able to acquire the necessary information and also to mobilize the necessary resources. Consequently, the interaction among actors leads to a *Cooperation* type of implementation according to the arrangements of the Contextual Interaction Theory.

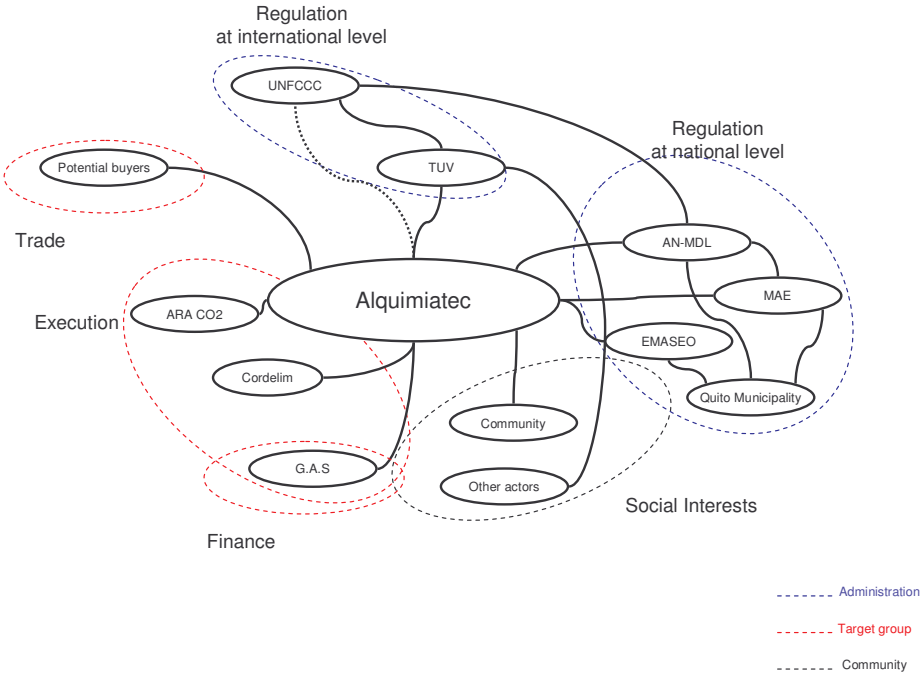


Figure 28 Implementation Network of the Zambiza Project

5.1.3. Analysis of the implementation network of CDM in Ecuador in the renewable energy and municipal solid waste sector

Based on the two examples and the information recollected in the effectiveness section of this research, a generalization will be generated at the renewable energy and municipal solid waste sectors in order to understand the roles of actors in CDM implementation. The main observation is that the implementation of CDM in the renewable energy sector has been quite more prominent than in the landfill gas sector. Consequently, it could be asked if there are any kind of variations among actors' interaction in these sectors that explains the differences in the observed outcomes.

The rules of the game for the renewable energy sector determine that the project execution can only be private entities. The regulatory framework of the sector also determines that the approval for such kind of projects works at a national level, mainly interacting with the Ministry of Environment, the Ministry of Energy and the National Electricity Council (CONELEC). These processes are clearly determined, and even though they are affected by certain bureaucratic steps, the flow of activities is quite standardized. Even more, these institutions have already developed incentive mechanisms and even promote the execution of CDM projects. On the other hand for municipal solid waste projects, municipalities are the main operational agents, but the institutional framework also includes the Ministries of Public Health, Environment and Urban Development and Housing. In only few cases the municipalities outsource the management of these facilities to private entities. Additionally, the regulatory framework for municipal solid waste projects involves the participation of actors at the national and municipal level. Consequently, for the execution of a landfill project, consensus has to be reached among all these actors, which may vary on each municipality as well as the requirements. These rules of the game determine that the renewable energy implementation network is less dense and complex than the one for municipal solid waste. A schematic representation of both networks can be seen in Figure 29 and Figure 30.

The access and diffusion of information for the project developers in both cases is still low, represented in the still small proportion of the target group that has reacted to the mechanism. The difference between both sectors may be in the experience that has already been developed in the renewable energy sector, where several studies and plans have been developed along time. Consequently, project developers in this sector have more information of the type of projects that could be implemented and the type of technologies that could be used. On the other hand no previous experiences and little research have been done regarding the management of GHG from solid wastes at the municipal level.

Regarding the accessibility to resources, is considerably affected by the investment environment of the country. The high country risk and the low access to capital affect the possibility for project developers to mobilize the necessary resources, especially investment capital, for project implementation. Specifically comparing between the two sectors, public project developers as the case of municipalities and their waste management systems are usually managed bellow operational costs or receive very little resources. This is observed by the small presence of technically managed waste management systems in Ecuador. Additionally, municipal waste management projects are not commercially viable without CDM revenues. Consequently, the execution of projects is completely dependent of the CDM component. Since developers can not access initial investment capital, this decreases the possibilities of project implementation, especially for small scale projects. In the case of renewable energy projects the implementers can only be private entities, as mandated by the sector law. The projects that these types of actors will implement are commercially oriented and CDM revenues are only a marginal contribution to the revenues, thus projects have more possibilities to access initial sources of capital. In both sectors, project developers can also increase their access to resources by integrating their efforts with other actors in the carbon market. This is observable in the partnerships created, for example, between the World Bank and the Abanico or Sibimbe projects. Another example is the liaison with technology providers as the case of the Zambiza project. This allows specific projects to increase their possibilities to implement CDM projects. In this case the performance of the administration, in this case Cordelim and the National Authority is also affected by the low allocation of resources from the Ecuadorian government, which directly affects for example the diffusion and promotion of CDM.

Finally, the motivations of the administration and the target group will be analyzed. At the country level, and affecting the implementation of CDM in general, the motivation of the Ecuadorian government towards the implementation of the CDM is not satisfactory. This is observed in the little allocation of resources to administration agencies, whose sources of resources have mainly been from international cooperation projects. In contrary to what has been observed in other countries, where the governments are trying to maximize implementation of CDM either by the development of carbon funds, integration of CDM into national policies, clear support to the administration entities, etc. the

Ecuadorian government has not shown clear steps to do this. On the sectoral level however, the situations is different. In the renewable energy sector for example, several incentives schemes have been implemented already and the involved institutions promote the executions of these kinds of projects. The same applies in the municipal solid waste sector. However, specific incentive mechanisms have not been developed yet. In the case of the National Authority and Cordelim, their motivation to project implementation is also positive.

The motivation of the target group towards implementation in general is positive, especially once project developers understand the mechanism. Nevertheless, is clearly affected by the low access to capital, the high risks for investments in Ecuador and the cost and complexities of the mechanism.

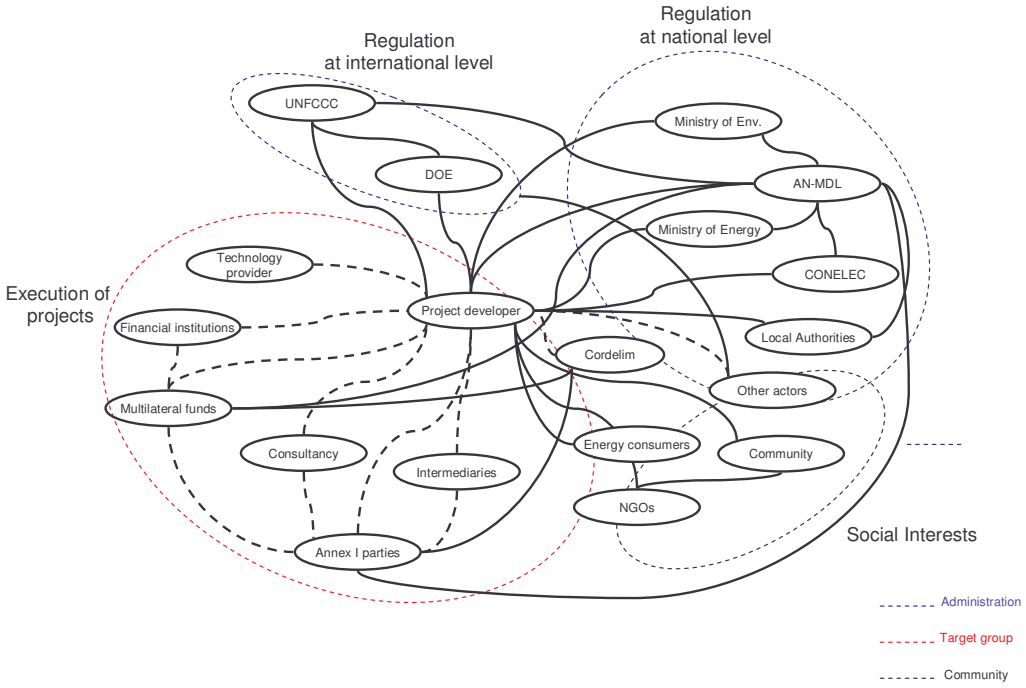


Figure 29 Implementation network of CDM in the renewable energy sector in Ecuador

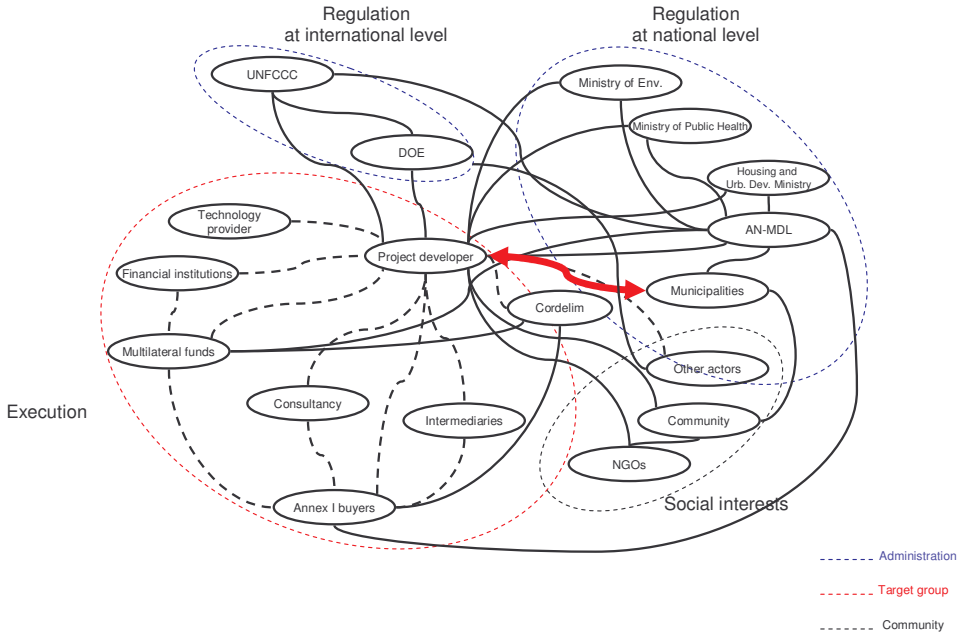


Figure 30 Implementation network of CDM in the municipal solid waste sector in Ecuador

5.2. Networks changed or modified due to CDM

Regarding the development of networks around the implementation of CDM projects in Ecuador, several cases have emerged. First the approval network at the national level has been developed. As shown in the two case studies, its central actor is the CDM National Authority (AN-MDL) and varies among the type of projects under evaluation. However it creates a policy community type interaction and determines the participation of the other entities in relation to the approval of CDM projects. It has also created links among the CDM National Authority (AN-MDL) and other institutions, for example with PROMEC-CONAM and CONELEC.

Second, the actual execution of projects has also lead to the development of implementation networks or coalitions who share a common objective and resources. In the Abanico project for example, this is clearly represented in the association among the Netherlands CDM Facility, The World Bank and the project developer, creating a multilateral implementation network. The NCDMF provides resources and commissions the WB the acquisition of carbon credits on its behalf. The WB will develop then a portfolio of different types of CDM projects. Usually the WB provides consultancy services for the development of the CDM component of the project, and in exchange the project developer will sell the CERs to the WB, and thus to the NCDMF. In this way the Dutch government benefits by accessing a CER portfolio with diverse options and with a considerable volume; and most of all with the support that the WB will offer regarding the projects is supporting. For the project developers on the other hand, the interaction with the WB will also allow them to access the know-how and financial resources that will facilitate the execution of the project. Additionally, project developers will benefit also from the image of an institution as the WB, as in the case of the Abanico Project, where the CDM revenue and the fact that the WB was the buyer of CERs had a positive impact in accessing a credit from the Inter-American Investments Corporation.

Another example of this type of interaction is also shown in the Zambiza case study. However, in this case it is a bilateral business to business association, in which the technology provider invests in the company at the same time that provides the technology necessary for its implementation and later it participates in the project revenues.

Similar associations have been developed in other projects. The Andean Development Corporation (CAF) has a similar structure to the one used by the WB through its Latin-American Carbon Program (PLAC). This is the case for example of the Calope Project, in which the Dutch government will participate.

Finally, another implementation structure that is common is when consultancy or brokerage companies invest in the development of a CDM project, either in the infrastructure but most likely in the CDM transaction cost as validation, national approval, registration and the consultancy fees. Thus, becoming a project participant and sharing, receiving of buying a portion or the total of the CERs of the project.

6. DISCUSSION

Under this section, a discussion is presented regarding the analytical framework developed and it s application. The main components of the framework were the use of Intervention Theories, Policy Evaluation and the Contextual Interaction Theory combined with Policy Networks Theory as an explanatory argument to the observed outcomes.

The model of the Contextual Interaction Theory applies most likely to instruments where the implementer is the government and the target group is made of individuals or companies and these last ones will be forced to implement the mechanism. In the case of CDM, the instrument is of voluntary character. Consequently, the balance of power, the need to understand the instrument and to allocate the necessary resources shifts from the government to the project developer for project execution. Consequently, based on the concepts of the CIT and the findings of the research a new model has been proposed.

Ma	Mt	I+	Pi	Process
+	-	-		1. None
+	+	-	+	2. Learning
			0	3. Cooperation (forced)
			-	4. Cooperation (strongly forced)
+	+	+	+	5. Cooperation
			0	6. Negotiation
			-	7. Cooperation (forced)
-	-	-		8. None
-	+	+	+	9. Opposition by administration
			0	10. Negotiation
			-	11. None

Ma: Motivation administration
Mt: Motivation target group
I+: Access to information to the project developer
Pi: Independence of project developer from other actors' resources

The main variables are still motivation, information and power. However, the motivation will be for the administration and the target group towards effective implementation. The information will be seen as the access to information to the project developer because the implementation power is mainly on his control. The power balance will be seen as the independence of the project developer from other actor's resources to implement the CDM project.

Consequently, the interaction will be initially dependant on the information and motivation of actors. In line with Dinica and Bressers (2004), both variables interact. Thus, the motivation of the project developers may be affected when they are exposed and learn about the mechanism or on the other hand they may be motivated to search for financial resources and then learn about CDM. In the case that the project developer has no access to information and has no motivation to implement CDM, then there will be no implementation at all as in situation 1. The same will happen if additionally the administration has no motivation to implement the mechanism, as seen in situation 8. Once either motivation or information are obtained, the focus will be on the balance of power for the project developer, reflected in its independence from resources of other actors. If the project developer has a low understating of the mechanism and has enough resources, then it will engage in a learning process, situation 2. If his power situation is neutral, then it will be forced to cooperate if it engages in CDM, situation 3. If the balance of power is completely negative for the project developer then it will be strongly restrained and forced to cooperate if it engages in CDM implementation, situation 4. When project developers are motivated and have accessed all the necessary information and they have a

positive balance of power then cooperation will occur, situation 5. If the balance of power for the project developer is neutral, then it will have to negotiate, situation 6; and if it is negative it will be forced to cooperate with the actors that are providing the resources, situation 7. It could also be possible the administration may not be motivated to implement the mechanism and actors are and have access to the necessary information. In this case if the power of balance is positive for the developer, then it will face opposition by the administration, situation 9. If the balance of power for the developers is neutral then it will be forced to negotiate, situation 10; and if the balance is negative, then there will be no implementation because it will not be able to change the motivation of the administration.

Regarding the use of intervention theories for policy evaluation, the categorization of effectiveness and the development of an intervention theory of CDM allowed to identify prerequisites for effective implementation. However, the sustainable development objective of CDM is rather vague and is not quantitatively defined neither by the National Authority or the UNFCCC. Thus, the definition of what is effective CDM became more difficult and subjective. Additionally, the qualitative approach used and the complexity of the mechanism increases the possibility of addressing causality. For example, the degree to which the execution of a project or its effects could be arguable to CDM. However, the assumptions within the intervention theory as logical steps for the achievement of certain effect can be used to overcome this problem.

The use of theoretical based models, as the case of the Contextual Interaction Theory and Intervention Theories, offers both advantages and limitations when used for this research. Since they are theory based, they are more accurate in defining and creating operational variables. However, this could also become too rigid and create a quite artificial vision of reality that it may be harder to integrate when synthesizing the results. These contrasts with models developed by Matland (1995), for example, who proposes the analysis of implementation based on the degrees on conflict and ambiguity, which allows a more flexible understanding of reality and is not so limited. On the other hand, the use of more structured methods seems to provide a more solid structure for replicability, thus the allowing for other researches to use the same method in different cases. This is indicated by Mickwitz (2004) as one of the benefits of the use on interventions theories for evaluation, since most of it is done mostly based on empirical grounds and not in theory.

The use of multiple methods have also been useful and highlight that evaluation of complex instruments as CDM, that have financial, political, technical, social and environmental implications, require a multidisciplinary approach in order to be fully understood.

It was also found that the evaluation of CDM is full of complexities and a common understanding on methods is difficult. Literature efforts of CDM evaluation differ widely on their approaches. For examples, several evaluations are based on country, projects or global levels. Others differ in the objectives and expectations that CDM should comply with, especially the contribution to sustainable development. Since is vaguely defined, authors use different definitions, as the National Authorities do so. Consequently, the appreciation to sustainable development varies largely and this creates room for favorable and critical positions regarding the effectiveness in achieving this objective.

Regarding CDM and its contribution to sustainable development, several authors have indicated that the market characteristics of the mechanism are leading to a preference of low cost and high volume of CERs projects that have very little contribution to sustainable development Figueres (2006), Kim (2004), and others. Even more, this has been indicated as negative incentive for developing countries to strengthen their sustainability requirements, because this will decrease their opportunities to develop CMD projects, since once these issues are mandated by law this type of projects will become the baseline. Thus, CDM is accused to create a “race to the bottom” phenomenon in developing countries policies Sutter (2003). In the Ecuadorian case analyzed in this research, the administration clearly indicates that the selection of the current requirements responds to issues regarding the complexity and cost that this will represent and the current market situation. Cases were the national regulations affect the implementation of potential CDM projects were already noticed for example in

the requirements for emission levels from the oil industry or the environmental regulations for plantations in the forestry sector. On the other hand, several of the CDM projects observed do have a clear contribution to the sustainable development in Ecuador. Consequently, it is proposed here that the analysis of sustainability of CDM deserves a more case to case approach, because each project is different. Nevertheless, broad guidelines and indicators could be developed. Going further, a standardization of the assessment methods of CDM sustainability could be beneficial. In this way, even though different projects will be evaluated, the similarities on the evaluation methods will allow easier comparisons and drawing of conclusions.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

The objective of this research was to analyze the implementation of the Clean Development Mechanism in Ecuador. This was addressed in the following research questions:

- *What is the effectiveness of CDM implementation in Ecuador?*
- *What is the role of actors in CDM implementation and how they influence the process?*

The research proposed an analysis of the prerequisites for effectiveness and the initial effects of CDM projects implemented in Ecuador. Based on these findings, it can be concluded that the current CDM implementation in Ecuador could lead to an effective achievement of the mechanism's expected goals. It was observed that even though Ecuador is not among the large volume actors in the CDM market, its carbon intensity and the fact that the sources of GHG emissions of the country match, in most cases, those that are demanded for the market, may for allow the development of several CDM projects. In fact, a continuously growing pipeline of CDM Ecuadorian projects in different stages of development exists. Even more, the characteristics of the county's emissions potential have also determined that the type of projects to be executed have a more tangible contribution to sustainable development The largest proportion of CERs generated in Ecuador corresponds to renewable energy projects and the second largest percentage corresponds to landfill gas projects. In the Ecuadorian CDM portfolio 58% of the CERs are from renewable energy projects, which clearly contrasts with the 6% of the total CERs from renewable energy projects and more than 50% of the CERs from HFC and N_2O projects in the global market. The incentive for renewable energy projects and landfill projects clearly contribute to Ecuador's sustainable development. This is reflected in the fact that half of the country's power generation originates from fossil fuel sources, including imported ones. Additionally, adequate management of solid waste is scarcely developed or even absent in several cities in the country.

Ecuador has proactively developed the necessary institutional and regulatory frameworks necessary for project implementation. This process is considered clear, project based and in general terms not too complex. The main requirements to prove the contribution to sustainable development are the compliance with all the regulations affecting the project and the support for national and local development policies. The divisions of tasks between the National Authority and Cordelim, regulation and promotion respectively, have been recognized as a productive and practical institutional setting. Even more, the function of Cordelim has been recognized, by local and international actors, as very relevant in the development of the mechanism in the country.

Among the factors that may affect the achievement of the mechanism's objectives is the high country risk index, which undermines the access to capital and the interest for foreign investors. Furthermore, the CDM institutions are highly dependant on foreign resources, which may endanger their long term functioning. Additionally, the Ecuadorian government has not been very active in supporting these organizations neither at the political or financial level. Even more, the involvement of the government in the whole CDM policy setting is still low, in contrast with several other governments that are developing carbon funds or integrating CDM in their new policies. The proportion of the target group and the type of project developers that are actually executing CDM projects also allows for the conclusion that the mechanism is not widely diffused among the target group and that actors with low level of resources can not face the transaction costs or complexities of CDM. This also supports statements indicating that the project focus of the CDM is not enough to reshape the carbon intensity of developing economies. Even though it is significant, the contribution of 100 MW in 2006 to the Ecuadorian grid from CDM projects is still small compared to the 1500 MW of fossil fuel installed

capacity. Additionally, renewable energy and landfill gas projects have considerable effects on the environmental, technical and economic aspects of sustainable development. However, by the inherent characteristics of the technologies in use and the type of project ownership most commonly observed, they do not contribute significantly to the generation of employment, poverty reduction and distribution of profits, which make up the social dimension of sustainable development. It should also be noted that several actors in the community that do not agree completely with the current development of projects as they have not been able to interact or access to the public participation mechanisms already present in CDM. This is partly a result of the national approval process, which is mainly based on technical requirements that overlook these social aspects.

In contrast with several critics to the CDM, the implementation of CDM in Ecuador, even if driven by circumstances, shows that the mechanism could actually achieve its objective of contributing to sustainable development of the host country at a larger scale. The selective effect that the country's GHG emissions create over the type of projects executed in Ecuador could be simulated by regulation, either at the UNFCCC or host country level. This may restrict the large proportion of low sustainability projects as HFC and N_2O and actually promote others with more sustainable effects, such as renewable energy.

The higher concentration of projects and CERs from the renewable energy projects compared to those from the municipal waste management sector was analyzed based on the actors' interactions within the implementation networks. It was found that more clear rules of the game, which determines the type of actors and the complexity of interactions within the network, combined to a further experience and knowledge available in the renewable energy sector directly affect the availability of resources and the motivation of project developers in this sector. Consequently, developers in the renewable energy sector are more likely to mobilize the necessary resources and proceed to project implementation.

It was also found that the introduction of CDM has lead to the appearance of several implementation partnerships in which actors do not only interact, but share resources and motivations towards the implementation of CDM projects.

The concepts from the Contextual Interaction Theory were useful to understand how actors' interactions affect implementation. However, because CDM characteristics of voluntary adoption and dependency on resources even in cases of full access to information, a modified model was proposed in the discussion chapter of this research.

7.2. Recommendations

The theoretical framework developed from the research could be improved and used for further evaluation of the mechanism. However, a better scale for evaluation would be at the country level - especially for comparisons among effectiveness and the networks involved in implementation. Additionally, the modified model of the Contextual Interaction Theory could be evaluated as a tool for analyzing CDM implementation based on the involved actors.

CDM implementation has several implications. It has drawn a considerable amount of resources into the development of a carbon market. It is supposed to contribute to the sustainable development of the host country and also contribute to the mitigation of the climate change problem. Consequently, continuous evaluation, monitoring and research of the mechanism to see whether it is fulfilling its objectives are necessary. Further research is recommended in the actual impact of projects when they start generating CERs and how this relates to the objectives of the mechanism. Additionally, not only the effectiveness should be evaluated, but also several other criteria such as acceptability, relevance, sustainability, etc. are necessary to evaluate to determine in an integrated way whether and how the CDM has actually worked.

Regarding the process itself in Ecuador, it could be recommended the creation of a mechanism that insures the adequate participation of local stakeholders prior to national approval. It was noticed along the evaluation that even though the project developers have conducted their own stakeholder consultation and that projects are again later opened to public comments at the validation stage, the perspectives of stakeholders affected by the project are not considered. Most of the sectoral and local regulations that CDM projects have to comply with are more on the environmental and technical aspects of projects. Thus, the evaluation process may include a consideration regarding the social aspect of sustainability. This, along with the whole sustainability aspect of CDM in Ecuador, could also be reinforced with the complete institutionalization of the National Council of Sustainable Development, which at the moment of study was still on a new re-implementation process.

The increase of political and financial support to both Cordelim and the CDM National Authority (AN-MDL) are fundamental. Both organizations have a recognized performance and have accumulated a considerable degree of experience and capacities. So far, most of the resources have been obtained from external cooperation agencies. However, this endangers the long term sustainability of the organizations. The Ecuadorian government should have a more proactive approach to both organizations, especially in financial terms.

In the same way, the approach towards CDM as a whole from the Ecuadorian government could also be improved. Several other countries, such as Chile, Argentina, Brazil, Vietnam, etc. are developing carbon development funds in order to support the development of CDM projects. These funds could be directed to contribute to the development of national policies and strengthen the position of national project developers in the market. Additionally, with few exceptions, no small scale or community projects are present in the CDM portfolio in Ecuador. This could be also improved with such funds and incentive schemes.

Efforts should be directed at the national level in order to improve the investment environment in the country. This not only affects the CDM, but the development of the country itself. For example, the legal and tributary guarantees that the Ministry of Foreign Trade, Industrialization, Fisheries and Competitiveness (MICIP) offers to investors has already been used by some CDM project developers and up to a certain degree decreases investment risks present in Ecuador.

Additionally, the integration of the CDM National Authority (AN-MDL) and Cordelim with other governmental bodies it is recommended in order to develop joined approaches towards CDM. In a similar way, as it has been done in other countries, CDM could be considered in the national policy making. Thus, the development of these measures around the mechanism will increase the benefits of implementation.

More diffusion is still necessary and several sectors of potential project developers are still unaddressed. This requires a strengthening of Cordelim's functions, which will also improve the technical support of this institution, which was required by several actors in the target group.

At the regulatory level, the proposed sectoral approach for CDM may overcome the small impact that projects are having in the overall picture of the carbon economy of non Annex I countries. This means that CDM could be implemented at a sectoral level, including several projects, rather than in a project base scenario.

8. ANEXXES

Annex 1 Actors interviewed

Interview code	Organization	Name	Description
12	Dayanama S.A. (Dayanama Project)	Oliveira Nilson	Actual/potential Project developers
18	Repsol YPF, Ecuador	Hernan Sanchez	Actual/potential Project developers
20	Conservation International Ecuador (CI)	Cevallos Jaime	Actual/potential Project developers
26	Profafor	Jara Luis	Actual/potential Project developers
27	Electroviento S.A. (Salinas Wind Farm Project)	Schwetje Olaf	Actual/potential Project developers
28	Cormadera	Mateus Pablo	Actual/potential Project developers
31	Requested anonimity	Requested anonimity	Actual/potential Project developers
35	Ambato Municipality (Ambato Landfill Project)	Acurio Javier	Actual/potential Project developers
39	Conservation International Ecuador (CI)	Bastidas Soledad	Actual/potential Project developers
23	Finnish Environmental Institure (SYKE)	Requested anonimity	Annex I CDM organizations
40	Finnish Ministry for Foreign Affairs	Eerola Hannu	Annex I CDM organizations
13	Cordelim	Neira David	CDM administration in Ecuador
25	AN-MDL	Caceres Luis	CDM administration in Ecuador
6	UNEP/Dirección de Energías Renovables y eficiencia energética (DEREE), Ministerio de Energia	Jacome Carlos	Ecuadorian Institutions
11	Proyecto de Modernizacion de los Sectores Electrico, Telecomunicaciones y Servicios Rurales, Consejo Nacional de Modernizacion del Estado (PROMEC-CONAM)	Dulce Jose	Ecuadorian Institutions
29	Consejo Nacioanl de Electricidad (Conelec)	Oliva Patricio	Ecuadorian Institutions
34	Consejo Nacional de Desarrollo Sustentable (CNDS)	Domingo Paredes.	Ecuadorian Institutions
36	Dirección de Energías Renovables y eficiencia energética (DEREE), Ministerio de Energia	Aguirre Douglas	Ecuadorian Institutions
37	Accion Ecologica	Granda Patricia	Ecuadorian Institutions
7	Independent Consultant	Sutter Christoph	Expert
9	Independent Consultant	Figueres Christiana	Expert
10	Former Minister of Energy	Teran Pablo	Expert
24	Former Minister of Environment	Luque Lourdes	Expert
33	Hamburg Institute of Economics	Michelowa Axel	Expert
38	Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)	Pedroni Lucio	Expert
1	Ecoinvest	Mazaferro Marco	International consutancy
32	GreenStream Network (GSN)	Tunjala Tommi	International consutancy
3	Requested anonimity	Requested anonimity	International organization
4	UNEP/RISO, CD4CDM	Hinostrosa Miriam	International organization
8	The Gold Standard	Schulp Michael	International organization
16	Independent Consultant	Yanez Guido	Local consultancy
17	Aqualimpia	Moncayo Gabriel	Local consultancy
19	Consejo Empresarial para el Desarrollo	Manzano Ines	Local consultancy

	Sustentable del Ecuador (CEMDES)		
21	Eficacitas	Blum Juan Carlos, Gallegos Blanca	Local consultancy
22	Consejo Empresarial para el Desarrollo Sustentable del Ecuador (CEMDES)	Andrade Jimmy	Local consultancy
5	Sociedad Agrícola e Industrial San Carlos S. A. (San Carlos Project)	Puga Amalio	Selected CDM project
14	Hidroabanico S.A. (Abanico Project)	Flores Hernan	Selected CDM project
15	Alquimiatec S.A. (Zambiza Project)	Tobar Andres	Selected CDM project
30	Hidalgo & Hidalgo S.A. (Sibimbe Project)	Sixto Duran Ballen	Selected CDM project
2	TUV SUD	Castro Javier	Validator (Designated Operational Entity)

Total interviews collected 40, 20 where not answered.
Table 19 Actors interviewed

The Clean Development Mechanism, an Analysis of the Implementation in Ecuador

Juan Carlos Parreño de la Torre[19]
Wageningen University and Research Group, The Netherlands
Environmental Policy group

Dear respondent

Thank you very much for participating in this research, which is the graduation project for my MSc degree on Environmental Sciences. The main objective of the study is to analyze the implementation of CDM in Ecuador and the perception and effects of different actors on it. Thus, a diverse range of stakeholders are being interviewed to obtain the main effects, perceptions and opinions about CDM. One section of these interviews is the opinion of CDM experts searching for criterion for the evaluation framework; and in case of participation in CDM activities in Ecuador, to identify their main opinions about it. The interview has an open structure and includes between 15 and 20 questions. Please mention at the end of the questionnaire if you wish your name not to be mentioned on the study. Thank you again, your opinion will be of much importance for the study. A copy of the results will be send to you via email once the study is completed.

1. Could you please briefly describe your organization?
2. How did your organization get involved in CDM?
3. What is your opinion about CDM?
4. Which do you think are the main objectives of CDM, and what is your opinion about them?
5. What opinion do you have about the development of the CDM market?
6. Could you name 5 indicators for successful CDM implementation in the following categories?

	a. CDM Project	**b. CDM in a country**
1		
2		
3		
4		
5		

7. Could you indicate 5 ways that you consider CDM can contribute to the sustainable development of the host country?

1
2
3
4
5

8. How effective do you consider the implementation of CDM has been so far? (*Considering effectiveness as the accomplishment or leading to accomplishment of the CDM objectives mentioned in question 4)*
9. Which do you consider is the main contribution of CDM towards the mitigation of climate change?
10. Which do you consider is the role of countries like Ecuador in the CDM market?

Next section to be completed in case of any CDM activities in Ecuador

[19] juancaparre@hotmail.com
juan-carlos.parreno@wur.nl

11. Is or has your organization been involved in any CDM activities in Ecuador?

If yes to question 11:

12. What opinion do you have about the implementation of CDM in Ecuador?
13. What opinion do you have about the Ecuadorian CDM National Authority and about the CDM promotion agency Cordelim?
14. What problems do you consider the implementation of CDM in Ecuador is faced with?
15. What can be improved for CDM implementation in Ecuador?

Annex 3 Cordelim CDM indicative portfolio

Project Name	Participants	Participants	Technology	MW	Start year	$t(CO_2)$/year annual average	$t(CO_2)$/ 2012	$t(CO_2)$/ 2012 adjusted	State	LOA	LOE	ERPA[20]	Sector	Type
Abanico	Netherlands Carbon Fund	HidroAbanico S.A.	Run off hydro	37.5	2006	156660	1096620	1096620	Registered	X	x	x	Energy	RE
Sibimbe	Netherlands Carbon Fund	Hidalgo&Hidalgo	Run off hydro	15	2006	57870	405090	405090	Registered	x	x	x	Energy	RE
San Carlos		Sociedad Agrícola e Industrial San Carlos S.A.	Bagasse cogeneration	28	2005	43731	349848	349848	Registered	x	x		Energy	RE
Rio Calope	Netherlands via CAF	Enermax S.A.	Run off hydro	16.6	2006	66185	463295	454029.1	At validation		x	x	Energy	RE
Hydro Sabanilla	Netherlands Carbon Fund	Hidlegren	Run off hydro	20	2007	95578	573468	344080.8	PDD		x		Energy	RE
Salinas Wind Farm		Electroviento	Wind energy	15	2007	23250	139500	83700	PDD		x		Energy	RE
Sigchos 1	PCF		Hydro	18	2007	94483	566898	340138.8	PDD		x		Energy	RE
Pilalo 3			Hydro	11.8	2007	59734	358404	215042.4	PDD		x		Energy	RE
Perlabi		Perlabi	Run off hydro	2.8	2004	7508	67572	58862.72	At validation		x	x	Energy	RE
Jondachi		Erdesu	Run off hydro	12	2008	56567	282835	169701	PDD		x		Energy	RE
Victoria			Hydro	10	2008	41133	205665	102832.5	PIN			x	Energy	RE
Villonaco	Protocol Energy International	Enerloja SA	Wind energy	15	2008	39912	199560	99780	PIN				Energy	RE
Valdez		Valdez Sugar Company	Bagasse cogeneration	15	2008	52772	263860	131930	PIN			x	Energy	RE
San Jose del Tambo		Hidrotambo	Hydro	7.4	2008	30057	150285	75142.5	PIN			x	Energy	RE
San Jose de Minas		Hidroelectrica San Jose de Minas	Run off hydro	5	2007	29831	178986	89493	PIN			x	Energy	RE
Llanganates		TermoPichincha	Run off hydro	27.6	2008	128288	641440	320720	PIN				Energy	RE
Chorrillos		Municipality of Zamora	Hydro	4	2006	12000	84000	21000	PIN				Energy	RE
Huascachaca		Azual Provincial Council	Wind energy	30	2008	43316	216580	108290	PIN				Energy	RE
La Delicia		Energy Power CIA Ltda.	Hydro	5.8	2008	30700	153500	61400	Assesment				Energy	RE
Pilaton San Carlos		Energy Power CIA Ltda.	Hydro	8	2008	42510	212550	85020	Assesment				Energy	RE
Saloya		Energy Power CIA Ltda.	Hydro	23	2008	112000	560000	224000	Assessment				Energy	RE
Hidromundo			Hydro	34	2008	4880	24400	9760	Assessment				Energy	RE

[20] As for June 14-2006. The underlined projects have an actual ERPA. The rest of projects appear as having closed their CERs negotiations.

Zambiza		Alquimiatec	Landfill Gas	NA	2006	83966	587762	576006.76	At validation		x	x	WM	LFG
Las Iguanas		Guayaquil Municipality	Landfill Gas	NA	2007	780000	4680000	2808000	PDD			x	WM	LFG
Ambato		Ambato Municipality	Landfill Gas	NA	2006	12579	88053	44026.5	PIN			x	WM	LFG
Pronaca, Animal waste		Pronaca	Animal waste treatment	NA	2003	9195.9	91959	54071.892	At validation			x	WM	AWM
Pronaca, Animal waste		Pronaca	Animal waste treatment		2005	6212.59	49700.72	48706.7056	At validation			x	WM	AWM
Pronaca, Animal waste		Pronaca	Animal waste treatment		2000	5754.59	74809.67	16918.4946	At validation			x	WM	AWM
Danayma, Palm			Methane recovery	NA	2006	7009	49063	29437.8	PDD			x	WM	AgWM

Annex 4 UNEP RISOE CDM Portfolio

Title	Host country	Status	Type	Methodology	ktCO2/yr	yrs.	Credit start	2012 ktCO2	Validator	Credit buyer	PDD Consultant	Start comment	Host LoA	Reg. Request	Time lag months	MW	Technology/Resource
San Carlos Bagasse Cogeneration Project	Ecuador	Registered	Biomass energy	AM15	44	7	5-Jul-05	328	TÜV-SÜD	n.a.	Econergy Brazil	11-Nov-05	22-Dec-05	23-Dec-05	1.37	28.0	Bagasse cogeneration
Sibimbe (15 MW) Hydroelectric Project (NM54)	Ecuador	Registered	Hydro	ACM2	57	7	1-Feb-06	400	DNV	Netherlands (NCDF)	WB-CF	18-Nov-04	1-Dec-04	25-Nov-05	0.43	15.0	
Abanico (14,88 MW) Hydroelectric Project	Ecuador	Registered	Hydro	ACM2	142	7	1-Feb-06	996	DNV	Netherlands (NCDF)	WB-CF	18-Nov-04	24-Nov-04	10-Oct-05	0.20	14.9	
Pronaca: Afortunados Swine Waste Management	Ecuador	At validation	Agriculture	AM6	4.3	7	1-Jun-05	43	DNV	n.a.	Clear-Green Environmental ltd. & Efficacitas Consultora Cia. Ltd.	20-Oct-05			6.37	0.0	Flaring
Pronaca: Valentinos/San Javier Swine Waste Management	Ecuador	At validation	Agriculture	AM6	9	7	1-Mar-03	92	DNV	n.a.	Clear-Green Environmental ltd. & Efficacitas Consultora Cia. Ltd.	20-Oct-05			6.37	0.0	Flaring
Pronaca: Tropicales-Plata Swine Waste Management	Ecuador	At validation	Agriculture	AM6	6	7	1-Sep-00	75	DNV	n.a.	Clear-Green Environmental ltd. & Efficacitas Consultora Cia. Ltd.	20-Oct-05			6.37	0.0	Flaring
Perlabi (2,74 MW) Hydroelectric Project	Ecuador	At validation	Hydro	AMS-I.D.	8	10	1-Apr-04	66	DNV	n.a.	CORDFELIM, DEUMAN	29-Oct-05			6.07	2.7	
Calope Hydroelectric Project (16.6 MW)	Ecuador	At validation	Hydro	ACM2	62	7	1-Jun-06	435	DNV	Netherlands	Deuman	18-Jan-06			3.43	16.6	
Poza Honda and La Esperanza Small Hydroelectric Projects	Ecuador	At validation	Hydro	AMS-I.D.	41	7	1-May-06	277	SGS	n.a.	CORDELIM	18-Mar-06			1.43	9.2	Existing dams
Zámbiza Landfill Gas Project	Ecuador	At validation	Landfill gas	ACM1	94	10	1-Jul-06	654	TÜV-SÜD	n.a.	ARA Carbon Finance GmbH	3-Dec-05			4.93	0.0	Flaring

Annex 5 Letter of approval to Project Ratio (UNEP RISOE CDM Portfolio)

COUNTRY	Letter of approval	PROEJCTS	RATIO	q	Rating
Chile	12	20	0.60	4	1
Honduras	9	16	0.56	4	2
South Korea	5	10	0.50	4	3
Argentina	4	9	0.44	4	4
Mexico	19	43	0.44	4	5
Brazil	48	135	0.36	4	6
South Africa	3	9	0.33	4	7
Ecuador	3	10	0.30	4	8
Malaysia	4	15	0.27	4	9
India	73	283	0.26	4	10
China	14	61	0.23	4	11
Philippines		21	-	4	
Thailand		12	-	4	
Nepal	2	2	1.00	3	
Moldova	3	4	0.75	3	
Morocco	3	4	0.75	3	
Bangladesh	2	3	0.67	3	
Nicaragua	2	3	0.67	3	
Panama	3	5	0.60	3	
Sri Lanka	3	5	0.60	3	
Armenia	1	2	0.50	3	
Costa Rica	2	4	0.50	3	
Israel	1	2	0.50	3	
Peru	3	6	0.50	3	
Colombia	3	7	0.43	3	
Guatemala	3	7	0.43	3	
El Salvador	2	5	0.40	3	
Bolivia	1	4	0.25	3	
Vietnam	1	5	0.20	3	
Indonesia	1	7	0.14	3	
Cyprus		2	-	3	
Egypt		2	-	3	
Nigeria		2	-	3	
Tunisia		2	-	3	
Uruguay		2	-	3	
Bhutan	1	1	1.00	1	
Cambodia	1	1	1.00	1	
Fiji	1	1	1.00	1	
Jamaica	1	1	1.00	1	
Papua New Guinea	1	1	1.00	1	
Dominican Republic		1	-	1	
India		1	-	1	
Israel		1	-	1	
Ivory Coast		1	-	1	
Kyrgyzstan		1	-	1	
Mongolia		1	-	1	
Pakistan		1	-	1	
Tajikistan		1	-	1	
Tanzania		1	-	1	
Uganda		1	-	1	

Annex 6 Time lag from start of public comments to issuance of letter of approval from the host country (UNEP RISOE CDM Portfolio)

Interval	Frequency	Relative per	Abs per
1.00-0.03	3	0.4%	0.4%
1.03-3.54	296	39.8%	40.2%
4.54-7.05	284	38.2%	78.4%
8.05-10.56	106	14.2%	92.6%
11.56-14.07	23	3.1%	95.7%
15.07-17.58	12	1.6%	97.3%
18.58-21.09	4	0.5%	97.8%
22.09-24.60	6	0.8%	98.7%
25.60-28.11	6	0.8%	99.5%
29.11-31.62	2	0.3%	99.7%
32.62-35.13	2	0.3%	100.0%
Total	744	100%	

Annex 7 Solid Waste Management Situation in Ecuadorian cities with a population over 100,000 inhabitants

	Population	**Canton**	**Final Treatment**	**Awareness of CDM**
1	2,039,789	GUAYAQUIL	Landfill	Yes
2	1,839,853	QUITO	Landfill	Yes
3	417,632	CUENCA	Landfill	Yes
4	287,282	AMBATO	Landfill	Yes
5	287,018	SANTO DOMINGO	NA	
6	238,430	PORTOVIEJO	To be implemented as CDM	Yes
7	217,696	MACHALA	Controlled dump site	Yes
8	193,315	RIOBAMBA	Open dumpsite	No
9	192,322	MANTA	Controlled dump site	No
10	178,714	DURAN	NA	
11	175,077	LOJA	Landfill	No
12	157,792	ESMERALDAS	NA	
13	153,256	IBARRA	Landfill	No
14	143,979	LATACUNGA	Open dumpsite	Yes
15	140,103	MILAGRO	Open dumpsite	No
16	139,790	QUEVEDO	NA	
17	132,824	BABAHOYO	Open dumpsite	No
18	117,634	CHONE	Open dumpsite	
19	111,671	SANTA ELENA	NA	

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