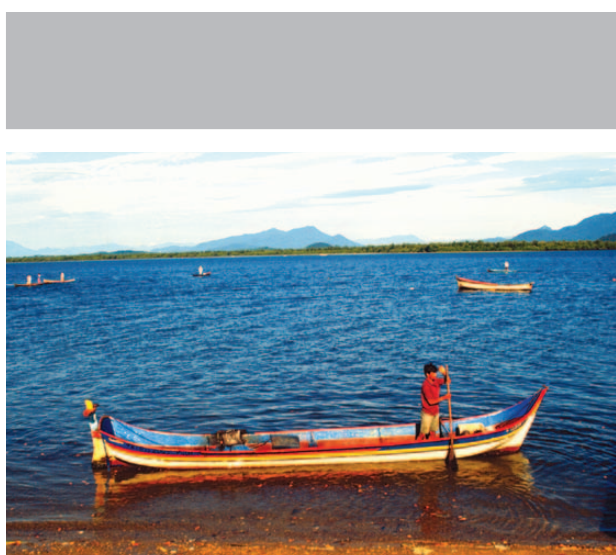




ANALYTICAL FRAMEWORK FOR

Climate Change Action



INTER-AMERICAN DEVELOPMENT BANK

Analytical Framework for Climate Change Action

Inter-American Development Bank

March 2010

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ISBN: 978-1-59782-117-9

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Produced by the IDB Office of External Relations.

Photos: IDB photo library except as noted: Cover, top right, Shutterstock.com, p. xiii, istockphoto.com, and p. 12, istockphoto.com.

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Abbreviations, Acronyms, and Conversions

BRT	Bus rapid transit
CCLIPs	Conditional Credit Lines for Investment Projects
CCS	Climate Change Strategy
CDM	Clean Development Mechanism
CEIF	Clean Energy Investment Framework
CERs	Certified Emission Reductions
CIF	Climate Investment Funds
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalents
COP 16	Sixteenth Conference of the Parties (to the UNFCCC)
CTF	Clean Technology Fund
ECLAC	Economic Commission for Latin America and the Caribbean
EE	Energy efficiency
GDP	Gross domestic product
GEF	Global Environment Facility
GHG	Greenhouse gas
IDB	Inter-American Development Bank
IEA	International Energy Agency
IET	International Emissions Trading
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated water resources management
JI	Joint Implementation
LAC	Latin America and the Caribbean
LCDS	Low-Carbon Development Strategies
LULUCF	Land use, land use change, and forestry
NAMAs	Nationally Appropriate Mitigation Actions
NAPs	National Adaptation Programs
NWRPs	National Water Resources Plans

PBLs	Policy-based loans
RE	Renewable energy
REDD	Reducing Emissions from Deforestation and Forest Degradation
SCF	Strategic Climate Fund
SECCI	Sustainable Energy and Climate Change Initiative
SRES	Special Report on Emissions Scenarios
TNAs	Technology Needs Assessments
UNFCCC	United Nations Framework Convention on Climate Change
VERs	Verified Emission Reductions
ha	hectare
Kw	kilowatt
Mt	megaton
MtCO ₂ e	megatons of CO ₂ equivalents
MW	megawatt
MWh	megawatt-hour
tCO ₂ e	tons of CO ₂ equivalent gases

Executive Summary

The Latin America and the Caribbean (LAC) region is highly vulnerable to the detrimental effects of climate change and, like all other regions in the world, must invest in climate change “adaptation” activities as an economic and social development priority. Some difficult questions that need to be addressed are how much and in what way the region should invest to address climate change issues and how the Inter-American Development Bank (IDB) should support the region’s efforts.

Adaptation is a key priority for LAC, as the region’s poor are especially vulnerable to climate change effects. Climate change effects threaten to undermine long-term efforts to achieve sustainable development. According to the most recent Intergovernmental Panel on Climate Change (IPCC) assessment report, important changes in precipitation and increases in temperature have been observed in the region. Moreover, climate ensemble models have projected a mean warming in the region by the end of the century of 1–4°C in an optimistic scenario and 2–6°C in a pessimistic scenario. Temperature movements of this scale would cause dramatic changes in the region’s natural systems, affecting crop yields and the availability of water for human consumption, energy production, and irrigation.

Climate models also predict that the Caribbean basin will be prone to more intense and more frequent extreme weather events, affecting millions of people already vulnerable because of other, non-climate-related stresses that directly compromise their adaptive capacity.

This increased vulnerability has several potential negative consequences, including: (i) adverse effects on food security and agricultural export revenues; (ii) significant changes in water quality, quantity, and availability for human consumption; (iii) damage to coastal zone areas due to rising sea levels; (iv) more frequent bleaching and eventually extremely high levels of dieback in coral reefs and associated ecosystem services, particularly in the Caribbean; (v) increases in economic damage from the greater intensity and increasing frequency of hurricanes and tropical storms; (vi) significant biodiversity loss through species extinction in most tropical areas and loss of ecosystem services; and (vii) gradual replacement of tropical forest by savanna in the Amazon.

To address climate change adaptation challenges, LAC countries should target such key economic sectors as land use, land use change, and forestry (LULUCF), agriculture, water resource management, and urban development, as the consequences of inaction in these sectors could be catastrophic for the economic sustainability of LAC nations. The means to protect these sectors should be developed and concrete adaptation measures fully incorporated into sector planning. Examples of such measures include: the provision of insurance coverage against catastrophic events to agricultural producers and local populations; the application



of technology to increase crop resistance to increased temperatures; the adoption of adequate water governance frameworks to guarantee water provision in areas exposed to climate stress; and the adoption of engineering and policy options to increase the climate change resilience of cities. Equally important will be the protection of major infrastructure investments in the energy, transportation, and tourism sectors, including use of climate-sensitive and risk mitigation solutions in the design, construction, and operation of facilities.

Climate change mitigation policies and related sustainable development practices are needed as well. Under current climate change mitigation policies and related sustainable development practices, global

greenhouse gas (GHG) emissions will continue to increase over the next few decades. Continued GHG emissions at or above current rates are expected to cause further warming and induce many changes in the global climate system in the 21st century and beyond.

The entire LAC region is a relatively minor contributor to the global GHG emissions that cause climate change. However, while the total amount of the region's emissions is small, this does not absolve the region of its global responsibilities. On a per capita basis and in terms of the size of the regional economies, the LAC region contributes more to GHG emissions than other developing countries, including China and India.

In 2008, Latin American and Caribbean countries accounted for 8.6% of the world's population, 8.2% of the world's GDP, and close to 12% of global GHG emissions. In terms both of the ratio of GHG emissions to population and of their ratio to GDP, the Latin American and Caribbean region falls between low- and high-income countries. It is worth noting that estimates for China and India show much lower emissions per capita than LAC and a much lower ratio of emissions to GDP.

The LAC region also has vast areas of forestland that are lost each year and will continue to be gravely threatened, making land use change and emissions resulting from deforesta-

tion a top priority for the region and the world.

In this context, a clear rationale can be provided for turning increasing attention in the region toward mitigation activities that are both environmentally sound and cost-effective. These “no-regret” mitigation activities can be supported by the IDB with a relatively high level of confidence. When the costs and benefits of national actions for mitigation are less clear and cannot be internalized under existing policy frameworks, the IDB should assist countries in developing new policies that will align the economic incen-

tives necessary to carry out mitigation measures. In this way, the IDB can act as a catalyst of climate-related needs and actions that would otherwise remain unaddressed. Not only can the IDB help Latin American and Caribbean countries fulfill to a fuller extent their responsibilities with regard to global GHG mitigation, but the effect also would be to buffer to the greatest extent possible the setbacks that climate change presents to the Millennium Development Goals by fostering clean and adaptable development methods.



The IDB's Role in Helping LAC Achieve Readiness for Climate Change Action

In order to address the issues of climate change in the world's more vulnerable and developing regions, several funds have been created and made available for climate-change-related development projects in areas that are very relevant to the causes or effects of climate change. These funds will be reviewed at greater length in this document but include the following:

- ➔ Funds under the United Nations Framework Convention on Climate Change (UNFCCC), including the Global Environment Facility (GEF), Least Developed Countries Fund, and Special Climate Change Fund.
- ➔ Funding through Kyoto Protocol's Clean Development Mechanism (CDM), which provides financial assistance for mitigation projects in non-Annex I Parties (mainly developing countries) by issuing Certified Emission Reductions (CERs) for emissions reductions or removals achieved.
- ➔ Other global funds, including the Climate Investment Funds (CIF), comprised of the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF).

While these funds are available for utilization by countries, they require from potential recipient countries readiness to access and implement the funds. In the case of LAC, immediate action to improve readiness significantly can and should be taken if these funds are to be optimally employed to address the region's significant vulnerability and clean development needs.

With the goals of helping to address the issue of climate change in the region and also of helping client countries have access to these international funds, in 2007, the IDB's Board of Directors approved the Sustainable Energy and Climate Change Initiative (SECCI) and, soon after that, in 2008, its own financial tool, the SECCI IDB Funds (SECCI IDB Fund and SECCI Multi-Donor Fund). The main objective of these funds is to mainstream climate change mitigation and adaptation within IDB operations by targeting the provision of comprehensive sustainability options in areas related to the energy, water, and environmental sectors, and by building climate resilience in key priority areas vulnerable to the impacts of climate change.

Since launching SECCI, the IDB has worked steadily on the issue of climate change in Latin America along three main lines of activity: (i) developing and strengthening institutional and regulatory frameworks to foster investments; (ii) providing technical assistance; and (iii) providing lending instruments for public and private sector operations. At present, the SECCI itself is working in more than 20 LAC countries using a full array of instruments, such as technical cooperation projects, retainers to assist public and private clients prepare investments, and direct loans for innovative projects.

These activities have set the foundation for application of more sophisticated Bank instruments, such as Conditional Credit Lines for Investment Projects (CCLIPs) and policy-based loans (PBLs). These instruments have proved key in scaling up financing needed by countries in the region for clean energy and climate adaptation activities and have allowed countries access to the aforementioned international funds, including CIF (investment plans prepared nationally), the Adaptation Fund (in its initial stages of implementation), the GEF (through its climate window), and other global sources. The high demand for SECCI funds led to the replenishment of US\$40 million in the SECCI IDB Fund in 2009, doubling the capital originally allocated.

Going Further: Mainstreaming Climate Change Mitigation and Adaptation in the Region

Helping make these funds available to clients is a means to achieve one of the IDB's priorities regarding climate change. The core objective that lies behind access to these funds is to prepare the region for the challenge of climate change by promoting clean and sustainable development, which will require substantial financial as well as technical and knowledge-based resources.

At times, climate-related needs may differ from traditional social and economic development objectives. The IDB will need to meet the considerable challenge of integrating the



activities of preparing the region for climate change and promoting clean development while, at the same time, staying on the track of improving the quality of life of LAC citizens.

The IDB believes that achieving climate change readiness while at the same time measurably improving the region's social and economic conditions, as expressed by the Millennium Development Goals, is possible. In order to achieve this on a policy level, climate change must be approached from a cooperative and cross-sectoral perspective. The task is a global one that requires that global interministerial and regional approaches intersect. On a regional basis, cooperation between governments is important, as most countries in the region face similar challenges, and mutual collaboration and exchange could facilitate the path towards clean energy solutions and reduction of climate vulnerabilities. At the national level, it is paramount that the policies of climate change be mainstreamed into every aspect of the policy-making process, and across economic sectors and key social and infrastructure investments.

International organizations will also need to begin to operate differently. The IDB Group recognizes that current and future commitments and actions under the United Nations Framework Convention for Climate Change following the Copenhagen conference in December 2009 and as the 2012 post-Kyoto regime begins to take shape will require a significant shift in the IDB's approach to many of its programs.

The IDB will have to expand its role in the implementation of existing and new funding mechanisms being promoted at the global and regional levels, including the Clean Development Mechanism, the Global Environment Facility, the Adaptation Fund, and the recently proposed Copenhagen Green Climate Fund. The current and future work of the Bank will need to be responsive to the evolution of this international framework and mobilize international resources in line with national priorities as well as regional and global objectives.

An immediately significant outcome of the Copenhagen Accord for the IDB is agreement for provision of new short-term financing (US\$30 billion) for climate change mitigation and adaptation activities. The IDB will be able to participate in channeling those resources through the various means available (the GEF and CIF, among others). The IDB will need to demonstrate institutional readiness for channeling major new sources of finance as they become

available. This is likely to require appropriate institutional architecture dedicated to the areas of mitigation (including forestry), adaptation, and carbon finance, as well as commensurate and significant increases in the staffing of these and other climate-related capacities. During the upcoming IDB Governors' Meeting in March 2010 in Cancún, the IDB will underline its commitment towards mainstreaming climate change across Bank operations.

Toward a Climate Change Strategy

The IDB is engaged in the development of a Climate Change Strategy (CCS) to be submitted for approval by its Executive Board in 2010. The Strategy will be a guiding instrument with the objective of scaling up support for actions to mitigate and adapt to climate change within Latin America and the Caribbean. Through specific strategic lines of activity, the CCS will promote the development and use of a range of public and private sector financial and nonfinancial instruments for strengthening institutional, technical, and financial capacities to address climate change challenges within LAC. The CCS will also guide and facilitate the Bank's dialogue with governments, civil society, and the private sector concerning regional and national climate policy agendas and assist Bank management in making decisions regarding the structuring, design, and implementation of its lending and nonlending portfolio in the area of climate change.

As a first step toward the formulation of the CCS, the Bank has produced this "Analytical Framework for Supporting Climate Change Action," as a "think piece" that reviews current regional issues in climate change and the reasoning behind key elements to be integrated into the drafting of the CCS. This document will serve as an analytical point of departure in developing key elements of the CCS, and will also serve as a tool for soliciting feedback from member countries in the upcoming formulation of the CCS.

For the purposes of the present analysis, the Bank has assessed Latin American and Caribbean regional issues in terms of climate change. These issues fall into one of two categories: climate change adaptation, which includes all the efforts to adjust/adapt to the effects of climate change; and climate change mitigation, which includes the causes of climate change (GHG emissions) and their abatement. Section 1 of the document therefore highlights the significance of climate change to the region by first reviewing vulnerability to climate change and adaptation challenges presented in LAC and describing opportunities and challenges in key economic sectors and infrastructure areas. Section 1 then reviews contributions to GHG emissions by sector and the potential for emission reduction by technology. These findings will be used to support the analytical bases and conceptual framework that underlie the Bank's increasing support for climate change mitigation and adaptation activities in the region.

During this review, the Bank has identified key priorities for mitigation and adaptation support to the region. It also has identified the technological, economic, and institutional barriers that need to be overcome in order to successfully intervene in development trajectories and promote cleaner and more climate-resilient measures.

This document reviews key findings with regard to vulnerability to climate changes and the adaptation needs that are a key priority for the region and for the Bank. Changes in climatic conditions are affecting hydrological balances across the region and altering crop yields, availability of water for human consumption, energy production, and irrigation. The region must be ready to confront impacts of climate change in vulnerable economic sectors and infrastructure systems by advancing clear climate adaptation measures in agriculture, water resource management, energy and transportation infrastructure, tourism, health, urban development, and disaster risk management. The technical and financial requirements for building climate resilience across sectors and into the future are still unclear, but the effort required will certainly be of enormous proportions in terms of financial resources, institutional capacities, and political will. Given that climate change is threatening key economic sectors and the livelihood of millions of people, especially the poor, the mobilization of resources around innovative solutions for adaptation will be critical in the years to come.

This document then presents several main findings in terms emissions and mitigation potential. At the outset, the analysis identifies land use, land use change, and forestry as the main contributor to emissions in the region. The impacts of LULUCF include intensive land vegetation change, destruction of forests, expansion of agriculture, and land degradation. Therefore, LULUCF should be given a high priority when designing national GHG emission reduction programs, and it will be a top priority for IDB interventions in the region.

The second-most-important sector for mitigation is the energy production and consumption sector. Important technological opportunities for GHG reductions in energy generation from fossil fuels and in energy-consuming sectors (i.e., transportation, water, and sanitation) are now available and can be successfully implemented. The potential for developing renewable energy (RE) sources, such as wind, solar, hydro, geothermal, and bio energy is ample and the declining costs of such technologies (mainly in wind) are conducive to their full expansion. However substantial work remains to be done in reducing existing regulatory and market barriers. The largest opportunities for GHG reduction in the energy sector lie in energy efficiency (EE). Most energy efficiency measures currently available to reduce energy consumption in buildings, infrastructure services, and industry are cost-effective, with benefits exceeding costs by large margins. However, the success of EE programs largely depends on whether governments provide the right incentives to help overcome existing barriers to implementation of these programs, including reduction or elimination of



energy subsidies and the facilitation of market conditions for scaling up production and installation of energy efficiency technology. The third-most-important sector for mitigation is emissions from the agriculture and livestock sector, which account for 20% of total GHG contributions (primarily methane and nitrous oxides), and emissions from wastes, which account for 3% of total GHG contributions (mostly methane).

Section 2 of the document reviews the financial tools available to address LAC's regional and national priorities and how the IDB's own development tools and funds can be used to help its client countries reach climate change mitigation and adaptation objectives. This section describes existing and new financial mechanisms that will play an important role in mobilizing the additional resources required for climate action, including resources from the Clean Investment Funds, the Global Environment Facility, the Clean Development Mechanism, voluntary carbon markets, and a range of lending and technical assistance programs offered by the Bank. This discussion also stresses that the international community should increasingly focus on how to ensure that public and private sector financing reinforce and complement each other at the international and national levels. The Bank, through its expanding Sustainable Energy and Climate Change Funds and its increasing role in mobilizing GEF and CIF resources, views itself as an important partner for resource mobilization in the region. The Bank also brings to the table the unique capacity to articulate public and private funding under the same institutional umbrella, which will facilitate the scaling up of investments in clean energy technology and climate adaptation practices. Section 2 concludes with a short assessment of results and opportunities emanating from the UNFCCC 15th Conference of the Parties (COP 15) in Copenhagen and prospects for support to the region in preparation for the COP 16 to take place in Mexico at the end of 2010.

In the last section, Section 3, this document presents the key areas of action or "tools for action" that the Bank will use to respond more effectively to growing demand for climate change interventions. This set of tools will help support the strategic lines of action that will be part of the Bank's aforementioned Climate Change Strategy.

In preparing for development of a specific CCS, the Bank has assessed its own capacities, readiness, and comparative advantages for addressing climate change in LAC and has identified the following areas the Bank will strengthen, consolidate, and focus on in support of the region's climate agenda: (i) expansion of the knowledge base of the Bank and the region regarding options for addressing challenges in climate change mitigation and adaptation; (ii) strengthening of institutional frameworks and capacity building; (iii) development of guidelines and criteria for mainstreaming climate change mitigation and adaptation in IDB operations, climate-proofing projects, and GHG reporting; (iv) identification and development of lending and technical assistance potential in key sectors; and (v) development of mechanisms for scaling up investments and addressing financial gaps.

By strengthening these tools, the Bank will endeavor to mainstream climate change sustainability objectives into its operations and efforts and better equip itself as a catalyst for clean development in the LAC region.

Analytical Bases for Increasing Climate Change Mitigation and Adaptation Support in the Region

Climate change has been increasing in recent times due to rising levels of GHG concentrations caused by human activities, primarily the release of carbon dioxide (CO₂) because of the burning of fossil fuels and land use change. This has been scientifically proven. Observations include increases in global average air and ocean temperatures, melting of snow and ice, and rising global average sea levels. Climate change has the potential to reverse the hard-earned development gains of the past decades and the progress that has been made toward achieving the Millennium Development Goals in LAC. Climate change can also cause new problems such as mass migrations and exacerbation of conflicts over land and increasingly scarce natural resources. As climate change intensifies, more serious consequences are likely in the future, posing increasing threats to the social, economic, and environmental development objectives in Latin America and the Caribbean. These threats include the following:

- A significant decrease in agricultural productivity in some regions, with adverse consequences for food security and export revenues.
- Significant changes in water quality, quantity, and availability for human consumption and for agriculture and energy generation as the result of changes in precipitation patterns; an increase in the intensity and frequency of extreme events; and the disappearance of tropical glaciers that could affect millions of people dependent on water supplies from the tropical glaciers in the Andes as well as generation of electricity in countries that are highly dependent on hydropower, such as Ecuador, Bolivia, and Peru.
- Damage to coastal zone areas due to rising sea levels, which could represent high economic costs to the region.
- More frequent bleaching and eventually extremely high levels of dieback in coral reefs and associated ecosystem services, with high economic costs, particularly to the Caribbean.
- Increases in economic damage from the greater intensity and increasing frequency of hurricanes and tropical storms because of higher sea surface and air temperatures.
- Significant biodiversity loss through species extinction in most tropical areas and loss of ecosystem services.

- Gradual replacement of tropical forest by savanna in the Amazon, triggering a process of desertification throughout the region due to the important role the Amazon system plays in the region's precipitation patterns.

Extreme climate events are having strong negative effects on the highly vulnerable LAC region, resulting in high economic costs. A recent study by the Economic Commission for Latin America and the Caribbean (ECLAC) shows that between 1970 and 2007 extreme weather events cost the region US\$80 billion in damages to human settlements, industry, and infrastructure.¹

Drawing on methodologies that address the economics of climate change,² some countries in the region are already identifying and assessing the economic implications of climate change, including potential costs and benefits of mitigation and adaptation in specific sectors (see Box 1).³

LAC is highly vulnerable to the detrimental effects of climate change and, like all other regions in the world, must invest in climate change “adaptation” activities as an economic

BOX 1

THE ECONOMICS OF CLIMATE CHANGE IN MEXICO, CHILE, AND OTHER LAC COUNTRIES

The *Study of Economic Impacts of Climate Change in Mexico* reveals that the total costs of climate change to the Mexican economy will range between 3.2% of GDP (using a 4% discount rate) and 10.4% of GDP (using a 0.5% discount rate) by the year 2050. According to the study, the total cost of reducing CO₂ emissions to the indicative target established by the Mexican government (50% CO₂ emissions reduction by 2050, taking 2002 as baseline and on a business-as-usual scenario) amounts to 0.5% and 1.0% of GDP, using US\$10 per ton of CO₂ and a 4% and 0.5% discount rate, respectively.^a A similar study done for Chile reveals that by 2050, Chile could lose an estimated 0.7% of GDP per year as a result of the impacts of climate change. Among the key effects are the impacts on water supply in Chile; the availability of water for irrigation could be reduced by as much as 15% by 2040, resulting in a significant reduction in agricultural productivity. In addition, the power generation capacity of hydroelectric plants might decrease up to 11% by 2040, representing an annual economic cost of US\$78–101 million under a low-emissions and high-emissions scenario, respectively.^b The preliminary results of a recent report on economics of climate change in 15 Latin American and Caribbean countries show that climate change could have an economic impact, by 2100, of between 34.5% and 137.3% of GDP (which correspond to the IPCC low-emissions scenario and high-emissions scenario, respectively). A strategy targeting a mitigation of 30% of the projected emissions under either scenario would cost between 0.7% and 2.2% of GDP, depending on the costs of mitigation assumed in the analysis.^c

^a Government of Mexico, SHCP, and SEMARNAT, *La economía del cambio climático en México: síntesis* (2009).

^b ECLAC and Government of Chile, *La economía del cambio climático en Chile* (2009). The high-emissions scenario corresponds to a temperature increase of 3–4 degrees, and the low-emissions scenario to 2–3 degrees.

^c ECLAC, *La economía del cambio climático en América Latina y el Caribe: síntesis* (2009). These figures (0.7% and 2.2%) are based on mitigation costs of US\$10 and US\$30/ton CO₂e, respectively.

and social development priority. However, before policies can be designed and investments made to increase the climate resilience of the region's economic activity and physical infrastructure, more resources need to be invested in assessing climate vulnerability of key sectors and identifying viable adaptation alternatives. The technical and financial requirements

for building climate resilience across sectors and into the future are being assessed, but it is already certain that the effort will be of enormous proportions and require the mobilization of innovative solutions, vast financial resources, institutional capacities, and strong political will for effective action.⁴

Addressing the question of how much and in what manner the region should invest in mitigation activities is difficult. After all, the region is a minor contributor to global GHG emissions relative to other regions of the world. Even though the region is a minor contributor in terms of total emissions, this does not absolve the region of its global responsibilities. On a per capita basis and in terms of the size of Latin American and Caribbean economies, the region contributes more to GHG emissions than other developing countries, including China and India. Moreover, the region has vast areas of forestland that are lost every year and will continue to be gravely threatened, making land use change and emissions resulting from deforestation a top priority for the region and the world.

Against this backdrop, a general justification for paying increasing attention to mitigation activities in the region can be provided in the case of activities that are both environmentally sound and cost-effective. These activities, commonly known as “no-regret” mitigation activities (including those oriented towards improving energy efficiency), can be supported with a relatively high level of confidence. Many mitigation renewable energy technologies are largely commercially viable and available for immediate implementation. When barriers to the implementation of mitigation policies prevent governments from acting or the cost and benefits of technologies are less clear and cannot be internalized under existing policy frameworks, LAC countries will need to develop new policies to overcome existing barriers and align the economic incentives necessary to carry out mitigation measures. The international community should act as catalyst of mitigation priorities that would otherwise remain unattended and thus help LAC countries meet to a fuller extent their responsibilities with regard to global GHG mitigation.

The following subsections summarize key issues, opportunities, and limitations with regard to climate change adaptation and mitigation.



Vulnerability to Climate Change and Adaptation Challenges in the LAC Region

Adaptation is a key priority for the LAC region, given that climate change effects threaten to undermine long-term efforts in the region to achieve sustainable development. According to the most recent IPCC assessment report,⁵ important changes in precipitation and increases in temperature have been observed in the region. Moreover, climate ensemble models



have projected for the region by the end of the century a mean warming of 1–4°C in an optimistic scenario and 2–6°C in a pessimistic scenario. These changes in mean temperatures will affect hydrological balances across the region and may create potentially important rainfall anomalies in the intertropical region and smaller ones in the extratropical regions. This would in turn seriously affect crop yields and the availability of water for human consumption, energy production, and irrigation. Furthermore, climate models predict that the Caribbean basin will be prone to more intense and more frequent extreme weather events, affecting millions of people already vulnerable because of other, non-climate-related stresses that directly compromise their adaptive capacity. Increased vulnerability to climate change threatens the achievement of the Millennium Development Goals, as it superimposes higher risks on existing vulnerabilities, especially among the poor, threatening their welfare and livelihoods.

Estimating the cost of adaptation to climate change is still at a preliminary stage in both developed and developing economies. However, it is already clear that, by far, infrastructure is expected to account for the largest share of predicted adaptation costs. The most vulnerable sectors that require special attention in the climate change adaptation agenda are agriculture and forest resources, water resources, energy and transportation infrastructure, tourism, health, urban development, and disaster risk management. The following subsections will summarize the vulnerability issues and the opportunities for implementing adaptation measures in each of these sectors.

Vulnerability of Agriculture and Forest Resources

Climate change variability and elevated GHG concentrations in the atmosphere are causing higher temperatures and alterations in hydrological precipitation and transpiration cycles,

directly affecting crop yields and the livelihoods of rural communities. These reductions in output will be particularly severe in some hard-hit regions of the world, such as the Andes. An even greater problem arising from climate change is its economic and social impact on the rural poor (58 million people in LAC, constituting 46% of the rural population), who have limited adaptation choices. LAC's rural poor are particularly vulnerable to agricultural disruptions because they are largely dependent on rain-fed agriculture and have no access to drought-resistant livestock, seed varieties, or crop insurance.

The direct economic impacts of climate change on agriculture in the LAC region are significant. An analysis conducted by ECLAC in Colombia, Chile, Ecuador, Paraguay, and Peru indicates that climate change could pose a substantial threat to the agricultural productivity of South American countries, as up to 66% of the continent's area could be affected by land degradation.⁶ A recent report shows that the financing requirement for adaptation in LAC's agricultural sector is on the order of US\$1.2 billion per year from the present to 2050.⁷

The decline in agricultural production and productivity caused by climate change will demand the introduction of adaptation measures to maintain or increase productivity through both changes in production practices and shifts in crops planted as well.⁸ Water availability and quality is one of the main drivers of agricultural vulnerability. The majority of LAC countries, with the exception of Chile, depend on rainfall for agricultural production. Increases in the intensity and variability of rainfall in the region will result in an increase in flooding and drought.⁹ It is projected that the water resources accumulated in glaciers and the snow cover will decline during this century, resulting in a reduction in the availability of water for agriculture. Higher water temperatures and extreme changes in climate can also affect water quality and exacerbate many forms of water contamination. An increase in the sea level is very probable and may result in extended areas of salinization of subterranean water and estuaries, reducing the availability of fresh water.

Another factor determining the vulnerability of the agricultural sector is soil degradation. The region suffers from extensive soil erosion, loss of organic matter, worsening of nutrient values, and salinization. Vast extensions of land are at risk of desertification due to overexploitation of pastures, deforestation, and inappropriate methods of irrigation.

Some of the key challenges for confronting climate change in the agricultural sector include the development of measures of risk protection against climate events via insurance by providing coverage of producers and local populations against catastrophic events; and advanced research in genetics and biotechnology



to increase crop resistance to increased temperatures, increased droughts, and threats from pests and diseases.

Unlike agricultural crops, tropical forests are not amenable to technological solutions to reduce their vulnerability and help them adapt to climate change. However, forests do play a major role in reducing a diverse set of climate change vulnerabilities by, for example, helping to regulate sources of water, reduce erosion, permit application of integrated watershed management systems, and maintain the health of ecosystems in general. An adaptation strategy in the forest sector involves the incorporation of adaptation measures to areas under forest cover, including those areas subject to mitigation measures under LULUCF (mainly forest edge and mosaic forest).

Vulnerability of Water Resources

Approximately 14% of the Latin American and Caribbean population, two-thirds of which lives in rural areas, has no access to safe drinking water. Currently observed vulnerabilities in the region are likely to increase because of the combined effects of existing water deficits,

growing demand for water, and expected changes in precipitation patterns and water availability in many basins. Recent studies indicate that the number of people in LAC experiencing increased water stress because of climate changes could range between 12 and 81 million by 2020 and between 79 and 178 million by 2050.¹⁰ The investment and financial flow needed by 2030 for construction of additional infrastructure to meet LAC's projected demand for water supply caused by population and economic growth and adaptation to climate change is on the order of US\$23 billion.¹¹

Severe water stress is expected in eastern Central America, where the availability of water and generation of hydropower will be greatly affected, and in the Andean region, which is heavily dependent on glaciated watersheds to cover day-to-day water demand. The Andean region deserves particular attention with regard to climate change effects on water resources, as runoff from glaciated basins is an important element of the regional water budget, playing an important role in freshwater regulation in associated watersheds and ensuring year-round water flows for agriculture, drinking, power generation, and ecosystem maintenance. The effects of climate

change are exacerbated by natural phenomena, such as La Niña and El Niño, which affect precipitation and river flows in the region.



Improving water governance through adequate institutional frameworks, policies, and actions that reduce vulnerability to climate change is critical. A number of measures can be taken in this regard, such as: introducing effective water resource management practices within a clear institutional framework that is sensitive to climate; mainstreaming climate change adaptation into water management practices by integrating climate change risks for the water sector into key national and local development plans; implementing adaptation measures; and enhancing information and knowledge management given that water resource management affects other sectors, too, such as energy, health, and food security. Through the adoption of integrated water resources management (IWRM) systems, LAC would be in the position to facilitate the legal and institutional framework required for design and implementation of climate change adaptation measures, especially at the watershed level.

Vulnerability of Energy Infrastructure

The vulnerability of energy infrastructure to climate change has the potential to result in serious limitations in LAC's energy supply in the near future. Fossil fuel power generation plants, pipelines, and transmission lines are exposed to extreme changes in weather conditions, requiring climate risk mitigation/adaptation measures for existing infrastructure and the application of new climate safeguards to newly planned infrastructure. Power generation from renewable sources, such as hydropower, is currently threatened by a reduction of water flows and changes in rain patterns in the Andean, Caribbean, and Central American regions. Climate change has considerable potential economic impacts for the Caribbean electricity infrastructure resulting from a rise in the sea level. The development of other sources of renewable energy, such as wind and geothermal, could also be affected, as these sources are also vulnerable to climate change. Water shortages and soil acidity can affect the productivity of agro-energy crops, thus affecting the biofuel industry and energy cogeneration.

Vulnerability of Transportation Infrastructure

Access to goods and socioeconomic opportunities is critical for economic growth and social well-being. The potential impact of climate change on transportation is significant, geographically widespread, and modally diverse, and may extend to both transportation infrastructure and operations. Transportation's vulnerability to climate change is a function of the nature, magnitude, and rate of climate variation to which a facility or network is exposed, the facility or network's sensitivity, and its adaptive capacity. The types of stress relevant to transportation are those resulting from flooding, erosion, and tidal and storm surges, as well as material temperature stress and lack of visibility due to storms, to name a few variables. Adaptation measures should be designed to protect or enhance the resilience of a transportation facility or network to actual or expected climatic effects and may range from changes in location of key facilities and transportation network hubs to changes in logistics, in



design of facilities, and in materials used in construction. Once transportation sector vulnerabilities are identified, transportation adaptation plans must be developed in close coordination with disaster relief plans and emissions mitigation plans. Economic and financial analysis must be improved so that investments in adaptation measures in the transportation sector are fully integrated into sector planning.

Vulnerability and Adaptation Needs in the Tourism Sector

Tourism infrastructure is highly vulnerable to climate change. Many countries in LAC rely on the tourism sector for their livelihoods and economic growth, especially those in the Caribbean, where tourism and travel contribute 14.8% of GDP.¹² In extreme cases, some tourism infrastructure (hotels, ports, airports, utilities, and access roads, among others) could become unusable for significant periods because of climate change impacts. It is therefore critical that every existing and proposed tourism development plan and tourist infrastructure project incorporate the necessary sector vulnerabil-

ity assessments and climate adaptation measures, including the short-, medium-, and long-term investments required to reduce climate risks.

Health Vulnerability and Climate Change

Regional impact assessments of climate change on the health sector show that the main concerns are heat stress and increased incidence of disease, including malaria and dengue, as well as cholera and other waterborne diseases.¹³ Malaria continues to pose a serious health risk in Latin America, where a little more than 30% of the population lives in tropical and subtropical regions, with potential risk of transmission ranging from 9% in Argentina to 100% in El Salvador. Therefore, the costs associated with health services in the region's countries, including treatment and social security payments, are likely to increase. Models have predicted that a significant increase in the number of people at risk of dengue because of changes in the geographical limits of transmission would be most prominent in Brazil, Ecuador, Mexico, and Peru.¹⁴ Airborne diseases are also a growing concern in large cities, where higher concentrations of CO₂ and fluctuations in temperature and rainfall are causing increased chronic incidence of respiratory problems and pulmonary diseases.

Climate Vulnerability and Resilience in the Urban Development and Housing Sector

Three-quarters of LAC's population lives in urban areas. Vulnerability to climate change is especially acute for urban concentrations in coastal areas because of rising sea levels affecting coastal cities. Fifty percent of LAC's urban agglomerations with populations greater than five million are located in areas intersecting the Low Elevation Coastal Zone,¹⁵ posing a threat to urban public and private infrastructure, such as transportation systems, water and sewage networks, and buildings, as well as to economic activity. In addition to urbanized coastal areas, high-altitude urban concentrations are also highly vulnerable to extreme weather events, such as floods and landslides.

City governments in Latin America have begun to respond to the effects of climate change on urban development. However, there are significant information gaps, and systematic evaluation of effects of climate on urban areas and the effectiveness and real contribution of climate change actions is still lacking. Several capitals and large cities, like Mexico City, São Paulo, Buenos Aires, Rio de Janeiro, Porto Alegre, Curitiba, Bogotá, and Quito, have already begun devising responses to the implications of climate change for urban environments, and a range of mitigation actions have been put in place, including CO₂ pollution abatement and energy efficiency programs. However, these responses have not fully addressed analyses of climate vulnerability, especially given the magnitude of the problem these analyses reveal lies ahead. Most informal settlements in LAC cities share characteristics that intensify the vulnerability of their residents to climate change. These include poorly constructed buildings; inadequate infrastructure; lack of safe drinking water, drainage, and sanitation services; and severe overcrowding with negative public health consequences.

There is widespread consensus that urban centers in LAC should systematically adopt adaptation measures to protect their urban and municipal infrastructures. These measures should include both “hard” engineering options to increase climate resilience in public infrastructure, buildings, and housing stock, and “soft” options that relate to policy changes, capital mobilization, and financial safeguards. Key barriers underscoring the low adaptive capacity of Latin American cities to climate change are the lack of data on vulnerability to climate change and risks at the local level and limited resources and institutional capacities in the context of fiscal constraints and conflicts between various levels of government.





Climate Adaptation and Disaster Risk Management

Climate change increases the risk of disasters in several ways. Specifically, it modifies the number, intensity, magnitude, and frequency of a broad spectrum of climate events, from extreme to small scale. It also increases the variability of climate conditions, generating new threats in areas where populations have never had to confront them. This means that existing mechanisms for response and adaptation, as well as economic planning to confront disasters that is

based on past vulnerabilities and historical registries of hydro-meteorological threats, may now be insufficient. Therefore, improved practices, strategies, and instruments to address risk are required.

Adaptation to climate change and management of disaster risk share similar objectives in that each pursues the construction of resilience to face natural disasters. Both are centered on reducing the vulnerability of the population to natural disasters through improvement of methods to anticipate, resist, absorb, and recover from their impact. Adaptation to climate change and management of disaster risk complement each other in that the analysis of risk performed today is not based solely on the review of historical registers but also on modeling future scenarios that consider future trajectories of variability and climate change. The disaster risk management process has developed and applies a series of instruments and solutions that may serve as an example for adaptation to climate change, provided that these are applied more generally (not on an ad hoc basis) and receive more financial support for implementation. Additional barriers that need to be overcome include lack of information about how to integrate adaptation to climate change and disaster risk management and lack of institutional capacity to work on the topic in coordinated ways at both the national and local levels.

GHG Emissions: Sector Contribution and Mitigation Potential in LAC

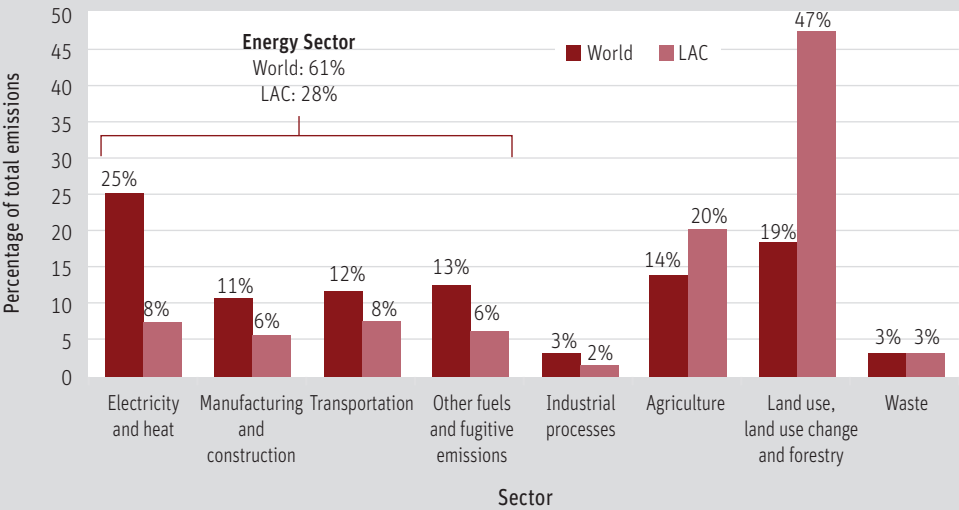
In 2008, Latin American and Caribbean countries accounted for 8.6% of the world's population, 8.2% of the world's GDP, and close to 12% of global GHG emissions, when all GHGs are considered.¹⁶ In terms both of the ratio of GHG emissions to population and of their ratio to GDP, the Latin American and Caribbean region falls between low- and high-income countries. A growing number of countries in LAC are recognizing the need to moderate their GHG

emissions trajectories, and this will require accelerating investment in less-GHG-intensive technologies, even where these have higher commercial costs and associated risks.

Curbing GHG emissions represents a great challenge for public and private investment. Between now and 2030, LAC's energy needs will expand 75%, requiring as much as US\$1.8 trillion in investment in energy supply infrastructure, 85% of which will have to come from private sources.¹⁷ Governments, multilateral development banks, and the international community should be prepared to create the right market environment for this investment to take place by, for example, strengthening private incentives, enhancing national technical capacities and innovation, and improving access to the financing needed to meet future energy infrastructure capital investment costs. All the aforementioned are foundations for facilitating the transition toward more climate-resilient, low-carbon growth in the region.

LAC accounts for close to 12% of global GHG emissions. Compared to the world as a whole, LAC generates relatively more GHG emissions (as a percentage of its total GHG emissions) in two sectors: LULUCF (47% in LAC versus 19% globally), as a result of emissions from intensive deforestation; and agriculture (20% in LAC versus 14% globally), mainly as a result of nitrous oxide emissions from intensive and inefficient use of fertilizers and methane emissions from cattle raising. Energy-related emissions in LAC (electricity and heat, manufacturing, transportation, and other fuels and fugitive emissions) account for a significantly smaller percentage of LAC's total GHG emissions: 28% in LAC versus 61% globally (see Figure 1).

COMPARISON OF LAC'S AND WORLD'S GHG EMISSIONS BY SECTOR (2000)



Source: World Resources Institute, Climate Analysis Indicators Tool, version 6.0 (Washington, D.C.: World Resources Institute, 2009).

Note: Emissions included in the figure are carbon dioxide, methane, nitrous oxide, perfluorocarbons, hydrofluorocarbons, and sulfur hexafluoride. Total GHG emissions in 2000 were 4,696.6 MtCO₂e (LAC) and 40,809.1 MtCO₂e (world).

What follows is a discussion of the various emitting sectors in Latin America, starting with the largest contributor to GHG emissions in the region, land use, land use change, and forestry, followed by agriculture, energy generation and consumption, and wastes. This section then presents an analysis of mitigation opportunities through energy efficiency programs as well as an analysis of emission reduction potential through renewable energy sources.

Emissions from Land Use Change/Deforestation

It is increasingly clear that no strategy for mitigating global climate change can be successful without addressing the largest source of emissions, LULUCF. This is especially true in LAC, where this sector emits so much more than in other regions. LAC's high percentage of GHG emissions from LULUCF results from several drivers: intensive land vegetation change, the destruction of forests, the expansion of agriculture, and land degradation. The benefits of controlling deforestation in LAC (in terms of CO₂ emissions reductions) are very substantial. In addition, protection and sound management of forests brings a suite of cobenefits associated with sustainable rural development, including poverty reduction, conservation of



ecosystem services (e.g., access to safe drinking water), and protection of biodiversity, all of which are the core underpinnings of social and environmental sustainability.

Tackling deforestation and forest degradation presents significant governance, economic, and social challenges. Improving forest governance includes reduction of forest degradation through stronger environmental monitoring and enforcement systems, adequate management of protected areas, assurance of and improvements in property rights, promotion of sustainable forest management practices for timber and nontimber products, adoption of technology innovations to increase land productivity, and support for the creation of markets for ecosystem services.

The most important issues affecting deforestation and forest degradation in LAC are land value and land rights, profitability of agricultural and forest practices, and access to markets. A mitigation strategy in the area of LULUCF should target forestlands where the competitive economic return from agriculture is not high, and, therefore, where forestlands are not under extreme pressures from agricultural uses. These areas account for 39% of all forest resources in LAC and include land on the forest edge (or frontier) and mosaic forest located eight hours or more away from markets. For example, in Central America and the Caribbean, the predominant landscape is mosaic lands and forest edge under severe pressure from agriculture conversion or forest degradation. South America has also vast expanses of land on the forest edge, as well as considerable expanses of mosaic lands. The other two categories (mosaic forests located less than eight hours away from markets, which account for 10% of LAC's forest resources, and forest core areas, which account for 51% of all forests in LAC) are subject to lesser land use change pressures.

Another large potential for emissions reductions from LULUCF involves grasslands, which can sequester carbon more quickly than forests due to the rapid rates of growth of grass and shrub species and which can improve management of soil organic carbon content.

Emissions from Agriculture and Livestock

GHG emissions from LAC's agriculture and livestock sector are lower than emissions from other sectors. However, they are high relative to the rest of the world, at 20% of total emissions versus 14% globally. GHG emissions from agriculture and livestock account for the highest percentage of GHG emissions (21–35%) in Argentina, Bolivia, Brazil, and Colombia.

GHG emissions from the agriculture and livestock sector include: methane emissions due to processes such as enteric fermentation (from ruminants), management of animal fertilizers, and irrigated rice cultivation; nitrous oxide emissions from use of fertilizers, residues from the management of soils, and nitrogen fertilization of various crops; and CO₂ resulting from the burning of pastures and agricultural wastes.¹⁸ Methane and nitrous oxide emissions are particularly important in national inventories of GHG emissions because of their climate-warming effect, which is greater than that of CO₂.¹⁹

Several mitigation strategies that address the emissions drivers mentioned above (livestock, fertilizer use, and farming methods) are currently being discussed and analyzed for

adoption in the region. In several countries, sustainable agriculture or low-input-use farming methods have been introduced to increase organic material in the soil and reduce the use of machinery, pesticides, and chemical fertilizers. It is also widely recognized that the proper metrics in estimating GHG mitigation potential in the agricultural sector must include the full system of production, including carbon emissions from the use of electricity and fossil fuel inputs, fertilizers, lime, fungicides, irrigation, and production of seeds and farm machinery in the sector.

Emissions from Energy Generation and Consumption in Key Sectors

Energy generation and consumption account for 28% of the region's total GHG emissions compared to 61% in the rest of the world. The following bullet points discuss emission contributions and mitigation potential in key sectors:

- ➔ *Electricity generation from fossil fuels.* Power generation accounts for a relatively low proportion of emissions in LAC (7% of LAC's total GHG emissions) given the dominant use of hydroelectricity in the region and, consequently, the low use of fossil-fuel-fired power plants. LAC emits about 200 grams of CO₂ per kilowatt-hour of energy generated, the lowest rate of any region in the world. Although LAC has enjoyed many decades of growth with relatively clean power compared to the world's average, with the most recent economic crisis there has been a shift away from hydroelectricity toward electricity generated from burning natural gas and coal, which will definitely increase the carbon intensity of the region's power sector. This shift has been driven by concerns over the past few years about the need to increase the region's diversity of energy options as a means to improve its energy security. Reductions in water availability due to changing hydrologic conditions resulting from climate change have destabilized the supplies of hydroelectric power upon which the region has traditionally depended.
- ➔ *Transportation.* The transportation sector accounts for 8% of total GHG emissions in the region. LAC's emissions from transportation have increased over the past decade at a faster rate than those from any other energy-consuming sector because of fast urbanization, high rates of motorization, an aging vehicle fleet, and fuel combustion patterns. If one considers direct CO₂ emissions from energy consumption in the region, the transportation sector is the largest contributor of CO₂ emissions, for in 2007 it contributed as much as 35% of LAC's total CO₂ emissions—the highest rate in the world. Road transportation accounts for 90% of transport emissions in the region, with half produced by passenger traffic and the other half by freight travel.

Through the promotion of sustainable transportation, the region can move toward a more sustainable low-carbon transportation path.

Travel needs can be avoided or reduced through better integration of land use and transport-planning policies and transport demand management measures. If travel does

need to take place, cities can promote a shift from more carbon-intensive to less carbon-intensive transportation modes. For passenger transportation, emission reductions can be achieved through shifting from private vehicles to mass transit (bus rapid transit and rail-based systems) and to nonmotorized transport (improvement and expansion of footpath and bicycle networks, bicycle taxis or pedicabs, and so on). For freight transportation, emission reductions can be achieved through shifts from truck to rail and inland waterways.



Improvements in transport efficiency are also important to mitigate impacts (i.e., application of fuel economy standards, new technologies in public and private transport, improvements in infrastructure, and capacity building in local institutions). In the area of passenger transportation, the promotion of bus rapid transit (BRT) systems is now accepted as an efficient and convenient alternative to private transport in the region, bringing considerable CO₂ reductions in LAC cities and generating environmental cobenefits with reductions in airborne pollutants and toxins, in noise levels, and in the number of accidents. Examples of such successful BRT projects are Bogotá's Transmilenio and Mexico City's Metrobus.

In the area of freight and logistics, a comprehensive framework needs to be put in place in coordination with private operators that would include connecting different modes, facilitating the modal shift towards more sustainable modes (such as railroads and waterways), improving information and communications technologies, and improving vehicle efficiency and operation of freight fleets.

In summary, sustainable transportation systems—both passenger and freight—offer a large potential for emissions reductions in the LAC region. However, key technical and financial barriers need to be overcome to realize that emission reduction potential, including lack of coordination among sectors that affect emissions from transportation; lack of data and studies in support of sustainable low-carbon transportation; and lack of financial sources and delivery mechanisms for implementation on the ground.

- **Water and sanitation.** The water and sanitation sector makes a relatively small contribution to LAC's GHG emissions (3% of the total in LAC). But even if their contribution to climate change is small by comparison with other sectors, the supply of water, wastewater treatment, and solid waste collection are energy-intensive operations whose demand for energy will increase as service provision improves and coverage expands to keep pace with increasing urbanization and economic growth. Furthermore, methane emissions from landfills in LAC are expected to increase by 30% between now and 2030 as



a result of (i) an increase in solid waste generation associated with an increase in income; (ii) an improvement in final disposal practices, with a movement from open dumps to sanitary landfills; and (iii) a lack of a regulatory framework that would guarantee proper landfill gas management practices.

Mitigation measures in the water and sanitation sector are principally focused on: (i) limiting emissions in solid waste treatment and disposal by capturing and utilizing the methane generated at landfills and reducing the amount of degradable and recyclable material entering landfills; (ii) reducing emissions in wastewater treatment plants by implementing

advanced aerobic treatment technologies combined with capturing and using methane or nitrous oxide; and (iii) reducing emissions in water utilities by increasing their operating efficiency and energy use.

Mitigation Opportunities through Energy Efficiency Programs

Energy efficiency is defined as a reduction in the energy used for a given energy service or level of activity. Improving energy use through EE measures is the cleanest, quickest to implement, most reliable and stable, and most cost-effective component available to increase the performance of any energy matrix, and it also provides GHG reduction and economic benefits. EE measures can be applied on the supply side (through efficiency in generation, transmission, and distribution) or on the demand side (through reducing energy demand by means of specific end-use devices and systems). The benefits of adopting energy efficiency programs include reduction of energy demand in the short term, which in turn can delay the construction of new power generation capacity, increase market competitiveness, and reduce fossil fuel consumption and associated emissions of local and global pollutants.

The IEA estimates that EE measures will account for more than half of global energy-related GHG emissions abatement by 2030,²⁰ with largely negative net abatement costs. It is possible to implement such efficiency measures in LAC without compromising the level of services delivered or the region's economic competitiveness. Some countries in the region—most notably Mexico and Brazil—are already reaping substantial electricity savings from EE programs. Although many factors influence the viability of EE programs for a particular country (climate, structure of sector energy consumption, technology and industrial structure, and energy intensity²¹), opportunities for energy savings and emission reductions through EE measures are present across the region, especially given LAC's low levels of energy productivity. These opportunities are present across many sectors: power supply (new genera-



tion, cogeneration, and transmission and distribution), transportation, buildings (public and private), industry, agriculture, and water supply.

A recent close examination by the Bank to assess EE potential in the region showed, in general terms, a large potential for energy and cost savings. Energy consumption could be reduced by 10% over the next decade by investing in energy efficiency, mainly in buildings and transportation systems, with savings of up to US\$37 billion in deferred investments for new power generation projects. Total energy consumption could be reduced by approximately 321,000 gigawatt-hours in 2025, and CO₂ emissions could be reduced by 135 megatons of CO₂ equivalent (MtCO₂e) per year by 2025.

The success of EE programs largely depends on whether governments provide the right incentives to help overcome existing barriers to implementation of these programs. Key barriers include: high fuel and electricity subsidies, which discourage investments in EE; financial barriers such as lack of capital for investments in new energy-efficient equipment or technologies; and lack of information to consumers, vendors, manufacturers, and policy-makers about the availability of EE technology and its benefits. Incentives to overcome these barriers can take many forms, ranging from tax rebates and subsidies to regulations requiring specific efficiency standards for vehicles and appliances to information campaigns.

Renewable Energy Potentials

LAC has considerable potential for renewable energy generation. RE sources (hydro, wind, solar, marine, bioenergy, and geothermal) could make a far greater contribution toward meeting energy needs in the LAC region than existing trends suggest. Internal Bank estimates show that the region's hydropower potential (estimated at 687 gigawatts) could account for 28% of total energy generation by 2015 and could reach 36% by 2030. Part of this new clean energy supply could be developed through small hydro plants, which have fewer environmental and social impacts than large hydroelectric projects.

Enhanced renewable energy implementation and use could lead to substantial GHG reduction at a relatively low cost, even if only a fraction of the total RE potential (including biomass) is developed. An IDB analysis shows that the mitigation potential (in megatons of CO₂e of avoided emissions) of developing just 10% of the total renewable energy potential

in 15 LAC countries through geothermal, wind, and hydropower would be 158 MtCO₂e per year.²² This would represent 80% of total CO₂ emissions from the power sector in the selected countries. The implementation of RE technologies in the power sector brings additional benefits in terms of energy security, reduced dependence on fossil fuel and exposure to high price volatility, and reduced pollution and public health improvements.

Primary limiting factors affecting LAC's current and future ability to promote the use of RE in the region are lack of institutional capacities, inadequate governance structures, and inadequate regulatory frameworks to facilitate a cleaner energy matrix. The region's traditional, short-term-focused energy framework, which is based on a least-cost energy-planning model, must be aligned with a longer-term, cleaner, sustainable energy-planning model. This entails a greater effort regionally and in each nation, supported by capacity-building programs, technology transfers, and financing, taking into account the diverse country conditions, legal frameworks, and cost structures underlying the viability of RE.

The primary RE technologies that are well suited for LAC include the following:

- *Hydropower.* Hydropower remains an abundant renewable energy resource and is relevant for meeting the region's electricity demand trends. Most notably, in some of the region's countries, such as Brazil, Colombia, Ecuador, and Peru, the realization of a relatively small percentage of total available potential could entirely cover electricity demand, and, in most countries in the region, it could represent an important share in energy supply. However, changes in hydrologic cycles will affect the hydropower potential of existing and future energy infrastructure. Therefore, governments will have to incorporate climate variables into their energy planning schemes.
- *Wind energy.* Favorable wind conditions for wind technology deployment have been identified in the Tehuantepec region of southern Mexico, the Patagonia region of Chile and Argentina, the northern coastlands of Colombia and Venezuela, some interesting Central American "hot spots," and some areas of Brazil. Current total installed capacity of wind energy in LAC is only 840 megawatts (MW) (0.5% of total capacity in LAC), with wind projects operating mainly in Brazil, Costa Rica, and Mexico. Improvements in wind technology and decreases in cost are improving the prospects for expansion of wind energy sources. Significant barriers for wind power development include: lack of stable, long-term regulatory conditions; lack of suitable infrastructure and



access roads; lack of heavy machinery availability and transmission facilities to harvest real wind potential; scarce financial mechanisms tailored to wind power projects; and limited technological knowledge.

- *Solar energy.* Solar energy represents an important renewable energy alternative in LAC. According to existing studies on solar resources, some countries and areas in LAC (specifically, Mexico and most of the countries in Central America, the Caribbean, northern regions of Colombia and Venezuela, Peru, Bolivia, and northeastern Brazil) show irradiation values greater than 45 kilowatts per square meter per year, which can be classified as excellent for commercial resource exploitation. The use of photovoltaic panels for energy generation has proven to be cost effective and able to provide adequate energy supplies in rural electrification projects, and there are large photovoltaic applications in the Caribbean, Argentina, Chile, and Mexico. Nevertheless, photovoltaic and thermal-solar sources still face high technology costs and intermittency in the supply of energy, both strong limitations for solar power development in the region.
- *Geothermal energy.* Geothermal energy represents an important potential source of base load heat and power. However, high exploration costs and high levels of risk have hindered project implementation and have limited projects to high-grade geothermal resources. However, reductions in the costs of geothermal technology are making geothermal energy an increasingly attractive source of energy for the region. Currently, geothermal energy is used as an energy source only in Costa Rica, El Salvador, Mexico, and Nicaragua. Mexico is a leader in implementation of geothermal technology, having the third-largest installed capacity worldwide. It is remarkable that 100% of electricity demand in many countries in LAC could be supplied by geothermal energy, mainly in Central America (Costa Rica, El Salvador, Guatemala, and Nicaragua), and in Bolivia in the Southern Cone. Geothermal energy could also make an important contribution to the electricity supply in all countries of the Andean region (Chile, Colombia, Ecuador, and Peru).
- *Bioenergy.* LAC is uniquely suited for bioenergy production given its abundance of sun, water, and available land. Bioenergy can be used for transport (in the form of a liquid fuel) and in industries (to generate electricity). It is estimated that by 2025, a





reduction of 105 MtCO₂e could result from production of ethanol, mainly of Brazilian origin, and that a reduction of 27 MtCO₂e could be realized through production of biodiesel during that same period. Recognizing the direct and indirect implications (social and economic) of biofuel programs for food security, land use, biodiversity, and water resources is critical. LAC countries must be prepared to meet sustainability criteria for biofuels projects.

- *Marine energy*. Despite the fact that marine energy technologies are still in experimental phases, with few developments at commercial scale, marine energies (marine currents, tides, and waves) represent a very interesting energy supply alternative whose potential has barely been investigated. Hypothetically, in Chile, the realization of approximately 13% of the country's marine (wave) energy potential could meet the entire present national electricity demand.

Financial Mechanisms and Resources for Addressing Financial Gaps and Scaling Up Investments in the Region

Over the years, the IDB has developed several mechanisms for addressing financial gaps in key sectors and for scaling up climate-change-related investments. In recognition of the scale and urgency of climate change challenges, the IDB is obligated to consider the full range of resources available for climate action (such as fiscal resources, multilateral development banks, donor communities, private sector, CIF, carbon finance, and so on). The Bank also should ensure that public and private sector financing reinforce and complement each other at the international and national levels.

In order to respond better to climate challenges in the region, the IDB will need to mainstream climate change across the Bank's operations using existing and new instruments. Available IDB instruments that catalyze and attract innovative financing to climate-related projects include technical cooperation, investment grants, knowledge- and capacity-building products, climate change policy-based loans, and conditional credit lines for investment projects. The Bank must implement these products primarily by drawing on Bank financial resources such as SECCI Funds, participating in the CIF, and leveraging complementary private sector instruments, such as loans, guarantees, and other risk-sharing mechanisms. It will also need to mobilize other resources, such as the GEF and those under Kyoto Protocol mechanisms, in order to help countries meet the vast levels of investment required. These financial resources will be described in more detail below.

Key to this support will be coordination between finance/planning ministries and national environmental and climate authorities. Through policy dialogues, climate change policy-based loans, and technical cooperation, the IDB already supports a number of national finance and planning ministries in working together with climate change national focal points to better understand the implications of international UNFCCC negotiations and the need to enhance national capacity to assess economic implications of climate change, to identify national priorities for action within development and budgetary plans, and to assess and absorb international finance to address climate change. The Bank will also work to strengthen its support for effective measurement, reporting, and verification of climate mitigation and adaptation actions.

The IDB must increase its support to public and private clients for developing Clean Development Mechanism programs of activities, piloting sectoral approaches, and exploring use of voluntary markets for climate mitigation projects. This support should include assistance in assessing the countries' institutional capacity to promote carbon markets, which encompasses identification of policies, design and implementation of information and training programs, and development of national trading platforms. Key to this effort will be the launching of a carbon finance platform in Spanish for project developers in the region.

The IDB also needs to increase its support in the development of national adaptation programs that address sectors such as agriculture and water in an integrated manner. This includes providing assistance for conducting vulnerability and adaptation assessments of the sectors as well as for developing scenarios that would inform sectoral and budgetary plans that give sufficient attention to the economic and social priorities of LAC countries.

What follows are descriptions of financial tools available to address LAC's regional and national priorities. These descriptions are of existing and new financial mechanisms that will play an important role in mobilizing additional resources required for climate action, including the Bank's Sustainable Energy and Climate Change Funds; the Climate Investment Funds; the Global Environment Facility; resources under the Kyoto Protocol (CDM); voluntary markets; and a range of lending and technical assistance programs offered by the Bank. This section will then conclude with a short assessment of results of opportunities emanating from COP 15 in Copenhagen and prospects for support to the region in preparation for the Sixteenth Conference of the Parties (COP 16) in Mexico at the end of 2010.

SECCI Funds

The Bank will continue administering the SECCI IDB (Ordinary Capital) and SECCI Multi-Donor Funds. A replenishment of the SECCI IDB Fund has been approved, with up to an additional US\$40 million to be allocated to technical cooperation and investment grants. In tandem with this new Bank commitment, the IDB will seek support from donor countries to replenish the SECCI Multi-Donor Fund, thus enhancing considerably the availability of funds for the 2010–2011 period.

Mobilization of GEF Resources

The United Nations Framework Convention on Climate Change facilitates a global source of funding in helping address the issues under discussion. The UNFCCC was adopted by the world's nations more than a decade ago to address imminent causes and consequences of climate change and entered into force in February 2005. The Global Environment Facility has been designated as an operating entity of the financial mechanism of the Convention on an ongoing basis, subject to review every four years. So far, it has allocated about US\$250 million each year for long-term mitigation projects, including in the areas of renewable en-



ergy, energy efficiency, and low-GHG-emitting technologies. The GEF also manages special funds under the UNFCCC (the Least Developed Countries Fund and the Special Climate Change Fund) to support adaptation activities as well as development and transfer of technologies. It also manages the private-sector-focused GEF Earth Fund. The IDB is supporting its borrowers in accessing financing from the GEF. Specifically, the Bank plans to develop an active pipeline of GEF-funded projects and an IDB-GEF Earth Fund platform to provide concessional financing for private sector projects that generate critical environmental benefits.

In addition, the Bank will work closely with the international community in establishing and implementing the new UNFCCC financial mechanisms emanating from the Copenhagen Accord, as part of the collective commitment to support projects, programs, and policies related to mitigation, including REDD-plus, as well as adaptation, capacity building, and technology development and transfer.

Mobilization of CIF Resources

Toward the end of 2008, two new climate change funds—collectively called the Climate Investment Funds—were created at the global level. These funds are dedicated to supporting climate-change-related investments in low-carbon technology (the Clean Technology Fund) and integration of climate change within development planning (the Strategic Climate Fund). The governance of these funds is composed of equal representation by developed and developing countries, with civil society and the private sector, along with UN agencies, serving as active observers on the trust fund committees. In September 2008, potential donors pledged US\$6.2-billion to the CIF over the next three years for assisting countries with national climate change programs relating to low-carbon growth and climate resilience.

Given that the future financial architecture and funding strategy for climate change under discussion in UNFCCC deliberations on the future of the climate change regime is not yet available, the aforementioned new funds provide an important interim source of finance for the IDB to fill an immediate financing gap. The IDB has been fully involved in the joint effort among multilateral development banks to launch and implement the CIF resources. However,

MEXICO'S CLIMATE INVESTMENT PLAN

Mexico was the first country to submit an investment plan to the CIF Clean Technology Fund. The plan was approved by the CTF Trust Fund Committee in January 2009. This plan, prepared jointly by the IDB, the World Bank, and the International Finance Corporation (IFC), outlines US\$6.2 billion in investments to be covered by various sources, including the IDB, the World Bank, the CTF, carbon finance, and, to a lesser extent, the IFC. The plan estimates annual reductions of 95 million tCO₂e. The CTF's commitment to the plan is US\$500 million to cover programs in urban transportation, renewable energy, and energy efficiency in public sector projects (in lighting, cooling/refrigerators, and air conditioning) and in private sector projects. The IDB is providing cofinancing to match the CTF funds. In December 2009, the first private sector project under Mexico's investment plan was approved for a total of US\$102 million in partial financing for two wind power projects totaling 318 MW in the state of Oaxaca. Under this program, the IDB will manage a US\$30 million CTF loan supported by SECCI and CTF technical cooperation for strengthening Mexico's national development banks, as well as for scaling up of carbon finance for renewable energy and energy efficiency.

it should be noted that the long-term future of these funds will depend on agreement regarding the future financial architecture under the UNFCCC.

Meanwhile, the IDB, along with five other multilateral development banks, is an implementing agency of the CIF and remains closely involved in the design and programming of these funds. The World Bank is the trustee of the funds and hosts the administrative unit of the CIF. The CIF therefore require the IDB to collaborate closely with the World Bank Group at the international level as well as in the programming of the funds at the country level.

At the IDB, SECCI acts as the CIF focal point and technical counterpart of the funds for the IDB Group. The primary role of the focal point is to develop and coordinate IDB input into CIF governance activities; to promote mainstreaming of CIF-related objectives across the Bank; and to maintain a high level of quality control for all CIF-related investments and activities. SECCI also coordinates across the IDB Group in the programming of CIF resources in a number of countries. Such programming is done via investment plans for Latin American and Caribbean countries prepared by the various divisions of the IDB Group jointly with the World Bank Group and presented to the CIF Committee. These investment plans delineate the areas in which various public and private sector windows may be able to use a blend of CIF and IDB money for projects that promote countries' transition to low-carbon economies, as well as projects that make those economies resilient to climate change. In combination with CIF funding, the IDB will provide additional grants and concessional financing to support the undertaking of programmatic approaches toward public and private sector investments in support of these goals.

Resources under Kyoto Protocol Mechanisms

Another source of funding lies in the Kyoto Protocol's Clean Development Mechanism, which provides financial assistance for mitigation projects in non-Annex I Parties (mainly developing countries) by issuing Certified Emission Reductions for CO₂ reductions or removals. The CDM has grown rapidly and has developed a significant carbon market, generating additional finance for supporting renewable energy and energy efficiency investments in developing countries. The UNFCCC estimates that financing through the CDM could reach up to US\$125 billion by 2030. It should be noted that, although the number of host countries is growing, CDM activity and projects are currently concentrated in a small number of countries (Brazil, China, India, and Mexico).

The Bank will strengthen its role in supporting public and private sector clients' participation in the CDM, including support for the habilitation of resources for various CDM activities such as Project Idea Notes, Project Design Documents, validation, and so on. The Bank will pursue increased access to the Adaptation Fund as a source of financing for mainstreaming adaptation into countries' national and sectoral plans.

The Kyoto Protocol mechanisms are continuing to evolve according to outcomes of the Copenhagen summit and subsequent planned meetings. The Bank is actively supporting LAC's engagement in a renewed and/or new international framework. Support will also be directed toward enhancing the region's participation in voluntary markets for carbon emissions reductions.

Voluntary Carbon Markets

A number of markets (so-called voluntary markets) are buying credits from projects for their emissions reductions or trade emissions reductions in a manner that is not regulated in the UNFCCC. The emissions reductions that are traded in these voluntary markets are called verified emission reductions (VERs). The number of these markets has increased substantially in the last two years (it is calculated that their trading volume amounted to about US\$335.3 million in 2007 and US\$704.8 million in 2009). Transactions for voluntary markets may take place over the counter or through trading platforms such as the Chicago Climate Exchange. Since the procedures for verifying these credits and eligible activities tend to be more flexible, the value of VERs tends to be significantly lower than that of credits from markets regulated in the UNFCCC.

Additional IDB Fund under Consideration

One supplementary mechanism that will be explored for scaling up investments in sustainable energy and climate change mitigation and adaptation activities is the establishment of an IDB Climate Change Cofinancing Facility. This could help increase the leverage ratio of IDB to CIF and other sources of cofinancing. The facility would be designed to maximize

leverage of other multilateral and bilateral resources as well as domestic financing for both the public and private sector and to support emerging priorities (and rules) for a post-2012 international carbon market. This facility would accelerate the IDB's leverage for countries accessing the CIF and provide additional resources necessary to meet the Bank's targets for low-carbon investments.

Funding Possibilities Following Copenhagen

The IDB will support Latin American and Caribbean countries in preparing for the UNFCCC conference in Mexico in 2010 and in identifying national priorities and actions on climate change as well as needs for financial and technical assistance, as established in the Copenhagen Accord.

One significant feature of the Copenhagen Accord, which has strong implications for IDB, is the agreement for provision of new, short-term financing (US\$30 billion). Given the fast-start nature of this commitment, the resources are likely to be mobilized through existing channels, including (i) a replenishment of the GEF; (ii) new pledges to the CIF; (iii) contributions to special funds such as the Adaptation Fund; and (iv) direct contributions through existing bilateral and other multilateral agencies and programs. However, it is uncertain whether a new Copenhagen Green Fund will be agreed by all Parties in the upcoming COP 16 in Mexico and what kind of role multilateral development banks will play in longer-term financing (2013–2020 and beyond). Both issues will be a key focus of the negotiations in the coming year.

One of the most important lessons from Copenhagen for regional development banks is that they can and should engage and support countries in strengthening their position in international negotiations (as the African Development Bank did with its member countries in preparations for COP 15 in Copenhagen). This conclusion is a signal for the IDB to engage extensively in discussions with Bank stakeholders in the region—governments, nongovernmental organizations, and the private sector—in preparation for COP 16. This should occur in the context of the Bank's consultations while developing its Climate Change Strategy.

The upcoming IDB Governors' Meeting in Cancún should provide a platform for the IDB to signal a strong political commitment to supporting the region's position in the global scene and to committing the resources necessary to fully engage with and on behalf of LAC in reaching mitigation and adaptation objectives. A regional outreach proposal will be promoted in preparation for COP 16 in order to strengthen support for the IDB as the bank of choice with respect to climate change financing for countries in the region. This proposal must be supported by a number of events during 2010 to build on progress during 2007–2009. Goals are to signal progress towards tackling climate change through Bank operations and to strengthen partnerships with key regional and international agencies, most notably ECLAC, the United Nations Environment Programme, the United Nations Development Programme, and the other multilateral development banks.

The IDB's Key Areas of Action for Addressing Climate Change

The IDB has identified five key areas of action or organizational capacities it will further develop and utilize to address climate change mitigation and adaptation more effectively. This set of capacities will help define the strategic lines of action that will compose the Bank's Climate Change Strategy currently under development.

The IDB's key areas of action include:

- Strengthening the knowledge base for addressing mitigation and adaptation priorities.
- Strengthening institutions' and private and public capacity for climate change action in the region.
- Developing guidelines to mitigate climate impacts of the IDB's investment portfolio.
- Identifying and developing lending strategies and technical assistance potential in key sectors.
- Adopting mechanisms for scaling up investments and addressing financial gaps in the region.

These key areas of action will need to be supported by dialogue, outreach, and information/communication activities in line with IDB member countries' priorities and need for stakeholder engagement in the climate agenda. These activities will facilitate internal and external communications and will help build consensus and joint action towards achieving the goals and objectives set forward by the CCS.

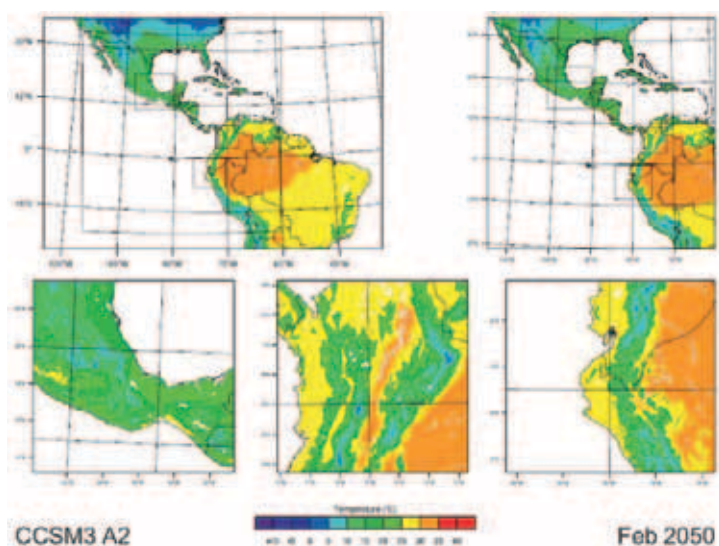
Strengthening the Knowledge Base for Addressing Mitigation and Adaptation Priorities

The IDB will expand its knowledge base on clean development and adaptation, in order to be able to provide training, guidance, support, and knowledge products to its clients.

As a leader in the international finance community, the IDB has generated a strong knowledge base in development that spans many decades. The IDB should continue to provide

crucial support for knowledge generation in climate change mitigation and adaptation, consolidate this information, and make it available to regional and international participants in the climate agenda. Drawing upon this base, it should address knowledge needs in the individual sectors and policy disciplines participating in the climate change agenda, including the energy, water resource management, agriculture, forestry, transportation, and urban development sectors and policy disciplines. It should also address the need for deeper understanding of the different dimensions of the global and regional policymaking process, including the dimensions of environment, economics, politics, technology, and communication. This climate-change-related knowledge building and management capacity should be supported by several specific efforts, including the following:

- Supporting studies on the economics of climate change (i.e., continue supporting the development of studies to identify and assess the economic implications of climate change).
- Guiding and supporting development of climate change vulnerability and climate risk assessments, specifically by guiding and supporting development of improved systems for executing climate change vulnerability and risk assessments that integrate the full range of socioeconomic, biophysical, and environmental impact variables, including training to develop local technical and institutional capacity.
- Developing disaster risk management and reduction policies, specifically by promoting risk sharing and innovative transfer mechanisms such as insurance schemes or other means to address loss and damage associated with climate change and assistance for longer-term efforts for economic diversification, as is prioritized in the Bali Action Plan.
- Guiding and supporting development of GHG inventories, specifically by providing analytical tools for building GHG inventories and assessing emissions reduction potential.



- Developing analytical instruments and information/training platforms incorporating the latest developments in climate change knowledge, specifically by creating interactive and dynamic tools to facilitate evaluation of programs and projects related to new areas of interest requiring technical guidance.
- Supporting regional networks, specifically by providing support for development of analytical studies and tools for use by regional networks of renewable energy technology and innovation centers.
- Partnering with the private sector to increase knowledge, specifically by developing programs to educate and learn from the private sector with regard to how to identify and manage the risks presented by climate change as well as identifying opportunities to develop and adopt innovative solutions to the climate change challenges in LAC.
- Partnering with other regional development institutions and nongovernmental organizations to exchange experiences and knowledge and to combine knowledge and learning in the interests of more informed development of strategies.

Strengthening Institutions and Private and Public Capacity for Climate Change Action in the Region

The IDB will leverage its unique position in the region to help its clients strengthen their institutional frameworks as well as public-private capacity.

The IDB plays an important role in assisting governments in creating and consolidating the necessary capacities for policy development and implementation. The IDB will support institution building and technical capacity through promotion policy frameworks and aim for the region's full development of its potential for climate mitigation and adaptation, under both public and private sector project development. Accordingly, the IDB has identified the following lines of action aimed at strengthening institutional frameworks and capacity building to respond to climate change challenges:

- *Supporting development and implementation of country and subregional climate change strategic action plans.* Assist countries' public entities in the development of strategic climate change action plans in tandem with existing Bank country assistance strategies and programming exercises.
- *Strengthening institutional capacity and supporting the development of policy and regulatory frameworks.* Support countries' priorities and objectives on climate change, whether the emphasis is on low-carbon development or on integrating climate resilience into development plans. The Bank will continue to utilize programmatic policy-based loans to advance institution building and policy reform in climate change.
- *Development and capacity building for institutions for sustainable power markets.* Strengthening existing institutions to address the challenges of climate change, particularly those associated with the power sector.

- *Providing technical assistance to and strengthening of climate change government entities within national ministries.* Promote capacity-building programs for national climate authorities and climate change focal points within the various ministries, including support for improving regulatory frameworks to facilitate investments in sustainable energy.
- *Providing technical assistance to and strengthening of subnational (provincial, state, municipal) entities.* Promote institutional strengthening of subnational authorities for the development of climate change action plans.
- *Mobilizing private sector solutions.* Promote development of innovative applications of financial and nonfinancial products and services and the necessary business climate so that private entities are enabled and encouraged to build and contribute to a climate-sustainable economy.
- *Fostering the capacity and knowledge of financial intermediaries.* Provide support to financial intermediaries for assessment and identification of opportunities in energy efficiency, renewable energy generation, and low-carbon technologies using methods such as financial techniques, credit analysis, marketing, product development, and conferences/campaigns, among others.

Development of Guidelines to Mitigate Climate Impacts of the IDB's Investment Portfolio

The IDB will develop guidelines and criteria for mainstreaming climate change mitigation in its operations, and will develop internal capacity for climate-proofing projects and GHG reporting

The IDB's internal climate sustainability mainstreaming effort will pursue three main complementary components. First is adoption of sector-specific principles organized around the four sectors with the largest carbon footprint and mitigation potential in the IDB's portfolio (land conversion, power generation sector, industrial sector, and waste management). Second is development of specific guidelines for subsectors or facilities, including coal-fueled power plants, other fossil fuel power plants, oil and gas extraction, landfills, cement, pulp and paper, chemicals, agriculture, transportation, and dams. Third, the IDB will develop cross-sectoral guidelines to direct "climate proofing" of existing and new projects, use of carbon offsets, and adoption of GHG reporting mechanisms that will measure the climate performance of the IDB's own investments and operations (which will require generation of commensurate internal capacities).

Adoption of Sectoral Project Principles

The IDB will adopt sector-specific principles to ensure that Bank-funded projects take into account the best currently available technological options and practice management methods in order to guarantee adequate consideration of climate change impacts and adop-

tion of mitigation measures in relevant sectors. These sector-specific principles will in turn drive development of specific sectoral guidelines during 2010. The sector-specific principles include:

- *Power generation sector.* The IDB will continue to finance fossil-fuel-based power plants while becoming more selective with regard to the type of technology involved in projects proposed for funding. It will strive to balance environmental and economic benefits and impose more stringent GHG emissions performance standards on funded projects. In the context of country programming, the Bank will seek to fund projects that use less-carbon-intensive fossil fuels (i.e., those with less carbon per unit of calorific value) or that involve cofiring with carbon-neutral fuels (i.e., biomass). All power generation projects will be required to use the best-proven available technology appropriate to the particular characteristics of the project that allows for high efficiency and therefore lower GHG emissions intensity.
- *Industrial sector.* There are several options and procedures for mitigating GHG emissions from the industrial sector, including from extractive industries. The following options and procedures are to be considered: (i) sector-wide options, including, for example, the use of more efficient electric motors and motor-driven systems; (ii) process-specific options, including, for example, the use of turbines to recover the energy contained in pressurized blast furnace gas; and (iii) operating procedures, including, for example, control of steam and compressed-air leaks, optimum use of insulation, and optimization of equipment size to ensure high capacity utilization.
- *Waste management.* Methane emissions from solid waste and wastewater can be readily controlled using existing technologies. As proper waste management practices are gradually incorporated into municipal practices, the adoption of proper techniques for gas capture/elimination and use (for electricity generation) is now commonly required. The IDB will establish parameters for methane gas management in all IDB-funded waste management operations, based on technical characteristics and local conditions.
- *Land conversion in agriculture, transportation, and dams.* The Bank will require that GHG emissions generated from direct and indirect land use change caused by agricultural, transportation, and dam projects be taken into account in the analysis of the projects' environmental impacts. If emissions from a particular project prove to be potentially significant, the IDB will then support the project only if (i) these emissions can be reduced or avoided or (ii) a comprehensive options analysis demonstrates that the proposed project design is the only feasible alternative, that the benefits outweigh the costs, and/or that an appropriate carbon offset scheme can be identified.

Adoption of Sectoral Project Guidelines

Specific guidelines will be developed for subsectors or facilities following the above-described principles. These guidelines will ensure that projects in energy- and/or GHG-

BOX 3

SPECIFIC GUIDELINES FOR SUBSECTORS OR FACILITIES

Power generation	Coal-fueled power plants Fossil fuel power plants
Extractive industries	Oil and gas mining
Waste	Landfills
Manufacturing	Cement, pulp and paper Chemicals
Land conversion	Agriculture Transportation Dams

intensive industry sectors are designed to include the most appropriate available technology, taking into account energy use relevant for the sector, and are operated according to best practices regarding energy conservation and reduction in GHG emissions. Furthermore, the IDB will screen the projects it supports for energy efficiency opportunities early in the project cycle and offer energy audits and energy management training to its clients. In a climate-change-constrained world, IDB climate change guidelines will need to be periodically

reviewed and updated to take into account changes in technology as well as new developments in the science of climate change. Box 3 lists the subsectors or types of facilities for which guidelines will be developed.

Cross-Sectoral Guidelines

A set of cross-sectoral guidelines will also be developed to improve the IDB's performance in GHG accounting and reporting, climate proofing, and use of carbon offsets:

- **GHG accounting and reporting.** The IDB's Environmental and Safeguards Compliance Policy (OP-703, 2006) includes a provision that IDB-supported operations which produce significant quantities of GHGs will annually quantify direct GHG emissions in accordance with the emissions estimation methodologies of the IPCC or other internationally accepted methodologies. The Bank will develop technical criteria and guidelines to help its borrowers and clients comply with this provision. The annual reporting of emissions conducted under this policy will complement the estimation of GHG emissions carried out during the project preparation phase for projects with potentially significant emissions. In addition, the IDB will report on the carbon footprint of its portfolio of operations. The Bank will also develop technical criteria and guidelines to help project teams accurately assess the effect of a particular project on climate change as part of its Development Effectiveness Matrix for public and private sector operations.
- **Climate proofing.** The IDB aims to ensure that investments in infrastructure and other areas that may be sensitive to the impacts of climate change are able to withstand those impacts. To achieve this, the Bank will develop the capacity to assess the vulnerability to climate variability and change of the projects it finances, including capacity to develop a better understanding of the information and vulnerability assessment and risk

management instruments available. The Bank will also work with other multilateral development banks and other institutions to develop tools for measuring the vulnerability of investments to climate change and to identify measures to build climate resilience into projects.

- *Use of carbon offsets in IDB operations.* For projects that have the potential to generate significant GHG emissions, the use of carbon offsets in lieu of appropriate mitigation measures may be acceptable provided that the proposed offset scheme (i) is considered a last-resort option after exploration of possible mitigation measures and, in particular, changes in technology and project design; (ii) will result in (a) real, measurable, and long-term benefits related to the mitigation of climate change and (b) reductions in emissions that are additional to any that would occur in the absence of the offset scheme; and (iii) is implemented in a transparent and accountable manner. Where specific climate change criteria have been developed and in the absence of a global “cap and trade” mechanism or equivalent international framework, the use of carbon offsets to make up for differences with the climate change criteria will not be acceptable. The IDB will develop guidelines to provide further guidance on the adequacy of carbon offset schemes in IDB operations.

Identification and Development of Lending and Technical Assistance Potential in Key Sectors

The IDB will continue strengthening its ability to increase its lending and technical assistance programs in climate-sensitive sectors.

The Bank will strengthen its commitment to climate change mitigation and adaptation by directing financial resources for lending and technical assistance activities in key sectors, such as: land use, land use change, and forestry, agriculture and animal husbandry, energy, transportation, water resource management, sanitation, and integrated urban development and climate-resilient cities. It will also mainstream climate-related support in other sectors, such as tourism, rural development, health, education, and disaster prevention. The following subsections contain descriptions of opportunities for increasing the Bank’s lending and technical assistance in key sectors.

Land Use, Land Use Change, and Forestry

Land use change, particularly the conversion of forestland to agriculture, is a major driver of climate change. The Bank will support lending and technical assistance projects that reduce emissions from deforestation and forest degradation. It will promote cost-effective measures, that is, projects that could generate high reductions in deforestation while generating high economic and environmental benefits. The Bank will help member countries address barriers and challenges in the areas of governance, market development for the

MITIGATION AND ADAPTATION MEASURES TO BE PROMOTED BY THE BANK IN THE FOREST SECTOR

- ➔ Promotion of forest management practices for timber production in the face of prolonged droughts that reduce forest growth.
- ➔ Support for the effective establishment of protected areas, forest concessions, titling, and demarcation of indigenous land to avert or reduce open access to forests.
- ➔ Adoption of appropriate economic incentives for private individuals and firms to recover degraded forestlands and protect existing forests.
- ➔ Establishment of forest monitoring systems to prevent or minimize the impact of forest fires and diseases.
- ➔ Support for development of tools, pilot projects, and technical backstopping regarding social, environmental, and economic benefits of sustainable forest practices.
- ➔ Support for local communities, women's groups, and indigenous peoples in the development of ecosystems services for biodiversity and goods (timber and nontimber forest products).
- ➔ Support for development of private-public partnerships, including information sharing on carbon finance and voluntary and regulated carbon markets in forestry activities.

public goods and services provided by forests, and carbon finance under regulated and voluntary markets.

Agriculture and Animal Husbandry

Agriculture is the most climate-sensitive economic sector, and the rural poor in the Latin American and Caribbean region will have the greatest exposure to the effects of climate change in the coming years. Accordingly, the IDB considers it critical to develop strategies for promoting sustainable agriculture that include measures to mitigate the effects of climate change at many different levels, ranging from crop and on-farm management to the community and policy levels. The IDB will also support climate change adaptation measures to reduce the agriculture sector's vulnerability to climate change.

Sustainable Energy

The Bank will strengthen its sustainable energy portfolio through lending and technical assistance in energy efficiency, renewable energy, biofuels, and selective fossil fuels energy projects. The following considerations will be taken into account:

- ➔ *Energy efficiency.* The Bank will support implementation of EE programs, through both technical assistance and financing. EE is the quickest and cheapest intervention in order to reduce GHG in the region. The Bank will assist public and private sector clients

MITIGATION AND ADAPTATION MEASURES TO BE PROMOTED BY THE BANK IN THE AGRICULTURE SECTOR

- ➔ Improved fertilizer use and better methods of application (e.g., using nitrogen fertilizer more efficiently to reduce nitrous oxide emissions; switching to no-till or low-till techniques to preserve carbon stored in soil).
- ➔ Conservation practices on arable lands (e.g., reducing methane emissions from rice production through better tillage practices, water management, and crop rotation).
- ➔ Carbon capture activities in well-managed pastures in grassland areas or other marginal, already deforested lands that have been employed in low-productivity agricultural and/or cattle farming.
- ➔ Methane capture on farms.
- ➔ Bioenergy production on agricultural and cattle farms, among others.
- ➔ Sustainable coastal management and fisheries.
- ➔ Water resource management that responds to current vulnerabilities derived from declines in water supplies stored in glaciers and snow cover, growing demands for water supplies for domestic use, and irrigation due to increasing population and the expected drier conditions in many basins.
- ➔ Measures to reduce extensive soil erosion, acidification, loss of organic matter, compaction, nutrient impoverishment, and salinization, which reduce productivity.
- ➔ Introduction of agricultural risk insurance to address consequences of climate variability and its devastating impacts, especially on agriculture and rural livelihoods.
- ➔ Improvement of crop and livestock research, including biotechnology research, to overcome impacts such as increased heat, drought, and threats from pests and disease.

in designing energy efficiency projects and overcoming existing barriers that prevent expansion of EE programs.

- ➔ *Renewable energy.* The Bank will support development of renewable energy projects in the region while addressing financial and institutional challenges mainly due to the relatively high up-front cost of technology and regulatory barriers.
- ➔ *Biofuels.* The Bank will provide technical assistance for the assessment of biofuel potential, feasibility studies, assessments of socioeconomic and environmental sustainability of biofuels, identification of the most competitive indigenous feedstocks for biofuels production, and project financing.
- ➔ *Fossil fuel projects.* When fossil fuel energy plants are demanded in the region, they will have to comply with specific Bank guidelines to ensure the mobilization of technologies or other choices to lower the carbon intensity of these plants, including improvements in efficiency.

For private sector operations, the IDB's experience in the region shows that financing is one of the principal barriers to EE and RE generation projects in LAC. Therefore, the Bank

EXAMPLES OF POLICY ACTIONS AND ACTIVITIES TO BE PROMOTED BY THE BANK IN THE ENERGY SECTOR

- ➔ Expansion of the availability of resources for energy efficiency and energy conservation programs.
- ➔ Support for local financial intermediaries in developing lending programs for carbon-mitigating investments, such as energy efficiency projects and renewable energy investments.
- ➔ Working with donors and other agencies to maximize the benefit to public and private sector projects of climate-change-oriented funds, such as the Climate Investment Funds (CIF) and the GEF.
- ➔ Efforts to obtain additional sources of financing to support private sector renewable energy and energy efficiency projects throughout the region.
- ➔ For climate adaptation, applications of appropriate land use planning (zoning plans based on vulnerability to climate-related events), climate adaptation/resilience measures in infrastructure planning, and building codes incorporating climate resilience.

nological instruments. In addition, a shift from private vehicles to mass transit systems (BRT or rail) and/or to nonmotorized transportation (footpath and bike networks, bicycle taxis, or pedicabs) will be encouraged. Measures to improve transport efficiency through application of fuel economy standards, introduction of new technologies, better practices on the part of private transport operators, and capacity building will be encouraged.

The IDB will expand the application of existing financial products (i.e., loans, guarantees, and technical cooperation) to private sector clients and to national and subnational government clients to support the development of low-carbon transportation projects. It will also work with donors and other agencies to maximize the benefits derived by public and private sector projects from climate-change-oriented funds, such as the Climate Investment Funds and the GEF, and will seek to obtain additional sources of financing to support private sector low-carbon transportation proj-

will support local financial intermediaries with expertise and capacity to analyze and appropriately structure financing deals for such projects. This will reduce transaction costs and interest rates, encouraging potential borrowers to invest in energy-efficient projects. The Bank will offer financial products properly adapted to the target market that can generate a steady flow of investment projects and build capacities within private market actors to scale up these projects on a commercial basis.

Sustainable Urban Transportation

The transportation sector has a very high potential for emissions mitigation if innovative approaches for sustainable transportation are adopted. The Bank will support transportation solutions that reduce/avoid travel needs through better integration of land use and transport-planning policies and transport demand management measures, coupled with adequate use of planning, regulatory, economic, informational, and tech-

ects throughout the region. The Bank will also work to expand the knowledge base of transport- and emissions-related information to improve decision making and will promote regional forums for discussion and identification of appropriate policy actions and Nationally Appropriate Mitigation Actions (NAMAs). To guide and implement these types of activities, the Bank is developing a Strategy for Sustainable Transport and Climate Change, which will establish key lines of activity for public and private involvement.

Water and Sanitation

The water and sanitation sector makes a small contribution to climate change compared to other sectors. However, there are actions with clear benefits that can be undertaken in the sector, including: mitigation measures that have ample economic and environmental justification for intervention; and adaptation measures that are available for use in reducing climate risk in water and sanitation projects.

The IDB will continue supporting economically sound climate mitigation solutions and energy options for water and sanitation operators in the region. Energy efficiency solutions introduced in water utilities and methane capture and energy generation in landfills across the region are two examples of the range of projects to be financed by the Bank to mainstream climate in water and sanitation infrastructure projects.

Integrated Urban Development and Climate-Resilient Cities

LAC countries will need to adopt effective regulatory and market-based instruments to control emissions, reduce vulnerability of their urban populations exposed to climate risks, and improve the resilience of their economic activity and physical infrastructure in cities. Within urban areas, the most serious climate-related risks fall disproportionately on the urban poor,

EXAMPLE OF SUSTAINABLE TRANSPORTATION POLICY INSTRUMENTS TO BE PROMOTED BY THE BANK

- Global transport land use planning to improve transport efficiency.
- Demand management (economic, regulatory, information technology, and other instruments to reduce the number of trips).
- Nonmotorized transportation integrated with public transport systems.
- Street conversion to pedestrian use.
- Energy-efficient transportation modes such as mass transit.
- Improvement in cargo management and logistics.
- Emissions and vehicle weight and dimensions control and regulation.
- Air quality sampling and monitoring.
- Highway safety and maintenance.
- Transit management and noise control.
- Technological improvements and use of clean energy.
- Institutional strengthening and data collection and management.

BOX 7

MITIGATION AND ADAPTATION POLICY MEASURES TO BE PROMOTED BY THE BANK IN THE WATER AND SANITATION SECTOR

- ➔ Increasing operating energy efficiency, as energy costs on average represent up to 40% of operating budgets among water utilities in the region. This includes addressing non-revenue water, which will be highly beneficial, as this could account for up to 40% of the water supply in many utility companies in the region.
- ➔ Supporting development of integrated waste management, with passive or active methane capture that minimizes GHG emissions in landfills and wastewater treatment plants.
- ➔ Promoting and supporting new recycling and composting initiatives aimed at reducing GHG emissions from raw material transformation processes and methane generation processes, respectively.
- ➔ Expanding national and subnational governments' programs for loans and guarantees to financial intermediaries to help scale up projects related to water treatment and waste management.
- ➔ Supporting, as part of the Water Initiative (approved in 2007), mitigation measures specifically to consolidate activities and results of the current special programs and, in particular, (i) Water Defenders, in the context of IWRM, and (ii) Efficient and Transparent Companies, in the context of mitigation measures.
- ➔ Building capacity to assess vulnerability and risk associated with climate variability and change.
- ➔ Reducing vulnerability in water management systems through climate-proof physical infrastructure (structural flood defenses and drainage).
- ➔ Implementing better management practices to address climate change impacts, through water conservation and water recycling.
- ➔ Promoting design and implementation of adaptation programs consistent with development plans, including disaster risk management schemes, new infrastructure design and construction codes, community awareness, and insurance alternatives, among others.
- ➔ Raising institutional consciousness among regulators, in order to incorporate climate adaptation requirements in public and private utilities.

who tend to live in areas with the greatest vulnerability to climate-related events and are least prepared with protective infrastructure and resources. Additional financing from the public and private sector, including carbon markets, will be mobilized to cover the incremental costs of climate change mitigation and adaptation measures.

The IDB will develop an Integrated Urban Development and Climate Resilient Cities (IUDCRC) Program to address cross-sectoral challenges for climate change mitigation and adaptation in the region. This program is required because, given the region's current rate of urbanization, the largest responsibility for GHG mitigation will be concentrated in urban areas, and cities will need to reduce their vulnerability and improve their resilience to climate change in order to survive. The IUDCRC Program will support national and local governments as well as urban communities, organizations, and private sector entities operating in urban areas in the development and implementation of policies and programs that promote inte-

ACTIONS TO BE PURSUED TO REDUCE GHG EMISSIONS AND IMPROVE CLIMATE RESILIENCE IN URBAN AREAS

- ➔ Incorporation of comprehensive and multisector approaches in land use planning with the aim of reducing carbon emissions.
- ➔ Introduction of integrated urban management schemes that will link the provision of urban services (energy, transportation, water and sanitation) to GHG mitigation objectives while taking into consideration economic efficiency, social equity, and environmental sustainability.
- ➔ Adoption of urban-planning schemes (land use/zoning, land rights, etc.) that take climate resilience and disaster risk reduction into account.
- ➔ Promotion of building designs and standards that support the capacity of buildings to withstand extreme weather, as well as other potential disasters.
- ➔ Promotion of building standards and materials that have an impact on the efficient use of energy, including the adoption of energy efficiency design and construction.
- ➔ Scaling up of green housing programs, including support for “green mortgage” programs and direct engagement of private sector mortgage originators.
- ➔ Improvement in local governance through the creation of an appropriate enabling framework to facilitate the involvement of private sector and local communities in achieving climate mitigation and adaptation objectives.

grated and sustainable urban and environmental management towards GHG emission reduction and climate resilience. The goal of the program will be to support critical infrastructure sectors, such as energy, transportation, water and sanitation, and housing, through technical cooperation and lending programs that facilitate the mobilization of resources from the international community and attract a wide range of actors and partners to its initiatives.

Other Sectors Relevant to the Climate Change Agenda

The Bank will provide support to other sectors in which mitigation and adaptation measures are needed by devising specific interventions to incorporate adequate emissions and vulnerability reduction in investments and capacity-building programs. These other sectors include tourism, rural development, disaster prevention, health, and education.

Strategies for Scaling Up Investments and Addressing Financial Gaps in the Region

The IDB will continue to innovate and develop financial mechanisms that will allow for the scaling up of investments and the addressing of financial gaps.

The Bank will continue developing the necessary mechanisms for scaling up investments in key/relevant sectors and draw on the full range of resources required (mainly from fiscal

resources, multilateral development banks, donor communities, private sector, the CIF, and carbon finance) in priority sectors, including energy generation, transportation, water, sanitation, forestry, agriculture, and urban development and housing. In recognition of the scale and urgency of climate change challenges, attention will focus on how to ensure public and private sector financing at the international and domestic levels, with each complementing and reinforcing the other. The Bank will continue working to fund climate-change-related initiatives across IDB operations through a range of existing instruments—technical cooperation, investment grants, and knowledge and capacity-building products as well as climate change policy-based loans and leveraging of conditional credit lines for investment projects—along with private sector instruments such as loans, guarantees, and other risk-sharing mechanisms. It will use these to assist countries in leveraging and attracting innovative financing. Financial resources will be mobilized from a number of sources: the SECCI Funds, CIF resources, the GEF, and resources under the Kyoto Protocol mechanisms.

The Bank will continue administering the SECCI IDB and SECCI Multi-Donor Funds. With the replenishment of the SECCI IDB Fund, the IDB will seek active support from donor countries to replenish the SECCI Multi-Donor Fund, thus enhancing considerably the availability of funds for the 2010–2011 period.

The CIF will probably become one of the main vehicles for channeling international financing under the new mechanism emerging after Copenhagen. Therefore, through CIF funding, the Bank will provide additional grants and concessional financing to support the undertaking of programmatic approaches toward public and private sector investments in support of countries' efforts to transition to low-carbon and/or climate-resilient economies. The Bank will also continue supporting its borrowers in accessing financing from the GEF, especially under its expanded Climate Window, by developing an active pipeline of GEF-funded projects and an IDB-GEF Earth Fund platform to provide concessional financing for private sector projects that generate critical environmental benefits. Finally, the Bank will strengthen its role in supporting public and private sector clients' participation in the CDM, including support for the habilitation of resources for CDM processes such as Project Idea Notes, Project Design Documents, validation, and so on. Support will also be directed toward enhancing the region's participation in voluntary markets for carbon emissions reductions.

Looking forward, the Bank will also work closely with the international community in establishing and implementing the new UNFCCC financial mechanisms emanating from the Copenhagen Accord. It will be part of the collective commitment to support projects, programs, and policies related to mitigation (including Reducing Emissions from Deforestation and Forest Degradation—REDD and REDD-plus), adaptation, capacity building, and technology development and transfer. The Bank will pursue increased access to the Adaptation Fund as a source of financing for mainstreaming adaptation into countries' national and sectoral plans. It will also actively support LAC's engagement in a renewed and/or new international framework.

Notes

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- 21 Energy intensity is a measure of the EE of a nation's economy. It is calculated as units of energy per unit of GDP. High levels of energy intensity indicate that a country needs more energy consumption to generate one dollar of GDP, and low levels indicate that the country needs less energy consumption to generate one dollar of GDP.
- 22 Solar energy and marine technologies were not included in the analysis because of lack of data and immaturity of the technology, respectively. In all LAC countries except Peru, a 10% realization of renewable energy does not require a higher installed capacity than current capacity.



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