



Climate Change and IDB: Building Resilience and Reducing Emissions

Sector Study: Energy



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Office of Evaluation and Oversight

1350 New York Avenue, N.W.

Washington, D.C. 20577

www.iadb.org/evaluation

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This sector study was prepared by Maria Elena Corrales, Juan Manuel Puerta, Veronica Gonzalez, Carlos Morales, David Suarez, and Maria Paula Mendieta as an input for the evaluation *Climate Change and the IDB: Building Resilience and Reducing Emissions*.

ACRONYMS AND ABBREVIATIONS

CCLIP	Conditional credit line investment project
CCS	Integrated Strategy for Climate Change Adaptation and Mitigation, and Sustainable and Renewable Energy
CDM	Clean Development Mechanism
CIF	Climate Investment Fund
CTF	Clean Technology Fund
CO ₂	Carbon dioxide
CO ₂ eq	Carbon dioxide equivalent
CTF	Clean Technology Fund
EE	Energy efficiency
EEC	Energy efficiency and conservation
GDP	Gross domestic product
GEF	Global Environmental Facility
GHG	Greenhouse gas
GW, GWh	Gigawatts, gigawatt-hour
IDB	Inter-American Development Bank
IDB-9	Ninth Capital Replenishment, IDB
IEA	International Energy Agency
kW, kWh	Kilowatt, kilowatt-hour
LAC	Latin America and the Caribbean
LULUCF	Land use, land use change, and forestry
MDB	Multilateral development bank
MIF	Multilateral Investment Fund
MW, MWh	Megawatt, megawatt-hour
NSG	Non-sovereign-guaranteed
OECD	Organisation for Economic Co-operation and Development
OVE	Office of Evaluation and Oversight
PBL	Policy-based loan
RE	Renewable energy
SCF	Structured and Corporate Finance
SECCI	Sustainable Energy and Climate Change Initiative
SESG	Sustainable Energy Sector Guidelines
SG	Sovereign-guaranteed
SMEs	Small and medium enterprises
TC	Technical cooperation
tCO ₂	Tons of carbon dioxide
UNFCCC	United Nations Framework Convention for Climate Change

PREFACE

Climate change (CC) poses important risks to development in Latin America and the Caribbean (LAC). Climate adaptation can limit the negative impacts and is important in achieving sustainable development and equity, including poverty reduction and economic growth. Integrating CC mitigation into development work is also an opportunity to foster and support the design and implementation of sustainable projects, programs and policies. Low-carbon alternatives contribute to more sustainable development. LAC countries are increasingly incorporating CC in their national policy agendas and aim to reduce GHG emissions and build climate resilience and the IDB has supported these efforts in the Region.

In 2013-2014, the Office of Evaluation and Oversight (OVE) carried out an evaluation of IDB's support for CC mitigation and adaptation (RE-459). This is OVE's first evaluation of IDB's interventions and institutional set-up related to CC. The evaluation seeks to document and to draw lessons from the recent IDB experience related to CC (2004-2014). It focuses on IDB-financed operations in important climate-related sectors—agriculture and natural resources, energy, disaster risk management, and transport—that directly support climate resilience-building (adaptation) or GHG emissions reduction (mitigation) or that have these outcomes as co-benefits. A number of background papers were produced for the evaluation and this is paper is one commissioned by OVE to support the overall CC evaluation.

EXECUTIVE SUMMARY

Though energy is one of the main sources of greenhouse gas (GHG) emissions worldwide, in Latin America and the Caribbean (LAC), energy-related emissions are (and will remain) relatively low, mostly because of the Region's "green" electricity matrix. LAC remains strongly committed to preserving its low-carbon electricity matrix over the long term—a commitment expressed in National Communications of all LAC countries. To pursue a low-carbon electricity matrix, the Region will have to rely on mitigation measures, particularly increasing installed capacity from renewable sources. At the same time, LAC will also continue to invest in traditional fossil fuel technologies to ensure the reliable provision of electricity.

This evaluation—part of an overall climate change evaluation—looks at the work of the Inter-American Development Bank (IDB) in energy and climate change through both the public and the private sector windows. The evaluation includes all the activities associated with the energy sector, except those related to energy use in transport (which is covered in a separate paper).

Since 2004, IDB has progressively added climate change mitigation as a part of its energy portfolio. Indeed, up to 70% of IDB-financed projects contain mitigation measures. In contrast, climate change adaptation has received much less attention. In the total US\$9 billion portfolio under study, approvals were almost equally divided between the public (55%) and the private sector (45%). Public sector interventions focused on institutional strengthening to overcome the institutional and regulatory barriers to the introduction of climate change mitigation measures and on construction and rehabilitation of power grid and hydropower stations. The private sector portfolio was more oriented toward new renewable sources (wind, solar). However, in spite of the surge in mitigation investment, good-quality operation-specific climate change indicators are not being consistently incorporated into these projects and monitored.

Among the Bank's interventions in energy efficiency, the most relevant, effective and clearly quantifiable reduction of GHG emissions is related to the rehabilitation of or new investments in hydropower plants, new wind power generation processes, and the carbon offset of a "dirty" coal power project. The Bank's direct investments in renewable energy will potentially mitigate close to 10 million tons of CO₂eq per year, 52% through the public and 48% through the private sector portfolio. These emissions are equivalent to 2% of LAC's overall electricity emissions.

The evaluation found that aligning IDB projects with energy-sector objectives was crucial to effective mitigation. IDB projects tended to be more successful when GHG mitigation was introduced as a co-benefit of a broader national electricity-sector goal such as reducing dependence on imported fossil fuels, providing electricity coverage to dispersed populations, or increasing energy security by diversifying sources. The alignment with energy-sector goals was, however, not a sufficient condition for success.

For NSG operations, the evaluation found that during the period under analysis, SCF shifted towards supporting renewable energy and energy efficiency projects, becoming an important actor for the region in this field. Furthermore, SCF was successful in channeling financial resources from developed markets to support climate-friendly initiatives in the region, mostly by using B-lending arrangements. Moreover, some operations have shown the important role the IDB can play in pushing actions forward, for example, by leading the structuring of operations with multiple lenders or by promoting agreements between public and private actors.

However, there is room for improvement in maximizing the relevance of NSG operations. Interventions were more relevant when market failures linked to climate change (externalities, information asymmetries, lack of long-term finance) were correctly diagnosed and suitable designs were proposed to address them.

The environmental and social risks of energy projects are not limited to GHG emissions, and many “green” projects may end up not being so green. Every energy source has associated environmental and social risks: renewables projects tend to have social risks associated with the large surfaces needed for the power plants and conflicting land uses, wind power can convey important environmental risks in the form of bird and bat fatalities, and fossil fuels imply higher GHG emissions. GHG emissions are one important dimension, but they have to be weighed against other social and environmental risks. At the same time, opportunities for effective mitigation may be present in high-carbon projects. For instance, IDB has had a successful experience securing a binding emission offset agreement from a coal-fired power station.

Finally, a general finding of the evaluation is that intervention strategies were more relevant whenever IDB private and public sector action was coordinated. For example, in the Uruguayan energy matrix reform, IDB’s participation—financing the first three large-scale renewable energy projects—not only added financially but contributed to the development of a market for private sector investments in energy (demonstration effects). The coordination between the public and private sector windows, though not entirely seamless, helped align all the actors with the same objective. In contrast, when projects were approved without a relationship with what the Bank’s public sector is doing, their relevance tended to be lower. The Bank’s work in Mexico is an example; while the country is undertaking a major energy reform in which IDB’s role has been limited, the Bank’s operations focused on financing/refinancing some wind farms. Not only are these projects facing significant operational, environmental, and social challenges, but their sustainability could be threatened if the reform succeeds in reducing energy prices.

On the basis of these findings, the evaluation team makes the following suggestions:

Suggestion 1: Ensure that projects’ possible co-benefits in terms of climate change are identified and effectively incorporated in the energy sector portfolio.

Suggestion 2: Consistently address identified barriers—notably those related to market distortions and subsidies—to ensure projects’ sustainability.

Suggestion 3: Strengthen the alignment and cooperation between the Bank’s public and private sectors, particularly in view of the likely merge-out of the private sector.

Suggestion 4: Take advantage of GHG mitigation opportunities in high-carbon projects in which IDB participation can make a difference.

Suggestion 5: With regard to the private sector, tailor interventions and instruments to the market failures to be addressed; increase the Bank’s relevance by further advancing the role of the Bank as an institution that structures projects and leads syndications; and foster the implementation of safeguards in high-risk “green” projects.

I. INTRODUCTION

- 1.1 **Climate change is a global development challenge that is closely related to the unprecedented consumption of energy in our times.** In the past 40 years, global energy consumption has risen at an average rate of 2.1% per year, following the worldwide acceleration in the rate of economic growth (3.1%) (World Bank WDI, 2012). As economic growth continues, energy consumption is expected to keep rising. For instance, between 2011 and 2034, the demand for energy is expected to increase by one-third, with most of this increase occurring in developing economies (IEA, 2013a). Looking forward, the main challenge is to produce enough energy to sustain economic development while curtailing emissions of greenhouse gases (GHGs). To meet that challenge, the world economy needs to become an energy-efficient, low-carbon economy.
- 1.2 **Through the United Nations Framework Convention for Climate Change (UNFCCC),¹ the international community has been promoting both mitigation and adaptation strategies to cope with climate change.** GHG emissions generated by the production, transformation, transportation, and consumption of energy have been identified as one of the main causes of climate change. As a consequence, the global strategies promoted by the UNFCCC include measures to mitigate energy-related emissions: increasing the efficiency of supply and demand of energy, and incorporating low-carbon sources—and particularly renewable energy sources such as solar energy, wind power, geothermal electricity, and micro hydropower systems—for electricity production. In the area of adaptation, the energy sector has been less active than other sectors whose vulnerability to climate change is more evident (agriculture, coastal development, natural disaster prevention, transport). However, there are some indications that climate change is starting to affect the energy sector. In particular, there are concerns about the effects of climate change on the availability of water for hydropower generation.
- 1.3 **The multilateral development banks (MDBs) have been called to play a key role in the transition to a low-carbon economy, through both their public and private sector windows.** In 1997, the Kyoto Protocol established a binding reduction of CO₂ emissions for developed economies and a Clean Development Mechanism to trigger investment in developing countries. Kyoto entered into force as a pilot only in 2004, and it was to last through 2012. The next step—the Copenhagen Summit of 2009—had the ambitious goal of producing a full-scale binding emission cap for all countries. In the end, the meeting attained much less:² while governments were to continue to work on an international emission cap agreement, developed countries committed to mobilize US\$100 billion per year from the public and private sectors to finance climate-change initiatives in developing countries by 2020. The MDBs and the private sector were called to play a

¹ The United Nations Framework Convention on Climate Change is a treaty signed by 195 countries in 1992, “...to cooperatively consider what they could do to limit average global temperature increases and the resulting climate change, and to cope with whatever impacts were, by then, inevitable.” Website: <https://unfccc.int>.

² For an analysis of the negotiation process and the main outcomes of Copenhagen, see, for instance, Bodansky, 2010. For the full text of the Copenhagen Accord, see [link](#).

pivotal role in that commitment: the MDBs' role was to "play a significant multiplier role and leverage additional green investments" (UN, 2010).

- 1.4 **The increased worldwide interest in climate change resonated in the Inter-American Development Bank (IDB, or the Bank), which made climate change one of its top priorities.** Since creating the Sustainable Energy and Climate Change Initiative (SECCI) in 2007, the IDB has committed more attention and resources to climate change. In 2010, the Ninth Capital Replenishment (IDB-9) established climate change as an institutional priority and set a target of devoting 25% of the Bank's lending to climate change by 2015. In 2012, a Climate Change Division was created, and a full-fledged climate change strategy was approved to contribute to the attainment of the ambitious climate change goals embedded in IDB-9.
- 1.5 **In 2013-2014, the Office of Evaluation and Oversight (OVE) carried out an evaluation of IDB's support for climate change mitigation and adaptation.** This study looks at the overall portfolio of the IDB covering "all policy interventions that contribute to climate adaptation and mitigation, either as primary objective or while promoting other development or sectorial goals" (RE-459). The objective of this paper is to evaluate IDB's work in energy and climate change through both the public and the private sector windows. The evaluation includes all the activities associated with the energy sector, except those related to energy use in transport (which is covered in a separate background paper). The portfolio covered in this paper is the largest single portfolio in any background study: it includes operations for US\$9.1 billion, representing almost 78% of the overall climate change portfolio evaluated by OVE. It also includes virtually all the investments carried out through the Bank's private sector windows (87%).
- 1.6 **The evaluation methodology combines portfolio and document review and interviews with main stakeholders.** The evaluation team carried out a general portfolio review for the entire portfolio and a full review of all the documentation for a subsample of 45 projects—19 public sector interventions (44% of the portfolio) and 26 private sector interventions (49% of the total), both broadly representative of the Bank's different intervention strategies. OVE interviewed project specialists (origination and monitoring) for 37 projects and visited 26 clients in the countries, preparing an individual project note for each project reviewed. In addition to the project reviews, OVE's team reviewed the relevant literature on key aspects. For public sector projects, the team also reviewed technical cooperation. A full report from the Worldwatch Institute, *The Development of the Renewable Energy Market in Latin America and the Caribbean*, was also commissioned as a part of this effort (WWI, 2014).
- 1.7 **The paper is organized as follows:** Chapter 1 describes the opportunities and challenges in LAC related to GHG emissions. Chapter 2 examines the relevance of the Bank's strategy to address its climate change commitments. Chapters 3 and 4 present the evaluation findings on the sovereign-guaranteed and non-sovereign-guaranteed portfolio. Finally, Chapter 5 presents the conclusions and suggestions that result from the evaluation.

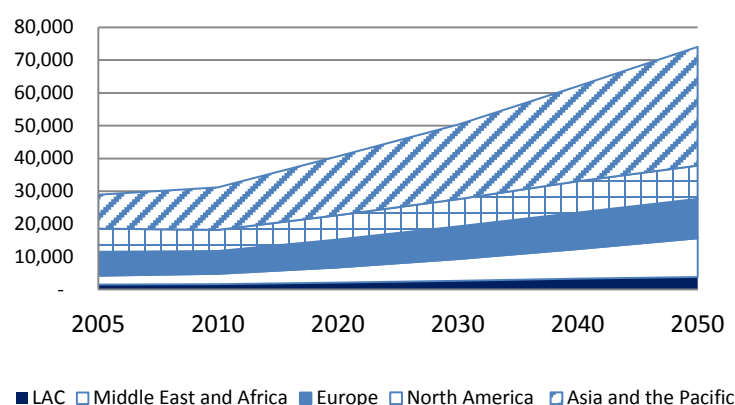
II. CLIMATE CHANGE AND THE ENERGY SECTOR: OPPORTUNITIES AND CHALLENGES

A. Greenhouse gas energy emissions: Current and prospective

2.1 **Greenhouse gas (GHG) energy emissions in Latin America and the Caribbean (LAC) are relatively low compared to those in other regions and to the world average.** Overall, LAC accounts for only 5.3% of global energy emissions, while the Region's GDP represents 7.5% of the world's (WRI-CAIT, 2014; World Bank WDI, 2012). However, the distribution of emissions is quite idiosyncratic to LAC: transport-related emissions are relatively more important in LAC (31%) than in the rest of the world (18%), while the power sector accounts for only 29% of LAC's energy emissions, compared to 44% worldwide. Also, fugitive emissions are relatively more important in LAC (8% of total energy emissions, compared with 4% in China or 6% in the United States), given the importance of the oil and gas industry in the Region (see Annex 1, Figure 1).

2.2 **Unlike overall emissions, energy emissions are growing more rapidly in LAC than in other developing regions.** Total emissions in LAC have grown at 1% per year, compared to China's (16%) or India's (10%). The modest LAC growth is driven by the drastic reduction in emissions from land use, land use change, and forestry (LULUCF) emissions, particularly because of the reduced deforestation in the Amazon basin (see Annex 1, Figure 2). However, energy-related emissions in LAC have risen sharply (76%) between 1990 and 2011, compared to a drop of 4% in Annex I countries (see Annex 1, Figure 3).³ Moreover, LAC energy emissions are expected to continue rising—by 132% between 2010 and 2050, close to the expected worldwide rate of 138% (see Figure 1 and Annex 1, Figure 4).

Figure 1. World energy emissions projections to 2050, by region



Source: OVE, based on IIASA (2013).

³ Annex I countries are Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America.

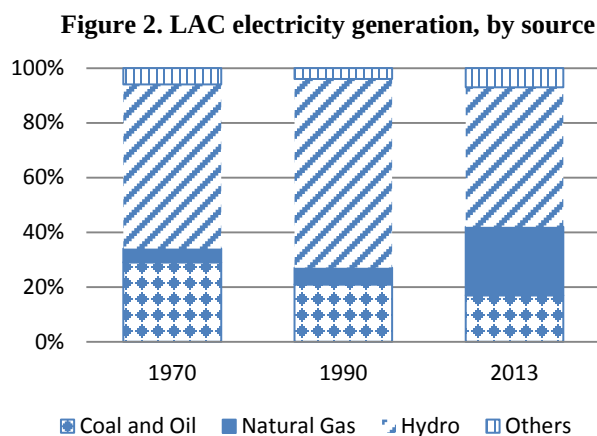
2.3 **The reason for LAC’s relatively low energy emissions is its “green” power matrix.**

The low-carbon energy matrix is in turn driven by the Region’s relatively clean electricity matrix. While coal-based generation is the most important source of electricity in the world, LAC’s power generation matrix is heavily concentrated on cleaner sources like hydroelectricity (50%) and natural gas (25%) (see Annex 1, Figure 5).⁴ Natural gas is increasingly becoming a major source of power generation in the Region.⁵ Though natural gas is not as clean a source of electricity as hydropower, GHG emissions from gas-based electricity generation are as much as 50% lower than those from coal-based electricity generation⁶ (see Annex 1, Figure 6) (IEG, 2009). New renewable sources account for very little of LAC’s electricity, though they have increased recently, reaching 5% of installed power in 2013 (see Figure 2 and Annex 1, Figure 7).

2.4 **Notwithstanding LAC’s small contribution to world emissions, LAC countries appear to be committed to keeping a low-carbon energy matrix.**

The voluntary targets countries include in their National Communications indicate their desire to maintain the low-carbon energy matrix. In particular, countries with high participation in regional emissions—Brazil, Argentina, Mexico, and Chile—have included in their National Communications

voluntary mitigation measures that will promote a clean economy in the Region (see Annex 1, Table 1). Furthermore, in 2010 Brazil, Chile, Colombia, Costa Rica, Mexico, and Peru made voluntary mitigation commitments to the United Nations Framework Convention for Climate Change (UNFCCC) in Copenhagen.



2.5 **To maintain a low-carbon energy sector, the Region will need to build on effective mitigation strategies with new renewable energies (RE) and energy efficiency and conservation (EEC).**

LAC is well endowed with renewable sources to reduce the consumption of fossil fuels. Besides the Region’s high hydroelectricity availability, many LAC countries have great potential for developing solar power and large-scale wind power. Some countries lying next to the Andes, and most of Central America, show high potential for geothermal electricity generation (see Annex 1, Table 2). The Region also has plentiful natural gas that can be exploited as a cleaner fuel. In addition, the Region has

⁴ The 5th IPCC report explains that GHG emissions from electricity generation can be mitigated using combined-cycle or combined-heat power plants as long as the fugitive emissions associated with the extraction and supply of natural gas are low or mitigated.

⁵ In 1990 hydroelectricity represented 69% of the Region’s capacity, coal and oil plants 29%, and natural gas only 6%. By 2013, the share of hydroelectricity decreased to 51% and the share of coal and oil to 17%, while the natural gas share increased to 25% (WWI, 2014).

⁶ IPCC, 2011.

relatively modern and competitive electricity markets and, in many cases, institutional frameworks that are conducive to private sector participation in generation.⁷

- 2.6 **Adaptation strategies are still largely on the drawing board.** LAC energy sector vulnerabilities related to climate change are still not fully assessed, and the Region has still to design and implement effective adaptation measures. Even when some of the anticipated impacts of climate change in the power industry have been identified, the lack of information and the high levels of uncertainty have limited the development of specific adaptation strategies (see Box 1).

Box 1. Climate change adaptation in the energy sector: A pending assignment

Energy sector vulnerabilities related to climate change in LAC are still not fully assessed, and advances in adaptation measures are still a challenge. Because LAC depends on hydropower for 50% of its electricity, water availability is a major concern. Several studies have been undertaken on the impact of climate change in relevant water basins, including two IDB technical notes on hydroelectric systems in Central America and the tropical Andes and a forthcoming in-depth analysis of climate change impacts on hydroelectric plants in the seven Central American countries. Additionally, the Bank and CEPAL conducted studies about the economic impacts of climate change in Argentina, Bolivia, Colombia, Ecuador, Peru, and Paraguay.

The latest report from the Intergovernmental Panel on Climate Change (IPCC) discusses some of those impacts. A 20% reduction in runoff projected for Central America's Lempa River basin could limit hydropower production in the region, with a potential reduction in capacity of 33%–53% by 2070–2099. Studies for the Sinu-Caribe basin in Colombia also project a reduction in capacity of up to 35% due to higher levels of evaporation, even with increases in rainfall. Chile, Argentina, and Brazil are expected to suffer capacity reductions as well. In contrast, higher levels of precipitation in Ecuador's Paute River basin are projected to increase hydropower generation capacity there.

Latin America has already experienced decreases in hydropower due to extreme droughts; for example, the drought in Costa Rica in 2001 reduced generation by 165GWh, causing losses of US\$8.8 million. In addition, glacial melt could cost Peru's electricity sector between US\$212 million, if a gradual adaptation scenario is implemented, and US\$1.5 billion under rationing conditions.

Increasingly, the topic of vulnerability to climate change and the need to adapt to its effects is receiving greater attention at the regional level and on some national levels in LAC; however, this attention must be translated into concrete action in one of the most vulnerable economic sectors. The region lacks in-depth assessments of the impacts of climate change on non-hydro energy sources, national-level vulnerability studies, and adaptation strategies.

Source: WWI, 2014.

B. Climate change mitigation: One Region, different realities

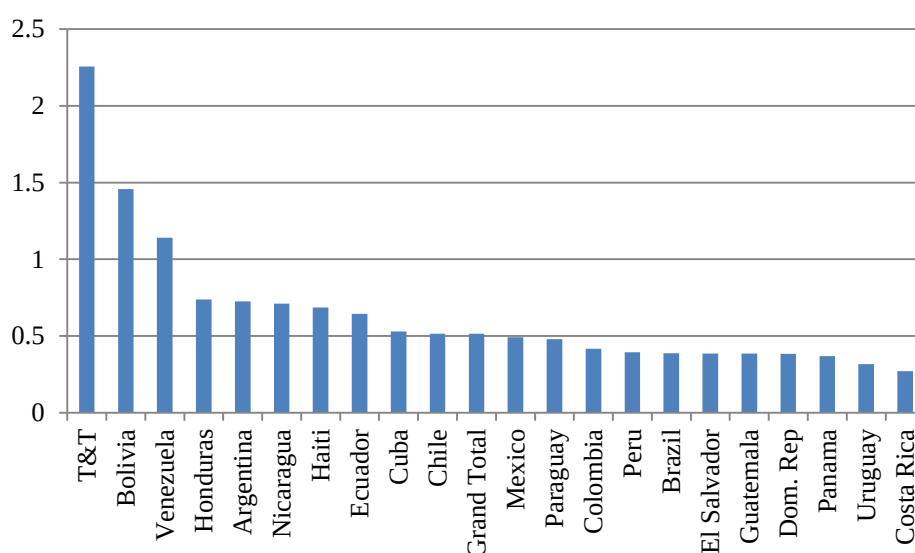
- 2.7 **The diversity of the energy sector in LAC implies that the technical opportunities for reducing GHG emissions are also very diverse.** Countries in the Region are very different in key features of the energy matrices that affect emissions, such as (i) energy intensities, (ii) the composition of the electricity matrix, (iii) the level of technical losses, and (iv) the intensity of fugitive emissions. Thus the opportunities for curtailing emissions are drastically different across the Region.

⁷

“After World War II, the sector expanded rapidly with vertically integrated state-owned utilities. [...] In 1982, Chile became the first country to deregulate and privatize electricity. The following decade most of the Region moved to adopt structures that ranged from complete market competition to state control” (Tissot, 2012).

2.8 The Region exhibits high variation in intensity levels of CO₂ per GDP. The main producers of hydrocarbons (Trinidad and Tobago, Bolivia, and Venezuela) are also among the countries with the highest CO₂ emission intensity in the Region. Uruguay, Brazil, and Colombia have the lowest intensities in the Region—that is, they need to emit less GHG to produce output. For instance, Uruguay produces US\$1,000 of GDP emitting just 0.32 tons of CO₂eq. In contrast, Trinidad and Tobago emits 7 times more (2.26 tons of CO₂eq) to produce the same US\$1,000 of GDP. This heterogeneity also characterizes the larger emitters—Mexico, Brazil, Venezuela, Argentina, Colombia, and Chile. Venezuela’s intensity levels of CO₂ per GDP are double the regional average, those of Brazil, Mexico, and Argentina are below the average. Yet Argentina’s intensity levels are almost twice as large as Brazil’s (0.72 vs. 0.39 tons) (see Figure 3).

Figure 3. Energy emissions intensity per GDP 2011 (tCO₂e/US\$1,000)



Source: WRI-CAIT, 2014.

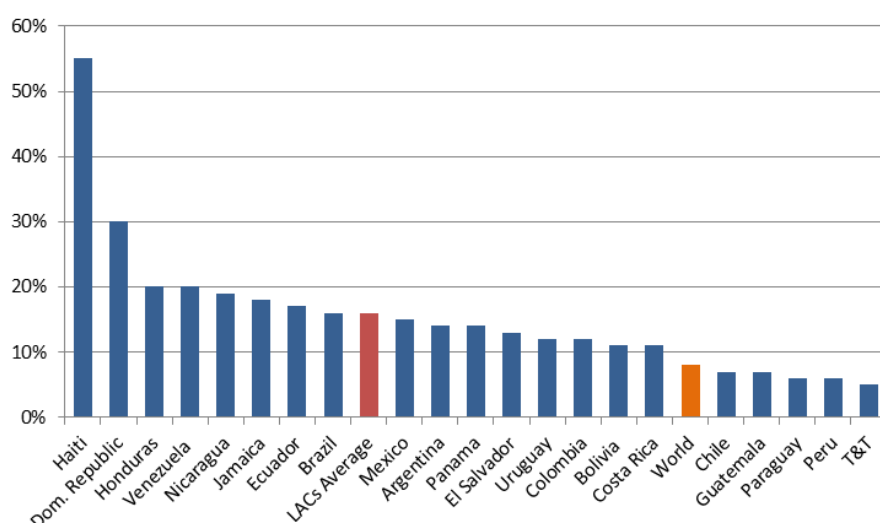
2.9 Electricity sector emissions are closely related to the share of fossil-based generation, which also varies significantly in the Region. South America has the highest levels of hydroelectricity in its electricity matrix—54% of its installed capacity (MIF and Bloomberg, 2013).⁸ However, Central America and Mexico have electricity matrices that rely extensively on fossil fuels: 43% and 75%, respectively (MIF and Bloomberg, 2013). On the whole, emissions related to electricity are concentrated in four large emitters that have higher-than-average CO₂ emissions per GWh: Chile, Mexico, Argentina, and Peru. Though the Central American and Caribbean countries tend to have high emissions per GWh, their small size means that they do not have a significant impact on overall emissions. Finally, some relatively large producers of electricity (Brazil, Venezuela, and Colombia) have low emissions per GWh because of their reliance on hydropower. Though

⁸ In 2011 hydroelectricity in Brazil and Venezuela represented 68% and 69% of electricity generation, respectively, while in Argentina natural gas represented 51% (IEA, 2013a).

the size of their economies makes them important for the Region's overall electricity-related emissions, the scope for reducing their power emissions is limited.

- 2.10 **Power losses in the Region, particularly in transmission and distribution, are another source of emissions.** Technical and commercial power losses in LAC (16%) are above the world's average (8%) and vary significantly among countries, ranging from 5% to 50% of the electricity output (WDI, World Bank). The highest technical losses seem to be concentrated in several Central American and Caribbean countries (Haiti, Dominican Republic, and Honduras) and oil producers (Venezuela and Ecuador). The largest energy producers and consumers tend to be around the regional average (Argentina, Brazil, and Mexico), though Brazil is on the higher end (see Figure 4).

Figure 4. Electric power transmission and distribution losses, 2011



Source: World Bank Indicators, 2014.

- 2.11 **Significant amounts of emissions are fugitive emissions—that is, they are related to the production and transport of hydrocarbons.** Fugitive emissions are not only large in LAC relative to the rest of the world, but are expected to rise, given the Region's fast-expanding production of both conventional and nonconventional hydrocarbons. LAC holds 20% of the world's fossil fuel reserves and currently produces 13% of the world fossil fuels (OLADE, 2012). Furthermore, the Region is home to some important nonconventional oil and gas fields. Today, Mexico and Venezuela account for 67% of total fugitive emissions in the Region (see Annex 1, Figure 8).

C. Opportunities to promote successful mitigation strategies

- 2.12 **Mitigation measures can support the attainment of energy sector goals.** Such goals as improving the fiscal situation, promoting rural electrification, or ensuring energy security can benefit from low-carbon energy strategies. For instance, incorporating renewable energy sources or improving the efficiency in the supply and demand of energy may have the potential of reducing emissions (the co-benefit) while targeting a major energy policy objective.

- 2.13 **GHG mitigation strategies can support countries' efforts to reduce their vulnerability to international oil prices.** Of the 26 countries in LAC, 18 are net importers of energy. These countries are highly sensitive to increases in fossil fuel prices. In many—for example, countries in Central America or the Caribbean—high fossil fuel prices are not passed on to the final consumer but rather absorbed by the government in the form of temporary fiscal deficits. In South America, Chile stands out as a net importer of hydrocarbons, with an electricity matrix that is highly dependent on fossil fuels; the country is taking significant steps to introduce RE in the energy matrix. By using more RE, countries can reduce fiscal vulnerabilities associated with the variation in international oil prices while at the same time generating the co-benefit of a low-carbon electricity matrix.
- 2.14 **The addition of cleaner energy sources (RE and natural gas) can help maintain the Region's green power matrix while increasing the robustness of the power system.** Some countries in LAC, particularly Brazil, Uruguay, Colombia, and Venezuela, have a high share of conventional hydroelectricity in their electricity matrixes: 68%, 63%, 71%, and 69%, respectively (IEA, 2013a). However, high dependence on hydroelectricity represents a long-term challenge for two reasons: first, the limited availability of new large hydropower projects and the environmental restrictions on their exploitation; and second, potential changes in precipitation patterns that result from climate change and may affect water availability, limiting the generation capacity of hydroelectric power stations.⁹ If these electricity systems become more vulnerable, clean energy sources—possibly including natural gas—can be an alternative. Diversification with low-carbon sources would broaden the electricity matrix and decrease the risks of system failures due to water deficits in times of drought. This is particularly true if the technologies can produce base load power—for example, geothermal energy or natural gas—facilitating the incorporation of other, less predictable renewable energies (wind or solar).
- 2.15 **RE can also help meet electricity demand in rural and isolated areas.** On average, 6% of the population in LAC does not have electricity service. But this low figure masks significant differences—lack of access to electricity exceeds 15% in several countries: Bolivia (20%), Guatemala (18%), Guyana (20%), Haiti (72%), Honduras (17%), Nicaragua (34%), and Peru (19%) (OLADE, 2012). In most of these countries, expanding transmission networks to reach small, isolated communities (often in mountainous regions) is not economically viable. New renewable sources would have several advantages. First, they do not have increasing returns to scale in the production of electricity—that is, they can efficiently produce small quantities of electricity. Second, the availability of the resources is at least not worse in these areas than in others; and in some cases, these isolated regions may even have a better quality of the resource (e.g., solar power in the Andean highlands, wind power or microhydro in mountainous regions). Thus new renewable sources can be a technologically and economically feasible solution to bringing sustainable energy to these isolated areas. Of course, given the size of the isolated communities, the co-benefit of GHG mitigation will not be large.

⁹ For instance, the extraordinary droughts in the Southern Cone in the late 1990s led to major disruptions in the electricity supply in Brazil and Uruguay.

- 2.16 **Energy efficiency (EE) is an alternative to boost industrial competitiveness and reduce the investment in energy supply while achieving the co-benefit of a significant reduction in GHG emissions.** “Of all the untapped sources of clean energy in Latin America and the Caribbean, EE may offer the greatest impact at the lowest cost. IDB researchers have estimated that the Region could reduce its energy consumption by 10% over the next decade and save tens of billions of dollars by adopting existing technologies to increase efficiency and reduce new investments.”¹⁰ In countries such as Mexico, Brazil, and Chile, programs to improve energy end-use efficiency have been successful in improving the competitiveness of some sectors, with the additional advantage of relieving the pressure on new investments and reducing GHG emissions.
- 2.17 **In some cases, the early introduction of RE/EE can be seen as an opportunity to develop a comparative advantage in low-carbon technologies.** It also opens up the possibility of developing related national industries—particularly for the countries in the Region that have the largest domestic markets and the greatest experience with developing technological clusters. An “early-mover” approach could help develop new comparative advantages in low-carbon technologies (IEG, 2009). Brazil has successfully followed this strategy in wind energy development (see Box 2).

Box 2. Brazil Wind Energy Development Program

Brazil has encouraged new electricity generation from renewable sources—mainly wind energy, small hydropower plants, and biomass—to ensure that the electricity matrix remains low in carbon. In 2002, it created the Program of Incentives for Alternative Electric Energy Sources (PROINFA) to promote electricity generation from wind, biomass, and small hydropower plants (less than 30MW) through power purchase agreements. A total of 144 contracts were signed, equivalent to a total capacity of 3,299 MW. Among those contracts, the highest share comes from wind energy, with 1,422 MW in 46 projects, followed by small hydropower projects (1,191 MW in 63 projects) and biomass projects (685 MW in 27 plants). Because the program required a minimum of national technology content, it promoted the development of a national wind energy industry. The result was an impressive fall in the cost of wind electricity generation—from \$R205/MWh in 2005 to around \$R100/MWh in 2013. Wind energy is now competing in national energy auctions, and it is expected to grow from 2.8 TWh in 2011 to 45.4 TWh in 2021.

- 2.18 **Finally, the introduction of RE and EEC allows countries to gain access to the significant grants and concessional loans associated with GHG mitigation activities.** The creation of such funds as the Clean Technology Fund (CTF), the Special Climate Change Fund, and the GEF Trust Fund has provided LAC countries with concessional resources that enable them to compensate for the incremental costs of a low-carbon development.¹¹ Approximately two-thirds of these resources are destined to mitigation activities, mainly in the energy sector. LAC has succeeded in attracting some US\$5.2 billion between 2010 and 2012 (see Annex 1, Figure 9).

¹⁰ See IDB energy efficiency homepage at www.iadb.org, accessed on May 20, 2014.

¹¹ In December 2012 in Doha, Germany and the United Kingdom launched the NAMA Facility, which will contribute an initial €70 million of funding to support developing countries that show leadership in tackling climate change and that want to implement ambitious climate protection measures (NAMAs). <http://www.international-climate-initiative.com/en/issues/nama-facility/>

D. Challenges to the introduction of climate change mitigation strategies¹²

- 2.19 In spite of significant incentives, the introduction of RE and EEC in LAC faces significant technological, regulatory, financial, and social challenges.** On the technical side, most renewable energies are intermittent and non-dispatchable, generating challenges for the management of the electric system, especially as the share of renewables increases. In addition, many countries have biases in their regulations that deter the development of renewable energies (e.g., implicit or explicit subsidies for fossil fuels, regulatory obstacles to electricity autoproduction). Given the typically lower profitability of renewable sources vis-à-vis traditional sources, the limited availability of adequate concessional funding is also important.
- 2.20 LAC has taken important regulatory and institutional steps to facilitate and promote clean energy and EE investments.** However, the level of progress varies significantly across the Region (see Annex 1, Figure 10). Most mechanisms target the regulatory, economic, and financial needs of RE projects, and each has its own potential benefits and drawbacks. Addressing resources and technology as well as social and human resource barriers requires building capacity, raising awareness, and creating supporting institutions such as national or regional knowledge centers. LAC countries already use a wide mix of policies and targets tailored to domestic conditions, but fewer than half of the 26 LAC countries have announced concrete RE targets and measures (WWI, 2014), and there are still regulatory and institutional barriers to the adoption of clean energy technologies in the Region.
- 2.21 The technical characteristics of renewable energies (most notably intermittent supply) have important implications for electricity markets.** Those implications include a limited use of installed capacity vis-à-vis non-renewable sources, impossibility of merit-order dispatch, and need for stand-by capacity. Although the price per MWh of some RE sources (e.g., wind) is already competitive in most markets, once it is adjusted to reflect the costs associated with intermittency (particularly the cost of stand-by capacity), these energy sources may become more expensive than non-renewables. More importantly, the intermittency of the renewable resources also implies that fossil fuel generation will have to play a role in electricity markets in the middle and long term. Although there are technical solutions to manage the intermittency of RE sources, addressing this challenge effectively may require additional, and sometimes substantial, investments.
- 2.22 Uncertainties regarding large-scale RE potential and the technical feasibility of its deployment can also hinder investments in RE.** Although mapping of this potential has been carried out in most of the 26 IDB countries, there is no overview of existing and publicly available resource assessments across the Region that includes all technologies. Final comprehensive decisions require knowledge about specific terrain features, land-use exclusions, and accessibility to the existing transmission grid in more detailed, publicly available assessments. This kind of information can be used for political deliberations and public consultations and as a first reference for investors, project developers, and other

¹² This section is based on the OVE study prepared by the World Watch Institute (WWI, 2014).

stakeholders. The perception of many technical risks is sometimes outdated, and integrated energy planning could help to address many remaining technological challenges.

- 2.23 **Infrastructure challenges can present major concerns for developing any energy project, whether conventional or renewable.** The use of RE often means that existing grid networks must be extended or upgraded to account for new factors, such as suitable project siting in resource-rich zones and the need to manage intermittent generation. All LAC countries need significant investments in modernizing the grid and extending transmission and distribution to meet existing and future demand growth. It is important that such investments reflect the technical requirements of a modern electricity system, including supply- and demand-side management.
- 2.24 **The size of the overall power market and the size of individual projects are key hindrances to achieving economies of scale.** Most of the Caribbean islands, and some countries in the broader LAC Region, have low-demand markets and therefore small projects. This increases the transaction costs and lowers the attractiveness for investors. Individual distributed RE projects do not compare to large hydro or fossil-fuel-based power plants in terms of generation capacity, necessitating new business models and bundling to achieve comparable structures for investment. Similarly, EE projects—particularly small-scale projects—depend on the reduction of transaction costs to be viable (see Box 3).

Box 3. Energy efficiency: Similarities with and differences from renewables

The general drivers of EE overlap to some extent with those of investment in generation capacity from renewables. High electricity prices encourage both increased supply (more capacity) and reduction in demand (energy efficiency). Regulation of the electricity sector may, however, have differential impacts. For instance, because most LAC countries subsidize residential consumption, EE investments are unviable at a household level. Since large firms typically pay for those subsidies (cross-subsidies) through their energy bill, they typically have incentives for EE. For RE, the incentive is inherent in the long-term power purchase agreement.

In contrast with RE investments that involve large projects, EE investments can involve projects of all sizes. Small EE projects for households and small and medium enterprises coexist with medium and large EE investments in processes and machinery in the industrial sector, while large public sector EE initiatives involve large investment projects, typically for public lighting or efficient water pumping equipment. Regardless of the size, EE investments are centered on the cash-flow generated by energy savings. Smaller absolute savings (in smaller projects) are typically not sufficient to make EE projects viable. In particular, EE projects need to be able to cover (i) the capital costs of the investment, (ii) the costs of the independent consultant that certifies energy savings, and (iii) insurance, in case the energy savings are not achieved.

- 2.25 **The establishment of regional power markets through interconnection in Central America or among Caribbean islands could increase the size of the electricity market, providing economies of scale for investment.** Though many renewable technologies are not affected by significant economies of scale, access to larger markets may be necessary for the full exploitation of some, such as geothermal in the Caribbean. Likewise, interconnection in Central American countries would allow for increased flexibility and greater incentives for investment. The variability of solar or wind power will become more apparent as countries increase the share of new renewables in their

electricity matrix; strengthening the interconnection of the grids in the Region will help countries cope with the inherent variability of renewable sources that depends on local conditions.

- 2.26 **Because of the subsidies many LAC countries use, the market remains heavily distorted in favor of fossil fuels.** According to the IMF (2013), the LAC Region accounts for approximately 5.4% of global fossil fuel subsidies of US\$1.9 trillion, or US\$102.6 billion yearly. While well-targeted subsidies can help provide low-income communities with greater access to electricity, widespread fossil fuel subsidies pose a high economic burden on the economy. With these subsidies, countries become more vulnerable to external shocks. Venezuela, Mexico and Argentina are among the countries with the highest fossil fuel subsidies in LAC, spending US\$33 billion, US\$28 billion, and US\$16 billion, respectively, in 2011 (IMF, 2013), and they are among the 12 countries in the world with the highest fuel subsidies (IEA, 2013d) (see Annex 1, Table 3). Besides introducing distortions in the energy market that promote inefficient use and carbon-intensive sources of energy (IEG, 2009), subsidies have fiscal implications for national budgets.¹³ Some countries (e.g., Brazil and Chile) have reduced the burden on their budgets through reforms; but many other countries continue to absorb fuel subsidies into their budgets. Phasing out subsidies would raise energy prices in the short term, offering higher incentives for RE deployment and EE measures.
- 2.27 **In addition, a number of market failures (missing markets, information asymmetries) could be affecting the deployment of RE.** This factor is particularly relevant for justifying the Bank's intervention in the private sector, which requires the existence of a market failure. Lack of long-term finance could affect small and medium firms that depend on local financial and capital markets. Information asymmetries in the form of lack of knowledge about relevant opportunities or uncertainty regarding the project's benefits can be a challenge. Finally, the fact that the social benefits of renewable sources are bigger than the private benefits (i.e., the externality associated with GHG emissions) might be a deterrent for private investment.

¹³

All IDB client countries except Belize, Colombia, Paraguay, Suriname, and Uruguay have subsidies for petroleum products. In some countries subsidies represent an important share of GDP: Venezuela (10%), Trinidad and Tobago (10%), Ecuador (10%), Bolivia (6%), Chile (3%), Argentina (3%), and Panama (2%). .

III. IDB RESPONSIVENESS TO CLIMATE CHANGE IN THE ENERGY SECTOR

A. Bank strategy on energy and climate change

- 3.1 **The IDB's work in climate change has been strongly focused on the energy sector.** In 2007, the Bank approved its Sustainable Energy and Climate Change Initiative (SECCI)¹⁴ to complement its existing efforts in the energy sector and replace its Action Plan on Renewable Energy, Energy Efficiency and Climate Change (CC-6043, September 2006). SECCI's objectives were to increase investment in RE and EE; promote regional access to the international carbon market; and build a critical mass of Bank resources, donor support, and partnerships to promote climate change mitigation in the energy sector. Between 2007 and 2013 SECCI funds increased and the energy sector share decreased, creating a more diversified approach to Bank climate change actions.
- 3.2 **IDB-9 and the Integrated Strategy for Climate Change strengthened the Bank's commitment to finance climate change mitigation and adaptation.** Under IDB-9, the Bank committed to devote 25% of its lending to finance climate change, renewable energy, and environmental sustainability by 2015. To support this objective, the Bank approved its Integrated Strategy for Climate Change Adaptation and Mitigation, and Sustainable and Renewable Energy (CCS) (GN-2609-1, 2012), along with an action plan for the next four years (2012-2015). These documents focus on three priority areas: strengthening IDB actions on adaptation; supporting activities with the largest potential for reducing GHG emissions, including LULUCF, transport, and power generation; and reducing the GHG footprint of the energy matrix by promoting energy efficiency, technology development, social commitment, and synergies between adaptation and mitigation (OVE, 2013).
- 3.3 **Both SECCI and the CCS acknowledged that the private sector plays a major role in country-level efforts to address climate change in the energy sector.** Both documents highlight the importance of promoting and strengthening an adequate regulatory environment; directing financial and nonfinancial instruments to address market failures; and developing mechanisms that will increase investment, resolve financial gaps, and mitigate the risks associated with incorporating the private sector. The CCS suggests improving financial instruments, creating incentives to improve EE and incorporate RE sources, and other sector activities related to climate change. For the energy sector, this emphasis is particularly important, given the extent of the private sector's involvement in the production, transportation, and consumption of energy, especially in the electricity industry.
- 3.4 **The Bank identifies the mitigation of climate change as a co-benefit of a sustainable energy matrix.** As a complement to the CCS, the Bank approved specific guidelines for designing and implementing sustainable energy projects (Sustainable Energy Sector

¹⁴ SECCI was IDB's contribution to the new international clean energy investment framework being developed by international financial institutions at the request of the international community, following the G8 Summit in 2005.

Guidelines, or SESG¹⁵). The Bank's sustainable energy concept integrates the need to promote reliable, universal, and affordable access to energy while "contributing to the reduction of environmental impacts, including climate change."

3.5 **The SESG included five areas of intervention in the energy sector that have potential co-benefits for climate change.** OVE used these lines of action to classify the energy climate change portfolio (see Annex 1, Table 3):¹⁶

1. **Support for regulatory framework changes, institution strengthening, and capacity building:** In each country, the regulatory and institutional transformations that will promote and facilitate the efficient use of energy and the incorporation of RE sources.
2. **EEC in energy supply:** Investments to rehabilitate large-scale hydroelectric and thermal plants, and power transmission and distribution lines.
3. **EEC in final energy demand:** The efficient use of energy at the end-consumer level and renewable energies in thermal applications.
4. **Renewable energies:** The incorporation of new hydroelectric projects, the development of new renewable energy sources (wind, solar, geothermal, bioenergy, waste-to-energy, and energy from the oceans), and the promotion of distributed energy systems from renewables.
5. **Other investments in traditional supply in the energy sector:** Because in many cases it will be impossible to meet the Region's growing demand with new RE only, the Bank would continue to support investments in traditional energy sources, particularly fossil fuels. The Bank will promote the more efficient use of these sources and encourage those technologies and systems that produce the least CO₂ emissions.¹⁷

3.6 **The CCS identified lack of long-term financing and lack of expertise to evaluate projects as the key limitations for private sector engagement.**¹⁸ The strategy proposed to address these challenges through two of its five strategic lines: (i) to address capacity issues, direct support to help firms design and implement climate adaptation plans or develop tailor-made products; and (ii) for scaling up investments and leveraging private

¹⁵ GN-2613. The Sustainable Energy Sector Guidelines (April 2011) and Guidelines for Coal-Fired Thermoelectric Generation Plants.

¹⁶ WWI, 2014, Table 4, presents the areas of intervention and includes the main actions identified.

¹⁷ The Bank developed guidelines for coal-fired thermoelectric generation plants "in a manner consistent with the IDB's vision to prioritize the development of renewable energy sources and the IDB's commitment to the protection of the environment, including reducing adverse impacts on the global climate."

¹⁸ The Bank's private sector strategy, approved in 2011 (GN-2598-7), does not discuss climate change; instead, it references the CCS.

sector investments, using Bank resources to leverage available international funds.¹⁹ During the discussion of the CCS (GN-2609), Management was encouraged to place more emphasis on three areas related to the private sector: (i) a specific approach to guide IDB's private sector involvement in energy production, (ii) definition of the Bank role in financing fossil fuels, and (iii) an analysis of the regulatory regimes, pricing, and subsidies in the energy sector.²⁰

- 3.7 **The possibility of coordinated public-private work and access to concessional funding are regarded as the Bank's most important comparative advantages.** To support these advantages, the CCS recognizes the need for the Bank to strengthen its skills and knowledge base and to develop instruments that will make it possible to successfully address mitigation and adaptation actions in the operations to be financed.²¹ The integrated use of resources from technical cooperation and public and private financing, the ability to carry on broad policy dialogue with countries, and the mobilization of resources from other sources are seen as key factors for success. In particular, the Bank's demonstrated capacity to mobilize resources from the Global Environmental Facility (GEF), Clean Development Mechanism (CDM), Clean Technology Fund (CTF), and Climate Investment Fund (CIF), as well as the emphasis of these mechanisms on financing activities in the energy sector, would contribute to positioning the Bank in this sector.²²

B. Energy and climate change portfolio

1. Portfolio under analysis

- 3.8 **Operations with direct or potential impacts on GHG emissions represented 78% of the Bank's total lending program in the energy sector.**²³ During the past decade (2004-2013), the Bank approved 131 loans²⁴ in the energy sector for a total of US\$11.7 billion, of which US\$9.1 billion (78%) and 96 projects (74%) were allocated to projects with direct climate change impacts. As Figure 5 illustrates, 42% of the funds went to RE projects (24% hydro and 18% other RE technologies), 21% to EE, 7% to policy-based loans promoting RE and EE, 5% to fossil fuel projects, and 3% to new thermoelectric

¹⁹ Specifically, "[The Climate Change Strategy] is designed to serve as IDB's strategic instrument for scaling-up support for climate mitigation and adaptation activities, contributing to low carbon development, environmental sustainability and climate vulnerability reduction in the Region.[...] The Bank will pursue the following five strategic lines of activity: [...] (ii) strengthen institutions and private and public sector capacity; [...] (v) scale up investments, address financial gaps and leverage private sector investments" (para. 4.1).

²⁰ See minutes of the policy and evaluation committee (PEA/11/3) of March 10, 2011, para. 1.17.

²¹ The CCS is accompanied by an action plan (GN-2609-3), in which some of the proposals are explained further.

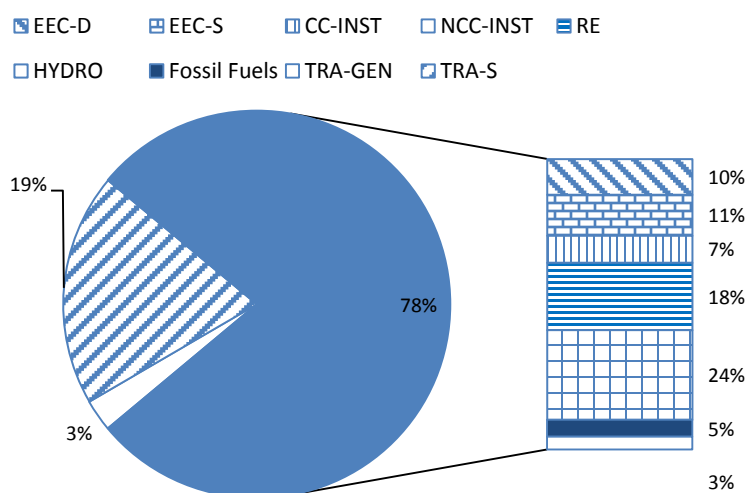
²² The CTF provides concessional financing for implementation of countries' low-carbon development plans, strategies, policies, and programs. Through the CTF, the Bank was effective at leveraging private financing for a wind farm project in Mexico, the largest of its kind developed in the Region to this day. The CIF's Strategic Climate Fund provides grants and concessional financing through three programs. One of those is the Scaling-Up Renewable Energy in Low-Income Countries Program, which allocates funding to pilot approaches to climate action; Honduras was the first LAC country to take part in the program (<https://www.climateinvestmentfunds.org/cif/>)

²³ Annex 2 in this report presents the methodology used to select and classify the portfolio for this evaluation.

²⁴ This includes three guarantees.

power plants. The remaining 22% financed new transmission and distribution (19%) and policy-based loans with no explicit RE or EE components (3%). It is important to note that, given the systemic nature of the energy sector, and especially that of the electricity subsector, all these investment categories have an effect on the possibility of advancing sectoral mitigation measures, even if they have no explicit climate impact. No operation was directed to support adaptation to climate-change-related impacts in the energy sector.

Figure 5. IDB's energy financing by area of intervention 2004-2013
(Total: US\$11.77 billion, 131 loans)



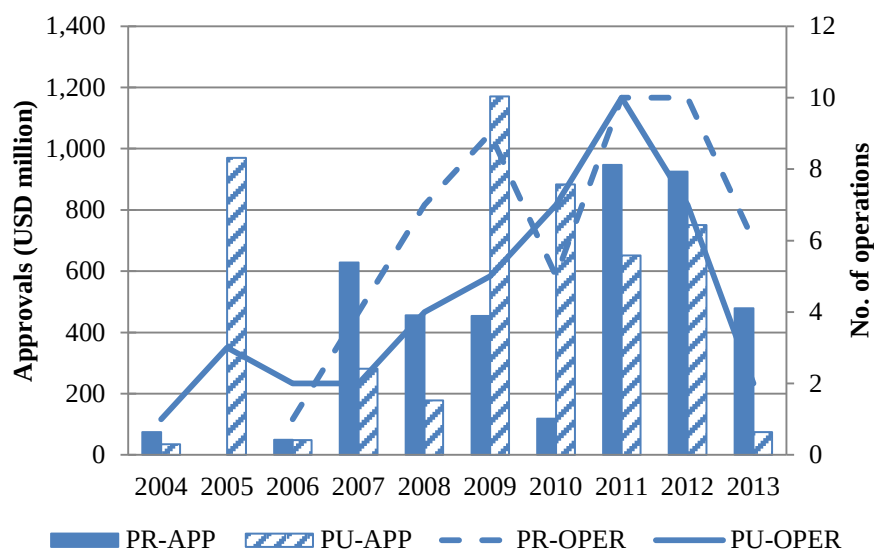
Source: Own calculations, data from OVE/OVEDA.

Note: EEC-D = energy efficiency and conservation in the demand for energy, EEC-S = energy efficiency and conservation in the supply of energy, CC-INST = climate-change-related energy institutional operation, NCC-INST = non-climate-change-related energy institutional operation, RE = new renewable energy, Hydro = hydroelectricity, TRA-GEN = traditional energy operations in electricity generation, TRA-S = other traditional energy supply operations,

- 3.9 **The Bank diversified its energy portfolio from traditional energy supply projects and large hydroelectric power plants to alternative RE, institutional strengthening, and EE operations.** Between 2004 and 2008, traditional energy supply and new large hydroelectric projects represented close to 73% of the lending program; this share decreased to 39% between 2009 and 2013 (see Annex 1, Figure 11). Although new large hydroelectricity projects accounted for the largest share (57%) of RE lending, between 2004 and 2013 the Bank financed more wind energy projects (11) than hydroelectric power plants (9). The Bank also financed six biofuels projects for a total of US\$388 million, equivalent to 8% of RE financing. Direct investments in solar, small hydro, and geothermal power plants were relatively small (3%, 2%, and 1%, respectively) (see Annex 1, Figure 12). In addition, the Bank financed these technologies through some rural electrification programs and global credit lines that are included in the portfolio under the category of multiple technologies.
- 3.10 **An increasing percentage of the Bank's financing was channeled through private sector operations, especially in the areas of alternative RE and EE in energy**

demand. Of the total funds approved in the energy sector during 2004-2013, 45% (US\$4.1billion in 53 operations) accounted for operations in the private sector. The private sector financing has increased since 2011, exceeding sovereign guarantee (SG) financing (see Figure 6). Moreover, non-sovereign guaranteed (NSG) operations have focused on alternative RE and EE in demand projects, while SG loans have targeted mainly new hydroelectricity power plants, EE in supply, and institutional strengthening and capacity building (see Annex 1, Figure 14). This specialization is due to the nature of the LAC electricity industry, which in most countries exhibits high private participation in generation activities, and high levels of public investment in networks, especially transmission networks.

Figure 6. Climate change portfolio evaluation, public vs. private operations, 2004-2013



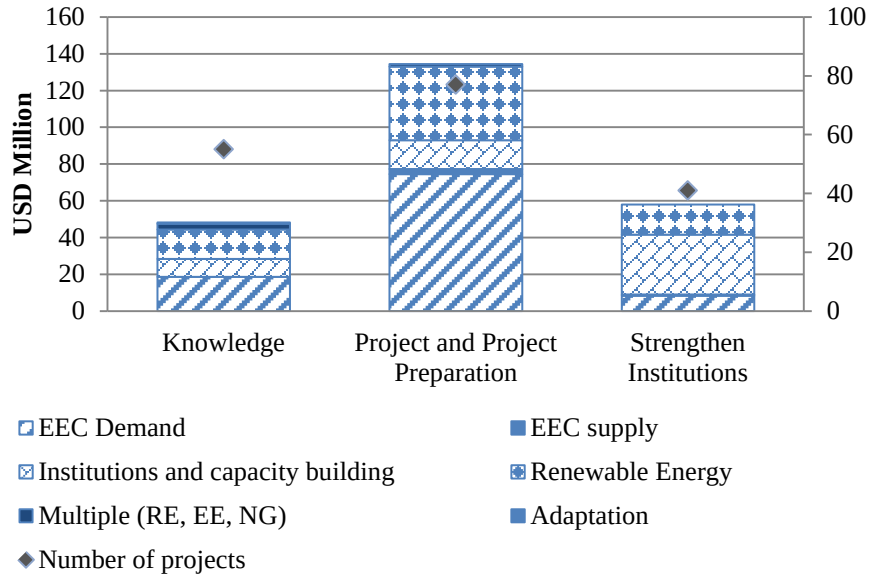
Source: Own calculations, data from OVE/OVEDA.

Note: PR-APP=Private Approval Amount, PU-APP=Public Approval Amount, PR-OPER=Private Number of Operations, PU-OPER=Public Number of Operations.

2. Other energy climate change operations and initiatives

- 3.11 **Grants have been an important tool in promoting the Bank's agenda on climate change in the energy sector.** During the last 10 years, US\$240 million in grant resources were approved for the financing of 173 investment grants and technical cooperations (TCs) related to RE, EE, and related capacity building and institutional strengthening. Grant resources have been allocated to activities in knowledge generation, projects and project preparation (including stand-alone projects, project preparation grants, and project identification TCs), and institutional strengthening. Almost half of the Bank's grant resources financed actions related to renewable energies in the Region. The TC instrument was also very important when associated with policy-based loan (PBL) operations to achieve progress on reform agendas and institution building. Stand-alone projects were mainly channeled through private sector initiatives (73% of all resources approved for stand-alone projects) and were highly concentrated in RE and EEC in demand (91%). Knowledge generation grants were more diversified and invested in EE in demand, RE, and other areas of intervention (see Figure 7).

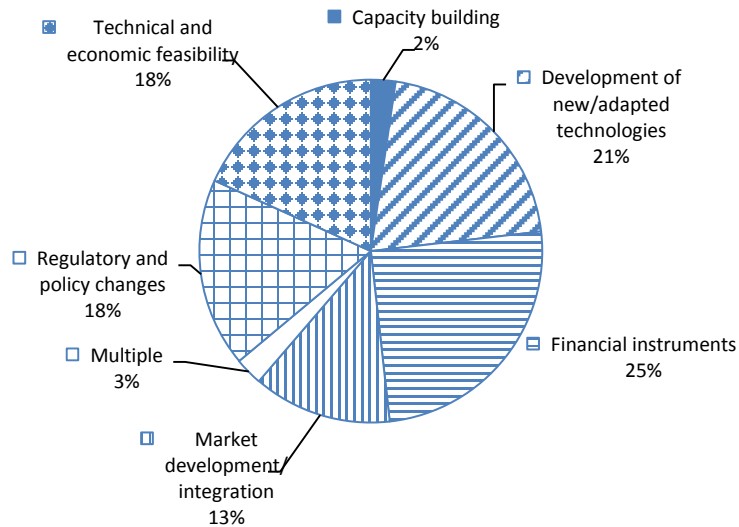
Figure 7. Climate change and energy grants funds, by activity (2004-2013)



Source: Own calculations, data from OVE/OVEDA.

- 3.12 **Overcoming barriers to the development of RE and to EE has been one of the main grant objectives** (see Figure 8). In addition, the Bank has supported several initiatives to promote and disseminate innovation in the energy sector related to RE and EE (Box 4).

Figure 8. Climate change and energy grant funds, by barriers (2004-2013)



Source: Own calculations, data from OVE/OVEDA.

Box 4. Other initiatives

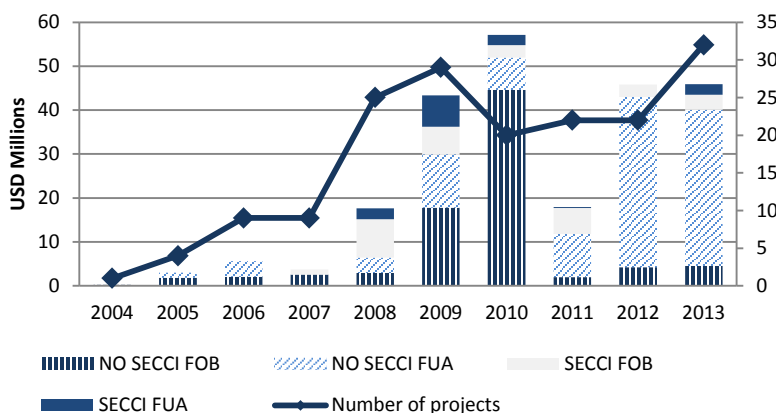
The Bank has been supporting a host of other activities to promote climate change mitigation in the energy industry.

- **The Climascope.** Sponsored by the MIF and researched by Bloomberg New Energy Finance, the Climascope is an assessment, index, and interactive web tool focused on the clean energy market. First released in 2012, it rates LAC countries on their ability to attract low-carbon energy investment. This year, nations were scored on 39 data points categorized into four broad parameters: (i) Enabling Framework, (ii) Clean Energy Investment and Climate Financing, (iii) Low-Carbon Business and Clean Energy Value Chains, and (iv) Greenhouse Gas Management Activities.
- **Sustainable Energy for All.** The IDB launched the LAC Sustainable Energy for All (SE4All) initiative in 2011 to extinguish energy poverty in the Region, in coordination with the [United Nations \(UN\) SE4All global initiative](#). SE4ALL has three objectives: (i) provide universal access to modern energy and supply electricity to the approximately 34 million people who live in LAC without access to this service and nearly 85 million who live without regular access to clean modern cooking fuels; (ii) double the share of RE in the LAC energy matrix, and (iii) double the level of EE in the Region.
- **IDEAS.** The Energy Innovation Contest (IDEAS) is an initiative to support the development of innovative projects that promote renewable energy, energy efficiency, biofuels, and energy access in rural areas. Sponsored by GDF SUEZ, the Nordic Development Fund, the Government of South Korea, the Multilateral Investment Fund, and the Inter-American Development Bank, it was launched in 2009. The fourth contest, launched in April 2013, seeks proposals that promote innovative solutions to energy problems, benefit local communities or regions, create jobs, and contribute to the reduction of GHG emissions.

Source: <http://www.iadb.org/en/topics/energy/>

3.13 **The Bank actively allocated grant resources to support the energy sector's climate change agenda.** The Bank has been very active in raising concessional resources from other sources of financing. In total, 53% of the funds invested in TCs came from external sources managed by the Bank, including those channeled through the SECCI. The main sources of external financing were the GEF (US\$39.5 million), the Nordic Fund (US\$21.7 million), and the Canadian Fund (US\$18.3 million). During 2012 and 2013 external funds that are not part of the SECCI initiative accounted for US\$74.3 million, far exceeding the SECCI fund (US\$6.3 million) and multidonor fund (US\$2.4 million) (see Figure 9).

Figure 9. Climate change and energy grant investments, 2004-2013



Source: Own calculations, data from OVE/OVEDA.

Note: NO SECCI FOB= Non SECCI ordinary capital funds, NO SECCI FUA= Non SECCI funds under administration, SECCI FOB= SECCI ordinary capital Fund, SECCI FUA= SECCI Multi-Donor Fund.

IV. THE BANK'S ACTION WITH SOVEREIGN GUARANTEE INSTRUMENTS

A. The Bank's sovereign guarantee portfolio

- 4.1 **Between 2004 and 2013, the Bank approved a total of 43 SG operations with direct climate change impacts** (see Table 1). A total of US\$5.04 billion was approved in this portfolio; this amount covered 74% of the Bank's energy lending activity with LAC governments and 55% of the energy climate change operations approved. A large share of the SG portfolio (42%) went to finance the construction of four new hydroelectric power plants in Bolivia, Colombia, Costa Rica, and Venezuela. Additionally, the Bank financed 14 operations for US\$1.28 billion to improve EE in energy supply (25%), mainly for the rehabilitation of existing hydroelectricity plants, but also for transmission and distribution lines. Only one project in this category was approved to finance EE actions in the transport of oil products. The investment portfolio in alternative RE was only 11% of the Bank's SG portfolio under evaluation, and was mainly in rural electrification programs that combine investments in RE in isolated systems with the expansion of networks.
- 4.2 **The Bank also supported programs to overcome regulatory and institutional barriers to climate change actions.** In total, between 2004 and 2013, 11 operations for US\$850 million (17% of the portfolio) were approved that supported policies seeking regulatory and institutional changes in seven countries. The main goals of these operations were to advance energy matrices with lower carbon content and/or promote actions for efficiency improvements in power generation, transmission, and consumption. In addition to the operations directly related to climate change, the Bank approved nine more loans for US\$313 million to provide institutional support to beneficiary countries' modernization and restructuring of their electrical systems. While these operations are not included in the portfolio under evaluation, OVE acknowledges that their success can help and facilitate subsequent operations that are more directly related to climate objectives.
- 4.3 **In the other intervention strategies defined by the Bank in the SESG, the portfolio was less active.** Only 1% of the portfolio, distributed in three operations, was approved to address activities related to improving energy end-use efficiency. The limited SG portfolio in this strategy responds to the nature of the actors implementing actions for EE in demand—actors that are almost exclusively from the private sector and are financed through NSG operations. Finally, a single operation from the sector's traditional portfolio was identified that had direct climate change intents: a loan to finance the construction of a combined-cycle power generation plant in Uruguay, whose financing reached almost 4% of the total climate change portfolio in the sector.
- 4.4 **In addition to investment loans and PBLs, the Bank has approved conditional credit line investment projects (CCLIPs) to partially finance RE and EEC projects through public development banks.** OVE identified one operation in Mexico (US\$1.2 billion) and one in Colombia (US\$0.65 billion) for a total of US\$1.85 billion, to be approved in phases. Up to 2013, only US\$250 million (three operations) had been approved in Mexico and US\$500 million (three operations) in Colombia. These projects are not included in the

energy climate change portfolio, but OVE acknowledges that some of the resources were channeled to the private sector to finance EE and ER projects.

Table 1. Climate change and energy SG portfolio, 2004-2013

	Approved amount (US\$ million)	% of total	Number of operations	% disbursed
EEC demand	47.0	1	3	7
EEC final demand	47.0	1	3	7
EEC supply	1,284.7	25	14	25
EEC supply of fossil fuels and natural gas	58.0	1	1	9
Rehabilitation of hydroelectric power plants	901.4	18	5	14
Rehabilitation of transmission and distribution grids	325.3	6	8	50
Institutions and capacity building	850.0	17	11	95^a
Regulatory and policy changes that promote EEC and RE	50.0	17	11	95
Renewable energy	2,662.2	53	14	76
Hydroelectricity	2,101.0	42	5	85
Multiple	472.5	9	8	49
Small hydroelectric	88.7	2	1	3
Traditional supply	200.0	4	1	29
Natural gas combined-cycle plant	200.0	4	1	29
Grand total	5,043.9	100	43	64

^a The only PBL that was not disbursed is Nicaragua's, which was approved at the end of 2013.

Source: Own calculations, data from OVE/OVEDA.

- 4.5 **The low execution levels of the operations in the SG portfolio limit the evaluation of their climate impacts.** Only 14 of the 43 approved projects are completed. Of the 11 PBL operations, 10 were fully disbursed and are subject to a more in-depth evaluation (see Table 2). Three additional operations of hydroelectric plants and one of network rehabilitation were also disbursed during the period. Because the other projects have not been completed, their evaluation could only be partial; thus their effectiveness and their potential impacts on CO₂ emissions are hard to identify.

Table 2. Disbursement status of climate change energy portfolio ^a

	Completed	Advanced	Starting	To start
EEC demand			2	1
EEC supply	1	8	4	1
Institutions and capacity building	10			1
Renewable energy	3 ^b	3 ^c	5	3
Traditional supply			1	
Total	14	11	12	6

^a Completed = 100% disbursed, Advanced = more than 50% disbursed, Starting = less than 50% disbursed, To start = 0% disbursed.

^b All hydroelectricity.

^c All alternative RE.

Source: Own calculations, data from OVE/OVEDA.

- 4.6 **Although the launch of SECCI substantially increased the formal climate change content of the IDB's energy portfolio, this did not necessarily mean more efficient monitoring and reporting of results in terms of reduction of GHG emissions or proxy indicators.** Whereas between 2004 and 2006, none of the six projects in the evaluated portfolio cited possible mitigation impacts, after 2007, 36 of the 37 projects in the portfolio mentioned climate change as a co-benefit of the project. However, only 9 of all the projects in the evaluated portfolio actually set mitigation targets and planned to measure GHG emission reductions; at the same time, most of the operations (37 out of 43) used indicators that indirectly indicate GHG mitigation (see Table 3). In the vast majority of cases, the evaluation found complex attribution problems, especially in PBLs, in which it is difficult to account for any reduction in emissions (see Box 5).

Table 3. Climate-change-related indicators in the portfolio

Type of project	Indicators				
	Any CC indicator	Emissions	RE capacity/production	Energy savings	Reduction of system losses
EEC demand	3	2	2	3	
EEC supply	13	1	6	1	9
Institutions and capacity building	9	4	7	10	2
Renewable energy	11	1	11	3	3
Traditional supply	1	1			
Total	37	9	26	17	14

Source: Own calculations, data from OVE/OVEDA.

Box 5. Project indicators of the energy climate change SG portfolio

Although Bank project objectives might be consistent with the objectives of the SECCI initiative that did not imply that the logic of the project and/or selected indicators could ensure that the interventions contributed to effectively mitigating GHG emissions. The analysis of the SG project indicators shows the following results for the 43 projects, of which 4 were PBLs:

- Nine of the projects have GHG emissions indicators. For PBLs, the attribution of results poses a complex problem: accounting for any possible reduction in emissions is challenging, since such changes would be observed outside the execution period of the operation.
- Of the projects in the portfolio, 26 had indicators related to increasing RE capacity and/or production. However, only 11 of these loans were directly financing new RE projects.
- Seventeen projects expected demand energy savings as a result of the project implementation, but only three had EE in demand as a main target of the project. Among PBLs, 10 projects expected EE improvement. Energy savings in the other 4 projects are due to the fact that the projects have activities to reduce demand, but the savings are marginal and do not constitute the primary investment objective.
- Fourteen projects presented reduction of energy losses in the supply of electricity as a results indicator. Nine of these projects were investments in EE in supply, mainly in the rehabilitation of transmission and distribution grids. However, this indicator is not necessarily a good measure of climate change mitigation impacts. In fact, only reduced technical losses leads to reductions in GHG emissions, and only 2 of the 14 projects separated technical from nontechnical losses in their indicators.

B. Evaluative findings²⁵

4.7 **The rationale for the Bank's SG operations in energy is the opportunity to attain co-benefits in the form of GHG emission mitigation while tackling relevant national energy sector objectives.** This paper organizes the evaluation of the SG portfolio around four areas of intervention: (i) institutional and regulatory development, (ii) improvements in energy efficiency, (iii) incorporation of renewable sources, and (iv) support to traditional energy sources. In each of these areas, OVE has assessed the Bank's role in generating climate change co-benefits, consistency in the use of instruments relative to the overall sector objectives, and the main results obtained.

1. Institutional and regulatory development

4.8 **Overcoming the institutional and regulatory barriers to the introduction of climate change mitigation measures was the most relevant co-benefit associated with this area of intervention.** The Bank financed programmatic loans in seven countries (Barbados, El Salvador, Nicaragua, Dominican Republic, Peru, Panama, and Trinidad and Tobago), all approved during 2009-2013. Conditionality was most frequently associated with changes in laws or preparation of new laws that promote or encourage the incorporation of RE sources in the energy matrix and/or improvements to end-use EE; development of policies, plans, and programs associated with these two activities; and the creation of planning or management units for such policies within agencies of the central administration responsible for the energy sector, and strengthening of the technical staff of these units.

4.9 **In five of these seven countries, the Bank's intervention sought to exploit the opportunities presented by their high dependence on imported oil.** In Barbados, El Salvador, Panama, and Nicaragua, the promotion of a new energy matrix was strongly

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See Annex 3 for a detailed evaluation of the projects.

associated with the goal of reducing the country's vulnerability to the prices of imported fossil fuels and, thus, reducing both electricity costs and energy dependence. In the Dominican Republic, where the Bank has a long history of interventions to improve the efficiency of the electricity system,²⁶ the Bank included the possibility of incorporating renewable sources in the energy matrix, but focused primarily on the goal—so far elusive—of improving the efficiency of the electricity system.

- 4.10 **When PBLs were related to broader energy policy objectives, their relevance improved.** In Barbados, El Salvador, and Nicaragua, the search for national economic policy goals relied on climate change mitigation strategies. In fact, one of the central problems of these countries is the impact that hydrocarbon imports have on national accounts, and the high domestic prices of electricity that jeopardize national competitiveness.²⁷ In addition, El Salvador and Nicaragua have a low level of power coverage. In these circumstances, mitigation actions were inserted in a highly relevant win-win strategy that promotes public policies aimed at transforming the energy matrix. Including RE and increasing EE would reduce the need for imported hydrocarbons, reducing prices and vulnerabilities at the same time as energy emissions. In contrast with these operations, in Peru and Trinidad and Tobago the operations were not linked to a broader energy sector goal and, thus, were less relevant.
- 4.11 **In countries with pressing fiscal needs, the effectiveness of the PBLs was compromised.** In El Salvador, though the results of the first operation were promising, the negotiation of the second stage occurred in an environment of strong fiscal constraints. Unlike the first PBL, the conditions for the disbursement of the second stage were not yet implemented, and consequently the timely disbursement of resources was not ensured. Paradoxically, the Government and the Bank agreed to reorient the PBL toward the area of climate change with superficial conditionalities that would be easier to fulfill,²⁸ allowing the timely disbursement of resources. In Panama and Trinidad and Tobago, while the PBLs included an explicit objective of climate change, they were both mainly oriented to support macroeconomic goals. Once the disbursement of the first operation was made, both interventions were suspended.
- 4.12 **The Bank's PBL operation in Peru, the most ambitious and comprehensive of all, opened spaces for the dialogue on relevant energy policy issue; nevertheless, its impacts toward a greener energy matrix were less visible.** The execution of the four PBLs and their related TCs created and fostered an energy policy dialogue, especially regarding natural gas. In spite of achieving most of the expected outputs, these operations have had limited impact on the promotion of RE and EE. The country's furthest advance in the energy field is legislation that promotes RE use in the national grid. This legislation

²⁶ OVE, CPE of the Dominican Republic 2009-2013.

²⁷ Electricity prices in Barbados are some of the highest in the Region: the residential rate is US\$0.30/kWh, and the non-residential rate is US\$0.33/kWh. The Government of Barbados subsidized the clause for fuel adjustment between December 2007 and November 2008, a period in which crude was usually quoted at more than US\$100 a barrel. For the 12 subsidies the total cost to the Government was approximately US\$18 million; the subsidies were abandoned as part of the Government's fiscal consolidation program (BA-L1021).

²⁸ See Annex 3 for a detailed analysis of PBL operations.

predates the New Sustainable Energy Matrix, and the Bank program has not managed to boost implementation of the legislation. Although it is true that the country requires integrated planning in the energy sector, the impact of the PBL in developing such a process has been very limited. The legal proposals and studies prepared have not been included in the decision-making process, and, while the sector's institutional system has advanced, it still shows important weaknesses in the managerial, regulatory, planning, and coordinating areas.

2. Improvement in energy efficiency in supply and demand

- 4.13 **The Bank's action in EE was focused on improving the efficiency of energy production and transport, mainly in countries' electricity systems.** The Bank approved 14 operations for a total of US\$1.3 billion in nine countries (Brazil, Dominican Republic, Ecuador, Guyana, Haiti, Honduras, Nicaragua, Suriname, and Venezuela)—8 of which were designed to improve the efficiency of the electricity system. Five operations (67% of the funds) focused on the rehabilitation of hydropower plants. The rest of the portfolio financed investments in transmission and distribution networks and activities to strengthen the management of the electricity system to reduce losses, with the co-benefit of reducing the GHG emissions associated with the saved electricity. The operation in Ecuador was the only one intended to improve the efficiency in the transport of refined products.
- 4.14 **Reducing energy losses through electricity grid rehabilitation has been challenging, so the net effect of these programs on emissions is unclear.** Every operation in this strategy, except for two in Brazil, was in a country in which the electricity sector presents important regulatory deficits and the state is heavily involved in the investments. Actions to improve EE in highly distorted institutional environments are relevant with respect to the verified high levels of loss, but the expected improvements in energy losses have not always materialized. Moreover, programs to improve efficiency in transmission lines, while they could reduce technical losses, could also reduce failures in supply and expand electricity coverage—thus increasing electricity consumption and reducing the carbon intensity per GWh used in spite of a possible increase in total carbon emissions.
- 4.15 **The more relevant, effective, and clearly quantifiable mitigation of emissions in this strategic area is related to the rehabilitation of hydropower plants.** The Bank financed the rehabilitation of four large plants to restore the capacity and efficiency of hydroelectric generation. Disbursements of these operations are still low, 14% on average. According to project documents, at the conclusion of the four projects a total of 922.6 MW of clean energy will be recovered, with the following distribution: 77.6 MW from the Furnas plant in Brazil, 32 MW from the Péligre plant in Haiti, 18 MW from the Santa Barbara and Central America plants in Nicaragua, and 795 MW from the Simón Bolívar plant in Venezuela. Once all the rehabilitation projects are concluded, a total of

1.1 million tCO₂ emissions per year will be avoided by not generating that electricity in thermal plants.²⁹

- 4.16 **The Bank's action did little to reduce emissions related to the hydrocarbon industry.** Only the operation in Ecuador (EC-L1040) funds activities to improve oil transport efficiency and lower emissions by replacing outdated diesel electric engines with others of greater efficiency. The project is under execution, with nearly 80% of the funds disbursed. Although the project document claimed a possible reduction of GHG emissions, it did not include any indicator to monitor and verify impacts after completion. No operation addressed fugitive emissions.
- 4.17 **In relation to actions to improve demand efficiency, the Bank's performance under the SG window has been marginal.** The Bank's portfolio in this strategic area includes only three operations that represent 1% of the portfolio, with very low levels of disbursement.³⁰ In addition, the Bank has funded a CCLIP program in Colombia (CO-L1124)—not a part of the portfolio under the scope of this evaluation—for a total of US\$650 million, being executed by BANCOLDEX. Two sections of the CCLIP have already been approved, with successful execution. As part of this relationship, the Bank approved an operation worth US\$10 million, financed by CTF (CO-L1124), to finance a “green initiative” that will provide loans to the private sector for investment in improving energy end-use efficiency.
- 4.18 **The most innovative intervention related to EE in demand is the creation of the green initiative in Colombia, although its effectiveness is still uncertain since it has not yet been implemented.** The Bank has had a relevant role in the design and funding of the Colombian green initiative, financing two TCs associated with this initiative (CO-T1332 and CO-T1328). One TC funded the design of the line of financing, identifying the priority areas for investment, the bottlenecks and barriers that could inhibit private investment in EE improvements, and the instruments to overcome them. The green initiative would be financed with funds from the third CCLIP line and would be complemented by CO-L1124, an operation financed with CTF concessional funds that will reduce the cost of the financing and/or compensate for the increased transaction costs related to the design of the initiative (see Box 7).

²⁹ Annex 4 of this report describes the calculation methodology. Emissions reduction were calculated considering that the new generation of renewable replaces a unit of energy generated in accordance with the average matrix of the last 10 years for each country.

³⁰ Two operations in The Bahamas, associated with a major PBL intervention, aim at create two funds for energy efficiency, one for the private sector (*Smart Fund*) and the other for the public sector (*Public Sector Smart Energy*). The third operation is a loan to Jamaica (JA-L1025) to finance the installation of efficiency improvement technologies in the public sector, for which two complementing TCs have been approved.

Box 6. The BANCOLDEX green initiative

The goal of this program is to support Colombia's actions to improve the competitiveness of the hotel, clinic, and hospital subsectors, while reducing GHG emissions, by testing an innovative model to finance EE in demand projects. The IDB finances the operation through a CTF concessional line of US\$10 million, and a counterpart by the same amount from a larger SG loan.

The goal is to increase EE investments in areas that were identified as having a high potential for improvements and that are strategic sectors for the country. The design of the project is innovative in that it incorporates two new processes that address the barriers that inhibit private investments in this area. First, it substantially reduces the costs of audits by incorporating preliminary designs of six particular technologies identified to produce greater energy savings in hotels, clinics, and hospitals. The promised savings will be easy to quantify and gauge. Second, it incorporates an insurance company that guarantees the proposed savings in the audit; if they are not reached, it would cover the potential loss. By including CTF funds, the Bank's credit lines, too, could be used to improve the financial conditions of the loans to the private sector.

3. Renewable energy sources

- 4.19 **The SG portfolio under the strategy for the development of RE sources was structured through two major areas of intervention.** The first, with the largest percentage of the climate change and energy portfolio (52%) and almost 80% of the RE portfolio, financed new hydroelectric power plants. The second area contains initiatives to finance a range of work in the energy sector, including, among other things, the promotion of RE to increase rural energy coverage. In this group, the program in Nicaragua is one of the most ambitious and far-reaching.
- 4.20 **The greatest impacts on climate change mitigation continued to be the result of major development of hydroelectric plants.** In total, the Bank has financed the development of four hydroelectric plants: Miscuni in Bolivia with a capacity of 80 MW, Porce III in Colombia with 660 MW, Reventazón in Costa Rica with 319 MW, and Tocomá in Venezuela with 2,160 MW. According to the project documents, the energy to be supplied by these projects is estimated to total 17,000 GWh per year, which could translate into a mitigating effect on emissions of 4.1 million tCO₂/year.
- 4.21 **The most coherent intervention, with a clear orientation toward the incorporation of RE and EE mitigation measures, was in Nicaragua.** This operation, launched in 2007, is an integrated intervention that gathers seven loan operations for a total of US\$225.4 million, and comprises three programs: the Electricity Sector Support Program, an investment loan program, and a three-stage PBL (see Box 7). The Bank has been a relevant actor in articulating a wide range of financial support that includes other multilateral agencies and concessional funds such as the CIF, with climate change mitigation goals.

Box 7. Nicaragua: An integrated intervention

The Bank's intervention in Nicaragua promotes the implementation of climate change mitigation measures that are firmly attached to the goals of national development policies. In the first place, the heavy dependence of the Nicaraguan energy matrix on imported fossil fuels negatively affects the national accounts and makes the country highly vulnerable to oil price changes. Second, the inefficiency of the electricity system raises the electricity rates, which are above the Central American average. And third, a large share of the population lacks electric service. To address these three issues, the country plans to implement EE programs and incorporate its important RE resources (wind, water, and geothermal).

The Bank's integrated intervention included three programs. The Electricity Sector Support Program (NI-L1021, NI-L1022, and NI-L1036) supported improving the electricity system through the rehabilitation of transmission and distribution lines and two hydroelectric plants. The sequential loans *Programa Nacional de Electrificación Sostenible y Energía Renovable* (NI-L1040, NI-L1050, and NI-L1063) invested in renewable generation, grid extensions and rehabilitation, rural electrification, pre-investment studies of renewable investments (hydro, wind), energy efficiency, and security of supply to isolated electricity systems by renewable generation development. Finally, a three-stage PBL operation, of which the first stage was approved in 2013 (NI-L1074), will allow the consolidation of the transformations.

- 4.22 **The Bank's intervention in Nicaragua has been relevant in helping to improve the sector's institutional system, improve efficiency, and incorporate new renewable sources.** All of these changes will help to reduce the country's vulnerability, increase the security of the power system, and reduce the country's carbon footprint. The regulatory and institutional changes are geared to expand the contribution of new RE sources. In this regard, Nicaragua is one of the most attractive clean energy markets in LAC. In 2006-2012 the country received US\$1.5 billion of cumulative clean energy investment—5% of its total GDP. This has allowed the incorporation of 80 MW (MIF and Bloomberg, 2013) from new wind generation during the past few years, as well as the development of a geothermal plant of 72 MW. Losses in the transmission network would be reduced by 4.56% (no technical losses), and the reduction in electricity consumption, estimated at 221 GWh per year, will mitigate CO₂ emissions.
- 4.23 **In Mexico, the Bank had partially financed RE projects in the private sector for approximately US\$250 million, using a CCLIP line with SG.** The Renewable Energies Program uses CTF concessional funds to leverage financing from both IDB and NAFIN. The Mexico CCLIP was originally designed to provide funds to small and medium enterprises (SMEs), with very little for RE. The low demand for SMEs' products, the favorable environment for the development of RE projects, and the leverage of the CTF changed the main focus of the CCLIP line, and the third tranche of the operation was fully devoted to financing RE.

4. Traditional sources of energy

- 4.24 **The only operation financed by the Bank with potential negative impacts on climate change was the Punta del Tigre combined-cycle power plant in Uruguay.** The loan was approved in 2012, and only 19 % of the resources have been disbursed. Although the plant is not yet in operation, the project is very important for the sector's expected growth. The 530MW plant will increase the country's installed capacity (2,709 MW in 2011) by around 20%. Though the initial project was expected to use natural gas from Argentina that option has been discarded. Instead, the country is conducting studies for the

construction of a liquid natural gas regasification plant (to be financed by the Bank's NSG window, UR-L1045) that will allow the country to import gas from other countries and maintain its domestic supply.

- 4.25 **The Bank's intervention in Punta del Tigre has been relevant in allowing the deployment of a low-carbon solution.** In fact, GHG emissions from the natural gas plant are expected to be 17% lower than a diesel-based plant of comparable capacity (0.39 versus 0.53 tCO₂/MWh). In addition, Punta del Tigre plays an important role in providing backup energy for the development of renewable energy. According to the project document, Uruguay is expected to increase its wind power installed capacity by 1,000 MW (roughly one-third of the installed capacity) in 2015 (see Box 8).

Box 8. Uruguay: Development of natural gas to support renewable energy

Uruguay's energy expansion plan is to diversify the energy matrix in a sustainable manner. As demand for energy increases, Uruguay faces the challenge of maintaining its low-carbon-intensive energy matrix without hydroelectric expansion potential. While promoting the use of alternative renewable energies, Uruguay has recognized the need to increase installed capacity of baseload energy to ensure reliability and allow for RE growth. To keep system costs and GHG emissions low, natural gas appears to be the most attractive fuel to complement alternative RE generation. The IDB has participated in this process by financing three wind energy projects (US\$240 million) equivalent to 205MW, and the construction of the Punta del Tigre combined-cycle power plant (US\$200 million) of 530 MW. The Bank is also assisting the Government of Uruguay in its plan to build a regasification plant (UR-T1102) and is preparing a private sector operation (UR-L1045). This plant will help to guarantee a stable natural gas supply in the country, which currently depends on a pipeline from Argentina and is very unstable. Between 2006 and 2012, US\$393 million has been invested in alternative RE in Uruguay, mainly from biomass and waste, and wind (MIF and Bloomberg, 2013).

V. THE IDB'S PRIVATE SECTOR ENGAGEMENT AND PORTFOLIO

A. Private energy climate change portfolio

- 5.1 **This section analyzes 53 Structured and Corporate Finance Department (SCF) projects in the energy sector that are related to climate change.** In the absence of a standard classification, the evaluation team identified and classified climate change operations using the eligibility criteria developed by VPS.³¹ Operations using financial intermediaries (e.g., green loans), although in many cases related to the energy sector, were excluded from the evaluative portfolio as OVE is preparing a separate report analyzing them. Table 4 summarizes the portfolio. Bank A-loans totaled US\$4.1 billion, and B-loans accounted for US\$3.5 billion (see Box 9).³² A full list of the SCF operations reviewed is included in Annex 2.

³¹ The classification is based on Management's Sustainable Energy projects and SCF's Generic Eligibility Guideline.

³² This amount corresponds to IDB B-loans. Some of the projects reviewed—for example, the San Jacinto geothermal project in Nicaragua, one of the few RE initiatives in a D country—included B-loans from other international organizations, particularly the IFC; these resources are not considered in the table.

Table 4. Portfolio under analysis (by intervention model)

	Operations	Approved* (A-loans) (US\$)	Syndicated (B-loans) (US\$)
EEC demand	19	1,068,375,986	1,453,100,000
EEC final demand	11	560,875,986	655,000,000
EEC using RE	8	507,500,000	798,100,000
Renewable energy	29	2,323,662,000	1,259,891,445
Bioenergy	6	409,000,000	429,200,000
Geothermal	1	40,000,000	
Hydroelectricity	6	743,062,000	736,247,000
Multiple	1	200,000,000	
Solar	3	144,400,000	
Wind	12	787,200,000	94,444,445
Traditional supply	5	742,000,000	816,423,407
Fossil fuel production	3	545,000,000	502,423,407
New thermo. plant	2	197,000,000	314,000,000
Grand total	53	4,134,037,986	3,529,414,852

*Original approved amount. Includes cancelled projects.

Source: Own calculations, data from OVE/OVEDA.

Box 9. NSG operations at the IDB

Private sector operations have many unique features. First, NSG projects follow a particular project cycle (manual PR-702-3) that incorporates specific requirements associated with the risks and needs of private lenders. Among other things, the creditworthiness of the counterparts and the possible vehicles to deliver resources are analyzed in the preparation period. In addition, the pricing and definitive lending amounts are not defined at Board approval, but later, in the so-called Pre-Closing meeting, where the Bank and the client settle the particulars of the operation. As a consequence, some approved projects never reach eligibility, as changing market conditions may affect the client's willingness to engage with the Bank.

NSG operations are often structured following the lending standards of international financial markets. Specifically, for energy projects the Bank engages in both corporate and project finance. For corporate finance, the client (e.g., a company seeking funds to build a power generation plant) is required to demonstrate sufficient assets on its balance sheet to secure an IDB loan. For project finance, the financing operation is based instead on the projected cash flows of the project. The difference between project and corporate finance is then one of risk: in project finance the risk is defined by the project, while in corporate finance the risk assumed is that of the borrowing firm. Accordingly, contractual arrangements in project finance typically give the lender much more control over the financial and technical decisions of the specific project.

Finally, NSG loans are made in the context of a working financial market and are often syndicated. This means that often the IDB is required to work closely with additional lenders. The syndication unit in SCF is the unit in charge of coordinating this process, and it plays an important role in mobilizing resources from private investors. For each specific project, this unit designs a lending scheme, considering each client's needs and the context in which the project will be developed. In A and B countries the involvement of commercial banks is common; in other countries additional funding for projects is usually obtained from other development institutions. In many deals, the IDB uses a A/B loan structure, in which the Bank retains a portion of the loan (the "A-loan"), but sells participations to other actors (the "B-loan") while maintaining the exclusive right to engage with the borrower.

- 5.2 **The bulk of the portfolio comprises RE initiatives and EE operations.** The RE portfolio is made up of 29 projects in renewable electricity generation and biofuels, adding up to US\$2.3 billion in A-lending and US\$1.2 billion in B-lending. The EE category includes EE of the final users (e.g., sustainable building, efficient equipment) and EE through the exploitation of co-generation opportunities. In this category, there were 19 operations for up to US\$1.1 billion in A-lending and US\$1.4 billion in B-lending. Finally, the Bank also financed five operations for traditional energy sources, particularly for coal-fueled power stations and hydrocarbon exploration.
- 5.3 **The RE portfolio is mostly concentrated in electricity generation, wind, and hydro power.** Wind power leads the portfolio with 12 projects totaling US\$787 million or roughly 19% of the amounts approved, heavily concentrated in Mexico, Uruguay, and the Dominican Republic. Hydropower follows with six projects and about 18% of the approved amounts. Solar adds another 3 projects for 3% of total approvals, mostly concentrated in the Atacama Desert. In addition, there are 6 biofuels projects for almost US\$409 million, four of which are in Brazil.
- 5.4 **Energy demand interventions are almost equally divided between those that support final energy users (e.g., sustainable buildings) and electricity co-generation projects.** Of the portfolio under analysis, 11 projects that total US\$561 million support initiatives for the adoption of technologies that lead to energy savings (EEC final demand). They include the promotion of sustainable household solutions, business facilities (particularly in the tourism sector), and the adoption of cleaner industrial technologies. The remaining 8 operations (for US\$508 million) support projects that incorporate small-scale renewable energy for self-generation purposes.
- 5.5 **Finally, about 18% of the approvals are devoted to traditional energies.** This part of the portfolio is divided between two thermoelectric plants in northeastern Brazil and investments related to fossil fuel exploration and extraction. The power plants in Brazil, approved in 2009, were the last two coal-powered thermoelectric generation projects financed by the IDB, and one was cancelled entirely before the first disbursement.
- 5.6 **Total installed capacity of the electricity generation projects financed by the Bank (both traditional and renewables) reached 4,653 MW in the period, mostly concentrated in hydro and wind investments.** These investments represented 6.3% of the net MW installed in LAC for the period 2004-2011.³³ The lion's share of the installed capacity went to hydropower (49% of all the MW installed by IDB projects), followed by wind generation (33.3%) and coal-powered stations (15.4%). The portfolio was completed by solar (1.4%) and one project for a geothermal plant (0.8%).
- 5.7 **The use of particular instruments is associated with the scale and risk profile of each intervention model.** For electricity generation operations, including traditional and renewable energy, project finance was used in 27 of the 34 operations considered. Project finance was used for large and long-term projects that require major infrastructure investments, such as industrial facilities, large cogeneration initiatives, and large-scale

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Calculations from data available at www.eia.gov.

tourism complexes. In only a limited number of cases were guarantees and subsidized loans (CTF) used as part of these intervention models. In contrast, for EE initiatives, which are usually on a smaller scale, most loans (12 out of 19) were financed using a corporate finance structure.

- 5.8 **Most of the portfolio reviewed was concentrated in the last few years and in a small number of A/B countries.** OVE found only six projects related to climate change in the period 2004-2007. However, since 2009, 5-10 projects that relate directly to the issue of climate change have been approved every year. Of the 47 projects that can be related to a specific country,³⁴ two-thirds of the projects and of the amounts went to four countries: Brazil, 13 projects; Mexico, 9; Uruguay, 5; and Chile, 4.
- 5.9 **Although these operations were approved fairly recently, a significant proportion of them are at an advanced stage of implementation.** At the time of this review, 33 of the operations were inactive; 27 had been completed (9 with partial cancelations), and the remaining 6 had been fully canceled. Of the 20 operations that were still considered active, 7 were waiting for financial closing, 3 were closed but still waiting for the first disbursement, and 10 were under implementation.

B. Evaluative findings

- 5.10 **The rationale for IDB intervention in the private sector is the existence of market failures (e.g., externalities, missing markets, asymmetric information)**—that is, the IDB intervenes because if nobody intervenes, the private sector would simply invest too little. Typical forms of market failure occur when investors cannot receive all the benefits of their investments. In the case of climate change, private investors receive only the private benefits (i.e., the price of the electricity produced) but not the additional social benefits (e.g., the price of the CO₂ not emitted). Other common market failures occur when private investors cannot obtain lending for a certain maturity, usually long-term (missing markets) or when the information is not evenly distributed among all the agents of the economy (e.g., savings in EE). In all such circumstances, the private sector would simply not invest as much as would be socially desirable. But in the absence of a market failure, IDB's lending to the private sector would actually be deleterious: the Bank's privileged access to the financial markets implies unfair competition with local financial institutions.
- 5.11 **Virtually all of the operations in the portfolio justify IDB participation because of the existence of market failures, in particular climate-change-related externalities, lack of long-term finance, or information asymmetries.** A first justification for IDB projects is their climate change mitigation role; indeed, the externalities associated with climate change mitigation activities have been called the “greatest market failure of all times.”³⁵ A second justification relies on the existence of information asymmetries to be addressed by promoting demonstration effects: by investing in projects, IDB would simply disseminate the information to all investors that then learn about the missed

³⁴ This excludes mostly some investment funds and facilities that can invest in many LAC countries.

³⁵ Stern, 2008.

opportunities. A third justification is related to the lack of markets for long-term debt or lack of long-term finance. Most of the projects argued one or more of these market failures as a justification for intervention.

- 5.12 **OVE organizes the discussion of results and effectiveness around these three justifications.** It also considers other sources of IDB value-added recognized by the main clients and stakeholders.

1. Climate change mitigation

- 5.13 **The IDB's level of involvement, in terms of the investments financed by the private sector, varies by country and technology.**³⁶ IDB contributed to 9% of the increase of installed capacity in hydropower in LAC (total 2271 MW). Excluding hydropower, IDB financed 16% of the new RE generation (total 1652 MW) for LAC in 2004-2011. If we exclude the projects in Brazil (58% of hydropower and 72% new RE), the picture changes dramatically: the contribution of the Bank in hydropower rises to 22% of the installed capacity in the Region, and 57.8% of the investments in RE.³⁷ The relevance of the Bank in terms of mitigation was particularly pronounced in smaller countries (Uruguay, Nicaragua, Costa Rica).
- 5.14 **Nonetheless, in terms of direct climate change mitigation, the portfolio's potential effect is limited.**³⁸ In spite of the Bank's non-negligible contributions to installed capacity, the projected impacts on emission reduction reach 4.7 million tons of CO₂eq annually, or about 1.0% of the emissions generated by the power industry of the Region.³⁹ This is explained by two factors. First, as discussed above, electricity production is a relatively small contributor to CO₂ emissions in the Region. Additionally, the energy generated in these new plants is a marginal share of the overall energy production of the region, which is still largely concentrated in traditional technologies.⁴⁰
- 5.15 **Moreover, the Bank's investments in traditional electricity generation were in some cases more relevant than those in wind farms, highlighting the importance of mitigation in every technology.** The Bank's intervention in one coal-fueled power plant was a useful learning experience that led to the clarification of the eligibility requirements for environmentally sensitive projects. Moreover, in an original and unprecedented

³⁶ All the data used in this paragraph come from www.eia.gov and OLADE (2013).

³⁷ These calculations are approximate, provided to illustrate the discussion. All the MW of the projects that received resources from the Bank were included.

³⁸ This calculation refers exclusively to the RE portfolio, for which it is possible to do GHG mitigation calculations with a limited number of assumptions.

³⁹ To perform these calculations, we took the figure for proposed GHG emissions abatement directly from the loan documents. When the loan proposal did not contain such information, to find mitigation figures we multiplied the project's expected generation per year by an estimated emission factor from OLADE (2013). See Annex 4.

⁴⁰ The estimation of the CO₂ emissions presented above should be interpreted with care, mainly because the emission reduction calculations are made against an assumed technological substitute. Also, since most renewables are intermittent by nature, their use implies the existence of a stand-by capacity, typically provided with the least efficient thermal plants.

approach, the operation required the sponsors of the coal-fueled power plant to compensate for the additional GHG emissions associated with the use of a suboptimal technology (see Box 10). In total, the sponsors agreed to offset 320,000 tons of CO₂eq either with their own projects or through the carbon markets. These mitigation measures were also sizable—almost equal to the emissions mitigated by the largest wind-farm financed by the Bank in LAC.⁴¹ Because it is unlikely that electricity generation will be 100% from renewable sources in the near future, the Region will continue investing in traditional generation, seeking opportunities for mitigation.⁴²

Box 10. The dilemmas of a green Bank

In 2009, the IDB approved in tandem two NSG loans for financing the Pécem and Maranhão (Termomaranhão) coal-fueled thermoelectric plants in northeastern Brazil. Both projects had been prioritized by the Government of Brazil as a part of the *Programa de Aceleração do Crescimento*, a federal government program intended to accelerate the country's growth through investments in infrastructure. Pécem and Termomaranhão supported the expansion of baseload electricity capacity in the Brazilian northeast by a combined capacity of 1080 MW in three units of 360 MW.

Both projects (Pécem and Termomaranhão) entailed the use of subcritical coal-fired power generation technology, which was not consistent with the MDBs' emerging good practice of requiring the use of "best appropriate technology available." By applying increased steam pressure, supercritical and ultra-supercritical technologies allow a significant increase in the efficiency of the plant, thereby reducing the CO₂ emissions.

In spite of all the benefits of the supercritical technology, it was difficult to change the technology, for both regulatory and technical reasons. First, the A5 auction from the Brazil's energy regulator had been based on least cost. In that sense, the technology chosen fulfilled the regulator's requirements. Second, as the Bank's own Environmental and Social Management Report noted, the use of supercritical technologies is not economically feasible for units smaller than 500 MW.

The project was approved at a time when the Bank was transitioning toward becoming a "green Bank." Although the Bank had granted eligibility to this project under its original design, during the approval phase discussions began around the subcritical technology, which other MDBs were phasing out. After weighing the costs and benefits of proceeding with the operations, the internal management committee (OPS) decided to add extra clauses requiring the sponsors to sign a CO₂ offset agreement. With this provision, the projects were finally approved by the Board, though Termomaranhão was eventually cancelled.

The experience of Pécem had deep implications for the IDB. First, it illustrated the need for clear technological guidelines on what the Bank can and cannot finance through its private sector windows. Directly as a consequence of Pécem, in 2009 the IDB approved a set of guidelines for coal-fueled power plants. This example was followed by guidelines for other environmentally sensitive sectors (e.g., cement, landfills, power plants).

Moreover, through negotiations with the sponsors of the project, the Bank managed to secure a carbon offset agreement that essentially covered the gap in emissions between a subcritical and supercritical technology. The sponsors agreed to offset 320,000 tons of CO₂eq per year, or roughly 10% of the plant's overall GHG emissions. This is a unique case in which the IDB's intervention resulted in a specific, binding agreement for GHG mitigation.

⁴¹ The savings from the coal-fired power station were roughly comparable to the 381,000 tons of CO₂eq saved by the largest operational wind farm in Mexico. Since then, the Bank has approved a loan for a new, larger wind farm, but it has not yet been constructed.

⁴² The compensation mechanisms are, however, only a second-best option, as compliance with the compensation agreement could be threatened by the eventual termination of the relationship between the Bank and the sponsor. In future scenarios, the Bank should instead push for the adoption of the cleanest technologies available—an approach that was not feasible in this case, as the local government had already established which technology should be used in this power generation facility.

- 5.16 **It should be noted that despite the use of the terms *green energy* or *clean energy*, new RE sources typically have significant environmental and social effects that need to be dealt with effectively.** In all the new renewable technologies, and particularly those that use a lot of surface area (e.g., solar), the issue of land rights is important. Regarding environmental risks, wind farms may imply high bird and bat fatalities,⁴³ and geothermal energy may entail health hazards associated with heavy metals (e.g., mercury) or fugitive emissions.⁴⁴ In sum, the fact that a technology is good for mitigation does not necessarily mean that it is environmentally friendly in general. The environmental and social risks of projects typically depend on project locations. Wind farms, for example, may have limited impacts in areas of low bird migration and with regimes of private property, while they can have significant risks if placed on the communal lands of indigenous peoples or in an area of high bird migration.⁴⁵
- 5.17 **In that sense, some of the “green projects” in the portfolio have posed environmental and social risks that have not always been effectively managed.** In particular, four IDB-sponsored loans to wind farms in Mexico were located in an area of confluence of bird migration routes. As a consequence, bird fatalities reached a figure as high as 30 times that of comparable wind projects.⁴⁶ Though the Bank’s safeguard unit correctly identified the high risk of these operations, the problem has not been effectively mitigated. While all the parks have produced action plans, clients have effectively not adopted the key actions contained in those plans. In particular, in one project the emergency shut-down procedure has not resulted in any shut-downs to date. In another a required post-construction bird and bat fatality study was not carried out.⁴⁷ As a result, the environmental safeguard performance of two of the three operational projects has been labeled as *unsatisfactory*.⁴⁸ IDB’s safeguard specialist cited among the reasons for this judgment that “*the client did not implement any of the recommendations provided by the bird experts in order to avoid/minimize impacts,*” that “*the client never activated the shutdown procedure, a key central mitigation measure agreed upon in the Common Term Agreement,*” and that “*the client failed to undertake a post-construction survey of bat fatalities.*” In one project, the specialist noted that “*the client retained information about the level of bird and bat fatalities.*”⁴⁹ At the time of this review, Corrective Action Plans for both projects had been agreed with clients, but were yet to be implemented. Another

⁴³ For a comprehensive study of bird fatalities, see Ledec et al., 2011.

⁴⁴ See, for instance, Kagel et al., 2005.

⁴⁵ It is important to mention, however, that abatement systems are available to mitigate these impacts: for example, a carbon mercury absorber can capture between 90% and 99% of the mercury in a geothermal facility.

⁴⁶ According to the evidence reviewed by OVE, approximately 5,511 birds are killed each year by the turbines from one of these wind farms. In comparison, the Altamont Pass wind farm in the US, which holds the record of fatalities in the country, kills 4,700 each year with 4,000 operational turbines.

⁴⁷ According to a World Bank study (Ledec et al., 2011), emergency shut-down procedures are both technically feasible and cost-effective. Indeed, early evidence for this assertion comes from an experimental shut-down in the WB project “La Venta II,” also located in Mexico’s Tehuantepec Isthmus. However, the efficiency of this system has yet to be demonstrated scientifically.

⁴⁸ According to ESGs database, only 16 out of 342 project ratings are *unsatisfactory* (less than 5%). Furthermore, the three wind farms in Mexico are the only energy projects rated as *unsatisfactory*.

⁴⁹ Source: ESG Mr. Blue Database. This is the explanation for one project; the other two are very similar.

wind farm had social risks related to a conflict over its location. A request has been submitted to the Bank's Independent Consultation and Investigation Mechanism (ICIM) that concluded that "the Requesters have alleged in reasonable detail that they could be directly, materially adversely affected and harmed by an action or omission of the IDB."⁵⁰ It has since been declared eligible for a compliance review.

- 5.18 **Finally, the Bank used limited concessional funds to address the externalities associated with climate change.** With the exception of the CTF funds and the Canadian Fund, the IDB has few concessional funds available for private sector lending. As noted above, if externalities are a motivation for IDB engagement, IDB needs to provide some sort of concessionality to the investors to compensate them for the fact that they cannot capture all the benefits they produce for society. In the portfolio evaluated by OVE, only two loan operations received concessional funding, one of them being the refinancing of a wind farm already built in Mexico. The fact that the wind farm was already built is at odds with the notion that low returns on the investment were preventing climate-friendly investments. In sum, there seems to be no evidence that the IDB is using its instruments to actually address the externalities associated with climate change.⁵¹
- 5.19 **The experience and overall effectiveness of energy demand interventions has been varied.** SCF has included EE goals in a wide range of sectors, by fostering the adoption of more efficient equipment, supporting the construction of sustainable facilities and by promoting co-generation initiatives. Although in some instances the Bank was able to obtain positive results, the high complexity of these operations proved to be an important barrier for effectiveness. In many of the projects reviewed EE goals were secondary, as deals were motivated and structured with other more prominent objectives in mind.
- 5.20 **Despite their potential for climate change mitigation, small scale EE interventions have been limited.** Despite their potential, these interventions face challenges related to both the size of the projects and the prevalence of energy subsidies in the region. The transaction cost of traditional EE projects (audits, credit, and performance guarantee) can easily become too high, particularly when the energy savings involved are too low; this would render the interventions unviable. In such cases, supporting financial intermediaries to develop standardized financial products that would reduce transaction cost can go a long way. The Bank has some experience in this area; particularly working with Green Lending lines (see Box 11). In addition, the high prevalence of energy subsidies in the Region encourages wasteful use of energy and reduces the profitability of EE interventions. Indeed, EE efforts can be easily mapped to countries and periods (e.g., oil shocks of the 1970s) with high-energy prices.

⁵⁰ See MI-32-1

⁵¹ In addition to the 2 projects included in the portfolio, Management has used concessional funding from the Canadian fund, the CTF, GEF and the Nordic fund in other loans and TCs such as PE-L1141, BR-L1111, CO-L1104, RG-X1125, RG-X1173 and RG-T2154. Most of them are green lending operations not included in the portfolio.

Box 11. Green lending operations

In addition to the portfolio of 53 SCF infrastructure and corporate finance projects related to climate change, OVE partially reviewed 16 SCF operations with financial intermediaries that are also related to the promotion of RE and EE investments. These operations seek to expand the availability of local financing to private sector firms developing green projects, and are for the most part credit lines to local banks (14 operations in 11 countries, for a total of \$497.5M). The remaining two operations are guarantees (one in Colombia and another in Brazil), totaling \$157M.

Green lending operations are currently the Bank's most common instrument for EE projects, as EE projects are often small, and Bank direct lending is not cost-efficient in these circumstances. Early evidence seems to suggest that these projects generally have allowed local banks to expand the size of their green portfolios, although the fungibility of money makes a precise quantification of the effect challenging. As expected, given the high transaction cost of developing EE projects (due to the need for energy audits in particular), the success of these projects in expanding the availability of financing for micro and small firms has been low.

OVE excluded these projects from this evaluation portfolio, as it is working on a stand-alone evaluation of these green lending operations.

2. Demonstration effects

- 5.21 **OVE also found mixed results in terms of direct demonstration effects.** Though direct demonstration effects are difficult to establish, a necessary condition is an early entrance to an underserved but profitable market. The evidence in this regard is partial and varies from country to country. The IDB's early participation in the wind farm projects in Uruguay (financing the first three wind farms in the country), and in Chile and Peru (financing the first large scale photovoltaic solar parks), certainly provided plausible instances of demonstration effects (see Box 12). Furthermore, its support to Uruguay's national utility to develop a "bankable" power purchasing agreement, although not entirely frictionless, may have facilitated the financing of later investments. In sharp contrast are the refinanced wind farms in Mexico or the biofuel projects the IDB financed around 2006 in Brazil—clearly difficult to justify, given Brazil's long history in ethanol production, dating back to 1975.

Box 12. A tale of two winds

The relevance of the Bank's investments in wind power is highly dependent on how they fit in an overall public-private energy strategy and the institutional context in which projects are developed. The recent experience of IDB investments in Uruguay and Mexico is illuminating.

IDB investments in Uruguay were closely aligned to the country's strategic decision—in a multiparty consensus—to diversify its energy matrix and mitigate the impact of high oil prices. After running pilot investments with different renewable technologies, the potential of wind power was proven. National investments were directed to creating an enabling environment, including the provision of essential public goods (national wind studies, profitability studies). After a trial period, in 2008 Uruguay successfully launched its first bid for wind farms, offering 20-year power purchase agreements with the national power utility. The success of the first bid motivated a second bid, and prices were reduced from an average of US\$93 per MW in the first bid to barely US\$63.5 per MW in the second.

The IDB private sector financed the first three wind farms from the 2008 bid—the country's first three large-scale power generation projects financed by the private sector. Given the country's lack of experience with private sector generators, the technical details of the power purchase agreements had to be worked out to make them “bankable.” In the end the coordinated work of IDB's public and private sector windows made the whole intervention relevant. IDB's private and public sector windows are jointly contributing to a relevant and coherent national goal in Uruguay.

In contrast, the Bank was less relevant in Mexico: IDB's work has been limited to the financing of private wind farms through SCF—an important endeavor, given that Mexico has one of the world's highest shares of thermal (and highly polluting) energy in its overall generation mix. However, some of these investments are currently facing significant operational, technical, environmental, and social challenges,

In parallel, the country is undertaking a substantial energy reform, in which IDB participation has been limited. The purpose of the institutional reform is to promote the expansion of hydrocarbon production. If the reform succeeds in reducing hydrocarbon prices and thus electricity prices, then it may threaten the sustainability of IDB-financed private sector operations in Mexico.

- 5.22 **Moreover, providing demonstration effects does not always require lending; other instruments (training, information sharing) might achieve that more efficiently.** Conceptually, demonstration effects are needed when there is some sort of information asymmetry that prevents some profitable investment from being carried out. One way of showing that it could be done is certainly by doing it; hence the logic of doing something new as a “demonstration” effect. However, this is not always the solution. The best example is the Bank's private sector EE interventions.⁵² The Bank financed large EE interventions for a bank and for hotels in Mexico and Central America. These interventions are highly profitable; indeed, the simple repayment period of an energy-efficient hotel was just 2.4 years, and the internal rate of return of the investment close to 40%. Since the additional costs reached barely US\$400,000 (5% of the construction costs), it seems unlikely that any demonstration effect resulted from just financing the project. In a highly profitable intervention with medium or large companies, the constraint to the development seems unlikely to be resolved by a loan. Instead, potential impact is to be found in diffusion, training, and information about the potential gains of EE—elements that can more appropriately be provided through other instruments, such as technical assistance.

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For energy efficiency in general, see the series of three papers on justification, financing and design of EE programs from the IDB. IDB, 2012, Guía A: Programas de Financiamiento de Eficiencia Energética, 2012; IDB, Guía B: Justificación de la Intervención del Gobierno en el Mercado de la Eficiencia Energética, 2012; IDB, Guía C: Diseño de Programas de Eficiencia Energética, 2012.

3. Financial additionality

- 5.23 **Although most SCF projects were successful in providing long-term financing and complied with the good-practices standards used by SCF, in OVE's view, the financial additionality of IDB's overall portfolio could be improved further.** The most common justification for IDB intervention was the existence of a lack of long-term finance. However, in the renewable portfolio, sponsors include world-class companies (ENEL, EDF) with ample access to national and international financial markets and, in many cases, assets that exceed those of the IDB. Though having large and experienced sponsors may be positive from a project finance perspective (i.e., reduction of sponsor risk), it undermines the idea that the IDB had financial additionality. The same is true for the portfolio with banks (BBVA, Bancolombia). Though a minority of projects admittedly targeted sponsors whose access to markets could have been limited, most of the firms in the portfolio have access to national and international markets (in fact, sponsors from 13 projects had a Moody's market rating, revealing access to international capital markets). This means that it is likely that many of the financed projects would have occurred even without IDB's involvement.
- 5.24 **Moreover, the IDB portfolio displays two additional features that limited financial value-added.** First, 72% of the portfolio is located in investment-grade countries, 68% is in the five richest countries in the Region, and 63% is in the five countries with the most developed financial sectors. Second, the average share of IDB financing in the overall project cost is just 12%. This, together with the fact that in 39% of the projects the IDB is one among several participating MDBs, suggests that the financial value-added of the IDB could be further improved.
- 5.25 **In the case of Mexico, the lack of additionality was aggravated by the fact that IDB involvement in RE investments was for the most part through the refinancing of existing projects.** During the project review, OVE found that the IDB refinanced short term loans to sponsors that either (i) had proven access to long term financing in the local market (with similar rates and tenors), (ii) were structuring projects that had been priced out by the market due to high risks, or (iii) were refinancing the transfer of existing assets.⁵³
- 5.26 **The IDB has been effective in leveraging resources from commercial banks, though it has not always managed to be the pivotal point in the operations.** Through B-lending, the IDB has been able to increase its financial additionality by leveraging US\$3.5 billion (46%). However, in a number of cases, the IDB missed the opportunity of being the leader in the syndication process (as an arranger). In those cases, that role was

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According to SCF these transactions should not be called refinancing operations, but rather take-out financing, on the grounds that the Bank substitutes a shorter-tenor bridge loan used to finance the riskier part of the project (typically the construction phase) with a longer-tenor loan. OVE still considers that the substitution of a loan with another that has different terms can always be construed as refinancing. Furthermore, the reference to take-out financing is not appropriate in this case, as take-out financing requires a binding formal agreement between parts before the construction phase, in which the lender agrees to provide permanent financing if certain conditions have been met. To the best of OVE's knowledge, these agreements were never signed in this particular set of operations.

taken by other multilateral organizations that participated in the same projects. The additionality of a B-loan in those circumstances is limited, as one can easily imagine that it would be substitutable for a B-loan of a partner institution (e.g., IFC). The Bank could have taken a stronger role, becoming the operation arranger. In addition, if the Bank intends to pursue lending for energy projects with long maturities (20-25 years), it would be useful to focus on syndications with clients that have longer-term funding than commercial banks. IDB's recent experience with Reventazón Hydropower Dam is an example in that direction (see Box 13).

Box 13. The Reventazón experience

In 2009, the Instituto Costarricense de Electricidad (ICE) began the construction of a new hydropower facility in the lower basin of the Reventazón River. With installed capacity of 305.5 MW and an expected generation of 1,407 GWh, it will represent almost 10% of total installed capacity in Costa Rica and will be the largest RE project in Central America. The project is expected to begin operations in August 2016, and it was approximately 60% complete at the end of 2013. The total cost of the project is US\$1.4 billion.

ICE decided to replicate the financial structure it had used for other hydroelectric plants, in which the project is developed through a special vehicle trust (*Fideicomiso*) that, on the one hand, allows for a project finance structure to access long-term funding that is not available on corporate finance grounds, and on the other hand, controls and uses all the assets acquired for the project, even those acquired directly by ICE with its own resources. In 2010 ICE presented this scheme to the Bank, and together the parties agreed to divide financing into two complementary portions: one that is reflected explicitly on ICE's balance sheet, and another, associated with the *Fideicomiso*, that will not be accounted for on ICE's balance sheet. Considering the special nature of ICE, in 2012 the Bank approved two operations: for the on-balance portion, an SG operation (CR-L1049, US\$88 million) that was the second operation of an existing CCLIP with the country; and for the off-balance portion, an NSG operation (CR-L1056) that consisted of a senior US\$200 million A-loan and a syndicated B-loan for up to US\$473 million. The remaining resources were provided by the IFC and four state-owned local banks (also senior loans).

Instead of selling the B-loan directly to other commercial banks, the Bank decided to sell it into the private placement market under US securities regulations. In a nutshell, the Bank and ICE appointed a placement agent to sell the participation notes of the B-loan among interested institutional investors. These participation notes are issued by a financial trust, which uses the proceeds of the issuance to buy the total participation in the loan, previously notified of the intention from the borrower (in this case the *Fideicomiso*) to use money from the B-loan. To minimize the funding risk, the B-loan is funded up front through an IDB loan. To protect investors against a potential conflict of interest within the IDB in the event of a default, the transaction includes a mechanism by which investors can step out from the B-loan and become direct lenders.

The Reventazón project is a good example of how the IDB can expand the potential investor base to a group whose maturity and risk profiles are more aligned to the kinds of projects that the IDB is financing (i.e., long-term projects). Mechanisms like the ones used in Reventazón can dramatically expand the Bank's financial leverage. However, as the step-out clause illustrates, these new mechanisms are more complex and require innovative responses to deal with new challenges (e.g., potential conflict of interest). Finally, Reventazón is an example of good coordination between the public and private sector windows under the strong lead of the country.

4. Other sources of value-added

- 5.27 **Though in many cases the relevance of the IDB private sector window was limited in terms of mitigation, demonstration effects, and financial additionality, the Bank added value in a number of other cases.**
- 5.28 **First, the Bank seemed to have added value when its private sector interventions were both fully aligned with the country's energy policies and coordinated with**

IDB’s public sector window. This finding is hardly surprising, since the energy sector is a highly regulated one. In that sense, the Bank’s private sector operations were more relevant in countries where the government had a clearly defined policy into which the private sector fitted. A clear example of this is Uruguay’s strategy to diversify its energy matrix by incorporating wind power and turning to the private sector for investment. To a clear national strategy, the IDB added technical value through its public sector window operations and policy dialogue.

- 5.29 **Better alignment of the Bank’s private sector portfolio with national policies also serves to mitigate important regulatory and country risks.** Many of the risks of these operations have to do with sudden changes in regulatory framework, including tariffs. Insofar as private sector investments fit into a coherent national policy, the likelihood of such changes is presumably lower. In contrast, when projects are carried out without a strong relationship with the policy framework, their risks and uncertainties are compounded. For example, the wind farms financed in Mexico with power purchase agreements to private firms may face significant risks if the recent regulatory changes translate into a drastic reduction of the cost of electric power. For the same reasons, the alignment of private sector investments to a long-term national strategy also makes the interventions of the Bank more likely to be sustainable in the long term.
- 5.30 **Clients seem to have recognized the Bank’s additionality in terms of safeguards.** Most of the clients and stakeholders interviewed by OVE highlighted the value-added of Bank safeguards both to help develop sustainable practices at the firm level and also to help insulate the firms against complaints of incorrect environmental and social management. Though safeguard enforcement was not always high, the clients did seem to value the IDB’s role in providing technical assistance.
- 5.31 **Another way in which the IDB added value was through its privileged access to the government.** Some clients appreciated having a partner that has direct dialogue with the government. For instance, in one IDB operation (in which the IFC also participated), some *force majeure* events had reduced the amount of energy that could be delivered to the grid. The government was open to renegotiating the feed-in tariff to ensure the sustainability of the project. Though it cannot be asserted that the negotiations were facilitated by the presence of the IDB and the IFC, it certainly seems a plausible explanation. However, this kind of “special relationship” between the IDB and the countries can also work as a double-edged knife, introducing concerns of conflict of interest in certain cases.

VI. CONCLUSIONS AND SUGGESTIONS

- 6.1 **LAC energy-related emissions will remain a comparatively low share of the global total, but the Region remains strongly committed to preserving its low-carbon electricity matrix over the long term**—a commitment expressed in the National Communications of all LAC countries. To achieve this objective, LAC relies on two important strengths: high availability of renewable resources and natural gas, and a modern and competitive electricity market in most of the countries. At the same time, environmental and social concerns associated with the development of new hydroelectric

plants, subsidies and distortions in energy prices, and technological and market failures are barriers to the expansion of hydro and new RE sources as well as the deployment of EE instruments.

- 6.2 **The LAC countries vary widely in their climate change challenges and opportunities.** There is vast variation in terms of GHG emissions, with the four largest economies accounting for nearly 75% of total emissions. To the diversity in source and amount of emissions, the Region adds diversity in terms of the composition of the energy matrices, the availability of energy sources, the intensity of energy consumption, the level of development of markets, and the dynamics associated with the interrelations among these variables and the national economy. The development of effective mitigation programs in the Region will depend largely on the recognition of such differences.
- 6.3 **LAC will have to rely on mitigation strategies to maintain its low-carbon pathway; such strategies will have greater opportunities of success if they are inserted into wider national objectives.** GHG reduction could be a clear co-benefit of strategies implemented to achieve wider national and sectoral objectives. For instance, through mitigation strategies countries can help to (i) reduce their vulnerability to oil price variations; (ii) reduce the energy system's weather vulnerabilities, particularly those related to the high share of hydropower in the Region; (iii) reduce investment needs in energy supply through more efficient energy supply; (iv) improve industrial competitiveness through lower energy prices; and (v) increase access to and coverage of electricity in rural and isolated areas.
- 6.4 **To develop adaptation strategies, the energy sector in LAC will have to expand its knowledge on vulnerability and the potential impacts of climate change.** While there is evidence of potential adverse impacts from climate change, there is no specific information about energy sector vulnerabilities, the magnitude of climate-change-related risks, or the Region's resilience capacity. The very nature of most renewable energies (weather-related intermittency) means that increasing their market share could lead to increased vulnerability of the power systems. If adaptation actions to address such vulnerabilities are to be designed and implemented, greater understanding of the sector's adaptation needs will be needed.
- 6.5 **The Bank correctly identified in its intervention strategy the need for synergies with national development goals and opened the possibility of financing high-carbon investments under certain conditions.** The Bank's sustainable energy concept integrates the need to promote reliable, universal, and affordable access to energy while "contributing to the reduction of environmental impacts, including climate change." The lines of action identified in the IDB climate sector strategy/framework included "green energy" strategies (adaptation of institutional and regulatory framework, promotion of EE at both the supply and the demand levels, and the incorporation of renewable sources of energy), as well as investments in types of traditional carbon-based generation with technologies and systems that produce the least CO₂ emissions. In addition, the strategy acknowledged that the private sector plays a major role in country-level efforts to address global climate change in the energy sector.

- 6.6 **Production, generation, transportation, and use of energy were the most important areas of the Bank's interventions to address climate change.** In fact, of all the climate-change-related lending identified by OVE between 2004 and 2013, energy (excluding transport use of energy) represented 70%. The energy climate-change-related portfolio also represented a large share of the total energy portfolio. Of the US\$11.7 billion approved for the energy sector, US\$8.6 billion (70%), and 94 of the 132 operations approved during 2004-2013, were devoted to climate change mitigation. No operation was devoted to adaptation to climate-change-related impacts in the energy sector.
- 6.7 **In response to the nature of LAC's power industry, the Bank's SG lending was directed to institutional strengthening and a few large hydropower rehabilitations, while the NSG portfolio focused on electricity generation with renewables and on EE in demand.** Of the total funds committed in this area during the evaluation period (US\$9.1 billion), 45% (US\$4.1 billion in 54 operations) was used for operations in the private sector which participation has increased over time. NSG operations have focused on new RE generation and EE in demand projects, while SG loans have targeted mainly institutional strengthening and regulatory changes, rehabilitation and new hydroelectricity power plants, and EE in supply. Many operations were in countries in which the electricity sector presents important regulatory deficits and the state is heavily involved in the investments.
- 6.8 **The Bank has leveraged funds from other financial institutions to promote its agenda on climate change in the energy sector.** The Bank has been successful in channeling concessional resources from other sources of financing. In total, 53% of the funds invested in TC came from external sources and were managed by the Bank. During the last decade, external funds accounted for US\$126.3 million, greater than the US\$114 million from the Bank. These grants were used in TCs, stand-alone projects, project preparation facilities, and nonfinancial products for the public sector.
- 6.9 **The launch of SECCI substantially increased the explicit climate-change-related portfolio, but the pervasive lack and poor quality of indicators jeopardized the monitoring of interventions.** After SECCI was created in 2007, the number of SG projects that mentioned having climate change implications increased sharply. However, the fact that the project objectives were consistent with climate change objectives did not mean that the logic of the project and the indicators selected would ensure that the contribution of the interventions to mitigating GHG emissions could be monitored. In general, most of the projects in the SG portfolio included indicators related to mitigation targets, but very few set mitigation targets, financed activities related to reducing GHG emissions, or planned to measure that reduction. In the private sector operations, though climate change mitigation was often cited as a justification for the investment, most operations did not contain climate-change-specific indicators to measure climate change results.
- 6.10 **In the public sector, the most innovative interventions aimed at overcoming barriers to mitigation have been carried out through concessional resources.** In fact, during the period under evaluation, the Bank advanced toward an active agenda of nonfinancial products to expand the knowledge base in the Region about barriers and challenges. In

particular, nonfinancial products were directed to identifying and proposing solutions to technological barriers (pilot projects in RE, identification of technologies and resources, knowledge diffusion) and barriers related to the electrical grid (e.g., smart grid). However, this knowledge was not always added to the approved operations.

- 6.11 **The relevance of PBL interventions designed to promote institutional and regulatory changes and advance the construction of a new and greener energy matrix was higher when they related to broader objectives.** When PBL operations were related to broader energy policy objectives and were fully integrated in a national policy, their relevance improved; otherwise, fiscal needs and political decisions often overthrew sustainable energy objectives and imposed a different set of priorities over changes in the energy matrix. In addition, short-term energy sector challenges and barriers jeopardized the ownership of interventions and long-term mitigation goals. The most relevant and effective PBLs (Barbados, El Salvador, and Nicaragua) were those that integrated a large range of instruments, including TC and investment loans. Climate change co-benefits, such as GHG emissions reduction, could not be verified in any of the PBL interventions.
- 6.12 **The more relevant, effective, and clearly quantifiable reduction of GHG emissions is related to the rehabilitation of or new investments in hydropower plants (SG), new wind power generation processes, and the carbon offset of a “dirty” coal power project (NSG).** The Bank’s direct investments in RE will potentially mitigate close to 10 million tons of CO₂eq per year, 52% through the public and 48% through the private sector portfolio. These emissions are equivalent to 2% of LAC’s overall electricity emissions. For the public sector portfolio, the greatest impacts on climate change mitigation continued to be the result of developing major hydroelectric plants. For other investments, particularly those in the efficiency of transmission lines, the net effect in terms of emissions is difficult to assess and most likely ambiguous, since the reduction of technical losses reduces supply failure, thereby increasing the scope of the lines. For the private sector portfolio, GHG mitigation was related to wind farms (1.5 million tCO₂/year) and new hydropower plants (3.0 million tCO₂/year).
- 6.13 **Though the private sector was successful in financing the expansion of installed capacity with new renewable sources, particularly wind power, its investments are difficult to justify in the light of the most plausible market failures.** The private sector of the Bank financed most of the new renewables and was particularly active in wind power investments. However, these operations have had very limited connection to the most relevant market failures that preclude spontaneous investment by private agents (climate change, demonstration effects, lack of long-term finance). In the case of climate change as market failure, given the limited availability (and use) of concessional funding, it is even conceptually unlikely that the Bank is targeting the challenge. For that reason, it is not possible to ascertain that the IDB private sector operations would not have happened, had it not been for the IDB.
- 6.14 **Despite this, the Bank’s private sector portfolio seems to have had some additionality for climate change, though not necessarily through its “green” projects.** Clients seem to value the Bank’s role in safeguards, its privileged relationship with governments, and elements that reduce project uncertainty. Accordingly, the Bank’s additionality seems to

have been related to connecting the investments with a defined strategy. Under such circumstances, it was also easier for the Bank to add value by structuring deals. As for safeguards, quite paradoxically, the Bank's additionality seems to have been stronger in a few "dirty" projects. In particular, the experience with the coal-fired thermopower station triggered a Bankwide discussion of the conditions under which such technologies should be financed. In turn, this discussion led to the production of specific guidelines for environmentally risky projects. By contrast, several of the Bank's "green" projects turned out to have significant environmental impacts that were not properly mitigated.

- 6.15 **Finally, a consistent finding throughout the SG and NSG portfolio was that the Bank's relevance for climate change was directly dependent on the level of alignment among its investments, the country energy strategy, and the Bank's public sector engagement.** In the public sector, the alignment of the Bank's operations with national energy strategies is key. Identifying the co-benefits for the country and understanding when and how to intervene are of paramount importance. For the private sector, a consistent finding was that private sector investment made in the context of a national energy policy that serves the midterm vision is not only highly effective but also likely sustainable. For example, in the context of the Uruguayan energy matrix reform, the Bank's participation—financing the first three large-scale RE projects—not only added financially but contributed to the development of a market for private sector investments in energy (demonstration effects). The coordination between the public and private sector windows, though not entirely seamless, helped align all the actors with the same objective. In contrast, when projects were approved opportunistically, without any reference to the current energy strategies and without a relationship with what the Bank's public sector is doing, their relevance tended to be lower. The wind farms refinanced in Mexico are an example: not only are these operations facing significant operational, technical, environmental, and social challenges, but they also may become unviable if the recent Mexican energy reform succeeds in reducing electricity prices.

- 6.16 **On the basis of these findings, the evaluation team makes the following suggestions:**

Suggestion 1: Ensure that projects' possible co-benefits in terms of climate change are identified and effectively incorporated in the energy sector portfolio, ensuring a clear identification of opportunities in each specific country. Improve the indicators that allow monitoring and evaluating the impacts of IDB operations on GHG emission reduction.

Suggestion 2: Consistently address identified barriers—most notably those related to market distortions and subsidies—to ensure projects' sustainability.

Suggestion 3. Strengthen the alignment and cooperation between the Bank's public and private sectors, particularly in view of the likely merge-out of the private sector. Part of this should involve aligning the incentives of public and private sector specialists.

Suggestion 4. Take advantage of GHG mitigation opportunities in high-carbon projects where IDB participation can make a difference. Many LAC countries explicitly state in their energy strategies that they will continue to add installed capacity from fossil fuels. In this context, the Bank could play an important role in promoting cleaner fossil fuels

such as natural gas. The Bank's participation could also lead to the introduction of more efficient and cleaner fossil fuel technologies.

Suggestion 5. With regard to the private sector:

- a. **Guide interventions by market failures, applying the right instrument for the market failure that needs to be solved.** Lending is not always the solution for all market failures; in some cases, a market failure could be addressed with concessional lending (climate change) or even soft interventions (demonstration effects).
- b. **Increase the Bank's relevance by further advancing the role of the Bank as an institution that structures projects and leads syndications.** The Bank can maximize its value-added if it takes the arranger role in syndications, instead of limiting its participation to obtaining additional B-loans with commercial banks. Increased coordination with the Bank's public sector and the national energy strategy should allow the private sector windows to take a more central role in structuring operations.
- c. **Work in safeguard enforcement of projects, particularly of high-risk "green" projects.** Also, the Bank may want to develop environmental guidelines for green projects, particularly to avoid wrong location decisions (e.g., wind farms in bird migration areas).

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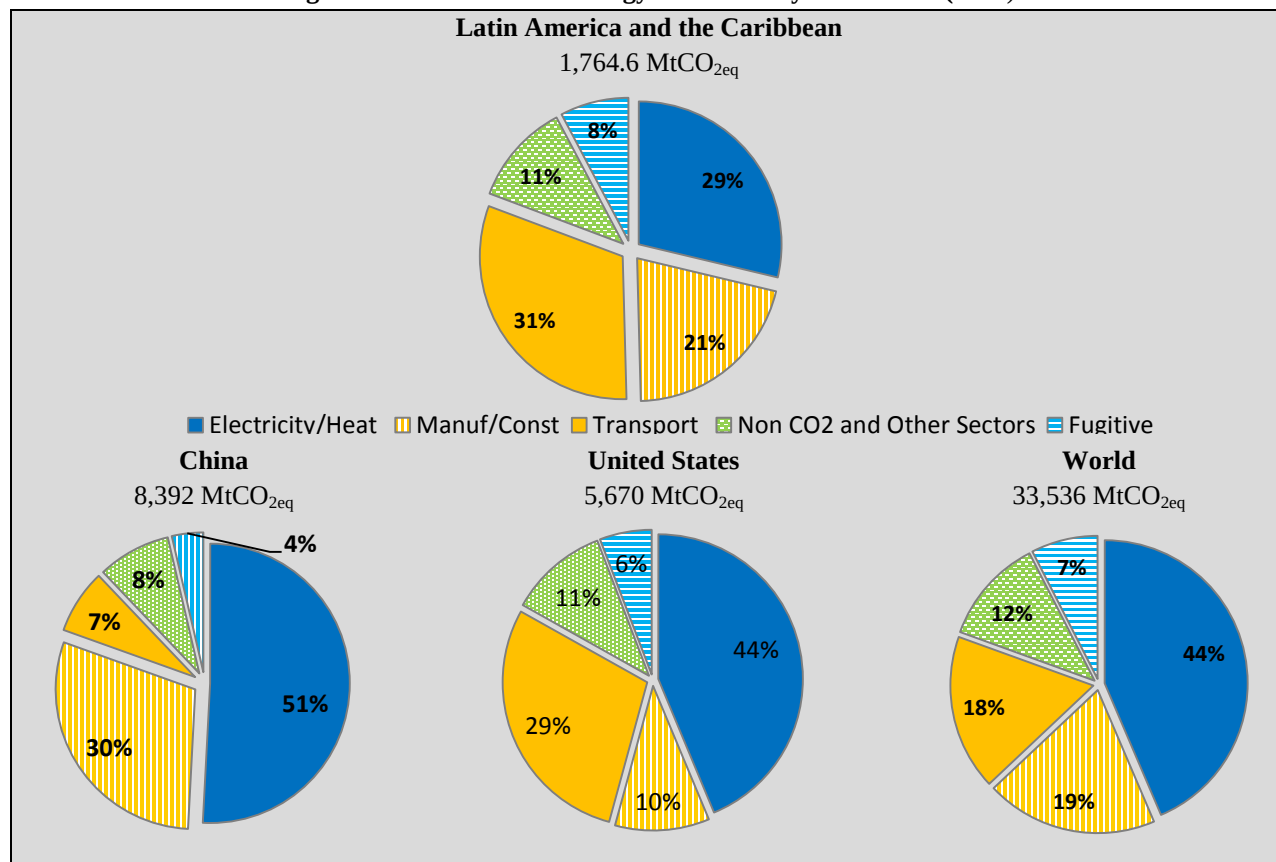
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ANNEXES

Annex I. Figures and tables

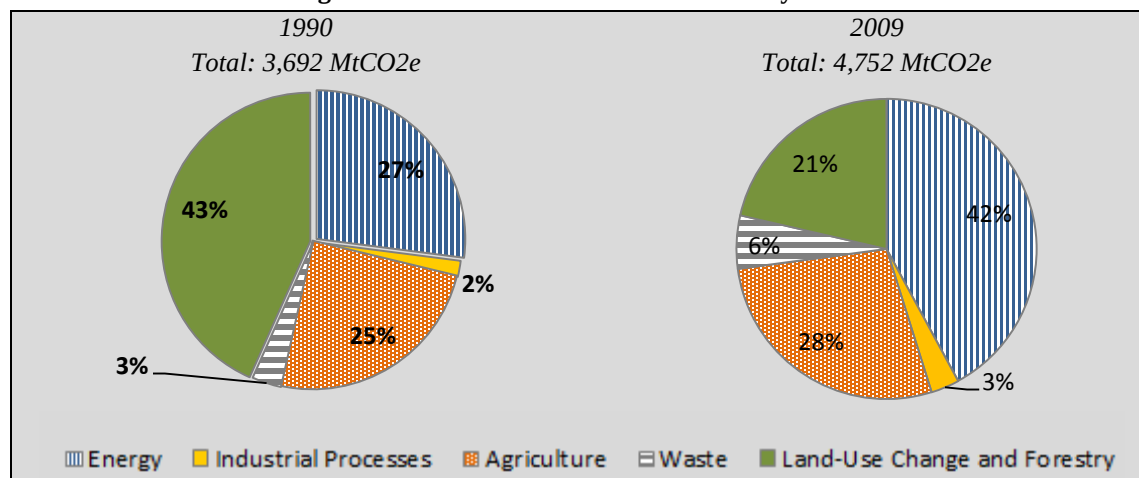
Chapter I

Figure 1. Distribution of Energy Emissions by Sub-Sector (2011)



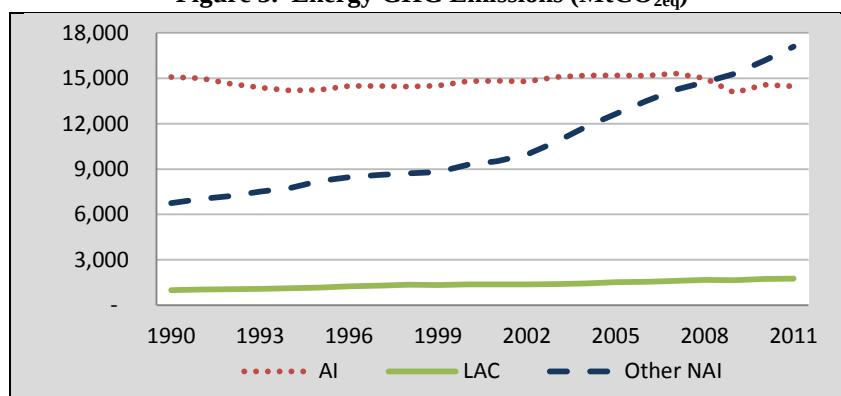
Source: Own calculations, data from WRI, CAIT (2014)

Figure 2. Distributions of LAC emissions by sector



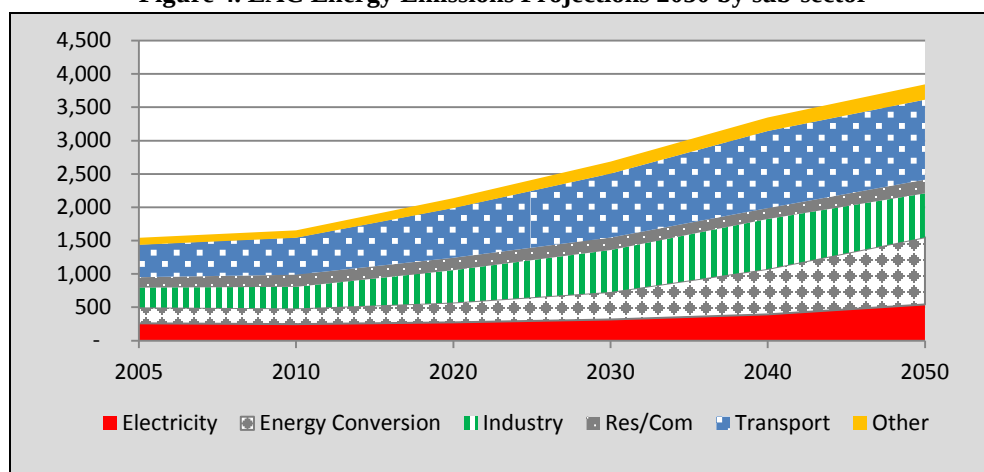
Source: WRI-CAIT (2014)

Figure 3. Energy GHG Emissions (MtCO_{2eq})



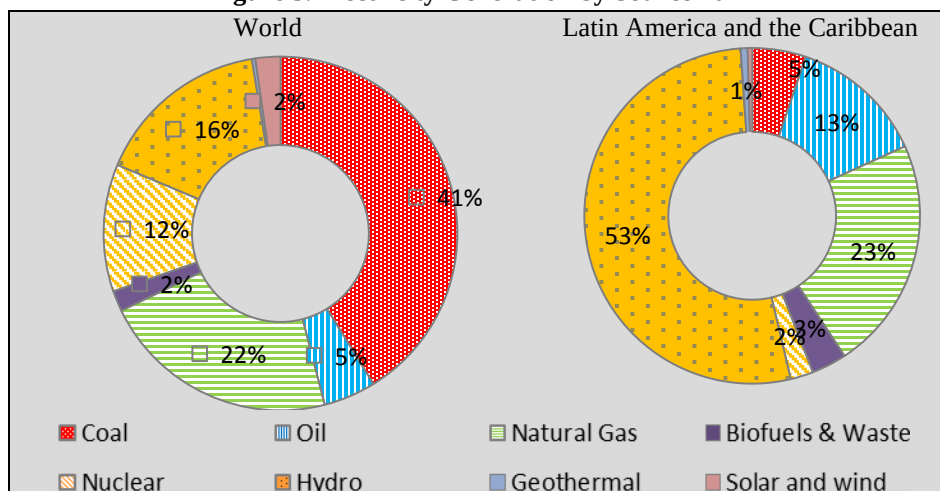
Source: WRI-CAIT (2013)

Figure 4. LAC Energy Emissions Projections 2050 by sub-sector



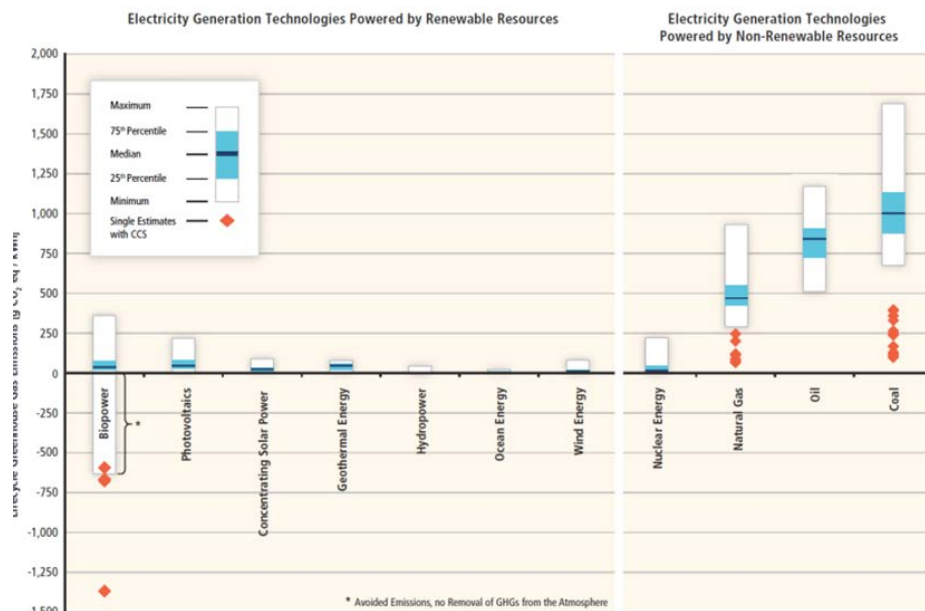
Source: Vergara, et Al.(2013)

Figure 5. Electricity Generation by Source 2011



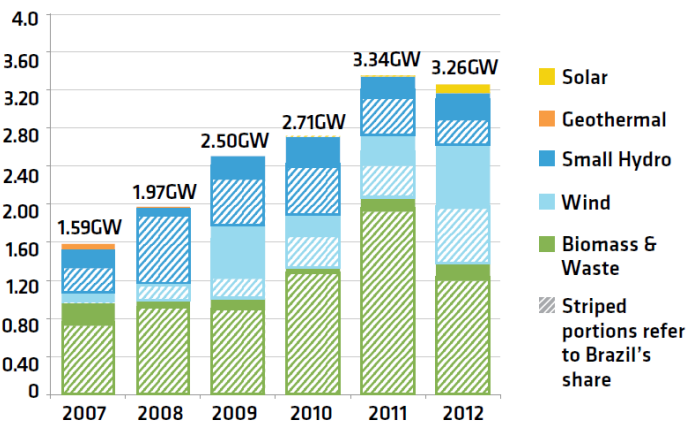
Source: Own Calculations, data from IEA, 2013

Figure 6. CO₂ Emissions of Electricity Generation Technologies



Source: IPCC, 2012

Figure 7. LAC Net Renewable Capacity Additions, 2007-2012 (GW)



Source: Climate Scope, 2013

Table 1. Summary of the mitigation measures in the energy sector, included in the national communications

Country	Year	Objective	Programs
Argentina (2a.)	2007	These studies identified measures and feasible mitigation policies that in a period of 15 to 20 years could mean a reduction of net emissions of more than 60 million tCO ₂ e per year. This total does not include the planned large hydroelectric and nuclear plants, or other mitigation options that were not analyzed by these studies	(i) Program for the Rational Use of Energy. (ii) Energy Efficiency Project with the participation of the electric energy distribution companies. (iii) National Plan for Wind Energy.
Brazil	2010	Despite the fact that Brazil is a developing country, however, there is an array of programs in the country to promote a significant reduction in such emissions. Some of these programs are responsible for the fact that Brazil has a relatively “clean” energy mix, specifically in terms of low levels of greenhouse gas emissions per unit of energy produced or consumed. Many other initiatives that are being implemented also contribute to the inflection in the growth rate of the greenhouse gas emissions curve in the country.	(i) The National Alcohol Program – Proálcool (ii) National Electric Energy Conservation Program – Procel (iii) National Program on the Rationalization of the Use of Oil and Natural Gas Products. Significant growth is expected for the share of new renewable energy sources in Brazil’s energy mix in the coming years. The new sources of renewable energy include the “modern use of biomass,” small hydroelectric plants - SHPs, wind energy, solar energy (including photovoltaic energy), tidal power, and geothermal power. Brazil seeks to replace fossil fuel-based energy sources, with high carbon content per unit of energy generated, by other sources with a lower content, or by sources that generate greenhouse gas emissions with lower global warming potential.
Mexico (3a.)	2010	SENER, in collaboration with its companies and deconcentrated bodies, is continuing with the implementation of programs, actions, and measures for energy efficient use and savings, whose goal is to reduce the rate of emissions growth in the country	CONAE and FIDE are carrying out programs for a more sustainable energy use. In 2005, the savings in electric power, a result of the application of Daylight Savings and projects carried out by the FIDE, were 5,205 million KWh, which represented a 3.1% decrease in the consumption of this resource in Mexico compared to the previous year. In generation capacity, the savings were 2,414 MW, and it is calculated that this is equal to 8% of the peak demand for the same year. The use of renewable energy is still being promoted in Mexico.
Chile (2a.)		Chile affirms the need to stabilize global atmospheric concentrations of greenhouse gases (GHGs) at a level that prevents hazardous anthropogenic interference with the planet’s climate system by reducing total emissions and protecting and improving GHG sinks and deposits through suitable	Work toward having 20% of the energy generated in Chile supplied by non-conventional renewable energy sources—our own local and global resources—by 2020. Improve current regulations governing access to energy resources, in order to increase investment in renewable energies in Chile

Table 1. Summary of the mitigation measures in the energy sector, included in the national communications

Country	Year	Objective	Programs
		mitigation measures. The country's contributions to international efforts in this regard are grounded in the principle of common but differentiated responsibilities	Improve information available about the country's energy resources in order to formulate a policy to promote energy efficiency and energy saving projects. Advance in energy efficiency certification and establish energy efficiency standards for residential construction, domestic appliances, lighting, and vehicle fleets.
Colombia		Although Colombia has no commitments to reduce emissions, and plays only a marginal part in GHG emissions (0.37% of global totals), it has developed and implemented a number of policies to promote sustainable development associated with low emissions of such gases, as the result of an evolution of mitigation on a national scale.	Ecopetrol has created a strategy to reduce GHG emissions under a collaboration agreement with IDB, signed in 2008. This action has identified 38 initiatives for mitigation in production, transport and refining, with a potential of some 2,000,000 tCO ₂ e per year, focusing on the exploitation of gas, fuel substitution, the generation of electricity with less GHG -intensive technologies and fuels, and energy efficiency.
Costa Rica (2a.)	2009	Policy to reduce emissions and second-generation climate change preparedness.	Replacement of fossil energy (GHG emitter) by hydropower and other clean energies Policy of Carbon Neutrality
Ecuador (2a.)	2011	A significant number of national voluntary mitigation actions (ANVM) ² have been developed, based on articles 14, 15, 71, 413 and 414 of the Constitution of Ecuador	Plan for the Renovation of the Fleet and Scrapping (RENOVA) Policies and strategies to change the energy matrix by 2020. According to the National Plan for the Good Living 2009 - 2013, their primary goal is the diversification of the national energy matrix, through the promotion of efficiency and a greater share of sustainable renewable energies.
El Salvador (2a.)	2013	Although emissions of El Salvador are globally insignificant to produce effects in the climate system (0.04 % of global emissions), this kind of actions will reduce net emissions, and may have a synergistic effect with the goals of other agendas and environmental adaptation	The CNE approved the National Energy Policy (PEN) in 2010, with the following six strategic guidelines: (i) Diversification of the energy matrix and promotion of renewable energy sources. (ii) Promotion of an efficiency and energy savings culture. (iii) Institutional strengthening of the energy sector and protection to the user. (iv) Expansion of energy coverage and preferential social rates. (v) Innovation and technological development. (vi) Regional energy integration
Honduras (2a.)			It was possible to identify that the country is requiring further promotion of another type of renewable energy projects, such as solar energy, wind power, and biomass.

Table 1. Summary of the mitigation measures in the energy sector, included in the national communications

Country	Year	Objective	Programs
			Similarly, projects for the industry are proposed to generate electricity with cleaner technologies that reduce emissions through cogeneration and energy efficiency. The Regional Program of Energy Efficiency for the industrial and commercial sectors in Central America.
Panama (2a.)	2011	Direct the Panamanian economic sectors towards efficiency and effectiveness in each of their processes, using the country's renewable resources sustainably, using the benefits offered by the carbon market, and motivating individuals and companies to become agents of sustainable and equitable development.	In the energy sector, the pursuit of sustainability must be compatible with three fundamental principles: competitiveness, security of energy supply, and environmental protection. It is necessary to assess how the different energy sources could help mitigating climate change, analyzing every alternative energy and technological option that will facilitate its adaptation to the reality of the country.
Paraguay (2a.)	2011	With the replacement of petroleum-based fuel by biofuels, which is currently in progress in the country, the amount of CO ₂ that would not be emitted into the atmosphere represents 226,145 tCO ₂ for a replacement of up to 5% of the amount of diesel fuel used in the year 2006 (reference year). In contrast, the cost of a venture that would replace approximately 14% of the demand would be close to US\$ 12 million, including costs of investment.	The promotion of measures leading to greater energy efficiency, and increasing those that will better help renewables to take-off. Developing viable and feasible alternatives to reduce the use of biomass, both at the domestic as well as industry level.
Peru (2a.)	2010	While Peru is not a large emitter in absolute figures, it presents emissions comparable to countries with a greater GDP that have already managed to disengage its economic growth path from the trend of a parallel growth of their emissions. Mitigation for Peru represents potential economic and social benefits against the costs of emissions reduction.	Promotion of renewable energies for the diversification of the energy matrix. The efforts in the shortest implementation time must be directed to increase energy efficiency, to prioritize hydroelectric generation, and to develop the potential of renewable and clean energies.
Uruguay (3a.)	2010	While mitigation is not a priority line of action for Uruguay, because it does not contribute significantly to global emissions and, in addition, it has no quantitative binding commitments in emission reductions, the country pledged to carry out mitigation actions.	To comply with its national energy policy for the 2005-2030 period, measures were directed to promote energy efficiency, diversification of the energy matrix and its integration to society.

Table 1. Summary of the mitigation measures in the energy sector, included in the national communications

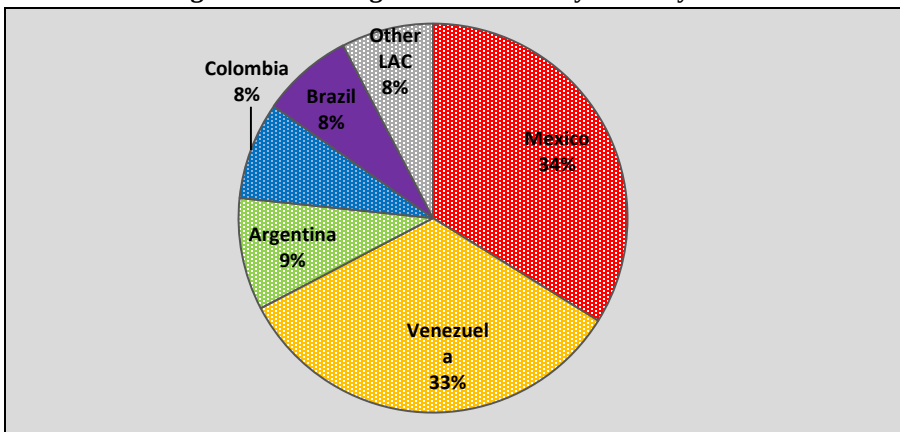
Country	Year	Objective	Programs
Venezuela (1a.)	2005	Mitigation options in the energy sector are possible either through the replacement of energy sources, incorporation of technologies that allow for a more efficient use of energy, or by the adoption of saving practices and energy conservation.	Improving efficiency of the electric industry Change of fuels or replacement of oil fuels by gas

Source: UNFCCC, 2013

Country	Hydro Potential	Wind Potential	Solar Potential	Geothermal Potential	Biomass and Waste Potential
Argentina	HIGH	HIGH	HIGH	HIGH	HIGH
Bahamas	UNKNOWN	MEDIUM	HIGH	UNKNOWN	MEDIUM
Barbados	LOW	HIGH	HIGH	UNKNOWN	LOW
Belize	MEDIUM	HIGH	HIGH	UNKNOWN	UNKNOWN
Bolivia	HIGH	HIGH	HIGH	HIGH	MEDIUM
Brazil	HIGH	HIGH	HIGH	MEDIUM	HIGH
Chile	HIGH	HIGH	HIGH	HIGH	HIGH
Colombia	HIGH	HIGH	HIGH	HIGH	LOW
Costa Rica	HIGH	HIGH	HIGH	HIGH	HIGH
Dominican Republic	HIGH	MEDIUM	HIGH	UNKNOWN	LOW
Ecuador	HIGH	UNKNOWN	HIGH	HIGH	UNKNOWN
El Salvador	HIGH	HIGH	HIGH	HIGH	UNKNOWN
Guatemala	HIGH	HIGH	HIGH	HIGH	HIGH
Guyana	HIGH	MEDIUM	HIGH	UNKNOWN	LOW
Haiti	HIGH	HIGH	HIGH	UNKNOWN	LOW
Honduras	HIGH	HIGH	HIGH	HIGH	HIGH
Jamaica	LOW	MEDIUM	HIGH	HIGH	LOW
Mexico	HIGH	HIGH	HIGH	HIGH	HIGH
Nicaragua	HIGH	HIGH	HIGH	HIGH	HIGH
Panama	HIGH	HIGH	HIGH	UNKNOWN	UNKNOWN
Paraguay	HIGH	HIGH	HIGH	UNKNOWN	MEDIUM
Peru	HIGH	HIGH	HIGH	HIGH	MEDIUM
Suriname	HIGH	LOW	HIGH	UNKNOWN	LOW
Trinidad and Tobago	LOW	LOW	HIGH	UNKNOWN	LOW
Uruguay	HIGH	HIGH	HIGH	UNKNOWN	MEDIUM
Venezuela	HIGH	HIGH	HIGH	LOW	HIGH

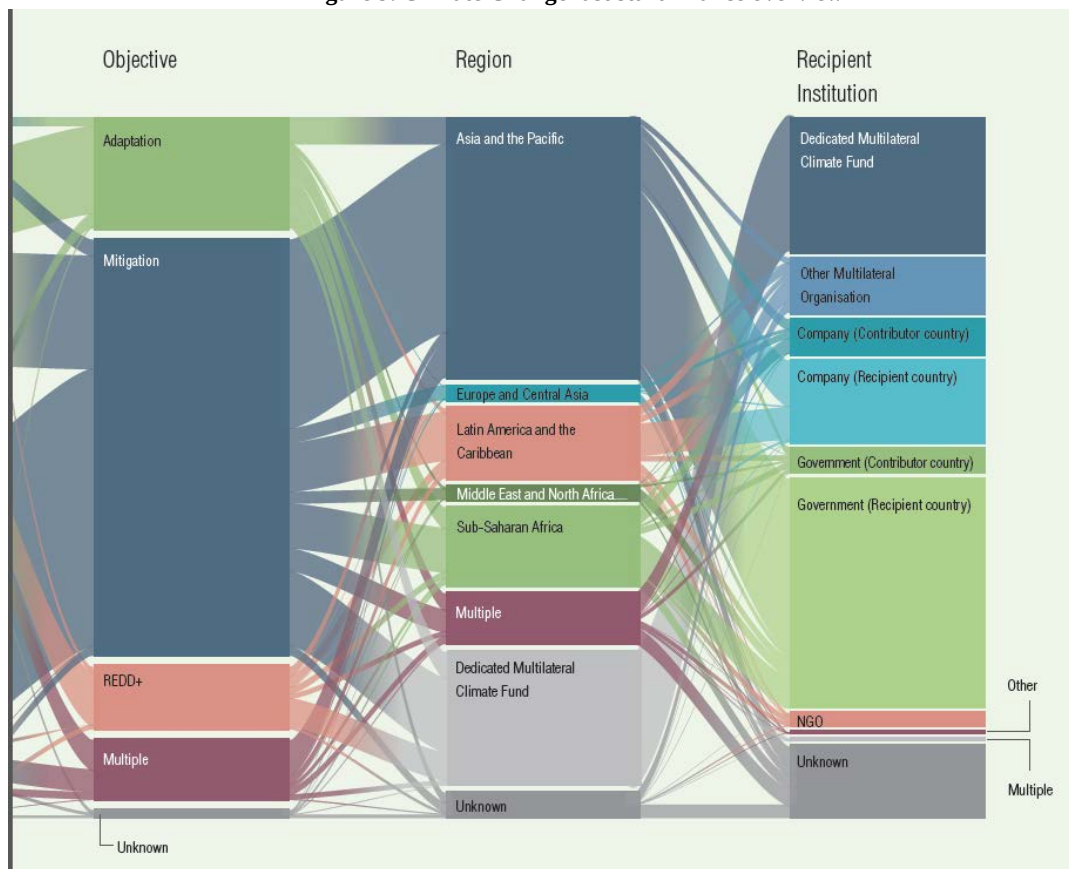
Source: OVE-WWI (2014)

Figure 8. LAC Fugitive Emissions by Country 2009



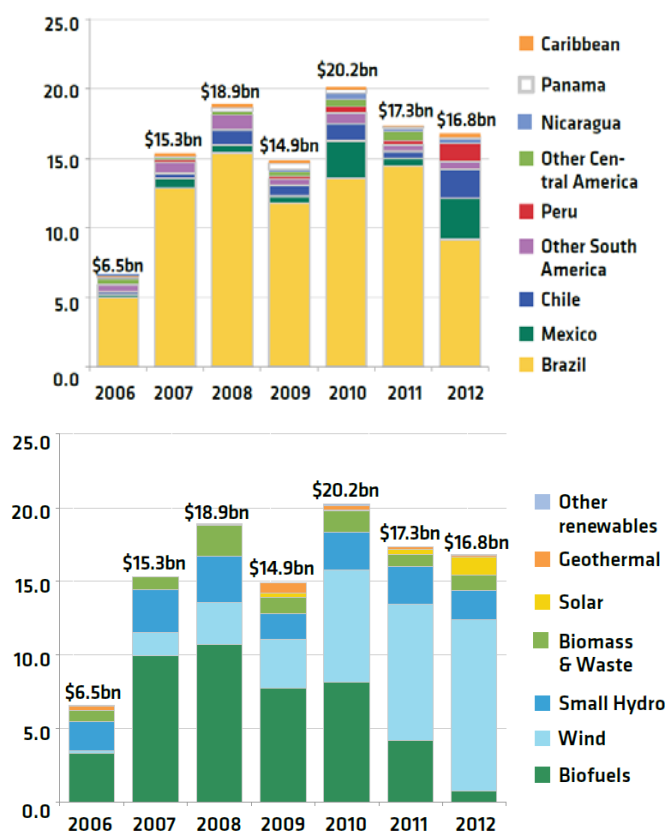
Source : WRI-CAIT (2013)

Figure 9. Climate Change fast start finance overview



Source: Nakhooda et. Al (2013)

Figure 10.LAC Annual Renewable Energy Investments 2006-2012 (US\$ billion)



Source: Climate Scope, 2013

Table 3: Fossil Fuel Subsidies LAC Countries 2011

Country	Total Fossil Fuel Subsidy (Petrol, Gas, Coal and Electricity)	
	<i>In Dollars</i>	<i>As % of GDP</i>
Antigua and Barbuda	\$ 17,807,185	1.58%
Argentina	\$ 16,062,545,485	2.88%
The Bahamas	\$ 110,216,176	1.40%
Barbados	\$ 18,349,380	0.42%
Belize	\$ -	0.00%
Bolivia	\$ 1,336,328,597	5.58%
Brazil	\$ 4,953,389,527	0.20%
Chile	\$ 6,957,196,170	2.77%
Colombia	\$ 1,241,036,080	0.37%
Costa Rica	\$ 131,959,350	0.32%
Dominica	\$ 5,553,741	1.13%
Dominican Republic	\$ 901,107,662	0.27%
Ecuador	\$ 7,738,388,683	10.08%
El Salvador	\$ 173,542,500	0.75%
Grenada	\$ 7,473,778	0.96%
Guatemala	\$ 500,375,292	1.05%
Guyana	\$ 25,766,025	1.00%
Haiti	\$ No data	
Honduras	\$ 77,925,433	0.44%
Jamaica	\$ 64,952,668	0.45%
Mexico	\$ 27,965,044,810	2.39%
Nicaragua	\$ 989,855	0.01%
Panama	\$ 738,605,100	2.22%
Paraguay	\$ -	0.00%
Peru	\$ 835,763,354	0.49%
St. Kitts and Nevis	\$ 8,664,963	1.19%
St. Lucia	\$ 10,626,593	0.82%
St. Vincent and the Grenadines	\$ 5,619,407	0.83%
Suriname	\$ -	0.00%
Trinidad and Tobago	\$ 2,422,090,430	10.23%
Uruguay	\$ 4,723,671	0.01%
Venezuela	\$ 32,914,146,364	10.40%
Total LAC	\$ 105,230,188,276	1.75%
Total World	\$ 1,943,407,743,717	2.72%
LAC IN TOTAL	5.41%	

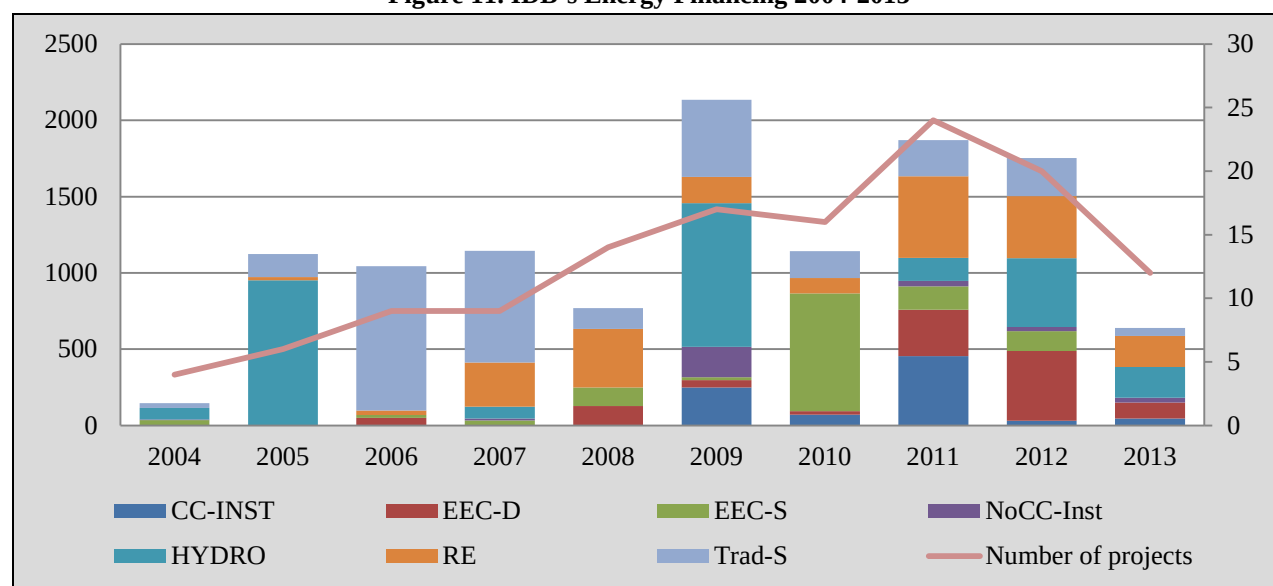
Source: Own calculations data form IMF and World Bank

Chapter II

Table 4. The Sustainable Energy Sector Guidelines (GN-2613). Summary of actions and directions.		
a. Energy efficiency and conservation (EEC) in energy supply and demand		
(i) EEC in energy supply	Rehabilitation of hydroelectric plants: large hydraulic projects in the region are more than 30 years old, and many have electromechanical systems that are reaching the end of their useful life.	The issue to consider is the potential environmental liabilities not addressed by the (original) project.
	Rehabilitation of thermoelectric plants: up-to-date technologies in terms of either efficiency in energy transformation or the emission of local contaminants and GHG.	Environmental liabilities not addressed by the project.
	Rehabilitation of energy transmission and distribution grids: prevent technical losses, leaks, etc. with a direct impact on the reduction of GHG emissions.	Management of polychlorinated biphenyls (PCBs) present in transformers, as well as the final disposal of equipment.
	Regional integration for energy transportation and exchange: generate economies of scale and increase efficiency in terms of generation costs and GHG emissions.	Regulatory framework, compatibility between energy and economic markets, economic risk for each stakeholder.
(ii) EEC in final energy demand	EEC on the final energy demand side: overcome information, regulatory, and financing barriers.	Proper disposal of energy saving equipment and cost-benefit studies of EEC technologies.
	Introduction of electricity smart grids: make it possible to increase efficiency and conservation, in addition to the use of renewable energies.	Social feasibility studies, social awareness and users.
	EEC using renewable energies: generates energy savings for users.	Regulatory framework
b. Low-carbon technologies (LCTs)		
(i) Renewable energies	New hydroelectric projects: changes in hydrological cycles will affect the potential of the current and future energy infrastructure.	Should have a positive GHG balance, environmental and social feasibility, and reduce environmental impacts, run of the river and reservoirs with smaller surface.
	Wind energy: absence of stable and long-term regulatory conditions; lack of infrastructure including transmission facilities; lack of financial mechanisms; and limited technological know-how.	Increase information, detailed assessment of the fit between technology and specific resources conditions, and in addition to traditional environmental impact studies, birds and bats must be counted and observed.
	Solar energy: technologies are already competitive in LAC regions with high energy prices, without the need for an additional subsidy.	
	Geothermal energy: limited know-how and lack of local experts, together with the high costs of project development.	Identification of potential resources and more detailed feasibility studies.
	Bioenergy: comply with the sustainability criteria set out in the guidelines and the sustainable biofuels toolkit.	Alternative use of land, deforestation should be avoided, better labor conditions and social protection.

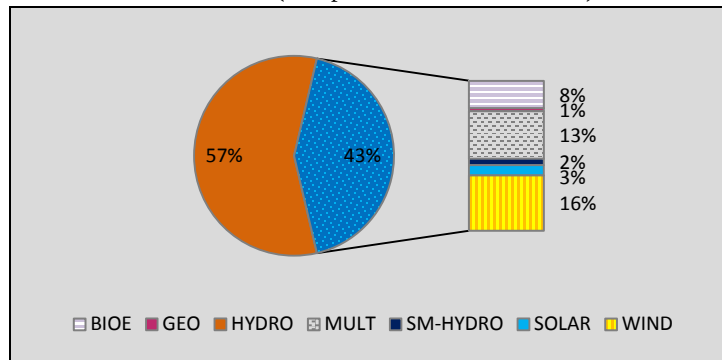
Table 4. The Sustainable Energy Sector Guidelines (GN-2613). Summary of actions and directions.		
	Waste-to-energy (WTE): environmental and economic feasibility studies to provide its clients with better knowledge of this alternative.	Complete specific studies on the availability and nature of waste and social impact evaluation and mitigation measures.
	Oceanic energy	
	Distributed generation using renewable energies: reduce the costs of electricity transmission, transformation and distribution.	Equipment suppliers and providers of post-sale services, it is critical to have a regulatory framework that is favorable to this measure.
c. Other investments in types of traditional supply in the energy sector		
(i) New electricity generation projects using fossil fuels.	To be considered within the Bank's climate change mitigation objectives, these projects must be included as part of each country's SEAP, without detriment to the Bank's ability to finance them outside the scope of climate change mitigation, if they satisfy the Bank's other eligibility criteria.	
(ii) New electricity transmission and distribution grids or transportation of liquid and gas fuels, including liquefaction and regasification of natural gas.	These new projects should be designed to achieve greater efficiencies in the existing system.	
(iii) Efficient use of fossil fuels:	For countries that produce fossil fuels, efficient management of those fuels, optimum use of fossil resources for local consumption, combined with the promotion of renewable energies.	

Figure 11. IDB's Energy Financing 2004-2013



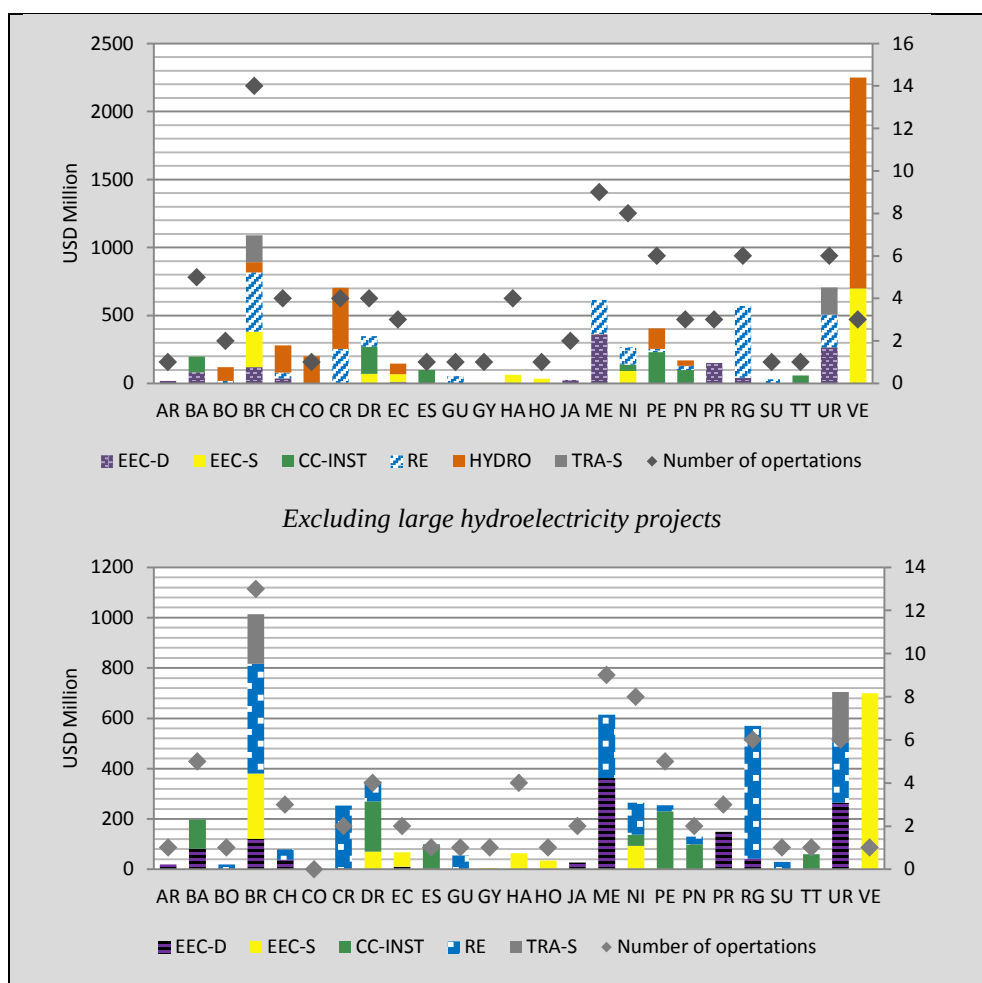
Source: Own calculations, data from OVE/OVEDA

**Figure 12 Renewable energy investments by technology
2004-2013 (43 operations, US\$ 5 billion)**



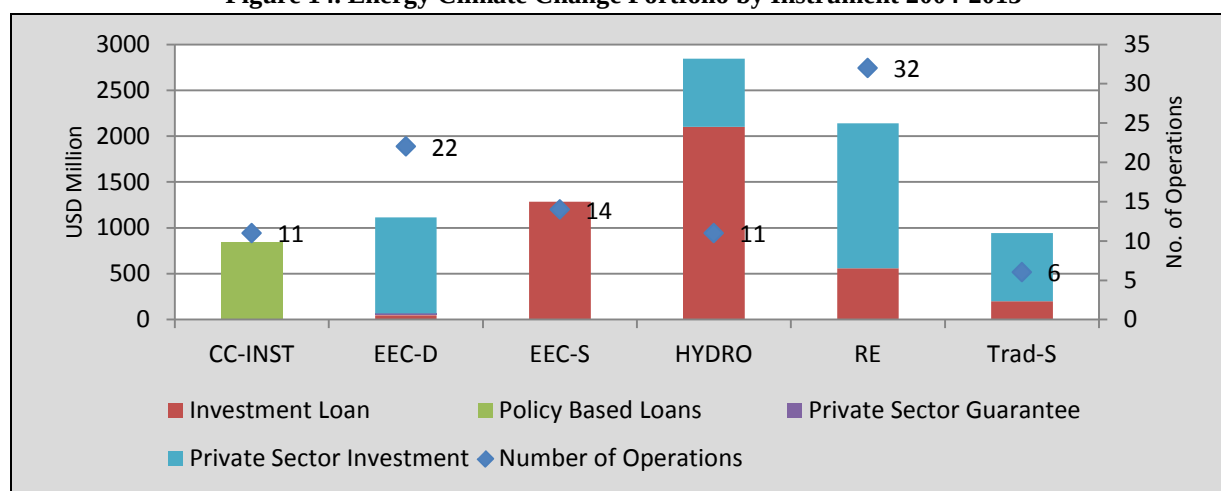
Source: Own calculations, data from OVE/OVEDA

Figure 13. Energy Climate Change Portfolio by country 2004-2013



Source: Own calculations, data from OVE/OVEDA

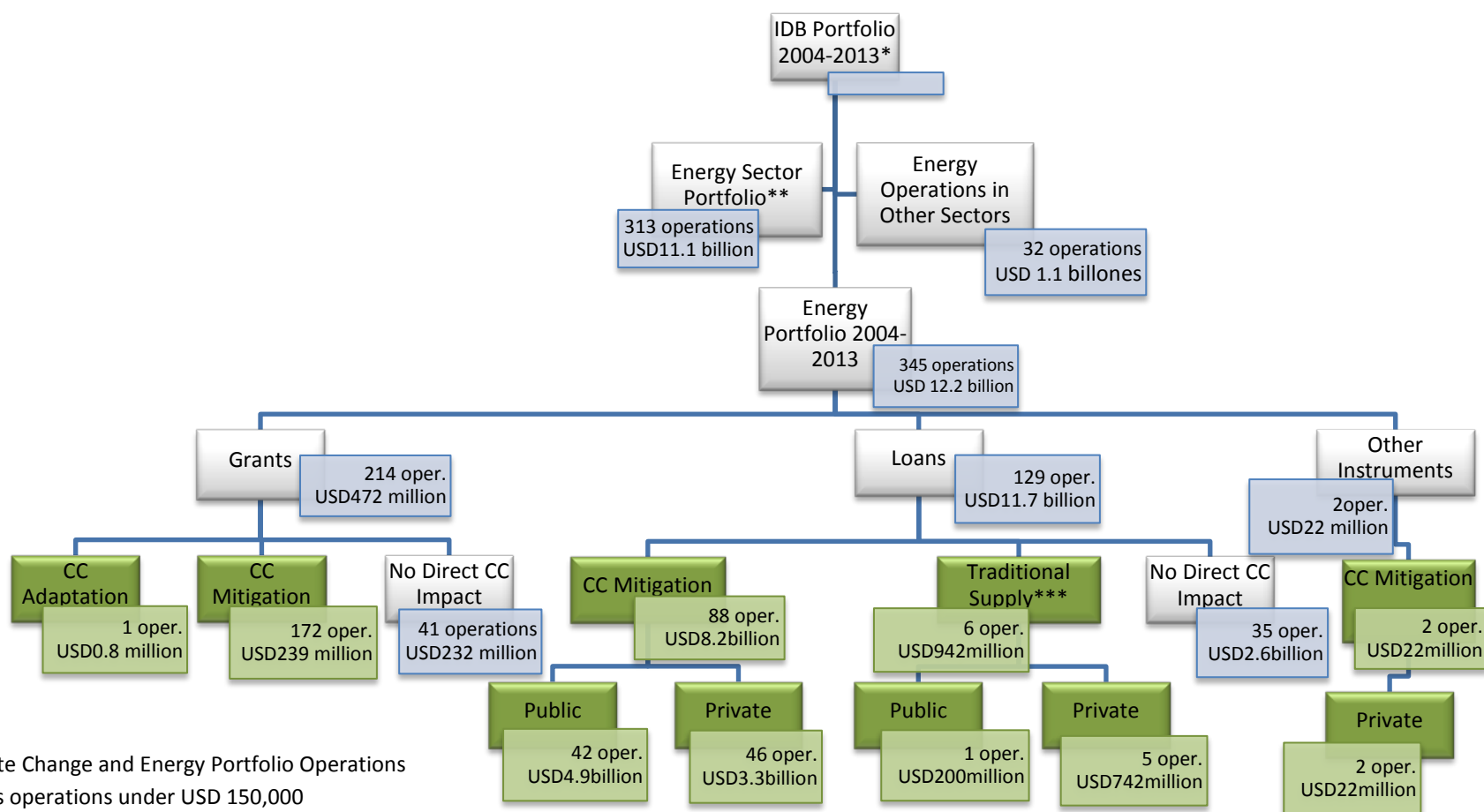
Figure 14. Energy Climate Change Portfolio by Instrument 2004-2013



Source: Own calculations, data from OVE/OVEDA

Annex 2. Climate Change and Energy Evaluation Portfolio Methodology

Figure 1 Climate Change and Energy Portfolio Diagram



■ Climate Change and Energy Portfolio Operations
 *Excludes operations under USD 150,000
 ** Sector code: EN
 ***Only operations with CC impact (thermoelectricity, natural gas, oil production)

Identifying IDB energy operations 2004-2013¹:

Between 2004 and 2013, the Bank approved 314 operations and US\$11.1 billion dollars in the energy sector (Sector Code: EN). Additionally, the Bank approved 32 (US\$1.1 billion) energy operations in other sectors such as agriculture, water and sanitation, and industry (these operations were identified using a key word search).

As a result, the evaluation identified a total 346 energy operations approved between 2004 and 2013 equivalent to USD 12.2 billion dollars (See Figure 1).

Selection Criteria for the Climate Change and Energy Portfolio:

For the purpose of this evaluation, OVE built a Climate Change and Energy Portfolio including all energy operations that were considered to have direct impacts in climate change. The criteria used to determine whether or not operations had direct climate change impacts were the following:

1. Energy operations were classified in 5 main areas of intervention and 22 activities based on the IDB Sustainable Energy Guidelines 2011. This classification allowed grouping operations according to their objectives and to better understand their potential impacts on climate change (See table 1).
2. In the case of sovereign guaranteed loans, the evaluation also took into account the presence of climate change related indicators (See Box 1). As a result, only those SG loans which had at least one climate change related indicator in their results matrix² were included in the Climate Change and Energy Portfolio.

Box 1. Climate Change Related Indicators in the Energy Sector:

1. GHG emissions reductions (tCO₂_{eq})
2. Additional renewable energy installed capacity (MW).
3. Additional electricity generation with renewable energy (GWh).
4. Energy savings (GWh).
5. Reduction of energy losses (% of energy supply).

After applying the selection criteria, OVE identified 267 operations, equivalent to US\$8.6 billion in activities with direct impacts in climate change.

¹ The evaluation excluded operations under US\$150,000, as well as MIF and IIC operations.

² With the exception of a hydroelectric project that was included in the portfolio because of its obvious climate change mitigation impact.

Table 1. Energy and Climate Change Project Classification

Main Area	Climate Change Impact	Activities ³
A. Energy efficiency and conservation (EEC) in supply.	Climate Change Mitigation	i. Rehabilitation of hydroelectric power plants
		ii. Rehabilitation of energy transmission and distribution grids
		iii. Energy efficiency in the extraction, production and transportation of fossil fuels and natural gas.
B. Energy efficiency and conservation (EEC) in final energy demand ⁴	Climate Change Mitigation	i. EEC on the final energy demand side (direct financing of efficient technologies)
		ii. Introduction of electricity smart grids
		iii. EEC using renewable energies (RE in thermal applications in residential, commercial, services, industrial, and agricultural sectors that generate energy savings for users).
C. Renewable energies (RE)	Climate Change Mitigation	i. New hydroelectric projects
		ii. Wind energy
		iii. Solar energy
		iv. Geothermal energy
		v. Bioenergy
		vi. Waste-to-energy (WTE)
		vii. Oceanic energy
		viii. Distributed generation using RE
		ix. Small hydroelectric projects ⁵
		x. Multiple technologies ⁶
D. Other ⁷ investments in types of traditional supply in the energy sector	Climate Change Impact (Emissions)	i. New electricity generation projects using fossil fuels:
		i.a New coal-fired plants
		i.b Plants that use liquid fuels
		i.c Natural gas combined-cycle plants
	Not direct impact on climate change mitigation or adaptation.	ii. New electricity transmission and distribution grids or transportation of liquid and gas fuels, including liquefaction and regasification of natural gas.
		iii. Fossil Fuels Production ⁸
E. Regulatory framework, institutional-strengthening and capacity building	Climate Change Mitigation	i. Regulatory and policy changes that promote EEC and RE.
	Not direct impact on climate change mitigation or adaptation.	ii. Other policy and regulatory operations in the energy sector

³ For the purposes of this evaluation, some activities were added, changed and removed compared to those in the guidelines. The following footnotes show the differences between the guidelines and this table.

⁴ A sub-category for EEC measures in transportation was excluded given that the transport sector was excluded from climate change and energy part of the evaluation and will present its own.

⁵ Small hydroelectricity projects were separated from large hydroelectricity power plants.

⁶ This activity was added to classify projects that financed multiple RE technologies.

⁷ This evaluation did not add rural electrification as a main area of intervention. Instead, it classified these operations according to the technologies used.

⁸ This activity replaced efficient use of fossil fuels.

⁹ Regional integration projects were moved from EEC in Supply to investments in traditional supply of energy.

Table 2. List of SG operations considered

Category	Sub-Category	Number	Name
EEC Demand	EEC final demand	BA-L1020	Sustainable Energy Investment Program
EEC Demand	EEC final demand	BA-L1025	Public Sector Smart Energy (PSSE) Program
EEC Demand	EEC final demand	JA-L1025	Energy Efficiency and Conservation Programme
EEC Supply	Rehabilitation of hydroelectric power plant	BR-L1278	Rehabilitation for the Furnas and Luiz Carlos Barreto Hydroelectric Power Plant
EEC Supply	Rehabilitation of transmission and distribution grids	BR-L1284	Pro-Energy RS Distribution
EEC Supply	Rehabilitation of transmission and distribution grids	DR-L1026	Electricity Distribution Network Rehabilitation Project
EEC Supply	EEC supply of fossil fuels and natural gas	EC-L1040	Modernization of Pumping Stations on the Esmeraldas-Quito Multiproduct Pipeline
EEC Supply	Rehabilitation of transmission and distribution grids	GY-L1037	Sustainable Operation of the Electricity Sector and Improved Quality of Service
EEC Supply	Rehabilitation of transmission and distribution grids	HA-L1014	Rehabilitation of Electricity Distribution System in Port au Prince
EEC Supply	Rehabilitation of hydroelectric power plant	HA-L1032	Péligre Hydroelectric Plant Rehabilitation Program
EEC Supply	Rehabilitation of transmission and distribution grids	HA-L1035	Rehabilitation of the Electricity Distribution System in Port-au-Prince
EEC Supply	Rehabilitation of hydroelectric power plant	HA-L1038	Supplementary Financing for the Peligre Hydroelectric Plant
EEC Supply	Rehabilitation of transmission and distribution grids	HO0224	PPP Support to Rural Electrification and to the Energy Sector
EEC Supply	Rehabilitation of transmission and distribution grids	NI-L1021	Electricity Sector Support Program
EEC Supply	Rehabilitation of hydroelectric power plant	NI-L1022	Electricity Sector Support Program Second Loan
EEC Supply	Rehabilitation of transmission and distribution grids	NI-L1036	Electricity Sector Support Program Third Financing
EEC Supply	Rehabilitation of hydroelectric power plant	VE-L1033	Rehabilitation of Units 1 to 6 of Powerhouse I Simón Bolívar Hydroelectric Plant
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	BA-L1021	Support for Sustainable Energy Framework For Barbados (SEFB) II
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	BA-L1022	Support for Sustainable Energy Framework for Barbados (SEFB) I
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	DR-L1050	Power Sector Sustainability and Efficiency Program
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	ES-L1059	Programatic Support to the Agenda of Structural Reforms in electric energy
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	NI-L1074	Program to Strengthen the Electricity Sector in Nicaragua
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	PE-L1054	Energy PBL
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	PE-L1055	Development of a New Sustainable Energy Matrix, Program II
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	PE-L1061	Development of a New Sustainable Energy Matrix Program I
Institutions and	Regulatory and policy	PE-L1121	Development of a New Sustainable Energy Matrix Program IV

Category	Sub-Category	Number	Name
capacity building	changes that promote EEC and RE		
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	PN-L1033	Energy Sector Consolidation Support Program I
Institutions and capacity building	Regulatory and policy changes that promote EEC and RE	TT-L1023	Sustainable Energy for Trinidad and Tobago
Renewable Energy	Hydroelectricity	BO-L1043	Misicuni Renewable Energy Hydroelectric Project
Renewable Energy	Multiple	BO0224	Rural Electrification
Renewable Energy	Small Hydroelectric	BR-L1303	CEEE Generation and Transmission Project
Renewable Energy	Hydroelectricity	CO-L1005	Porce III Hydroelectric Power Plant
Renewable Energy	Multiple	CR-L1009	First Electric Power Sector Development Program 2008-2011
Renewable Energy	Hydroelectricity	CR-L1049	Power Sector Development Program 2012-2016 (Reventazon Hydroelectric Project)
Renewable Energy	Multiple	GU-L1018	Multiphase Rural Electrification Program - Phase I
Renewable Energy	Multiple	NI-L1040	National Sustainable Electrification and Renewable Energy Program (PNESER)
Renewable Energy	Multiple	NI-L1050	National Sustainable Electrification and Renewable Energy Program (PNESER) II
Renewable Energy	Multiple	NI-L1063	National Sustainable Electrification and Renewable Energy Program III
Renewable Energy	Multiple	PN0150	Rural Electrification Program
Renewable Energy	Multiple	SU-L1009	Support to Improve Sustainability of the Electricity Service
Renewable Energy	Hydroelectricity	VE-L1003	Tocoma Hydroelectric Power Plant
Renewable Energy	Hydroelectricity	VE-L1026	Manuel Piar (Tocoma) Dam Supplemental Financing
Traditional supply	Natural gas combined-cycle plant	UR-L1070	Punta del Tigre Combined Cycle Power Generation Project

Table 3. Energy and Climate Change Project Classification

Category	Sub-Category	Number	Name
EEC demand	EEC final demand	AR-L1089	Loma Negra
EEC demand	EEC final demand	BA-L1027	Four Seasons Barbados
EEC demand	EEC final demand	BR-L1118	Gerdau Açominas Investment Program
EEC demand	EEC final demand	CR-L1045	Marriott Courtyard Alajuela
EEC demand	EEC final demand	JA-L1045	Caribe Hospitality Kingston
EEC demand	EEC final demand	ME-L1069	BBVA Bancomer Green Facility
EEC demand	EEC final demand	ME-L1110	Etileno XXI
EEC demand	EEC final demand	ME-L1124	Vinte Viviendas Integrales SAPI de CV
EEC demand	EEC final demand	ME-L1153	VINTE, Viviendas Integrales S.A.P.I. de C.V. II
EEC demand	EEC final demand	PR-L1054	Tupi Cement
EEC demand	EEC final demand	PR-L1073	Electroban SAECA: Productive financing for BoP microentrepreneurs
EEC demand	EEC using renewable energy	BR-L1017	Coke Production and Integrated Cogeneration
EEC demand	EEC using renewable energy	BR-L1194	Usiminas Energy Efficiency Investments
EEC demand	EEC using renewable energy	CH-L1056	Energia Pacifico S.A. Biomass Cogeneration Plant
EEC demand	EEC using renewable energy	CH-L1063	Subsole
EEC demand	EEC using renewable energy	EC-L1063	La Internacional
EEC demand	EEC using renewable energy	PR-L1071	Promoting Soybean Industrialization in Paraguay (CAIASA)
EEC demand	EEC using renewable energy	UR-L1059	Estancias del Lago
EEC demand	EEC using renewable energy	UR-L1068	Montes del Plata
Renewable Energy	Bioenergy	BR-L1107	Ituiutaba Bioenergy Project
Renewable Energy	Bioenergy	BR-L1108	Campina Verde Bioenergy Project
Renewable Energy	Bioenergy	BR-L1113	Moema Biofuel Project
Renewable Energy	Bioenergy	BR-L1170	Itumbiara Bioenergy Project
Renewable Energy	Bioenergy	PE-L1082	Maple Ethanol Project
Renewable Energy	Bioenergy	RG-L1019	Regional Sugar and Bio-Energy Program
Renewable Energy	Geothermal	NI-L1057	San Jacinto-Tizate Geothermal Power Project
Renewable Energy	Hydroelectricity	BR0370	Campos Novos Hydroelectric Power Project
Renewable Energy	Hydroelectricity	CH-L1067	Alto Maipo Hydroelectric Power Project
Renewable Energy	Hydroelectricity	CR-L1056	Reventazon Hydroelectric Power Project
Renewable Energy	Hydroelectricity	EC-L1026	Baba Hydroelectric Project
Renewable Energy	Hydroelectricity	PE-L1113	Chaglla Hydroelectric Power Project
Renewable Energy	Hydroelectricity	PN-L1054	Pando-Monte Lirio Hydroelectric Power Project
Renewable Energy	Multiple	RG-L1045	Abengoa Line of Credit
Renewable Energy	Solar	CH-L1069	Pozo Almonte and Calama Solar Photovoltaic Power Project
Renewable Energy	Solar	RG-L1030	Fundacion Covelo - Renewable Energy Solutions for Rural Populations in Central A
Renewable Energy	Solar	RG-L1050	Isolux Corporate Loan
Renewable Energy	Wind	BR-L1173	TECSIS
Renewable Energy	Wind	DR-L1049	Bani Wind Power Project
Renewable Energy	Wind	DR-L1051	PECASA Wind Power Project
Renewable Energy	Wind	ME-L1068	Eurus Wind Project
Renewable Energy	Wind	ME-L1076	EDF-La Ventosa Wind Project
Renewable Energy	Wind	ME-L1099	Eurus Wind Project - CTF Loan
Renewable Energy	Wind	ME-L1107	Mareña Renovables Wind Project
Renewable Energy	Wind	ME-L1125	BNS2 Wind Power Corporate Loan
Renewable Energy	Wind	RG-L1042	IMPSA Wind Energy Investment Program
Renewable Energy	Wind	UR-L1077	El Libertador Wind Project
Renewable Energy	Wind	UR-L1080	Palmatir Wind Project
Renewable Energy	Wind	UR-L1086	Carape I & II Wind Power Project
Traditional supply	Fossil fuel production	BR-L1120	Delba Vessel
Traditional supply	Fossil fuel production	BR-L1294	Delba Vessel - Second Phase
Traditional supply	Fossil fuel production	PE-L1016	Peru LNG Project
Traditional supply	New thermoelectric power plant	BR-L1192	TermoMaranhao Thermoelectric Power Plant Project
Traditional supply	New thermoelectric power plant	BR-L1193	Pécem Thermoelectric Power Plant Project

Annex 3. Evaluation of the SG projects in the portfolio.

BA-L1021	Support for Sustainable Energy Framework For Barbados (SEFB) II	2011	70000000	100%	The general objective of this second energy sector Policy-Based Programmatic Loan (2nd Energy PBP, or the Operation) is to reduce Barbados' dependency on fossil fuels by diversifying the country's energy matrix and promoting sustainable energy.
BA-L1022	Support for Sustainable Energy Framework for Barbados (SEFB) I	2010	45000000	100%	This is a programmatic policy based loan that will be disbursed in a single tranche of US\$45 million once the operation is eligible for disbursement and the authorities of the Government of Barbados have provided the Bank at its satisfaction wi
DR-L1050	Power Sector Sustainability and Efficiency Program	2011	200000000	100%	To initiate the reform process with policy measures that will provide a basis for the institutional, planning, and regulatory changes the sector needs, to ensure that an electricity policy is properly applied, that the planning process for expa
ES-L1059	Programatic Support to the Agenda of Structural Reforms in electric energy	2011	100000000	100%	The program is base in two tranches supporting policy and institutional measurements. The components are macroeconomic stability, improvement and consolidation of institutional framework; promotion of renewable energy, bioenergy and energy effi
NI-L1074	Program to Strengthen the Electricity Sector in Nicaragua	2013	45000000	63%	The proposed Program aims to reduce the oil bill and the tax burden representing to the GONI by both the financial insolvency of the electricity sector and consumer subsidies.
PE-L1054	Energy PBL	2011	25000000	100%	This operation, as part of the development of a New Sustainable Energy Matrix (NUMES) includes: (i) key actions to address the problems described, accompanying the development of diagnostic and technical dialogues, (ii) sectoral policy public c
PE-L1055	Development of a New Sustainable Energy Matrix, Program II	2010	25000000	100%	This operation, as part of the development of a New Sustainable Energy Matrix (NUMES) includes: (i) key actions to address the problems described, accompanying the development of diagnostic and technical dialogues, (ii) sectoral policy public c
PE-L1061	Development of a New Sustainable Energy Matrix Program I	2009	150000000	100%	The development and exploitation of its natural endowment of energy resources poses challenges for Peru. Included among the specific challenges to be faced are the managed growth of the hydrocarbons sector, specific issues related to the introd
PE-L1121	Development of a New Sustainable Energy Matrix Program IV	2012	30000000	100%	This operation is part of and completes the development of a New Sustainable Energy Matrix (NUMES) supporting: (i) key actions to address the problems described, accompanying the development of diagnostic and technical dialogues, (ii) sectoral
PN-L1033	Energy Sector Consolidation Support Program I	2009	100000000	100%	The program will support the policy reforms under a programmatic PBL-Program. The program will consist of three one-tranche loans each, with a medium-term framework of institutional and policy measures in the energy sector. The program will sup
TT-L1023	Sustainable Energy for Trinidad and Tobago	2011	60000000	100%	Support the Government of Trinidad and Tobago in the preparation of a sustainable energy program that will focus primarily on renewable energy, energy efficiency and conservation and optimization of fossil fuel based

Barbados

1. The Barbados Program constituted an integral intervention in the energy sector that, besides the two PBLs, integrated other lending operations and several technical cooperations for a total amount of US\$ 208.2 million. This program included (see table):
 - a. Two PBL operations and four technical cooperations associated to the objective of: reducing the country's high dependence on imported hydrocarbon fossil fuels, improving the competitiveness of the country in the reduction of energy costs; and promoting the environmental sustainability of the energy sector through the incorporation of renewable energy sources and end-use energy efficiency.
 - b. Two loans for the creation of energy efficiency funds, one for the private sector (*Smart fund*), and another for the public sector (*public sector Smart energy*).
 - c. Two operations for the implementation of efficiency measures, one with the private sector (Four Seasons Hotel) and an EU concessional fund, administered by IDB, to improve efficiency in energy consumption in the public sector.

The portfolio in the energy sector with impacts on climate change mitigation

BA-L1020	Sustainable Energy Investment Program	2010	10,000,000	Project Objectives. The objective of this project is to facilitate the increasing use of RE and implementation of EE measures through the creation of the Smart Fund, a package of economic instruments, that will facilitate funding for investment
BA-L1021	Support for Sustainable Energy Framework For Barbados (SEFB) II	2011	70,000,000	The general objective of this second energy sector Policy-Based Programmatic Loan (2nd Energy PBP, or the Operation) is to reduce Barbados' dependency on fossil fuels by diversifying the country's energy matrix and promoting sustainable energy.
BA-L1022	Support for Sustainable Energy Framework for Barbados (SEFB) I	2010	45,000,000	This is a programmatic policy based loan that will be disbursed in a single tranche of US\$45 million once the operation is eligible for disbursement and the authorities of the Government of Barbados have provided the Bank at its satisfaction wi
BA-L1025	Public Sector Smart Energy (PSSE) Program	2012	17,000,000	The objective of this Program is to promote and implement the use of Renewable Energy (RE) and Energy Efficiency (EE) measures through the creation of the Public Sector Smart Energy (PSSE) Program. Ultimately, the project will help to reduce Ba
BA-L1027	Four Seasons Barbados	2012	55,000,000	The proposed project consists of the financing of a 110-key Four Seasons Hotel at Clearwater Bay, on the west coast of Barbados. The Hotel is part of a larger, partially-constructed project, the Four Seasons Resort and Private Residences (the "
BA-T1007	Sustainable Energy Framework for Barbados	2009	1,000,000	The technical cooperation entails a series of consulting services that will measure the potential of renewable energy sources, the adoption of energy efficiency practices and the potential of bioenergy. Based on these findings the TC will facili
BA-T1008	Support Studies for the Upgrade and Expansion of the Natural Gas Network	2009	500,000	The technical cooperation will analyze the technical, economic and environmental implications of the three natural gas import options being analyzed by the Government: shipped Liquefied Natural Gas; shipped Compressed Natural Gas; and Comprese
BA-T1016	Support to the Preparation of Program BA-L1021	2011	1,000,000	Support the preparation of the Support for Sustainable Energy Framework for Barbados Program-Phase II (BA-L1021)
BA-X1001	Support to the Sustainable Energy Framework for Barbados	2010	1,000,000	The GEF operation will support the implementation of pilot projects for Barbados in the areas of energy efficiency and renewable energy. The pilot projects will be based on the findings of the studies carried out through the technical cooperati
BA-X1003	Support for the Public Sector Smart Energy Program	2012	7,700,000	The Support to the Public Sector Smart Energy Program (PSSE) is a Grant funded by the European Union (EU) and managed by the IDB under the bilateral agreement signed between the EU and IDB. This Project Specific Grant (PSG) will be executed in

- The Bank's intervention in the energy sector in Barbados was very relevant to the challenges in the energy sector and had an impact on the macroeconomic equilibrium of the country.** On the contrary, the intervention is of very low relevance in terms of their overall contribution to the mitigation of climate change. In fact, the GHG emissions of an economy such as that of Barbados are insignificant in the international stage. However, one of the central problems of the economy is the impact of imports of hydrocarbons on the national accounts and high domestic prices of electricity that affect national competitiveness¹. In such circumstances, it is a win-win strategy, highly relevant as it promotes public policies aimed at transforming the energy matrix replacing imported fossil fuels by renewable energies, accompanied by an intense program of improvements in use efficiency.
- The new sustainable energy matrix relies on a strategy of economically viable technologies of RE and EE.** Both PBLs had institutional strengthening, capacity building, and public education and awareness of sustainable energy as components. The first PBL

¹ Electricity prices in Barbados are some of the highest in the region: Residential rate: US\$0.30 /kWh. Non-residential rate: US\$0.33 /kWh. The Government of Barbados has subsidized the clause for fuel adjustment between December 2007 and November 2008, a period in which crude was usually quoted at more than US\$100 a barrel. For the government, the total cost of the 12 subsidy was approximately US\$18 million and was abandoned as part of the government fiscal consolidation program (BA-L1021).

provides policies and regulatory recommendations in these areas, while the second PBL considered that the Cabinet adopted the recommendations provided by the first PBL in these areas, including the filling of four technical positions in the Energy and Telecommunications Division to strengthen the capacities for the energy initiatives adopted under the PBLs. While the policies under the SEFB I & II were developed and passed by the GOBA parliament, executing units were created for the two investment loans (the Smart Fund and the PSSE), and an increase in renewable energy has been observed (in the form of solar power), much of the implementation of the energy efficiency and renewable energy measures funded by the investment loans, are still in the planning and pre-implementation stages².

El Salvador

4. **The programmatic intervention of the Bank in the energy sector of El Salvador was oriented to support structural reforms in the power sector, to include the creation of a new energy matrix.** In fact, during the 2004-2013 period, the Bank approved a set of eight technical cooperations whose efforts were consolidated into a programmatic operation in 2011, consisting of a PBL for US\$100 million to support the agenda of structural reforms in the power sector. In addition, the Bank approved in 2009 a non-financial product (NFP) in order to identify the challenges and options for the development of the Salvadorian electric sector (ES-N1025) followed by an update in 2011. Later, in 2012, the Bank approved two regional technical cooperations based in ES aimed at enhancing the technical capabilities for the development of geothermal energy.

² Barbados, technical note for the CPE. OVE, 2013

El Salvador. The portfolio in the energy sector with impacts on climate change mitigation

Operation Number	Operation Name	Approval Year	Originally Approved Amount	Available Balance	Operation Status
ES-T1147	Geothermal Regional Training Support Program	2012	823999	618919.75	Active
ES-X1004	Geothermal Regional Training Support Program	2012	1248221.28	299704.29	Active
ES-L1059	Support to the Agenda of Structural Reforms Electric energy	2011	100000000	0	Completed
ES-T1096	Biofuels Action Plan Development	2008	750000	0	Completed
ES-T1119	Energy Efficiency Program	2008	666200	0	Completed
ES-T1077	Sugar cane ethanol plant pre-feasibility study	2007	145000	0	Completed
ES-T1069	Support for the Implementation of the Country Energy Policy	2007	149000	0	Completed
ES-T1057	Feasibility of Producing Biodiesel	2006	73360	0	Canceled
ES-T1030	Studies on Dam Safety for Hydroelectric Power Plants	2006	199984	0	Canceled
ES-T1061	Power Sector Generation Indicative Planning	2006	145000	0	Completed
ES-T1007	Support for MINEC on Power Markets	2004	145000	0	Completed

The program funded by the Bank supported the consolidation of institutional and regulatory reforms that had been taking place since 2003 and promoted the development of renewable sources. In fact, in addition to conditionalities in the macroeconomic level, the Bank's intervention consolidated actions directed to³: (i) improving and strengthening the institutional capacities in the energy sector and, in particular, of the newly created National Energy Commission; (ii) promotion of the process to integrate the Regional Electricity Market; (iii) promotion of renewable energies and energy efficiency through legal and regulatory reforms; and (iv) promotion of regulatory changes to move forward with the incorporation of private initiative in projects of RE. In fact, the PBL collected a set of reforms that had already been made or were in the process of approval, which strengthened reforms in the Salvadorian electricity sector. The Bank supported the GoES process through four technical cooperations.

The conditions established in the PBL were fulfilled in its entirety and the second stage was expecting approval. In fact, the Government of El Salvador reported⁴ that all the conditions required to authorize the disbursement had been fulfilled and that this was the first of two

³ ES-L1059 Loan Document. 2011

⁴ Report of the compliance of special conditions prior to disbursement. Loan Contract No. 2570/OC-ES. 15-11-2011.

operations in a single section each, technically linked to each other, but independently funded. In spite of this, the second section of the PBL was not approved.

The fiscal urge of GoES prevailed over the objectives of the energy transformation strategy and drove the reorientation of the Bank's resources. The discussion on the second stage occurred in an environment of strong fiscal constraints for the Government. Unlike the first PBL, the conditions for the disbursement of the second stage were not yet implemented, and consequently the timely disbursement of resources was not ensured. Paradoxically, the GoES and the Bank agreed to reorient the PBL towards the area of climate change with superficial conditionalities, easier to fulfill that allowed the timely disbursement of resources. As a result, the Bank limited its involvement in the reform process of the Salvadorian energy sector and, while changes are maintained, the process lost momentum⁵.

Peru

The Bank's intervention in Peru through PBL loans was the most ambitious and far-reaching of the portfolio under evaluation. It is a series of four consecutive PBL operations, for a total of US\$ 230 million, with the aim of supporting the development of a new sustainable energy matrix (NUMES) based on technical, economic, environmental, and social considerations to maximize the benefits of renewable energy sources. In addition, set of non-refundable technical cooperations was approved, which helped supporting the executing agency (MEM) in achieving the conditions established in the program. Moreover, a credit line was approved for the private sector (Green lending) as well as two operations with the private sector to finance electricity generation from renewable energy (see table).

Perú. The portfolio in the energy sector with impacts on climate change mitigation

Operation Number	Group	US\$ 000	Year	Operation Name
PE-L1061	NUMES PBLs		2009	Program for the Development of a New Sustainable Energy Matrix I
PE-L1055			2010	Program for the Development of a New Sustainable Energy Matrix II
PE-L1054			2011	Energy PBL (Program for the Development of a New Sustainable Energy Matrix III)
PE-L1121			2012	Program for the Development of a New Sustainable Energy Matrix IV
PE-T1145	NUMES TCs		2008	Support for the Energy Strategy of Peru
PE-T1146			2008	Strategic Plan for Sustainable Energy and Bioenergy for Peru (PEESB)
PE-T1105			2011	Support for the New Sustainable Energy Matrix - NUMES III
PE-X1007			2012	Program for the Efficient and Sustainable Management of Energy Resources

⁵ Information provided by the Government of El Salvador during an assessment interview conducted by OVE, April 2014.

The Bank's intervention supporting the development of a New Sustainable Energy Matrix (NUMES) responded to the country's need to generate a comprehensive energy planning taking into account technical, social, economic, and environmental aspects in accordance with Peru's development goals. Specifically, the operations supported three lines: the development of institutional capacity for energy planning, the development of the regulatory framework, and the studies that would facilitate decision-making.

The results established in the PBLs were achieved in terms of studies and reports and the creation of a long-term goal matrix. The commitments of purchased products both in the policy matrix as in the results of the PBL were met. One of the technical results of greater importance for the NUMES program was the study of "New sustainable energy matrix and strategic environmental assessment as planning tools". The study developed scenarios of power generation in 2040 taking into account technical, economic, and environmental criteria. As a result of the development of these scenarios a generation goal matrix was created for the year 2040 for the interconnected electric system with 40% in thermal (mainly natural gas), 40% in hydraulic, and 20% in non-traditional renewable energy.

The relevance and impact of the intervention was very low due to a lack of ownership among decision-makers of the proposals produced, including the goal NUMES. Although it is true that the country requires an integrated planning of the energy sector, the impact of the PBLs in the development of such a activity has been very limited. The legal proposals and studies prepared have not been included in the decision-making and, while the sector's institutional system has advanced, it still shows important weaknesses in its managerial and regulatory skills, and mainly, in planning and coordinating the system. In addition, the long-term NUMES proposal gives no answer to the challenges that the Peruvian electrical system faces in the short and medium term⁶.

The impact of interventions on climate change mitigation has been limited. The country's furthest advance in the field of non-conventional renewable energy is the legislation that promotes their use in the national grid. This legislation is prior to NUMES and the program has not managed to boost its implementation. The expansion of the Peruvian electrical system and energy matrix responds to the price distortions derived from gas prices, which limits the penetration of other energy sources, particularly renewable and non-conventional energies. Likewise, the possibility of implementing energy efficiency measures is limited by the low level of energy prices at the level of final consumer. None of these restrictions has been overcome and facing the constraints that posed by the supply of natural gas, resulting from the delay in the construction of the gas pipeline, the most viable response will be the expansion on the basis of liquid hydrocarbons.

PBL interventions in PN and TT, while including an explicit climate change objective, they mainly addressed macroeconomic financial support goals. Panama's PBL (PN-L1033) for US\$100 million sought to respond to the expected impacts on the Panamanian economy in 2009

⁶ In the first place, to this date, the expansion of the system has taken place on the basis of natural gas, it is limited by delays in the construction of a new gas pipeline that has already been designed and is in the negotiation process. Because of this current limitation, the most viable response will be the expansion on the basis of liquid hydrocarbons.

and 2010 from the external global crisis, at the same time when the country was transitioning to a new government. On the other hand, in the case of TT the loan for US\$ 60 million (TT-L1023) responded to the deterioration of the fiscal situation in 2010 after several years of fiscal surplus. In this regard, both loans had counter-cyclical goal associated to policy reforms addressed toward supporting a more efficient, sustainable, and clean energy matrix. **Once the disbursement of the first operation was made, both interventions were suspended.** This coincided with the loss of urge in the macro situation. In the case of Panama because the crisis in the global system did not have the anticipated negative impacts, and in TT's due to the recovery of oil prices in the international market.

Nicaragua

The most systematic intervention, with a more clear orientation towards the incorporation of efficiency measures and renewable energy was made in Nicaragua. This is an integrated intervention that, since 2007, gathers seven loan operations for a total of US\$ 225.4 million, and comprises three programs. The first program "Electricity Sector Support Program" includes three operations (NI-L1021, NI-L1022, and NI-L1036) to support the electricity sector aiming at improving their efficiency through the rehabilitation of transmission and distribution lines and two hydroelectric plants. The second is the so-called PNESER or "National Sustainable Electrification and Renewable Energy Program" which also includes three sequential loans (NI-L1040, NI-L1050, and NI-L1063). Finally, the third program refers to an operation to support policies, it was established in three stages, the first of which was approved in 2013 (NI-L1074) and that will allow the consolidation of the promoted transformations.

NI-L1021	Electricity Sector Support Program	2007	32,700,000.00	98%	The program includes the following components: (i) investments in transmission and transformation; (ii) investments in rehabilitation and efficiency gains of existing hydro generatio and (iii) suport of institutional strengthening and support t
NI-L1022	Electricity Sector Support Program Second Loan	2008	40,200,000.00	44%	This operation, along with operation number NI-L1021, is part of the Support to the Electric Sector. Resources provided will chiefly be used to finance rehabilitation in Nicaragua's main renewable energy sources, the Santa Bárbara hydroelectric plant and the Centro América hydroelectric plant, thus moving away from fossil-fuel generation and reducing greenhouse gas emissions and pollution levels on the ground.
NI-L1036	Electricity Sector Support Program Third Financing	2009	20,000,000.00	74%	This operation, along with operation number NI-L1021, is part of the Support to the Electric Sector. The objective of the program is to make investments and provide institutional strengthening to the public companies in charge of electricity ge
NI-L1040	National Sustainable Electrification and Renewable Energy Program (PNESER)	2010	30500000	70%	The proposed operation represents the first loan from the Inter-American Development Bank (IDB) for the National Sustainable Electrification and Renewable Energy Program (PNESER, or "the program"). The program structure allows IDB resources to
NI-L1050	National Sustainable Electrification and Renewable Energy Program (PNESER) II	2011	22000000	21%	The objective of the PNESER is to support the efforts of the Nicaraguan government to reduce poverty by promoting access by a significant portion of the population to efficient, sustainable electricity service, with supporting creation of the c
NI-L1063	National Sustainable Electrification and Renewable Energy Program III	2012	35000000	0%	The proposed operation represents the third loan from the Inter-American Development Bank (IDB) for the National Sustainable Electrification and Renewable Energy Program (PNESER, or "the program"). The program structure allows IDB resources to
NI-L1074	Program to Strengthen the Electricity Sector in Nicaragua	2013	45000000	63%	The proposed Program aims to reduce the oil bill and the tax burden representing to the GONI by both the financial insolvency of the electricity sector and consumer subsidies.
NI-T1026	Development of Wind Power Generation in Isolated Systems	2005	300000	100%	Knowledge Renewable energy Wind
NI-T1034	Energy Efficiency Development in Nicaragua	2006	726350	100%	Acquisitions paid by this TC will reach about US\$110,000 in equipment and materias and US\$620,000 in consulting services.
NI-T1053	Support to Power Sector Investment Program	2007	350460	100%	Préstamos de inversión en apoyo al sector eléctrica acordado con el gobierno en Misión de Revisión de Programa Operativo, según ayuda memoria suscrito con fecha 11 de abril de 2007.
NI-T1094	Support to the Sustainable Electrification and Renewable Energy Program	2009	500000	100%	The objective of this TC is to support the Sustainable Electrification and Renewable Energy Program, which will be prepared in different tranches during the 2009-2012 period and with the participation of several co financiers.

The Support Program for the electricity sector combines credit lines for investments in infrastructure (transformation and generation) and technical support to improve the efficiency, quality, and coverage of electrical service. So far the program has succeeded in reducing losses (26.4 % in 2009 and 23.3 % in 2012) and reduced transmission failures. Electricity rates have also been revised to incorporate efficiency improvements. For its part the PNESER has driven institutional reforms in the sector in order to facilitate the incorporation of renewable energies, promote actions in energy-use efficiency improvements, and promote a rural electrification program that will allow reducing the levels of exclusion that amounted to 35% of the population.

The Bank has been a relevant actor in articulating a wide range of financial support that includes other multilateral agencies and concessional funds with climate change mitigation goals. In fact, in the case of PNESER, this is a program for a total amount of US\$404.7 million, of which IDB's contribution amounts for US\$85.5 million, while a significant number of other donors⁷ provide US\$288 million. The Bank is channeling its efforts with other donors to ensure

⁷ The financial institutions that cooperate in the PNESER are: Inter-American Development Bank (IDB), World Bank (WB), International Finance Corporation (IFC), Agency for International Cooperation of the Japan (JICA), the Central American Bank for Economic Integration (CABEI), European Investment Bank

the concessionality of the Program through the Climate Investment Fund (CIF), through the Scaling-Up Renewable Energy Program for Low-income Countries window (SPREP). In the case of the Electricity Sector Support Program, IDB has provided technical support to the transmission company executing the program, to form a CDM that capitalizes the climate impact of the program.

The Bank's intervention in Nicaragua drives the implementation of climate change mitigation measures firmly attached to the goals of national development policies. In the first place, the Nicaraguan energy matrix is highly dependent on imported fossil fuels, which negatively impacts the national accounts and makes it highly vulnerable to oil price changes. Second, the inefficiency of the electrical system, particularly transmission, and its dependence on imported fossil fuels impact the electricity rates, which are above the Central American average⁸. Finally, the country is resolved to overcome the high levels of population not supplied by the electric service. Overcoming of these three conditions is favored with the implementation of programs for efficiency improvements, and the incorporation of important renewable energy resources that the country has (wind, water and geothermal).

The Bank's intervention has been relevant in helping improve the sector's institutional system, improve efficiency, and incorporate new renewable sources, all of which are expected to have impacts on the country's carbon footprint. The promoted regulatory and institutional changes have opened the possibilities to expand the contribution of new renewable energy sources. In this regard, Nicaragua leads the ranking of countries in the Climatescope index which measures the investment environment for renewable energy in all IDB borrowing countries (Climatescope, 2013). Likewise, this has allowed the incorporation of 80 MW in wind generation during the last years, as well as the development of a geothermal plant of 72 MW. Similarly, Nicaragua is undertaking the rehabilitation of two hydroelectric plants that would increase their capacity and efficiency. Losses in the transmission network would be reduced and the reduction of the electricity consumption is estimated at 221 GWh per year. All of this will have a mitigating effect estimated at⁹ 23,081 tCO₂ per year.

d. Improvement of the efficiency of energy production and transport

The Bank's action in this area was associated to investment programs to improve efficiency of energy production and transport, mainly in the electrical systems. In total, the Bank approved 14 operations for a total of US\$1.3 billion in nine countries (BR, DR, EC, GY, HA, HO, NI, SU, and VE). In all cases, with the exception of an operation in Ecuador, the operations were aimed at improving the efficiency in the electrical system. The rehabilitation of hydropower plants concentrated 67% of the funds approved in five operations. The rest of the portfolio

(EIB), Nordic Development Fund (NDF) and Climate Investment Fund (CIF) / Scaling-Up Renewable Energy Program for Low-income Countries Program (SPREP). See PNESER. Ministries of Energy and Mines. February, 2010.

⁸ In Nicaragua, the current cost of electricity supply is one of the highest in Central America; in June 2012, the average residential rate in Nicaragua (US¢ 20.27 / KWh (kilowatt hour) was surpassed only by Guatemala (US¢ 22.92 /kWh), and is much higher than the average of the remaining four countries in the Region (US¢ 13.61 /kWh). CEPAL (2012). Central America: Statistics of the Electricity subsector, 2011. (Loan Document NI-L1074)

⁹ Loan Document NI-L1036.

financed investments in transmission and distribution networks and activities to strengthen the electrical system management, in order to reduce losses. Likewise, some of the interventions included technical assistance measures and regulatory reforms that would allow the optimization of the management of electric companies and the promotion of energy efficiency measures in the demand, or the incorporation of new renewable energy sources. Ecuador's operation is the only one intended to improve the efficiency in the transport system of refined products.

The more relevant, effective, and clearly quantifiable mitigation of emissions in this strategic area is related to the rehabilitation of hydropower plants. The Bank financed the rehabilitation of four large plants to restore the capacity and efficiency of hydroelectric generation. Disbursements of these operations are still low, 14% on average. According to project documents, at the conclusion of the four projects a total of 922.6 MW of clean energy will be recovered, with the following distribution: 77.6 MW from the Furnas plant in Brazil, 32 MW from the Péligre plant in Haiti, 18 MW from the Santa Barbara and Central America plants in Nicaragua, and 795 MW from the Simón Bolívar plant in Venezuela. Once all the rehabilitation projects are concluded, a total of 1.1 million tCO₂ emissions per year will be avoided by not generating that electricity in thermal plants.¹⁰

¹⁰ Annex 4 of the energy report describes the calculation methodology. Emissions reduction were calculated considering that the new generation of renewable replaces a unit of energy generated in accordance with the average matrix of the last 10 years for each country.

Portfolio under the strategy for energy efficiency in the supply

SUB-CATEGORY	Number	Name	pipe_yr	orig_apprvd_amnt	% desembd	descript_desc
i. Rehabilitation of hydroelectric power plants	BR-L1278	Rehabilitation for the Fumas and Luiz Carlos Barreto Hydroelectric Power Plant	2011	128,660,000.00	75%	The program aims to finance the modernization and rehabilitation of the Fumas and Luiz Carlos Barreto hydroelectric power plants to: (i) recuperate their electricity generation capacity; (ii) increase their efficiency and reliability and reduce
	HA-L1032	Péligre Hydroelectric Plant Rehabilitation Program	2008	12,500,000.00	84%	The objective is to perform a mayor rehabilitation of the electromechanical equipment of Peligre Hydroelectric Power Plant in Haiti. The plant with 50MW rated capacity is the most important source of electricity to the country. There objective i
	HA-L1038	Supplementary Financing for the Peligre Hydroelectric Plant	2011	20,000,000.00	4%	The S-Financing will cover the funding gap for the rehabilitation of the PHPenvisaged under the first operation HA-L1032 (grant 2073/GR-HA) with the objective to help restore and preserve Haiti's capacity to generate electrical powerwith renewab
	NI-L1022	Electricity Sector Support Program Second Loan	2008	40,200,000.00	44%	This operation, along with operation number NI-L1021, is part of the Support to the Electric Sector. Resources provided will chiefly be used to finance rehabilitation in Nicaragua's main renewable energy sources, the Santa Bárbara hydroelectric plant and the Centro América hydroelectric plant, thus moving away from fossil-fuel generation and reducing greenhouse gas emissions and pollution levels on the ground.
	VE-L1033	Rehabilitation of Units 1 to 6 of Powerhouse I Simón Bolívar Hydroelectric Plant	2010	700,000,000.00	0%	The objective of this operation is to contribute to the technical sustainability of the Venezuelan electricity system by preserving a major source of clean, renewable energy, and to increase its efficiency through the modernization, rehabilitat
ii. Rehabilitation of energy transmission and distribution grids	BR-L1284	Pro-Energy RS Distribution	2012	130,556,650.00	8%	The program general objective is the expansion and modernization of the electricity distribution system in the area of the concession held by CEEE-D, which includes the Porto Alegre metropolitan area, and the implementation of new business and
	DR-L1026	Electricity Distribution Network Rehabilitation Project	2008	70,000,000.00	69%	The project enhances energy efficiency by reducing technical and nontechnical losses that leads to less electricity required, and therefore to reduce greenhouse gas emissions, in line with the Sustainable Energy and Climate Change Initiative (S
	GY-L1037	Sustainable Operation of the Electricity Sector and Improved Quality of Service	2011	5,000,000.00	62%	the Project will address the issue of electricity losses in a three-fold approach: (i) adequate monitoring, collection and analysis of key data in the system through the improvement of local capacities; (ii) prevent the progressive increase of
	HA-L1014	Rehabilitation of Electricity Distribution System in Port au Prince	2006	18,090,000.00	75%	Continuity sustain support and electricity quality services to Port Au Prince metropolitan zone and provide the foundation to re-establish financial, technical and managerial operation for EDH into to medium and long term.
	HA-L1035	Rehabilitation of the Electricity Distribution System in Port-au-Prince	2010	14,000,000.00	4%	Supplementary financing operation that will support the development of high, medium and low voltage works initially included in the original operation (HA-L1014), as well as other works within the project's components that may help respond to th
	NI-L1021	Electricity Sector Support Program	2007	32,700,000.00	98%	The program includes the following components: (i) investments in transmission and transformation; (ii) investments in rehabilitation and efficiency gains of existing hydro generatio and (iii) suport of institutional strengthening and support t
	NI-L1036	Electricity Sector Support Program Third Financing	2009	20,000,000.00	74%	This operation, along with operation number NI-L1021, is part of the Support to the Electric Sector. The objective of the program is to make investments and provide institutional strengthening to the public companies in charge of electricity ge
	HO0224	PPP Support to Rural Electrification and to the Energy Sector	2004	35,000,000.00	71%	Project objectives will be accomplished through investments geared toward the modernization of the Power Dispatch Center (PDC), the promotion of rural electrification and the reduction of energy losses. PDC investments seek the improvement and
	EC-L1040	Modernization of Pumping Stations on the Esmeraldas-Quito Multiproduct Pipeline	2010	58,000,000.00	79%	The objective of this operation is to support one of the subsidiaries of the company, Petrocomercial to modernize the transport system of refined products. The loan will support investments that will help improve capacity, efficiency and safe op
iii. Energy efficiency in the extraction, production and transportation of fossil fuels and natural gas.						

Annex 4. Emissions reduction potential for IDB RE Portfolio

Emissions reduction potential for IDB projects was calculated using the following formula:

$$(1) \quad \text{Mit. Potential (tCO}_{2/\text{year}}) = \text{Elec_Gen}_{ij} * \text{CO}_{2/\text{year}} / \text{Elec_Gen}_j$$

Where:

i = IDB Renewable Energy Project

j = Country

Elec_Gen_{ij} = Additional generation capacity of project i in country j (GWh)¹.

$\text{CO}_{2/\text{year}} / \text{Elec_Gen}_j$ = Ten year (2002-2011) average electricity GHG emissions per GWh generated in country j . (tCO₂/GWh)²

Thus, the total emissions reduction potential for IDB's RE projects is:

$$(2) \quad \text{IDB CO}_{2/\text{year}} = \sum_{j=1}^m \sum_{i=1}^{n_j} \text{Elec_Gen}_{ij} * \text{CO}_{2/\text{year}} / \text{Elec_Gen}_j$$

Where:

n_j = Is the number of IDB projects in country j

Emissions reduction potentials in (1) may also be grouped into different project categories such as IDB Window (Table 1) and project generation technology (Table 2).

These calculations are based on the average emissions per GWh between 2002 and 2011 and they assume electricity matrixes will maintain current emissions' intensity levels during the entire project's lifecycle. The emissions reduction calculations are indicative and do not intent to replicate internationally recognized methodologies such as CDM's.

Table 1. Emissions reduction potential from IDB projects by Bank's Window

	Additional	Additional	tCO ₂ /year
New Projects	6,403	30,303	8,894,741
Public	2,915	15,486	4,105,554
Private	3,488	14,817	4,789,187
Rehabilitation	923	4,327	1,102,130
Public	922.6	4,327.0	1,102,130
Total IDB	7,326	34,630	9,996,871
	Total MW	Total GWh	Electricity
Total LAC	316,745	1,428,419	497,450,000
IDB's share of	2.3%	2%	2%

Table 2. GHG Emissions reduction IDB generation projects by technology

Source	tCO ₂ /year
Hydro Electricity	8,212,971
Private	3,005,287
Public	5,207,684
Wind (All Private)	1,507,920
Solar (All Private)	38,400
Geothermal (All Private)	237,580

¹ Additional generation capacities for each project were taken from loan proposals or other loan documents.

² Emissions per GWh by country were taken from the Annual Energy Statistics Report 2012, Olade.

Table 3. Emissions reduction potential by IDB-RE projects

Project Number	Project Name	Window	Project	Source	Additional MW	Additional GWh	Country tCO₂/GWh	Emissions Reduction per Year	Emissions Reduction per Year from LP
BO-L1043	Misicuni Renewable Energy Hydroelectric Project	Public	New	Hydro	80	217	314	68,138	
BR-L1278	Rehabilitation for the Furnas and Luiz Carlos Barreto Hydroelectric Power Plant	Public	Rehabilitation	Hydro	77.6	2,452	259	635,068	
BR-L1303	CEEE Generation and Transmission Project	Public	New	Hydro	15	64	259	16,576	14,900
BR-0370	Campos Novos Hydroelectric Power Project	Private	New	Hydro	880	3310.4	259	857,394	
CH-L1067	Alto Maipo Hydroelectric Power Project	Private	New	Hydro	531	2320	395	916,400	
CH-L1069	Pozo Almonte and Calama Solar Photovoltaic Power Project	Private	New	Solar	26	60	395	23,700	51,100
CO-L1005	Porce III Hydroelectric Power Plant	Public	New	Hydro	660	3,105	348	1,080,540	
CR-L1056	Reventazon Hydroelectric Power Project	Private	New	Hydro	305.5	1,407	294	413,658	412,842
DR-L1049	Bani Wind Power Project	Private	New	Wind	30.6	91	583	53,053	51,200
DR-L1051	PECASA Wind Power Project	Private	New	Wind	50	150.6	583	87,800	89,813
EC-L1026	Baba Hydroelectric Project	Private	New	Hydro	75	602	430	258,860	
HA-L1032	Péligre Hydroelectric Plant Rehabilitation Program	Public	Rehabilitation	Hydro	32	62	335	20,770	
ME-L1068	Eurus Wind Project	Private	New	Wind	250	866	440	381,040	600,000
ME-L1076	EDF-La Ventosa Wind Project	Private	New	Wind	67.5	267	440	117,480	164,962
ME-L1107	Mareña Renovables Wind Project	Private	New	Wind	392	1,466	440	645,040	908,444
ME-L1125	BNS2 Wind Power	Private	New	Wind	74	278	440	122,320	172,265

Table 3. Emissions reduction potential by IDB-RE projects

Project Number	Project Name	Window	Project	Source	Additional MW	Additional GWh	Country tCO ₂ /GWh	Emissions Reduction per Year	Emissions Reduction per Year from LP
	Corporate Loan								
NI-L1022	Electricity Sector Support Program Second Loan	Public	Rehabilitation	Hydro	18	21	516	10,836	
NI-L1057*	San Jacinto-Tizate Geothermal Power Project	Private	New	Geothermal	72	460.4	516	237,580	280,703
PE-L1113	Chaglla Hydroelectric Power Project	Private	New	Hydro	406	2,250	196	441,000	
PN-L1054	Pando-Monte Lirio Hydroelectric Power Project	Private	New	Hydro	83.3	429	275	117,975	
RG-L1050**	Isolux Corporate Loan	Private	New	Solar	40	75	196	14,700	40,000
UR-L1077	El Libertador Wind Project	Private	New	Wind	65	247	129	31,863	175,000
UR-L1080	Palmatir Wind Project	Private	New	Wind	50	172.7	129	22,278	126,000
UR-L1086	Carape I & II Wind Power Project	Private	New	Wind	90	364.7	129	47,046	259,000
VE-L1003	Tocoma Hydroelectric Power Plant	Public	New	Hydro	2160	12,100	243	2,940,300	
VE-L1033	Rehabilitation of Units 1 to 6 of Powerhouse I Simón Bolívar Hydroelectric Plant	Public	Rehabilitation	Hydro	795	1,792	243	435,456	

* Additional GWh for this project was calculated assuming a capacity factor of 73%, equivalent to the average obtained for 71 geothermal globally. Source: Bloomberg New Energy Finance, October 2011.

**The projects were implemented in Peru.