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CLEAN DEVELOPMENT MECHANISMS PROJECTS IN THE ELECTRICITY SECTOR

Jessica MEZA*
Universidad Nacional del Callao, Lima, Perú

Juan GRADOS
Universidad Nacional del Callao, Lima, Perú

Wilmer CHAVEZ
Universidad Nacional del Callao, Lima, Perú

Wilver AUCCAHUASI
Universidad Privada del Norte, Lima, Perú

Ricardo GUTIERREZ
Universidad Privada del Norte, Lima, Perú

Edwin FELIX
Universidad Nacional de Moquegua, Moquegua, Perú

Mario RUIZ
Universidad Nacional de Moquegua, Moquegua, Perú

Héctor HERRERA
Universidad Nacional de Ingeniería, Lima, Perú

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Abstract

European companies that carry out energy activities are more or less significantly affected by the control of Greenhouse Gases - GHG emissions and the need to reduce emissions from their combustion facilities to comply with global, sectoral and specified limitations. the Kyoto Protocol.One way to counteract the excess emissions of its facilities located in European territory is to commit investment projects in the so-called Clean Development Mechanism - CDM.

The Latin American area is a reception center for CDM projects from companies worldwide. Highlighting the high potential that these countries have to develop CDM projects, especially energy, mainly due to the great availability of renewable resources (wind, solar, hydroelectric, biomass, geothermal). Thus, having a magnificent important business opportunity as host countries in the development of CDM project activities.

One of the objectives of the CDM is to support developing countries in technology transfer and promote sustainable development.Understanding by sustainable development, as the economic model that allows satisfying the needs of the present generations without compromising the possibilities of those of the future to meet their own needs; considering the ecological-economic-social aspect to raise the possibility of improving technology andsocial organization so that the environment can recover at the same rate as it is affected by human activity.

The wide portfolio of projects available in all sectors, although especially energy, is a reality and the Peruvian electricity sector is not alien to this trend; Several projects have already requested national approval of their projects to participate in the benefits of the CDM under the Kyoto Protocol.

Notwithstanding the foregoing, it should be noted that the processing of CDM project activities present significant entry barriers, with some factors being aggravated (definition of baseline, demonstration of the principle of additionality, etc.).

Keywords: Mechanisms, electricity, clean technology, projects.

Introduction

Reality of climatechange

The earth's climate has varied throughout history, due to natural variability and the influence of human activities.Climate Change is defined as those variations in climate that can be attributed directly or indirectly to human activities, causing changes in the composition of the atmosphere (greenhouse effect).

There is a certain level of natural greenhouse effect without which life as we know it would not be possible, as the planet would be too cold.Among these greenhouse gases (GHG) are carbon dioxide, nitrous oxide and methane, which are releasedby industry, agriculture and fossil fuel combustion.

GEI	POTENCIAL DE CALENTAMIENTO GLOBAL	CONTRIBUCIÓN AL CALENTAMIENTO GLOBAL (%)
CO2	1	55
CH4	21	15
N2O	310	6
SF6	23.900	24
PFC	6.500	
HFC23	11.700	

Figure 1.Shows GHGs and their contribution to global warming.

The problem of global warming is that the industrialized world has produced a 30% increase in the concentration of these gases [1] since the last century, when, without human action, said concentration was naturally in equilibrium.

Among the observed changes are the global mean temperature, height of mean sea level and snow cover in the northern hemisphere.

Fighting Climate Change means limiting greenhouse gas emissions. To this end, the international community, taking as a starting point the United Nations Framework Convention on Climate Change (UNFCCC) [2], agreed in 1997 to adopt the Kyoto Protocol, which sets quantitative ceilings for GHG emissions in countries. industrialized in the period 2008-2012.

Materials and methods

The internalization of environmental costs

Production activities cause impacts on the environment. However, the prices of most of these activities do not include the costs of these impacts and this can cause inefficiencies in the market. The environmental costs fall on society: “Those who pollute are not those who pay”.

To achieve an efficient allocation, there are two options, the first is to prohibit

The activity or product (for example leaded gasoline); and the second is to internalize environmental costs. However, two serious difficulties are encountered: the uncertainty in the quantification of costs (intangible goods) and the limited experience in the application of internalizationmechanisms; which will be achieved prudently and gradually.

The environmental problem is among the main points that are addressed in the agendas of the countries. Therefore, there are three mechanisms for internalizing environmental costs:

a) Regulatory Mechanisms and Market: through environmental quality standards, product standards, standards applicable to emission sources, emission rights trading, green certificate systems and renewable capacity auction system.
b) Economic Mechanisms: Premiums for production under the special regime, demand management programs, aid for energy saving and efficiency programs.
c) Fiscal Mechanisms: Energy and environmental taxes.

Clean development mechanism - CDM

The Kyoto Protocol [3] established three flexible mechanisms, one of them is the CDM, to help countries comply with their quantified commitments to limit and reduce emissions contracted, help countries not included in Annex I of the UNFCCC to achieve sustainable development and contribute to the ultimate goal of the UNFCCC.

Therefore, CDM is a mechanism that enables a country that is considered in Annex I of the UNFCCC to finance projects to reduce GHG emissions in countries not considered in Annex I or developing

countries to achieve their objectives. Reduction of emissions.Allowing creation.

Acquisition and transfer of Emission Reduction Certificates (CERs).

Figure 2 shows the scheme that complies with the CDM, which bring benefits for both the investing country and the host country; Thus, the first one, acquires emission credits through projects in countries not considered in Annex I; and, the second, receives foreign investment and technology transfer more efficient and advanced than its own.

Figure 2.CDM scheme

1. ELIGIBILITY CONDITIONS

Any project that wishes to be classified as CDM must comply with the following conditions:

Reaching real and measurable ghg emissions conditions.

Real GHG reductions (CO2, CH4, N2O, SF6, PFC and HFC23), measurable.

Achieve additional ghg emissions reductions

A project activity is additional if GHG emissions are reducedbelowthosethatwouldhaveoccurred in the absence of the proposed project activity.

For this, it is necessary to establish the Baseline of a CDM project activity, which is the scenariothat reasonably represents the GHG emissions that would have occurred in the absence of the proposed project activity.

Therefore, the dynamics of GHG isdemonstrated in theeventthattheprojectisnotexecuted and anacceptableestimate of theemissionsderivedfromtheabsence of theprojectactivity can be obtained.
Figure 3 shows theadditional GHG emissionreductionsthatwouldhaveoccurred in thepresence of theproject.

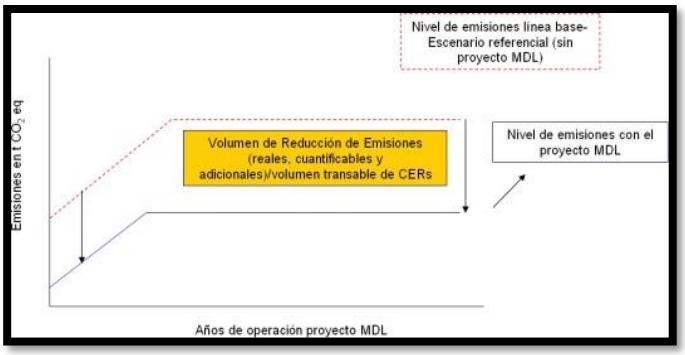

Figure 3. Concept of Additionality

The UNFCCC approvesmethodologiesthat can be applied as a conceptual frameworktoformulatetheBaselinemethodology of a particular project.

One of themethodologiestocalculatetheBaselineis ACM0002, whichis a consolidatedmethodologyforthebaseline of electricitygenerationbyrenewableenergysources of zeroemissionconnectedtothegrid. Emissionreductioniscalculated as:

Reducción de emisiones (tCO2/MWh) =Generación proyecto (MWh) X Factor de emisión de Margen Combinado (tCO2/MWh)

The calculation of the Combined Margin Emission Factor (FE) is determined based on the Operating Margin Emission Factor (FEom), which will depend on the characteristics of the electricity system and the specific information of the electricity sector available to the developer of the draft.

Voluntary development of projects

Theprojectpromotermustdemonstratethattheprojectiscarriedout on a voluntary basis.

Contribution to the sustainable development of the host country

The host country, the country wherethe CDM projectisbeingdeveloped, benefitsfromreceivingforeigninvestment and the transfer of more efficient and advanced technology than its own.

Limited accreditation period

Theprojectmusthave a limitedcreditingperiod, havingtwooptions: i) renewable, havingthreeperiods of sevenyears and; ii) mixed, for a period of ten years.

2. MAIN ORGANIZATIONS AND ENTITIES

Themainorganizations and entitiesthatgivethe CDM qualification to a project are:

Executive board (je)

UnitedNationsentity, responsibleforthesupervision of all CDM projectactivities. Among its functions is:

- Make publicly available relevant information on proposed CDM project activities in need of financing and on investors in order to assist in the financing of such project activities.
- Develop and maintain the Registry of CDM projects
- Issuance of Emission Reduction Certificates – CERs

Designated operational entities (doe)

EntityaccreditedbeforetheExecutive Board, whose function is:

- Validate CDM project activities.
- Verify and certify reductions in GHG emissions.

There are few DOEs worldwide, sincetheyhaveto be authorizedbytheUnitedNations, in Peruthere are no DOEs; but, severaloperatesuch as AENOR, TUV SUD, SQS, among others [4].

Designated national authority (and)

Agency designatedby a country that has ratifiedtheKyotoProtocol, which in the case of PeruistheMinistry of theEnvironment [5], withtheresponsibility of supervising and approvingall CDM-relatedactivitiescarried out in that country.

Itcertifiesthattheparticipation of theinvesting country isvoluntary and, in the case of thecountrieswheretheactivitieswill be implemented (host country), thattheseactivitiescontributetotheirsustainabledevelopment.

3. CYCLE OF A CDM PROJECT

Figure 3 shows thecyclethateveryprojectmustpasstoobtainthe CDM qualification.

Figure 4. Cycle of a CDM Project

Project design document

The promoter must identify and formulatethepotential CDM project, convinced of theviability of theproject, decide toimplementit as a CDM project, and therefore, prepare the Project DesignDocument (PDD); whichmustcontainmainly:

- Project general description.
- Methodology applied to calculate the baseline.
- Project duration / selected crediting period.
- Monitoring plan and methodology. Calculation of GHG emissions.
- Environmental impacts or repercussions of the project.
- Comments from those involved / interested.

Authorization

Onthebasis of the PDD, thepromotermustrequestitsapprovalfromthe DNA of theinvesting country and the host country.

Validación

Itistheprocess of independentevaluation of a projectby a DOE, tocheckiftherequirementsestablishedforthe CDM basedon the PDD are met.

Iftheproposedprojectactivityisdeterminedto be valid, the DOE mustsubmit a requestforregistrationtothe EB in theform of a validation report.

Registry

Theofficialacceptancebythe EB constitutes a projectvalidated as a CDM projectactivity.

Implementation and monitoring

Thepromotermustexecutethemonitoring plan contained in theregistered DDP, whichmust be carriedoutthroughouttheproject'saccreditationperiod, preparing a monitoringreportthatwill be sentforverification and certification to the DOE.

Check

Periodicindependentreview and ex-post determination of GHG reductionsthathaveoccurred as a result of the registered CDM project.

TheDOE'sVerificationReportwillestablishtheverifiedemissionreductions (CERs) thattheproject has generatedduringitsoperationperiod and that has been subject to inspection.

Certification

Writtenstatement, bythe DOE, in whichitaffirmsthat, during a specifiedperiod of time, theprojectachievedthereduction of GHG emissionsthathavebeenverified and thatwouldnothaveoccurredifthe CDM projecthad not been carried out.

Cers issuance

The Certification Report constitutes a requesttothe EB fortheissuance of CERsequivalenttothe GHG emissionreductionsthathavebeenverified and certified.

Results

Cdm projects in the electricity sector

receiving CDM projectsfromcompaniesworldwide and, specifically, they are the natural settingwhereenergycompanieshavemadelarge investments in the past.

In addition, highlightthehighpotentialthatthesecountrieshavetodevelop CDM projects, especially energy,mainly due to the greatavailability of renewableresources (wind, solar, hydroelectric, biomass, geothermal, etc.).

Therefore, Latin American countrieshave a magnificentimportantbusinessopportunity as hosts in thedevelopment of CDM project activities.

Potential CDM projects in theelectricity sector are renewableenergy, energyefficiency and the use of cleaner fuels.

Projectsbasedonrenewableenergysourcesconstituteone of the sectorial areasconsideredforthedevelopment of CDM-typeprojects, forexample, the Tacna project and Panamericana Solar 20 TS, thePurmacanahydroelectricplant, which are in theirvalidationcycle. Likewise, theHuaycolorobiomassthermalpowerplantisalready a registered CDM project.

Also the substitution of polluting energy sources for CDM projects based on renewable energy sources for the production of electricity is one of the main measures that the electricity sector is promoting; Thus there is the conversion from simple cycle to combined cycle of the Ventanilla thermal power plant, which has been registered as a CDM project, the validation of the simple cycle conversion project of gas turbines to combined cycle of the Kallpa thermal power plant, among others.

Currently, Peru has 21 registered CDM projects and 21 projects in thevalidationphase. Tables 1 and 2 listthe status of theprojects.

Titulo del Proyecto	País	Departamento	Estado	Tipo
Poechos I Project	Perú	Piura	Registrado	Hydro
Santa Rosa	Perú	Lima	Registrado	Hydro
Tarucani I ("the project")	Perú	Arequipa	Registrado	Hydro
Huaycoloro landfill gas capture and combustion	Perú	Lima	Registrado	Landfill gas
Quitaracsa I ("the project").	Perú	Ancash	Registrado	Hydro

Titulo del Proyecto	País	Departamento	Estado	Tipo
Ancon – EcoMethane Landfill Gas Project	Perú	Lima	Registrado	Landfill gas
Rehabilitation of the Callahuanca hydroelectric power station	Perú	Lima	Registrado	Hydro
Carhuaquero IV Hydroelectric Power Plant	Perú	Cajamarca	Registrado	Hydro
Caña Brava Hydroelectric Power Plant	Perú	Cajamarca	Registrado	Hydro
La Virgen Hydroelectric Plant	Perú	Junín	Registrado	Hydro
Poechos II hydroelectric plant project	Perú	Piura	Registrado	Hydro
La Joya Hydroelectric Plant	Perú	Arequipa	Registrado	Hydro
Fuel Substitution by Hydro Generation in Pasto Bueno	Perú	Ancash	Registrado	Hydro
Cheves Hydro Power Project, Peru	Perú	Lima	Registrado	Hydro
Bionersis Project Peru 1	Perú	Loreto	Registrado	Landfill gas
Santa Cruz I Hydroelectric Power Plant	Perú	Ancash	Registrado	Hydro
El Platanal Hydropower Plant	Perú	Lima	Registrado	Hydro
Ventanilla Conversion from Single-cycle to Combined-cycle Power Generation Project	Perú	Lima	Registrado	EE supply side
Santa Cruz II Hydroelectric Power Plant	Perú	Ancash	Registrado	Hydro
Yanapampa Hydroelectric Power Plant	Perú	Ancash	Registrado	Hydro
Huanza Hydroelectric Project	Perú	Lima	Registrado	Hydro

Figure 5. Registered CDM Project

Titulo del Proyecto	País	Departamento	Estado	Tipo
Triplay Amazonico Methane Avoidance Project	Perú	Ucayali	Validación	Biomass energy
Yuncán Hydropower Plant	Perú	Pasco	Validación	Hydro
Pucara Hydropower Plant (HPP)	Perú	Cusco	Validación	Hydro
Fuel switching at CIA REX S.A.	Perú	Lima Province	Validación	Fossil fuel switch
Santa Rita Hydropower Plant	Perú	Ancash	Validación	Hydro
Modelo del Callao Landfill Gas Capture and Flaring System	Perú	Callao	Validación	Landfill gas
Maple Bagasse Cogeneration Plant	Perú	Piura	Validación	Biomass energy

Título del Proyecto	País	Departamento	Estado	Tipo
Pias Hydroelectric Power Plant	Perú	La Libertad	Validación	Hydro
Huasahuasi I and II Hydroelectric Power Plant	Perú	Junín	Validación	Hydro
Purmacana Hydroelectric Power Plant	Perú	Lima Province	Validación	Hydro
Baños V Hydroelectric Power Plant (BVHPPP)	Perú	Lima Province	Validación	Hydro
Chancay Hydroelectric Power Plant	Perú	Lima Province	Validación	Hydro
Santa Cruz III Hydroelectric Power Plant	Perú	Ancash	Validación	Hydro
Manta Hydroelectric Power Plant	Perú	Ancash	Validación	Hydro
Nuevo Imperial Cañete Hydro Power Plant	Perú	Lima	Validación	Hydro
Centauro I Hydroelectric Project, Peru	Perú	Ancash	Validación	Hydro
TACNA SOLAR 20 TS: 20 MW Solar Photovoltaic Power Plant	Perú	Tacna	Validación	Solar
PANAMERICANA SOLAR 20 TS: 20 MW Solar Photovoltaic Power Plant	Perú	Moquegua	Validación	Solar
Las Pizarras Project	Perú	Cajamarca	Validación	Hydro
RenovAndes H1, Small Hydropower Plant, Peru	Perú	Junín	Validación	Hydro
Conversion of Open Cycle Gas Turbines to Combined Cycle at Kallpa Thermoelectric Power Plant	Perú	Lima	Validación	EE Supply side

Figure 6. Validated CDM Project

Peru ranks fifth in LatinAmerica in thedevelopment of CleanDevelopmentMechanismprojectswith 5% [7] of the total.

Figure 7 and Figure 8 show the number of CDM projects in Latin America and by country.

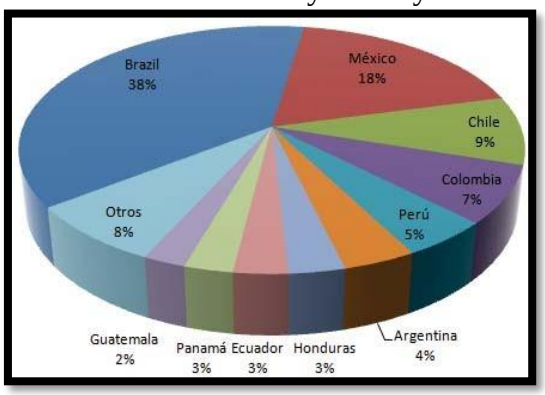

Figure 7. CDM Projects in LatinAmericaby Country

PROYECTOS MDL AMÉRICA LATINA (PAÍS ANFITRIÓN)	VALIDADOS	SOLICTUD DE REGISTRO	REGISTRADO	TOTAL	%
Brazil	176	2	197	375	38%
México	50	0	134	184	19%
Chile	38	0	51	89	9%
Colombia	38	1	35	74	7%
Perú	23	0	25	48	5%
Argentina	14	1	24	39	4%
Honduras	8	2	20	30	3%
Ecuador	11	1	17	29	3%
Panama	19	0	7	26	3%
Guatemala	12	0	11	23	2%
Uruguay	12	2	6	20	2%
Costa Rica	4	0	8	12	1%
República Dominicana	10	0	2	12	1%
Nicaragua	4	0	5	9	1%
El Salvador	1	0	6	7	1%
Bolivia	2	0	4	6	1%
Paraguay	2	0	2	4	0%
Cuba	1	0	2	3	0%
Jamaica	1	0	1	2	0%
Bahamas	1	0	0	1	0%
Guyana	0	0	1	1	0%
TOTAL	427	9	558	994	100%

Figure 7. Number of CDM Projects in LatinAmerica

Conclusions

There are timely measures to prevent or mitigate the effects of climate change and these measures are becoming better and scientifically accredited.

The CDM is a fundamental tool to achieve the GHG reduction commitments of industrialized countries and a real opportunity for host countries to obtain financial assistance to achieve technology transfer and a sustainable energy mix.

The promotion of renewable energies is one of the most important current ways to reduce greenhouse gas emissions due to its reduced environmental impact.

Latin American countries should take advantage of this opportunity to define, promote and institutionally support the development of CDM projects in theirgeographicalscope and overcomeentrybarriers (definition of a baseline, demonstration of theprinciple of additionality, etc.) that still present.

The COES as operator of the Peruvian electricity system must provide and have specific information so that the promoters of the CDM projects can determine theEmission Factor of theOperatingMargin and demonstratethattheprojectcontributestothereduction of additional GHG emissions.

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