CLIMATE CHANGE SECTOR FRAMEWORK DOCUMENT

CLIMATE CHANGE AND SUSTAINABILITY DIVISION

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**ABBREVIATIONS**

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<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<td>CARICOM</td>
<td>Caribbean Community</td>
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<td>CCAC</td>
<td>Climate and Clean Air Coalition</td>
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<td>CGIAR</td>
<td>Consultative Group on International Agricultural Research</td>
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<td>CGRFA</td>
<td>Commission on Genetic Resources for Food and Agriculture</td>
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<td>CIAT</td>
<td>International Center for Tropical Agriculture</td>
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<td>CIF</td>
<td>Climate Investment Funds</td>
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<tr>
<td>CO$_{2}$e</td>
<td>Carbon-dioxide equivalent</td>
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<td>CRI</td>
<td>Climate Risk Index</td>
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<tr>
<td>CSA</td>
<td>Climate-smart Agriculture</td>
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<td>DARA</td>
<td>Development Assistance Research Associates</td>
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<tr>
<td>DFID</td>
<td>Department for International Development of the United Kingdom</td>
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<tr>
<td>ECLAC</td>
<td>Economic Commission for Latin America and the Caribbean.</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<tr>
<td>GDP</td>
<td>Gross domestic product</td>
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<td>GHG</td>
<td>Greenhouse gas</td>
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<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>LAC</td>
<td>Latin America and the Caribbean region</td>
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<td>MDB</td>
<td>Multilateral development bank</td>
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<td>ND-GAIN</td>
<td>Notre Dame Global Adaptation Index</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<td>OVE</td>
<td>Office of Evaluation and Oversight</td>
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<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>REDD+</td>
<td>Reducing Emissions from Deforestation and Forest Degradation</td>
</tr>
<tr>
<td>RISE</td>
<td>Readiness for Investment in Sustainable Energy</td>
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<td>SEMARNAT</td>
<td>Department of Environment and Natural Resources of Mexico</td>
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<td>SFD</td>
<td>Sector Framework Document</td>
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<tr>
<td>tCO$_{2}$e</td>
<td>Tons of carbon dioxide equivalent</td>
</tr>
<tr>
<td>tpc</td>
<td>tons per capita</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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<td>WRI</td>
<td>World Resources Institute</td>
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I. CLIMATE CHANGE IN THE CONTEXT OF THE BANK’S SECTOR STRATEGIES

A. The Climate Change Sector Framework Document as part of existing regulations

1.1 The Climate Change Sector Framework Document (SFD) identifies the strategic areas of intervention for the Bank’s analytical work and operations. It also includes an analysis of the region's needs and the bottlenecks to effective incorporation of this issue in development processes, together with an analysis of the lessons learned from implemented projects.

1.2 This SFD, prepared in accordance with the “Strategies, Policies, Sector Frameworks and Guidelines at the IDB” (document GN-2670-1), will serve as a guide for the dialogue with borrowing member countries, including the private sector. It will also be a reference for the generation of knowledge products that contribute to incorporating the concepts of climate resilience and low-carbon development into the design and implementation of development policies and programs supporting the region's needs. This SFD will be updated every three years.


1.3 The Climate Change SFD is framed within the “Integrated Strategy for Climate Change Adaptation and Mitigation, and Sustainable and Renewable Energy” (document GN-2609-1) and the Disaster Risk Management Policy (document GN-2354-5) and its operating guidelines (document GN-2354-11). Moreover it is grounded and builds on the knowledge analyzed in more depth in the “Sustainable Infrastructure for Competitiveness and Inclusive Growth Strategy” (document GN-2710-5), as climate change is a challenge that needs to be overcome to ensure the sustainability of such infrastructure, so that it provides a reliable, uninterrupted, and inclusive service, and generates minimal social and environmental impacts. Given the cross-cutting nature of the issue, this document is also based on the approved SFDs in Agriculture and Natural Resources Management (document GN-2709-2); Transportation (document GN-2740-3); Water and Sanitation (document GN-2781-3); Gender and Diversity (document GN-2800-3); Tourism (document GN-2779-3); Integration and Trade (document GN-2715-2); Urban Development and Housing (document GN-2732-2); Energy (document GN-2830-3); Food Security (document GN-2825-3); and Environment and Biodiversity (document GN-2827-3).

1.4 In particular, this SFD recognizes that climate change measures often need to be considered to ensure that interventions proposed in these sector frameworks achieve their objectives in a sustainable way. This is extremely important because: (i) the accomplishment of equity and poverty reduction objectives may be delayed if climate change actions are not taken into account, as low-income population groups with limited access to resources are particularly vulnerable to the effects of this phenomenon; (ii) the impacts of climate change may worsen the

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1 According to the Intergovernmental Panel on Climate Change (IPCC) (2014), sustainability is a dynamic process that guarantees the equitable endurance of natural and human systems.
already low levels of productivity and innovation affecting the region; and (iii) failure to leverage low-carbon development opportunities would squander the multiple benefits this development offers, such as energy independence, reduced pollution, and job creation (Shrestha and Shakya, 2012; Chhatre and Agrawal, 2009; Ebeling and Yasué, 2008).

1.5 The Bank is ready to continue supporting countries in meeting the climate change objectives they set for themselves. Furthermore, as new climate finance opportunities arise from international agreements, the IDB will play a pivotal role in channeling these funds.

1.6 The following section presents international evidence on climate change policies and programs, and the implications for the Bank’s work. Section III covers the challenges in the region that the Bank will address while this SFD is in effect. Section IV summarizes the lessons learned on the logic of Bank projects relating to climate change. To conclude, based on the empirical evidence and the lessons learned, section V presents the dimensions of success, lines of action, and activities that are proposed as priorities for the Bank’s work with the countries to address the challenges identified.

II. INTERNATIONAL EVIDENCE ON CLIMATE CHANGE POLICIES AND PROGRAMS AND IMPLICATIONS FOR THE BANK’S WORK

A. Context and scope of climate change actions

2.1 The science of climate change often uses terms drawn from other disciplines, such as mitigation, resilience, and risk, which take on specific meanings in the context of climate actions. Table II.1 summarizes the key terminology so readers can better understand the concepts used in this document.

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<thead>
<tr>
<th>Table II.1. Definitions of key terms in this SFD</th>
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<tr>
<td><strong>Climate change.</strong> A significant change in the average state of the climate or its variability that persists over an extended period (normally decades or longer) that can be identified by statistical methods. Climate change may be due to natural internal processes, external forcings, or persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2014).</td>
</tr>
<tr>
<td><strong>Greenhouse gas (GHG).</strong> According to the IPCC (2007), “gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation that is emitted by the Earth’s surface, by the atmosphere, and by clouds. This property causes the greenhouse effect. Water vapor (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and ozone (O₃) are the primary greenhouse gases in the Earth’s atmosphere. Moreover, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, dealt with under the Montreal Protocol. Beside CO₂, N₂O and CH₄, the Kyoto Protocol deals with the greenhouse gases sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).”</td>
</tr>
<tr>
<td><strong>Mitigation [of climate change].</strong> “A human intervention to reduce the sources or enhance the sinks of greenhouse gases” (IPCC, 2014b).</td>
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2 In this regard, the Bank will support the fulfillment of national policies, plans, or purposes even if they are not reflected in international agreements.
**Vulnerability [to climate change].** Vulnerability is the degree to which a system (natural, human or material capital) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is dynamic and is a function of the exposure to a threat, the sensitivity, and capacity to adapt (IPCC, 2014; Smith et al., 1999). Any adaptation measure as a response to a climate change impact must begin with an analysis of vulnerability and the associated risks.

**Adaptation [to climate change].** Refers to a process of adjustment to actual or expected climate and its effects. Adaptation cannot be instantaneous, so it is implemented in phases, starting with the opportunities for adaptation (IPCC, 2014a). By its nature, adaptation must be a continuous, repetitive, and inclusive process and must actively involve various levels of government. In practical terms, for the prioritization of specific actions, it is suggested that those measures for immediate implementation fulfill one or more of the following characteristics: (i) respond to irreversible or very expensive impacts; (ii) be urgent; or (iii) respond to long-term objectives, such as infrastructure investments (Smith, 1997).

**Resilience [to climate change].** “The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change” (IPCC, 2007). In the specific case of climate change, this refers to the extent to which a system can recover from the impact of a climate event.

### 2.2 Climate change is a challenge for sustainable development.

The past decade has witnessed tangible progress on understanding that climate change is a problem for sustainable development, and that there is a shared, but differentiated, responsibility to respond (IPCC, 2007; IPCC, 2014). Part of this new understanding was based on a change in how the impacts of climate change are perceived, in which the view that climate change would cause gradual impacts has given way since 2005 to the idea that there may also be sudden changes, threshold shifts, and points of no return (Mayer, 2012). Since 2010, the international consensus has been that to avoid these sudden changes there is an urgent need to limit global GHG concentrations to prevent their concentration from passing the level of 450ppm of CO\(_2\)e (IPCC, 2014). This level is considered the last acceptable threshold to avoid a scenario of global temperature rises of more than two degrees Celsius, which would have a catastrophic effect on the climate (IPCC, 2014; Vergara et al., 2013; World Bank, 2012).³

### 2.3 Adaptation and mitigation measures help confront the challenge of climate change.

The interventions to confront climate change focus on mitigating anthropogenic GHG emissions and adapting to its impacts. These actions are complementary: mitigation focuses on reducing the scale of the possible global effects by curbing GHG emissions, while adaptation focuses on measures to reduce some of the impacts in a specific local area (IPCC, 2014). At the global level and in the member countries of the Organisation for Economic Co-operation and Development (OECD), GHG emissions are concentrated in the energy sector, followed by the agriculture sector (see Annex, Figure 1). The OECD and Asia have historically been the world’s largest GHG emitters (Blanco et al., 2014). Meanwhile, the impacts of climate change affect a range of sectors and regions, principally

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³ Increase in short-term global temperature under the emissions scenarios in the latest IPCC report—see IPCC (2014) for more details on climate scenarios.
those which are home to communities and people with limited resources (IPCC, 2014), including rural, campesino, indigenous, and Afro-descendant communities.

2.4 The main mitigation measures include activities linked to decarbonization of the energy, agriculture, and transportation sectors; reduction of deforestation; forestation; forest conservation; reforestation; increase in production efficiency; reduction in methane and other GHGs in agricultural production; and urban planning. Adaptation includes: (i) making changes to technology and infrastructure; (ii) considering climate change in the management and use of resources; (iii) using more resilient varieties; (iv) using climate information for decision-making and early-warning systems; (v) mapping and vulnerability analysis; (vi) using physical or natural infrastructure as a means of protection against rising sea levels, and including climate change impact considerations in the selection of the location of that infrastructure; and (vii) design, and management of infrastructure works. It is important to consider that even if anthropogenic GHG emissions were to cease, the manifestations and impacts of climate change will continue for several centuries, and the magnitude of the impacts and risk of irreversible changes will increase as global warming increases (IPCC, 2014). The foregoing underscores the importance of implementing both adaptation and mitigation measures.

2.5 **Economic growth can be achieved while reducing emissions.** The perception that there is a permanent tension between economic growth and the need to limit the concentration of GHGs in the atmosphere persists. However, the evidence suggests that this trade-off does not always apply (Global Commission on the Economy and Climate, 2014; de Freitas and Kaneko, 2011). The once-prevalent view that mitigation actions entail additional costs that are only partially offset by the benefits (Bollen et al., 2009; Pearce et al., 1996; IPCC, 2001) has changed, as it has been shown that huge mitigation opportunities exist, particularly in the developing world, with benefits that can exceed costs, particularly in the energy sector (Global Commission on the Economy and Climate, 2014).

2.6 **The actions necessary to mitigate and adapt to climate change may have co-benefits for development.** There are huge mitigation opportunities with substantial development benefits and co-benefits (IPCC, 2014; Shrestha and Pradhan, 2010). Investments in low-emission technologies have multiple benefits, including: more rural development due to better land management and restoration of degraded land; less volatile energy prices through reduced dependence on

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4 Short-lived climate pollutants offer mitigation opportunities as they are greenhouse gases or agents that have a relatively short residence time in the atmosphere (from days to decades), but make a significant contribution to climate change. These include black carbon, methane, and tropospheric ozone. Opportunities exist to reduce black carbon emissions, particularly by controlling diesel engine emissions, reducing agricultural burning, and reducing use of wood and other solid biomass fuels for cooking and in small-scale industry (CCAC, 2014).

5 Adaptation activities are geared towards reducing vulnerability to climate change impacts, such as increased frequency and severity of extreme weather events (drought, storms, hurricane winds, floods) as well as certain gradual changes, including temperature and precipitation, sea-level rise, and melting of glaciers.

6 For example, worldwide certain energy efficiency measures in the transportation and construction sectors provide cases of savings that exceed the original investment—without counting the additional incentives for cutting CO₂ emissions—(McKinsey & Company, 2009).
fossil fuels; reduced air pollution; fewer accidents and less congestion thanks to changes in modes of transportation (Global Commission on the Economy and Climate, 2014; Parry et al., 2014; Nemet et al., 2010; Bizikova et al., 2007; Goklany, 2007; Dowlatabadi, 2007). Other benefits may be job creation and increased resilience (ILO, 2011). The falling cost of renewable energy technologies (IEA, 2015a) has further widened the range of options for progress on a path towards low-carbon growth. Some adaptation measures often have co-benefits that include reduced GHG emissions, reduced health impacts, increased productivity, and poverty alleviation (Chambwera, et al. 2014).

2.7 Market failures hinder the implementation of mitigation and adaptation measures. Climate change “is the biggest market failure the world has ever seen. We all produce emissions, people around the world are already suffering from past emissions, and current emissions will have potentially catastrophic impacts in the future” (Stern, 2008). A lack of market incentives to reduce GHG emissions means there is limited demand for low-carbon technologies, holding back their development (Newell, 2010). Adaptation also faces externalities, information asymmetry, and moral hazard (Chambwera et al., 2014). Climate policies need to be developed and implemented to address these issues. These must include policies aimed at prices, science, and innovation (Newell, 2010), together with standards, rules, and national and international institutions to coordinate efforts (Chambwera et al., 2014).

2.8 Additionally, decision-makers find themselves in a scenario of limited resources with which to address multiple needs, in which investments in mitigation and adaptation are weighed up against other options. To assist this process, the relationship between climate actions and development needs to be taken into account. For example, the economic analysis of adaptation measures has evolved to factor in, where possible, nonmonetary and indirect costs and benefits, including risk and impacts on equity, among the various alternatives (Chambwera et al., 2014).

2.9 Climate change is a cross-cutting issue that involves action on various levels. Climate change has impacts on various sectors and stakeholders. It comprises a multitude of interconnected problems whose solutions can be analyzed and defined in a variety of ways (Pollitt, 2015; Giddens, 2011; Held et al., 2011). This represents a challenge for the coordination and implementation of actions for which a multidisciplinary, interagency approach is required encompassing various levels of government, together with key participants from the private sector, civil society, and academia.

2.10 In short, the challenge of climate change is a problem for sustainable development that can be addressed by implementing mitigation and adaptation measures. Mitigation measures concentrate on reducing GHG emissions, which are the main cause of global warming, while adaptation measures are geared towards reducing

7 For example, some adaptation measures are not cost-effective for private investors, while the implementation of certain measures may cause harm or create needs for third parties (Chambwera et al., 2014).

8 The evidence shows a degree of correlation between policy instruments and innovation in environmentally friendly technology (see Popp et al. (2010) for an overview of the topic, including regulations, prices, public spending, taxes, and subsidies; and Popp (2002) for fossil fuel or energy prices and energy efficiency).
some of the impacts of the phenomenon. In addition to climate benefits, these actions produce co-benefits that stimulate development, and the evidence shows that it is possible to generate economic growth while addressing this phenomenon’s challenges. Nevertheless, market failures, among other factors, limit progress on the issue.

2.11 Given that climate change is a negative externality linked to global GHG emissions but requires local action to reduce vulnerability to its impacts, it is important to strengthen the areas of knowledge and information and incorporate climate considerations in sector actions, regulatory frameworks, and financing options. In view of the foregoing, the evidence on climate change policies and programs is presented here grouped into four main areas: (i) information, knowledge and technology needs; (ii) the role of sectors in climate action;⁹ (iii) the relationship between institutional governance and climate action; and (iv) the link between climate finance and climate action. A comprehensive approach to the issue of climate change requires capabilities and actions in these four areas. For example, to design and implement adaptation and mitigation measures, specific information is needed for use by sectors or investors, who in turn follow policy guidelines and incentives put in place by governments and the international framework. This classification facilitates the thematic presentation, but does not imply that there are divisions between these areas. Rather, interaction, feedback, and synergies exist between them.

B. Information, knowledge, and technology needs

2.12 The unique features of climate change create specific information and training needs. Implementing climate actions relies on a series of factors concerning the availability and use of information (OECD, 2014), together with internal technical capacities relating to climate issues (Pollitt, 2015; Amundsen et al., 2010; Crabbé and Robin, 2006). Consistent and reliable climate information on the right scale for decision-making is also needed (Crabbé and Robin, 2006). Despite these requirements being recognized, a lack of information about the impact of climate change on the design and operation of infrastructure has been reported even in developed countries (Crabbé and Robin, 2006).

2.13 Moreover, the use of approaches, tools, and studies that enable decision-making in a context of uncertainty as to the exact magnitude of the impacts of climate change needs to be supported. The availability of reliable and consistent climate information needs to be combined with analytical methods that facilitate the management of uncertainty (IPCC, 2014), particularly in planning processes. The use of methods based on a robust analysis of alternatives allows specific response strategies to be tested in various scenarios with multiple variables whose behavior is uncertain, as in the case of climate change (Dessai and Hulme, 2007; Purkey et al., 2007; Lempert and Schlesinger, 2000). As far as research is concerned, the international consensus identifies as key actions those focused on improving understanding of costs, benefits (economic, environmental, and social), opportunities, synergies, trade-offs, and limitations of the main mitigation and adaptation options, and their impact on equitable development (Denton et al.,

⁹ In this SFD climate action is understood to mean any action the objective of which is to respond to a climate change impact or minimize the amount of GHGs emitted into the atmosphere.
Research into mitigation is focused on identifying market mechanisms facilitating the adoption of new, low-carbon technologies, and developing risk-reduction and financing instruments, along with mechanisms for their regulation (SDSN, 2014). For its part, the literature focused on adaptation has underscored the need to generate research programs centering on the "science of adaptation," understood as knowledge about what constitutes good adaptation and makes it possible to determine how successful practical interventions are (Swart et al., 2014).

2.14 **In order to manage present and future climate change challenges the issue needs to be approached from new perspectives.** In addition to the development of innovative ideas and options, technology transfer and knowledge dissemination (Eakin and Lemos, 2006) are crucial to progress on climate actions (IPCC, 2014). Given the importance of the topic, in 2010 the United Nations Framework Convention on Climate Change (UNFCCC) adopted the Technology Mechanism, which aims to facilitate the development and transfer of technology to support mitigation and adaptation actions. Under this mechanism, developing countries are called upon to prepare Technology Needs Assessments, by means of which priority is given to technologies for reducing their GHG emissions and increasing their resilience to climate change, according to their national development plans. Technology development is essential for long-term mitigation, particularly to succeed in replacing fossil fuels with low-carbon alternatives (Denton, et al., 2014). Increased resilience, for its part, frequently requires the review of existing technologies and the adoption of more efficient technological alternatives or technical innovations, and the adaptation of practices of proven effectiveness in the search for responses to new challenges (IPCC, 2014a).

2.15 It is also important to bear in mind that technology transfer does not just mean importing new equipment. Training on how to use it, marketing, and the capacity to provide local maintenance are also necessary. Moreover, technology designed and produced in developing countries can often be the most appropriate for their communities (Forsyth, 1999). Along these lines, Traerup and Stephan (2014) suggest that the challenge is not so much to develop new technologies for adaptation, but rather to develop mechanisms facilitating developing countries’ access and effective use of existing technologies. It is also necessary to strengthen local adaptation strategies and integrate traditional knowledge with new technologies.

2.16 **Adaptation to climate change includes additional aspects to those traditionally considered in the sectors.** Climatic conditions affect agricultural and forestry activities, tourism, transportation, infrastructure, energy supply, and water. As a result, these sectors have a certain amount of experience in managing climate variability, and have some measures and strategies that have proven effective. Consequently, many of the adaptation actions involve practices and tools developed in these sectors.

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10 For more information about the mechanism, see: [http://unfccc.int/ttclear](http://unfccc.int/ttclear).

11 Technology Needs Assessments (TNAs) arose before the Technology Mechanism and have been boosted by it. A recent study on TNAs commissioned by the UNFCCC finds that, in the case of mitigation, prioritized technologies were primarily focused on the energy sector, followed by land use-forestry, waste, and industrial processes. In terms of adaptation, the priorities were mainly in agriculture, water, infrastructure/settlements, climate observation and early-warning systems, health, tourism, and energy.
that have already been used. For example, disaster risk management measures that offer benefits in the current climate scenario and various future climate change scenarios are a viable starting point for dealing with projected trends in exposure, vulnerability, and extreme weather events (IPCC, 2012). However, to address the observed and expected impacts of climate change, these actions must consider unprecedented climate conditions or rates of change, future climate projections, and nonstationary regional climate conditions (Füssel, 2007). The foregoing involves, inter alia, the review, update, or creation of: (i) construction and design standards and parameters; (ii) production, conservation, and management practices; and (iii) criteria for decision-making in public investment.

2.17 A comprehensive, multisector approach needs to be implemented to address the various dimensions of the issue. The cross-cutting nature of climate change requires the challenge to be approached in a way that strengthens the interaction between the different actors and disciplines (Krauss, 2015; Weichselgartner and Kasperson, 2010; Howden et al., 2007; Crabbé and Robin, 2006). Adaptation action necessitates the integration of climate change issues with other risks (e.g. climate variability and market risk) and with other domains, such as sustainable development (Howden et al., 2007). In many cases mitigation actions include activities concerning more than one area of knowledge. This implies that the creation of climate response capacity is complex and multidimensional, demanding new capabilities and roles (Eakin and Lemos, 2006). Given these characteristics, the use of knowledge about climate actions is increased when it is accessible and there is a broader and more diverse agenda for collaboration (Krauss, 2015).

2.18 There is also a disconnect between researchers and decision-makers resulting from divergences over the objectives, needs, priorities, and scopes of these actors, and the different institutional arrangements and standards (Krauss, 2015; Weichselgartner and Kasperson, 2010; Huggel et al., 2015). This lack of coordination and communication also occurs between researchers in different disciplines (e.g. those specializing in adaptation and mitigation). This leads to decision-making based on limited analysis. For example, knowledge deriving from research into vulnerability and resilience cannot generally be used in a straightforward way (Weichselgartner and Kasperson, 2010). As a result, and in conjunction with the often limited applicability of this knowledge and the narrow dissemination of its practical implications for policy, strategies, or projects, the accumulated knowledge is used inadequately. Under these circumstances, promoting dialogue and interaction between diverse actors is crucial in order to disseminate information, knowledge, technologies, and best practices, and so strengthen the nexus between science and decision-making.

2.19 There are challenges to determining the effectiveness of climate programs due to difficulties in monitoring and setting targets, particularly in the case of adaptation activities. Although there has been progress on preparing strategies, procedures for implementing and evaluating them still need to be defined (Merk et al., 2012; Biesbroek et al., 2010). In the case of mitigation activities, targets are usually expressed in terms of CO$_2$e emissions so as to allow different options to be compared. This is particularly useful for measuring changes
at the national level. Nevertheless, this measure faces a series of challenges when it comes to calculating baselines and measurement thresholds, and attributing energy and transportation emissions by user and type of end use. To overcome these problems, sector indicators (e.g. passengers transported by mass-transit systems or hectares of land restored) or indicators focused on regulatory and institutional approaches, such as Climatescope (MIF et al., 2015) and Readiness for Investment in Sustainable Energy “RISE” (World Bank, 2015) have been used.

2.20 By contrast, adaptation actions can be measured and assessed in various ways (depending on the context), and there are usually practical difficulties in measuring them (Klein et al., 2005). What is more, different actors may evaluate the results in different ways (Noble et al., 2014). Nevertheless, there has been theoretical progress in the field of monitoring and evaluation, reflected in the establishment of evaluation and monitoring frameworks for projects financed from international sources (CIF, 2014). However, these models are difficult to apply at the national (OECD, 2015a) or institutional level. Some countries in Europe, Asia, and Africa have already developed—or are in the process of developing—national frameworks for climate change adaptation monitoring and evaluation, but few have been implemented (OECD, 2015a). Universal metrics have been proposed to compare the effectiveness of adaptation actions at the project level (Stadelmann et al., 2011), but no consensus has been reached on their validity and use. What is more, in the context of climate change vulnerability, Hinkel (2009) points out that the development of indicators is appropriate only in some cases because, among other factors, vulnerability is highly local, and it is impossible to establish a vulnerability and adaptive capacity indicator that is universally applicable.

2.21 The difficulties described have contributed to more efforts being devoted to mitigation than to adaptation (Noble et al., 2014). Therefore, to make headway in this area, it is essential to: (i) implement adaptation projects with evaluation frameworks that are relevant, robust, and readily utilisable (Burton and Mustelin, 2013); (ii) have information on the technical effectiveness of adaptation measures and their adoption rate (Howden et al., 2007); (iii) increase the availability of case studies (Heller and Zavaleta, 2009); (iv) have evidence to prompt actions; and (v) help set priorities (OECD, 2014).

C. The role of sectors in climate action

2.22 Climate change is unequivocal and there is evidence that over the past few decades it has affected natural and human systems across all continents and oceans (Denton et al., 2014). Stabilizing GHG concentrations requires a substantial transformation in production and consumption methods, and in modes of land use (IPCC, 2014b). For its part, climate resilience involves modifications to economic, social, technological, and political actions and decisions (Clarke at al., 2014). Therefore, the participation of key sectors through intra- and intersector actions is a central aspect of achieving resilient, low-carbon development.

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12 These changes are measured through national inventories, which provide reliable emissions figures for each type of fuel use in energy and transportation, although challenges persist in the agriculture and forestry sector.

13 For a classification of adaptation monitoring and evaluation models, see Ford et al. (2013).
2.23 For the purposes of this SFD, key sectors are considered to include: (i) the infrastructure sector, which includes transportation, water and sanitation, and basic services in urban areas; (ii) the agriculture, forestry, and biodiversity sector; and (iii) the energy sector, encompassing generation, conversion, and use. These sectors were identified on the basis of the significance of their contribution to GHG emissions and their vulnerability to the impacts of climate change. Climate change has impacts that affect social conditions and cross-cutting aspects that affect more than one sector. For this reason, areas related to social considerations, including livelihood, poverty, inequality, gender, and diversity, as well as intersector considerations, are included, with emphasis on the need for a comprehensive approach.

1. Infrastructure

2.24 Identifying the impacts of climate change and considering them in infrastructure planning, design, construction, operation, and maintenance are an essential part of increasing resilience. The evidence suggests that considering the impacts of climate change in the construction or reconstruction of infrastructure (known in some regions as “armor-plating”) reduces its vulnerability and extends its useful life, with additional costs that are generally lower than the cost of repair or reconstruction (ADB, 2013a and 2013b). For example, a worldwide analysis of the economic costs of climate change impacts on road infrastructure demonstrates the advantage of a strategy in which climate change resilience is considered from the initial phases of design and construction. (Schweikert et al., 2014). At the country level, road projects in the Solomon Islands and East Timor taking climate change into account in their design registered an economic internal rate of return greater than the social discount rate (ADB, 2013a and 2013b).

2.25 A number of structural and nonstructural measures are being implemented to reduce the impact of climate change on infrastructure quality and coverage. The nonstructural measures include: (i) long-term planning of adaptation measures (Government of Mexico, 2015; Solecki, 2012); (ii) use of models for vulnerability analysis (Murray and Grubesic, 2007); (iii) use of decision-support tools (including Hydrobid, WEAP); and (iv) use of dynamic programming methods to identify cost-effective adaptation investments for storm water drainage and water infrastructure, bearing in mind the greater variability of precipitation and return times of extreme precipitation events (Van der Pol et al., 2015). Structural measures include the use of green infrastructure (Bloomberg, 2012; Gill et al., 2007). New York is a case in point, where a green infrastructure plan is being used as an adaptation measure to capture rainwater before it floods communities and overwhelms sewage systems (Bloomberg, 2012).

2.26 The transportation sector accounts for close to a quarter of all global emissions, making it one of the key sectors for mitigation. The interaction

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14 For example, globally the largest GHG emitters are the energy sector (including generation, conversion, and use) and agriculture (see Annex, Figure 1), while the key impacts of climate change at the regional level are related to infrastructure, food production, and livelihoods (IPCC, 2014), several of which are multisector impacts.

15 This document presents only those sector considerations related to climate change adaptation and mitigation. A comprehensive approach to each sector is found in the relevant SFD.
between mobility policies and land-use planning have been documented to have great potential for reducing vulnerability, improving the provision of public services and infrastructure, and ultimately increasing mitigation potential (University of Cambridge, 2014). The most effective models to integrate land-use and mobility policies are those based on land-use planning geared towards transportation, densification, and compact growth. These are supplemented by demand-management policies, vehicle efficiency, improved technologies and fuels, modal integration, and fiscal instruments for land regulation (Mehrotra, 2011). Greater use of cleaner and more efficient public transportation and of nonmotorized transportation could save more than US$100 trillion in capital and operating costs between now and 2050 and reduce emissions by 1.7 gigatons of CO₂ per year, equivalent to a 40% reduction in passenger transportation emissions worldwide (Replogle and Fulton, 2014). This suggests that the most cost-effective way of reducing GHG emissions is to design cities that allow people to choose public transportation, walk, or cycle.

2. Agriculture, forestry, and biodiversity

2.27 Adaptation options exist for vulnerable farming communities. These alternatives sometimes need to be adapted to specific local populations and conditions and need coordinated support for their implementation (Dejene et al., 2011). Efforts focused on confronting current climate variability are helping to accomplish climate change adaptation (Baethgen, 2010). Examples along these lines include the use of climate forecasts for water resource availability and agriculture sector planning. Also, increased agricultural productivity is associated with the use of climate change adaptation strategies, while the decision to use them depends on access to information, credit, and agricultural extension services (Di Falco et al., 2011). The key actions to tackle and adapt to climate change in arid zones aim to increase water use efficiency and reduce demand (Thomas, 2008). In the case of coffee production, the priority is to develop high quality varieties adapted to high temperatures (Ovalle-Rivera et al., 2015) and to conduct research to identify alternative crops (Jones and Thornton, 2003).

2.28 However, technological improvements are insufficient to cover the risks associated with exceedingly unfavorable conditions, such as extreme weather events. In this case, different forms of insurance may be a promising option (Baethgen, 2010). The effective incorporation of adaptation measures usually requires integrated management of climate risk, combining various actions. These include access to inputs, diversification of income sources, use of forecasts, and climate insurance (Warner et al., 2013; Baethgen, 2010). Nevertheless, the cost and complexity and customers’ low willingness or ability to pay place certain limitations on the use of insurance (Warner et al., 2013). Advances in this area include the Horn of Africa Risk Transfer for Adaptation program, which combined weather index insurance with risk-reduction measures, giving producers the option to pay premiums in cash or through community work (Warner et al., 2013). The evaluation indicates that

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16 The savings stem from lower construction and operating costs for roads and parking lots.
17 This refers to communities engaged in farming to any degree, from subsistence through to commercial farming.
18 The program began in the state of Tigray (a highly drought-prone area) in 2007. It is currently known as the R4 rural resilience initiative and there are plans to expand it to other countries (Warner et al., 2013).
the program helped improve the living conditions of beneficiaries, who increased their savings and investments (Madajewicz et al., 2013).

2.29 **Approaches to climate change adaptation for biodiversity include a wide range of measures.** In a review of the literature on ways of considering climate change in biodiversity management, Heller and Zavaleta (2009) found the most effective recommendations for minimizing the impact of climate change on biodiversity to be an increase in connectivity and the integration of climate change in planning exercises. Other practices include: (i) creating migration corridors or conservation areas (Levin and Petersen, 2011; Krosby et al., 2010; Hodgson et al., 2009; West et al., 2009); (ii) protecting critical habits for endangered species (Ragen et al., 2008); and (iii) assisted migration (Dunlop and Brown, 2008; McLachlan et al., 2007).

2.30 **Mitigation activities need to consider the potential for reducing livestock emissions.** After energy and land-use change, the livestock sector is the largest source of emissions worldwide, with ruminants accounting for the biggest share of GHGs (Stehfest et al., 2009). This points to the importance of finding and implementing mitigation measures focused on reducing emissions produced by enteric fermentation, developing improved, more productive breeds, and promoting manure management (Smith et al., 2014). Demand-side actions are also important, as there is evidence that a switch towards diets based on lower meat consumption is potentially an effective means of reducing GHGs (Stehfest et al., 2009). These actions may also help reduce deforestation. For example, it has been estimated that eliminating deforestation in the Brazilian Amazon by 2020 will require a 26% to 40% cut in livestock production or a doubling of livestock density (Lapola et al., 2011).

2.31 **Actions linked to land use and land-use change represent an opportunity to reduce emissions and raise productivity.** Forest ecosystems contain approximately 60% of the carbon stored in terrestrial ecosystems and have the capacity to absorb (in their biomass, soils, and associated products) almost 10% of global carbon emissions projected for the first half of this century and, in principle, to store them indefinitely (IPCC, 2000). However, subsistence farming and the anticipated falling yields from existing farmland are factors accelerating deforestation and degradation (McNally, 2015). The loss of forest cover is correlated with greater risk and severity of flooding in developing countries (Bradshaw et al., 2007), as well as drier and hotter conditions (Lawrence and Vandecar, 2015). Additionally, agricultural productivity in the tropics is at risk due to climate changes associated with deforestation (Lawrence and Vandecar, 2015).

2.32 Nonetheless, there are alternatives that focus on improving land use and reducing land-use change. Worldwide, restoration of 12% of degraded land could feed 200 million people in 2030 and increase small producers’ income by US$35 billion to US$40 billion a year (Global Commission on the Economy and Climate, 2014), while reducing the pressure from the advance of the agricultural frontier. For its part, Reducing Emissions from Deforestation and Forest Degradation, while promoting Conservation, Sustainable Forest Management, and the Enhancement
of Forest Carbon Stocks (REDD+) represents an opportunity for Latin American and Caribbean countries due to the size of their forests and high rates of deforestation (Arriaga, 2012). Although the main purpose of REDD+ is to mitigate climate change, its activities can generate additional benefits for local populations, and environmental benefits such as the maintenance and generation of ecosystem services (Global Commission on the Economy and Climate, 2014; Miles and Dickson, 2010). The REDD+ situation in the region varies. However, it has made significant progress in recent years, indicating that governments are interested in domestic efforts to support forest conservation and sustainable management (Sanhueza and Antonissen, 2014).

Climate-smart agriculture (CSA) and low-carbon farming technologies have the potential to boost food production while increasing these systems’ adaptation capacity and contributing to climate change mitigation (McCarthy et al., 2011). These approaches are particularly relevant for Latin America and the Caribbean given that, according to world population growth projections, almost two billion more people will be living in developing countries by 2050. This means that agricultural output will need to be raised by 60% to meet new demand (FAO, 2013). To accomplish this goal under highly variable climatic conditions there needs to be a gradual transformation of current farming practices to ensure food security and minimize GHG emissions. An analysis by McCarthy (2014) of key CSA practices emphasizes that, although levels of adoption of conservation farming in Latin America and the Caribbean are relatively high, they tend to be concentrated among the largest farmers. This study also shows that adoption of irrigation by small producers is limited, despite evidence that it can have dramatic effects on stabilizing or increasing the yields of many crops, and the growing interest in irrigation among farmers due to the high variability of the climate.

3. Energy

Increasing energy efficiency is an opportunity with multiple climate and development benefits. This applies to various spheres, including industry, buildings/homes, public services, energy, agriculture, and transportation. Energy efficiency requires a combination of measures including the targeting of subsidies to low-income groups or less developed regions for a specific duration; improvement in the governance of institutions promoting energy efficiency initiatives; the introduction of performance standards in all sectors; the promotion of energy efficiency markets; the development of financial services; and the creation of consumer information and education campaigns. All these measures need to be adapted to cultural and regional contexts (IEA, 2015b). The public sector has a key role to play, in its various jurisdictions, in setting an example and

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19 Reducing emissions caused by deforestation and forest degradation, conservation, and sustainable management of forests and enhancement of forest carbon stocks (REDD+) constitute a mechanism that has been the subject of negotiations in the UNFCCC since 2005. The objective is to mitigate climate change by reducing net emissions of greenhouse gases through better management of forests in developing countries.

20 According to the FAO’s definition, CSA is based on increasing productivity and income sustainably while enhancing climate resilience and eliminating or minimizing GHG emissions insofar as possible.

21 The possibility of adopting irrigation is increased by a range of factors including increased temperature variability, declining average precipitation, and, during the winter, increased soil erosion, higher winter temperatures, and levels of education, among others (McCarthy, 2014).
incentivizing new actors, such as commercial banks, accreditation, certification, and inspection agencies, and services companies (ECLAC, 2014). Tailoring financial products makes it possible to reduce the perceived and actual risk in financial institutions, and help the industry standardize the language and metrics allowing the performance of the technologies associated with energy efficiency to be communicated, and so make financial resources available in the market (IEA-RETD, 2015). Given the perceived risks about the effectiveness of many energy efficiency technologies, energy performance contracting is one of the most promising measures in energy management (OECD, 2012).

2.35 Energy efficiency can be better harnessed by using it in conjunction with renewable energy. Experience in China, Denmark, France, Germany, India, Italy, the United Kingdom, and the United States (representing more than half of global energy demand) shows that stepping up the rate of implementation of energy-efficiency measures and the use of renewable energy sources could mitigate climate change, create jobs, reduce local pollution, and enhance energy security (IRENA and C2E2, 2015).

2.36 **Access to renewable energy for the most vulnerable population groups is an opportunity to reduce GHG emissions, improve living conditions, and bolster climate resilience simultaneously.** Coal and wood consumption in low-income countries for domestic use is currently among the main energy sources of energy for vulnerable sectors, and is therefore a source of emissions with negative repercussions in terms of health, children’s access to education (through illness or because children miss school while collecting firewood), and forest degradation (WHO, 2007). Access to energy services is key to the development of rural areas; although technically and economically viable technologies exist, innovation is crucial to achieve universal access to energy (Tawney et al., 2015). Decentralized renewable energy projects, rural electrification programs, or the supply of modern fuel for cooking can reduce emissions and contribute to adaptive capacity, by offering clean energy for domestic consumption. Moreover, rural electrification programs by means of network extensions, isolated systems, or individual solutions, while providing an alternative source for irrigation pumping and post-harvest work, also result in better health conditions, higher agricultural yields, and potential welfare improvements (Venema and Rehman, 2007).

4. **Social**

2.37 **In addition to providing climate benefits, adaptation and mitigation actions can improve beneficiary populations’ social conditions.** Community-based adaptation actions and conditional transfers to increase adaptive capacity can help improve the living conditions of the most vulnerable groups (Klinsky et al., 2014; Adhikari and Taylor, 2012). From the point of view of mitigation, various actions that reduce emissions—such as including renewable energy in isolated areas, disseminating clean technology for cooking food, improving public transportation, dense urban development, and reforestation actions using payments for environmental services—have helped raise living standards.

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22 In Guatemala, El Salvador, Nicaragua, and Honduras wood accounts for 50% of the energy sources used for cooking (Parker et al., 2015).
Social policy for adaptation can also promote and improve capabilities in more vulnerable and resource-poor areas (Klinsky et al., 2014). Conditional transfer is recognized as a proven and viable option to increase adaptive capacity in vulnerable countries in Latin America and the Caribbean (Wood, 2011). Moreover, compared with other options, conditional transfers applied as an adaptation policy tend to be more readily understood and accepted at the local level (IIED, 2011). In Africa, the use of insurance and social programs such as the so-called “safety net programs” (SNP) are a promising mechanism for reducing and/or transferring risk (IPCC, 2014; DFID, 2011; Olesen et al., 2011). The SNP-type social program in Ethiopia for small subsistence producers protects against extreme drought events by delivering cash or food resources in exchange for work on public projects. Impact evaluation studies indicate that this project has contributed significantly to improving childhood nutrition (CGIAR, 2013). A complementary program to protect household assets called “Household Asset Building Program” allows the poorest members of society in rural areas to access agricultural credit and other similar financial services, thus enabling them to protect their most valued assets while increasing their agricultural production (CGIAR, 2013). In India, the Productive Safety Net Programme has reduced vulnerability to drought while providing direct support to households (DFID, 2011).

5. Intersector

A cross-cutting approach is needed to address the impacts of climate change on water resources. In the case of water-resource management, the destabilization of hydrological systems—including the unseasonal behavior of precipitations—will cause a significant decline in stable hydroelectricity generating capacity and will affect the quality and availability of water resources for human consumption and food production. This impact makes it necessary to invest in adaptation measures to guarantee the energy supply (De Lucena et al., 2010) and respond to anticipated reductions in water availability (IPCC, 2014). It is also important to take a holistic approach, through measures that recognize the nexus between water, energy, and food (Bellfield, 2015).

D. Relationship between institutional governance and climate action

The cross-cutting nature of climate change and its distinctive features (e.g. multiple stakeholders and agents involved in generating GHGs, intra- and intersector effects, interventions with long-term impacts and initial investments that are often many times greater than those of projects without climate considerations) require a legal, regulatory, institutional framework that encourages consideration of the issue in the various sector actions, and in long-term planning in the face of uncertainty. Moreover, climate change has a negative impact on public budgets. The increase in the frequency and intensity of extreme weather events has repercussions on public budgets that are direct (e.g. the need for resources to deal with the emergency, reconstruction, and rehabilitation) and indirect (e.g. drops in productivity/exports, revenue). Evidence from 138 countries indicates that the budgetary impact can be as much as 1.1% of GDP (Lis and Nickel, 2009), in view of the higher frequency of extreme events. Developing countries with weak institutional development and low levels of governance are the most affected. Thus, actions focused on improving climate resilience from the economic and fiscal standpoints are key to achieving sustainable development.
The legal and institutional framework is crucial to both mitigation and adaptation. There is a variety of policies in specific sectors (energy, agriculture, water resources, transportation, urban development, etc.) as well as in cross-cutting areas (tax collection, public spending, financial regulations, planning, disaster risk management, etc.) to enable countries to advance towards climate-resilient low-carbon development. These policies frequently involve a large number of actors, interests, challenges, and opportunities, which represents a challenge to achieving progress (GGBP, 2014). One way of confronting this challenge is to design and implement policies whose purpose is climate action, and in which each sector can address its specific problems, but whose solutions consider options for low emission actions and/or that seek to improve climate resilience, i.e., policies that integrate climate change (Meirovich, 2014). These policies have the advantage of establishing a general purpose that encompasses actions by different sectors and levels, in addition to integrating climate actions with development objectives. In some countries, climate action can represent a legitimate and relevant purpose for political actors; in other cases, implementing these policies has the advantage that it is able to bring about consensus and change that would otherwise be very difficult or impossible to accomplish. It is also essential to incorporate climate considerations in existing policies.

In particular, national systems articulating risk management and climate change adaptation are the core of a country’s capacity to confront the challenges of the observed and projected trends in exposure, vulnerability, and extreme climate risks (IPCC, 2012). However, in general, the synergy between climate change adaptation and disaster risk management faces various challenges (Hori and Shaw, 2011). Consequently, a robust conceptual framework is needed that considers the risks associated with climate change as emerging factors and adopts a risk-based approach to climate change adaptation (IPCC, 2014 and 2012).

The integration of climate actions in national planning and public budgets, and the multisector approach are core challenges for progress in the area. For policies to have the expected impact it is essential that they be integrated in national planning processes, have a clear budgetary allocation enabling their implementation, and demonstrate the government’s commitment to incorporating these actions in the national development targets (ODI, 2013). However, difficulties arise when trying to include climate actions in national planning and give them priority over other policy options. At the national level, climate change policies may be perceived as a threat to economic development and growth (for example, they may make national industry less competitive as they use new and more expensive technologies, or require resources that could be devoted to other sectors, such as education, health or security). Other countries, by contrast, recognize that mitigation and adaptation yield a variety of benefits and are therefore carrying out actions at the national level. Moreover, given the different institutional agendas, an important challenge for advancing the climate agenda involves achieving effective

The effectiveness of climate policies can be enhanced when their design considers the results of studies involving behavioral economics, since these help to understand the decision-making process, particularly how individuals evaluate options and change their behavior (Gifford et al., 2011; Pollitt and Shaorshedze, 2011).
coordination between different government ministries and levels (Meadowcroft, 2011).

2.44 In the area of mitigation there are participatory exercises to integrate long-term strategies in national planning, also known as low-emission development strategies (LEDs). Various Latin American and Caribbean countries have used this tool, promoted by the United States Agency for International Development. LEDs are a strategic analysis and planning exercise that covers all economic sectors and seeks to reduce GHG emissions. In practice, LEDs are based on policy and program impact analysis and the implementation of plans to promote low-emission economic development. However, given that this exercise is voluntary and does not imply any commitment, the implementation of the proposed actions has so far been limited. Another similar tool for medium-term planning of low-emission actions is what is known as mitigation action plans and scenarios. These scenarios aim to create a space for participation open to all sectors of society to define different scenarios in accordance with possible climate policy decisions, creating an open space for the construction and testing of alternatives enabling greater benefits to be obtained. The most attractive part of this initiative is that it allows different scenarios to be created in which emission intensive sectors participate by proposing their own solutions, instead of being the responsibility of ministries in charge of climate policy. However, it is also voluntary and does not entail any commitment to reduce emissions or the allocation of specific resources in the budget, which has meant limited progress.

2.45 Frequently observed barriers to implementation of adaptation measures include the lack of long-term planning, a culture of crisis management rather than of prevention, and limited autonomy over financial resources at the municipal level (Crabbé and Robin, 2006). Other barriers include: (i) knowledge gaps (Begum and Pereira, 2013; Pasquini et al., 2013; Bryan et al., 2009; Deressa et al., 2009); (ii) uncertainty over the magnitude and impact of future climate change and the reaction and adaptation of ecosystems (Chambwera et al., 2014; Patt and Schröter, 2008); (iii) macroeconomic and financial considerations that hinder access to capital (Jeffers, 2013; Mckune and Silva, 2013; Pasquini et al., 2013; Leichenko et al., 2010; Flam and Skjaerseth, 2009; Hof et al., 2009; Bouwer and Aerts, 2006); (iv) constraints on governance and institutions (Steinberg and VanDeveer, 2012); and (v) the need for multilevel governance and policy integration (Biesbroek et al., 2010).

2.46 According to the OECD (2014), factors for the successful integration of climate resilience in development planning include: (i) political leadership and vision; (ii) development planning processes that consider climate resilience essential for coordinated actions at all levels of government; (iii) institutional structure that facilitates coordination and encourages the participation of all stakeholders; (iv) capacity building, particularly at the local level (v) a strong evidence base to make the case for action and help establish priorities; (vi) access to finance combining national and international resources; (vii) development of mechanisms for monitoring, evaluating, learning, and adjusting processes; (viii) feedback between lessons learned and the design of new policies; and (ix) creation of coalitions bringing together various governmental and nongovernmental actors.
2.47 For private actors, the presence or absence of climate actions is related to the existence or lack of clear ground rules in the form of regulatory frameworks; incentives (such as subsidies, taxes, and long-term financing); understanding of the inherent risks of climate change and options for reducing them; availability of information to manage resources; identification of cost-effective opportunities; and programs of subsidies or promotion of technological innovation. Moreover, private investments in mitigation and adaptation arise from market incentives and the exploitation of opportunities such as product/process certifications and product traceability. Market incentives create the possibility of reducing costs (e.g. through energy efficiency) and/or facing fewer operational risks affecting production (including climate risk management for long-term infrastructure). National and subnational policies are crucial to creating an institutional environment that fosters private investment in projects and programs (Brown and Jacobs, 2011). Combining carbon taxes with subsidies for innovation in clean technology is an example of a policy that can facilitate the sector’s adoption of this type of technology (Acemoglu et al., 2014).

E. Link between climate finance and climate action

2.48 Given the scale of the additional resources required for climate change mitigation and adaptation, it is essential to mobilize and use resources from a variety of sources, both national and international, and including the public and private sectors. It is also necessary to identify mechanisms to maximize resource availability, access, and use. To accomplish these objectives, the resources of governments, international climate funds, and development finance institutions play a fundamental role inasmuch as they bridge viability gaps and cover risks that the private sector is unwilling or unable to bear (Buchner et al., 2014).

2.49 Existing climate finance is insufficient and is primarily focused on mitigation. Global climate finance flows in 2013 came to approximately US$331 billion, mostly from the private sector (58%). Although considerable, this total volume of resources is insufficient, as an estimated US$700 billion is needed annually to meet the challenge of climate change (WEF, 2013). Resources are also known to be narrowly focused on increasing resilience. Indeed, only about 7% of global financing targeted adaptation activities, an area of investment in which development finance institutions (national, multilateral, and bilateral) played a key role, financing 88% of these actions (Buchner et al., 2014).

2.50 Mitigation and adaptation investments frequently involve a variety of factors not commonly considered in traditional financing. The characteristics of climate investments include: a bigger initial investment; a high degree of uncertainty, in that they involve new markets or technologies; lack of information; and risks of changes in policies and/or regulations, including international financing.

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24 The analysis of Agrawala et al. (2011) defines two type of spending on adaptation by businesses: soft investments that benefit the company’s bottom line (e.g. water use savings) and hard investments that imply bigger investments in infrastructure (typically in industries with long-term assets).

25 It is important to underscore the difficulty of accounting for investments in adaptation given that, in general, they form part of development projects rather than being independent investments (Climate Policy Initiative, 2014).

26 This amount does not include the private sector share given the lack of a reliable source of information (Buchner et al., 2014).
mechanisms (UNDP, 2011). The high initial costs and uncertainty favor the choice of investments in technologies with proven effectiveness, but higher GHG emissions. Thus, the uncertainty surrounding mitigation and adaptation measures, and the short-term vision are significant barriers for climate action (Fay et al., 2015; Höhne et al., 2015; Ricke and Caldeira, 2014; Stern, 2006).

2.51 **Addressing the barriers associated with the financial sector and existing regulations requires innovative approaches.** It is necessary to promote the identification, design, promotion, and use of various incentives, instruments, and policies enabling risks to be reduced, mitigated, or transferred between the public and private sectors. More leverage of private capital coupled with public resources is also needed. These instruments could be focused particularly on financial and technical solutions and on policies or rules (G20, 2014). The financial options include: (i) credit lines and microlending; (ii) financial tools for the reduction and management of risks, such as partial guarantees for credit, insurance, and risk-sharing mechanisms; (iii) capital market instruments that expand access to new sources of finance; (iv) private investment instruments (green investment funds); (v) local currency financing; (vi) participation of local financial intermediaries; and (vii) public-private partnerships. At the same time there is demand for technical alternatives such as technological tools for the monitoring and verification of adaptation and mitigation actions, development and application of standards and certifications incentivizing best practices, and promotion of the use of new production and consumption methods.

2.52 In the area of policies and rules, progress needs to be made towards establishing sustainable standards and eliminating subsidies for fossil fuels, while maintaining support that targets the neediest, tax incentives for green investments, development and identification of best practices for risk sharing between the public and private sectors, and efforts to scale up private sector participation. Financial sector and private sector participation are essential, as is that of the public sector at the regional, municipal, and national levels. Here international development and multinational cooperation agencies play a pivotal role in promoting these instruments and in being catalysts in this innovative process.

2.53 **Climate change is emerging as a risk for the financial system.** It is possible that climate change, along with other factors affecting natural capital and the policies that emerge in response to them, entail systemic risks for financial stability through effects on asset values, price volatility, fluctuations in the availability of inputs, and trade sanctions (Caldecott and McDaniels, 2014). For example, infrastructure projects—given their high stranded costs and expectation of long-term use—may in practice be irreversible investments, becoming unusable (or captive) assets if they use technologies that generate high GHG emissions, or if they do not incorporate climate resilience features (Smith School, 2015). This type of risk is still little known and frequently underestimated, resulting in overexposure of financial and economic systems. In view of the foregoing, it is necessary to link development strategies with sustainable infrastructure that incorporates climate

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27 The factors that are having an effect on natural capital include the degradation and unsustainable use of resources, loss of biodiversity, environmental pollution, habitat loss, and reduced water availability.

28 Policy responses include regulations and laws on environmental, fiscal, and economic matters.
risk considerations and favors climate-resilient low-carbon options (Bhattacharya et al., 2015).

F. Summary

2.54 This section presented international evidence on the importance of including climate change considerations in sector activities, regulatory frameworks, and investment planning. Climate change has economic, social, and environmental impacts that amplify existing needs and challenges regarding infrastructure quality and coverage, and people's livelihoods. Mitigation and adaptation activities are therefore crucial to achieving development goals.

2.55 At the sector level there are numerous opportunities for technically and economically viable actions that simultaneously help meet the challenge of climate change while furthering the achievement of sustainable development targets. However, certain barriers need to be overcome for their implementation. Five key elements stand out in relation to knowledge and information: (i) specific information and training needs arising out of the distinctive features of climate change; (ii) approaches to the issue from new perspectives that consider innovation, development, and technology transfer; (iii) inclusion of aspects in addition to those traditionally considered in the sectors, which implies a review of existing practices and the development of new measures; (iv) implementation of a holistic and multisector approach; and (v) the need to monitor and determine program effectiveness. Apart from information and knowledge requirements, other essential factors are: (i) a regulatory and institutional framework regarding climate change; (ii) the integration of climate actions in national planning and public budgets; (iii) the availability and use of climate finance through the participation of the public and private sectors; and (iv) the need to address the difficulties that investments in climate projects face.

III. THE MAIN CLIMATE CHANGE CHALLENGES IN THE REGION THAT THE BANK SEEKS TO ADDRESS

A. General climate change context in Latin America and the Caribbean

3.1 The region of Latin America and the Caribbean makes a small contribution to global emissions but it is highly vulnerable to climate change. In 2012, the region emitted approximately 10% of global GHGs. However, the trend in recent years has been towards an increase in total emissions, but with a reduction in GHG emissions per unit of GDP. This indicates that, as a region, it is possible to achieve economic growth while reducing emissions (Annex, Figure 2). The Germanwatch Index on global climate risk (CRI) shows the region’s high level of vulnerability, as four out of the ten countries with the highest losses from extreme

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29 Internal staff calculations based on WRI/CAIT information (http://www.wri.org, July 2015).
30 The region’s per capita emissions level was 7 tons in 2010, with an upward trend towards 2050 (Vergara et al., 2013).
events worldwide from 1994 to 2013 were in Latin America and the Caribbean (Honduras, Haiti, Nicaragua, and Guatemala – see Annex, Table 1).  

3.2 The energy sector, land-use change, and forestry are the main sources of GHGs in the region, making them key target areas for mitigation actions. Forty percent of emissions are concentrated in the energy sector (including generation, conversion, and use), followed by 31% in land-use change and forestry (Annex, Figure 1). This distribution differs from the global average in that the energy sector by far dominates emissions (contributing 72%) while land-use change and forestry represent 6%. A multisector approach with mitigation activities in the energy and land-use sectors is therefore essential for the region to contribute to achieving the 2050 global climate stabilization goal (Vergara et al., 2013).

3.3 Regional indicators show high vulnerability and differences in the ability to respond to climate impacts. Since evaluating adaptive capacity with a single indicator is complex, two alternatives have been used: the University of Notre Dame Global Adaptation Index (ND-GAIN), which summarizes countries' vulnerability to climate change and presents countries’ capacity to promote public and private investment in climate actions (Chen et al., 2015); and the climate vulnerability indicator developed by the Development Assistance Research Associates (DARA), based on 34 indicators of economic, human, and ecological effects of climate change (DARA, 2012). The ND-GAIN Index shows that Latin American and Caribbean countries have made headway in terms of their climate change readiness over the period 1995–2013 (Annex, Figure 3), although differences are observed from country to country. More vulnerable countries still have certain limitations in terms of their institutional capacity, with Central American countries, Haiti, Bolivia, Guyana, and the Dominican Republic standing out (Annex, Figure 3). The ND-GAIN Index does not show how possible climate change impacts will affect the economy, infrastructure, and environment. Given that new impacts mean that climate change will tend to affect current levels of vulnerability, the DARA index has been incorporated for a more thorough analysis, which includes expected climate change impacts by country. This index suggests that most countries in the region will be affected by climate change, and that they will become more vulnerable between now and 2030, and the projected economic costs are substantial (Annex, Table 2). Moreover, the level of

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31 The CRI assigns a score evaluating the level of exposure and vulnerability to extreme weather events, considering economic and human losses (Kreft et al. 2014). In comparison, OECD member countries were less affected since, according to this index, most were ranked after the first 50 most vulnerable countries.

32 In 2012 land-use change and forestry together with agriculture contributed half of Latin America and the Caribbean’s emissions (Annex, Figure 1).

33 In the ND-GAIN, the readiness index combines economic, governance, and social factors to measure a country’s capacity to promote investments and convert them into climate change adaptation actions. Higher readiness values represent greater capacity. Vulnerability refers to the exposure, sensitivity, and ability to adapt to the negative impacts of climate change in six sectors (food, water, ecosystem services, housing, and infrastructure). For more details, see Chen et al. (2015).

34 In general, higher-income countries are associated with high levels of readiness. For example, the five countries with the highest capacity are members of the OECD (Denmark, Switzerland, Finland, New Zealand, and Norway).
vulnerability of most countries in Central America and the Caribbean is particularly high.

3.4 **Climate change has significant impacts in Latin America and the Caribbean, affecting multiple sectors as well as social conditions and environmental services.** Some of the main impacts are increased frequency and intensity of extreme events, general rise in average temperatures, changes in precipitation patterns, rising sea levels, and glacier retreat (IPCC, 2014).\(^{35}\) These impacts negatively affect economic sectors, social conditions, and natural resources. A conservative estimate of regional costs is in the US$85 billion to US$110 billion range annually by 2050 (Vergara et al., 2013) – see Annex, Table 3, for a list of impacts and their associated costs.\(^{36}\) These amounts do not cover already urgent investment needs, including improvements in health care services, education, access to water and sanitation, energy security, and housing. The main challenges to progress on adaptation and mitigation lie in four main areas: (i) improving the availability of and access to information, knowledge, and technology; (ii) strengthening cross-cutting approaches to climate change in a context of considerable sector impacts; (iii) supporting governance; and (iv) improving access to and use of climate finance.

**B. Improve the availability of and access to information, knowledge, and technology**

3.5 **For progress on climate actions, the availability of information and local capacities need to improve.** There is an urgent need for sector studies analyzing current impacts and the causes of vulnerability in Latin America. These studies need to be published and the information derived from projects on this subject needs to be disseminated (Magrin et al., 2014). It is also necessary to plug gaps in the availability of local information and in the available information analysis, and to communicate the findings to decision-makers (OECD, 2014). There are also constraints on the planning and implementation of adaptation measures in Latin America related to the lack of impact and vulnerability studies, climate information, comprehensive and multidisciplinary studies, research on adaptive capacity, and local/indigenous knowledge and access to technological resources (Magrin et al., 2014; IPCC, 2007). Other priority areas for the region include: (i) identification of cost-effective actions, particularly in the area of adaptation; (ii) dissemination of available technologies; (iii) sustainable and efficient insurance mechanisms; (iv) analysis of the impact of climate policies on economic growth; and (v) evaluation of the impact of climate change on international trade (Chisari and Galiani, 2010).

\(^{35}\) The key impacts at the regional level are set out in the Annex, Figure 4 and Figure 5.

\(^{36}\) In general, the climate change impacts expected or observed in Latin America and the Caribbean are mostly negative (reduced productivity; loss and damage to infrastructure, coastal areas, and ecosystems; increased disease; reduced availability of water for human consumption and for use in agriculture and energy). However, the impacts in some specific locations are positive and include increased agricultural production for certain crops (for more details, see Magrin et al., 2014).
C. Make climate change considerations more central to sector actions

1. Infrastructure

3.6 Infrastructure coverage and quality will be impacted by climate change, affecting the region’s competitiveness. There is still work to be done on achieving universal access to basic infrastructure services in Latin America and the Caribbean, and the poor quality of services is causing significant losses in terms of business productivity and economic competitiveness (Serebrisky, 2014). The increased frequency and severity of extreme weather events and rising sea levels amplify these challenges by causing infrastructure damage or collapse and the loss of ecosystems and land (Williams et al., 2009; Jacob et al., 2007; Suárez et al., 2005). The increase in the number of high intensity hurricanes making landfall in the region has been associated with climate change (Curry et al., 2009) and it is reported that the increase in their frequency and severity will have a cost of around US$5 billion a year (Toba, 2009). Furthermore, it is estimated that approximately 6,700 kilometers of roads in Latin America would be damaged by a one-meter rise in sea level (ECLAC, 2011), while the member countries of the Caribbean Community (CARICOM) would lose 570 km of roads and 28% of the airports would be damaged (Simpson et al., 2010).37

3.7 Climate change will affect governments’ ability to plan and deliver basic services. This effect is particularly significant in urban areas (ECLAC, 2013; UN-Habitat, 2011; Hogan, 2003). Adverse location, in conjunction with the use of inappropriate building materials and lack of access to water, electricity, sanitation, and other basic services make the urban poor particularly vulnerable (World Bank, 2012). The Latin American and Caribbean region is highly urbanized, making urban poverty and inequality likely to be exacerbated by the impacts of climate change (Lampis, 2013). In turn, declining agricultural productivity caused by climate change impacts are further accelerating the rate of migration from the countryside to cities. This is placing considerable pressure on urban infrastructure and widening the gaps in public services, such as housing, water, and sanitation (Sánchez, 2015).

3.8 To address these issues, adaptation measures need to be implemented that focus on public investment planning, taking into account climate vulnerability, flood management, early-warning systems, urban planning, and land use, and the incorporation of climate considerations in projects. The region has shown progress in this regard, with efforts to make cities more sustainable through participation in the IDB’s Emerging and Sustainable Cities Initiative, and the development of metropolitan adaptation plans (Magrin et al., 2014). Moreover, progress has been seen in national infrastructure planning, as reflected in the 2020-2030 action plan for key infrastructure adaptation actions in Mexico (Government of Mexico, 2015) and in national infrastructure adaptation strategies (Uruguay, Ecuador, Colombia, and Nicaragua), which consider the impact of climate change when deciding on the location of works, the promotion of innovation and development/use of new technologies to boost resilience, monitoring and availability of meteorological and hydrological information, and efficient storage and use of water (Alencastro, 2014).

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37 In addition, in the case of CARICOM, Simpson et al. (2010) reported flooding in the vicinity of 35 of the 44 ports analyzed and losses or damages at four power plants.
3.9 The evidence shows that it is possible to reduce emissions while lowering costs and raising productivity. Public transportation and urban development policies could reduce GHG emissions by 30% in Latin America and the Caribbean, improve air quality and reduce respiratory diseases, and the absenteeism they cause (OECD, 2015b). This paradigm shift towards more compact urban growth, with well connected infrastructure and effective management, could raise productivity in urban areas, resulting in social and environmental benefits, including benefits for public health (Global Commission on the Economy and Climate, 2014). For example, bus rapid transit systems, which have lower capital and operating costs than alternative systems, such as subways and trams, have proven particularly effective at shortening travel times, cutting the number of accidents, and delivering public health benefits (Embarq, 2013).

3.10 However, current patterns of production and consumption in urban areas are unsustainable in the context of climate change. Recent studies show that the region is experiencing an increase in car ownership rates, increased fuel consumption, worsening air pollution in cities, and rising GHG emissions (OECD, 2015; ECLAC, 2014). The limited supply of mobility and accessibility services has a major impact on urban areas, particularly in the periphery, as it lengthens the time needed to reach basic services, affecting women and low-income groups disproportionately (ECLAC, 2013; El Colegio de la Frontera Norte, 2012). A prospective analysis of current economic growth trends reveals that the share of household spending on food and drink relative to total outgoings decreases with rising income, while spending on gasoline increases with rising income (ECLAC, 2014). Influencing consumption patterns by providing policy options that consider an alternative public-private transportation matrix as average income increases in the region is therefore crucial to achieving sustainable consumption (ECLAC, 2014; IDB, 2013). These actions also contain a significant element of improved social inclusion (ECLAC, 2014).

2. Agriculture, forestry, and biodiversity

3.11 Climate change will have a major impact on agricultural productivity, affecting people’s livelihoods in the region. Changes to precipitation patterns, temperature changes, and more frequent and intense extreme weather events (including droughts and floods) will affect crop yields, with significant losses projected (see Annex, Table 3). For example, at the regional level, net export earnings from corn, soya, wheat, and rice are expected to fall by US$11 billion by 2020 as a result of drier conditions during the grain development phase and shorter growing cycles (Fernandes et al., 2012). Moreover, significant yield reductions have been estimated, such as 20% for wheat and barley (Parry et al., 2004), between 21-34% for corn in Honduras, Guatemala, and Panama, and up to 66% for beans in Guatemala (ECLAC et al., 2012). Forecasts indicate that reduced precipitation and higher temperatures will affect food security among low-income populations.

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38 These policies include improving public and nonmotorized transportation infrastructure, implementing regulations on transportation technologies, and eliminating fuel subsidies.

39 These changes affect the agriculture sector particularly through impacts on evapotranspiration and evaporation rates, soil moisture, number of warm nights, temperature and water availability during various phenological stages, and run-off, among others. For more details, see Magrin et al. (2014) and Vergara et al. (2014).
population groups. Reduced crop yields and higher prices could lead to intensified malnutrition (Nelson et al., 2009) and increased poverty (Ahmed et al., 2009). Moreover, ocean warming is expected to cause a decline in the maximum fishing potential of Mexico, Brazil, Argentina, Peru, and Chile (Cheung et al., 2010).

3.12 In Argentina, scientific knowledge, land-use planning, and genetic improvement techniques have been identified as promising sources of improvements to increase resilience (Urcola et al., 2010). The use of climate forecasts for decision-making in the agriculture sector has proven to be effective in Uruguay, where the Ministry of Agriculture and Fisheries has begun to predict events such as pests and disease by modeling changes in rainfall patterns using data from agrometeorological stations. This information allows farmers to control pests and disease in a more sustainable way, avoiding excessive or late use of pesticide. The use of weather insurance is also an option to support the implementation of adaptation measures, create climate resilience, and ensure the provision of financial resources after an extreme event. For example, with a strong focus on the agriculture sector, the Climate Risk Adaptation and Insurance Project in the Caribbean offers climate-indexed insurance, early-warning systems, and risk reduction information to financial institutions and low-income individuals (Warner et al., 2013).

3.13 Ancestral practices and knowledge are also potentially effective adaptation measures (Valdivia et al., 2010; Altieri, 2004). However, in some cases it is necessary to address certain bottlenecks to their dissemination. A case in point is that of pre-Hispanic terraces widely used in the Andes. These have proven to be very effective and efficient at controlling erosion and soil loss on sloping ground (Posthumus and Stroosnijder, 2009; Chow et al., 1999; Altieri, 1999) but run a high risk of being abandoned (Inbar and Llerena, 2000) and can have high maintenance and restoration costs (Denevan, 1995).

3.14 The rural population’s overdependence on farming activities increases its vulnerability to climate change impacts. Smallholdings play a fundamental role in food security, particularly for a large portion of the population vulnerable to climate change impacts (Altieri et al., 2012). These production units, which are based on traditional or subsistence farming practices, produce 51% of the corn, 77% of the grain, and 61% of the potatoes consumed in the region (Altieri and Toledo, 2011; Altieri, 1999). In Mexico, family farms account for 70% of land used to grow corn and 60% of that used for beans (Altieri and Toledo, 2011; Altieri, 1999). In in Colombia, plantations of five hectares or less account for 95% of all coffee producers and 62% of total cultivated area (Fonseca, 2003). As a result of climate change, it is estimated that the number of households in extreme poverty in

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40 The subject of food security is covered at length in the respective SFD.

41 Other effects of climate change with repercussions for productivity include alterations to the distribution of plants and animals due to changes in altitude limits and displacement of species by rising temperatures (Parmesan, 2006; Laderach et al., 2009); alterations in plant and animal phenology (Root et al., 2003; Menzel, 2005; Cleland et al., 2007; Sherry et al., 2011; Walck et al., 2011); changes to the geographical distribution of pests and diseases (Porter et al., 1991; Lau et al., 2010); and changes in the qualitative characteristics of output (Sugiura et al., 2013). For example, a geographical redistribution and reduction in suitable land area is expected in the case of coffee cultivation (Ovalle-Rivera et al., 2015; Haggar and Schep, 2012; Laderach et al., 2009), with reductions in yields and quality, and increased incidence of disease and pests (Ovalle-Rivera et al., 2015).
rural Mexico could rise by 11 percentage points, while inequality could worsen, reflected in an increase of 20% in the Gini coefficient (López-Feldman, 2014).

3.15 Forestry and agroforestry systems play a vital role in maintaining livelihoods and preventing poverty, while also helping to reduce GHGs through carbon capture. Agroforestry, one of the many possible interventions, has been effective at improving productivity and incomes, as well as reversing soil degradation (Liniger et al., 2011). This practice is employed on between 200 and 357 million hectares in Latin America, and has developed significantly in certain sectors and countries (Somarriba et al., 2012). The evidence from CSA projects in the region shows that different countries’ and interest groups’ priorities could be aligned to achieve more efficient, effective, and equitable food systems that address environmental, social, and economic challenges (World Bank et al., 2014a-d).

3.16 **Ecosystem services and biodiversity will be affected by climate change.** Temperature rise, changing precipitation patterns, and more intense extreme events, in conjunction with the major land-use changes recorded in the region, compromise the integrity of natural ecosystems, ecosystem services, and biodiversity in large areas of Latin America and the Caribbean (Magrin et al., 2014). The gradual and sustained rise in surface temperatures in the Caribbean sea has increased the number of coral bleaching events, resulting in loss of biodiversity, with important economic impacts for services such as coastal protection, fishing, tourism, and biochemical production (Vergara et al., 2013). There is also a probability of approximately 15% that species in the Amazon will gradually become extinct, which may affect regional and global water and carbon cycles (Vergara and Scholz, 2011). Globally, climate change projections suggest that between 18% and 35% of species will be endangered (Thomas et al., 2004). This makes it necessary to conserve these resources and conduct research to identify key genetic traits for adaptation (CGRFA, 2011). Moreover, coastal-marine ecosystems play an important role in climate change mitigation as they sequester large quantities of carbon (Mcleod et al., 2011).

3.17 **Biodiversity conservation contributes to climate change adaptation.** Ecosystem-based adaptation (e.g., establishment of protected areas and biological corridors, restoration of ecosystems, community management of ecosystems) is a multisector adaptation measure based on the precept that ecosystem services reduce climate change vulnerability, in which Payment for Ecosystem Services is one of the models that has developed more extensively in Latin America than elsewhere (Magrin et al., 2014). Likewise, comprehensive attention to environmental management helps increase climate resilience (for more details, see the Environment and Biodiversity SFD). Some lines of action regarding biodiversity in national adaptation strategies in Latin America and the Caribbean include: (i) improving scientific understanding of vulnerability to climate change; (ii) designing and implementing economic and financial incentives to reduce vulnerability; (iii) promoting maintenance of genetic variability; (iv) including adaptation in management plans; (v) increasing and maintaining conservation areas; and (iv) identifying the main risks and adaptation actions (Alencastro, 2014).

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42 The evidence demonstrates the contribution of indigenous peoples to the protection and conservation of biodiversity (e.g., Stevens, 2014).
3. Energy

3.18 The region has a considerable endowment of natural resources that could facilitate the deployment of low-carbon technologies. Achieving development consistent with climate stabilization objectives is technically and economically feasible in Latin America and the Caribbean thanks to the region’s substantial endowment of renewable energy sources, coupled with the decreasing costs of low-carbon technologies and considerable co-benefits associated with the use of renewable energy sources (Vergara et al., 2013). Renewable resources in the region (solar, wind, marine, geothermal, and biomass energy) are, in theory, potentially sufficient to meet all its energy needs (Vergara, et al., 2014). In addition to being low-carbon, these options bring additional benefits in terms of energy security, industrial development, job creation, and stabilization of the balance of payments, while avoiding the costs of air pollution and climate change impacts. The benefits for society are big enough to justify the deployment of these technologies across the region (Vergara et al., 2014).

3.19 However, greater penetration of renewable energy in the medium term requires new models of management. Electricity networks tend to favor existing fossil fuel facilities with lower initial capital costs, despite their higher long-term operating costs. Policies and regulations therefore need to be updated, and the business model of utility companies changed (IDB, 2014). Some renewable energy technologies, such as geothermal, can provide baseload generation, and are easy to integrate with the networks. Others, such as wind and solar without storage, are variable, which makes it challenging to integrate them in electricity systems. However, recent experience in Uruguay and other countries shows that it is feasible to achieve a high penetration of these technologies through a combination of measures, including the strengthening of regional interconnections, changes in how generating systems are operated (particularly hydroelectric systems), and hourly demand management systems (ESMAP, 2015; Ecofys, 2015; Clean Energy Solutions Center, 2015; Towards 2030, 2015; IEA, 2015b).

3.20 Moreover, fossil fuel subsidies are hindering this transition. Fossil fuel production is subsidized by some governments, to the tune of an average of US$452 billion per year in G20 countries in 2013 and 2014 (Bast et al., 2015). Reforming energy subsidies in Latin America and the Caribbean would reduce the sector’s emissions by approximately 13%, equivalent to four billion tCO₂e (IMF, 2013). In view of the foregoing, their evaluation is relevant so that they favor the transition to low-carbon energy matrixes and universal access to energy (Bast et al., 2015; Global Commission on the Economy and Climate, 2014). The Dominican Republic’s experience shows that it is possible to substitute universal gas and electricity consumption subsidies with subsidies targeted on the most disadvantaged social groups. In the Dominican case, the program was built on the national subsidy system, accompanying other social initiatives focused on health and education (World Bank, 2013).

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43 More details on energy price distortions and their impact is presented in the Energy SFD.
4. Social

3.21 The region’s prospects for improving social inclusion and reducing inequality may be undermined by the consequences of climate change. The region’s vulnerability is mainly social, as well as geographic and economic (Cecchini et al., 2012). Gradual advances in development over the past decade (AFD, 2014; PAHO, 2012), in particular in the areas of health and nutrition, may be jeopardized by the additional pressure brought by climate change. The phenomenon produces impacts that include increased exposure to vector-borne tropical diseases, the appearance of diseases in areas where they were previously not endemic, and an increased incidence of cardiovascular and respiratory diseases. The main health threats associated with climate change in Latin America are malaria, dengue fever, cholera, and heat stress (Githeko and Woodward, 2003). This will drive up costs for health services. For example, it is estimated that treating additional cases of malaria and diarrhea will cost US$1 billion per year by 2050 (Annex, Table 3). Possible actions to reduce these impacts include: using preventive systems and disease transmission and exposure response mechanisms, implementing environmental pollution controls, with the co-benefit of reducing GHG emissions, and promoting multidisciplinary cooperation to design adaptation and mitigation strategies (Magrin et al., 2014).

5. Intersector

3.22 Despite the multiple benefits of low-carbon development, there are few success stories in which a change in the GHG emissions trend has been achieved. Among countries in Latin America and the Caribbean, Brazil and Mexico achieved changes in the trajectory of their GHG emissions. In Brazil's case, the national commitment to mitigation is on the way to being achieved thanks to efforts to reduce deforestation in the Amazon (Mendes, 2014). Along these lines, CO₂ emissions data published by PRODES/INPE indicate that over the last five years emissions have been the lowest since 1988, and a downward trend in CO₂ emissions from deforestation of the Amazon has been observed. In Mexico, various evaluations of the Special Climate Change Plan have reported changes in GHG emissions trends at the national level over the period 2006-2012 (IMCO, 2013; SEMARNAT, 2012). In this case there was greater concentration on trajectory changes in specific sectors (electricity generation, land use), where certain conditions in the country made it possible to combine the international climate agenda with domestic development needs (Meirovich, 2014).

3.23 Some efforts have been made to reduce vulnerability and increase climate resilience at the national level. One success story in terms of adaptation is

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44 For more information on this topic, see Agüero (2014), Pereda et al. (2014a, 2014b), Andreo et al. (2012), Gomes et al. (2012), and Honório et al. (2009).

45 The data published by Brazil's Ministry of Science, Technology, and Innovation show positive results for all the biomes evaluated. The evidence attributes 37% of the reduction in deforestation in the region over the period 2004-2006 to the expansion of protected areas in the Amazon (Soares-Filho et al., 2010). This same study also indicates that this was accomplished without displacing deforestation to other areas.

46 PRODES is the Brazilian Amazon's forest monitoring project; INPE is Brazil's national space research institute.

47 SEMARNAT is the Department of Environment and Natural Resources of Mexico.
Uruguay. The country has shown continuous improvement in its adaptive capacity, with substantial progress since 2004, when the country ran its first program of general adaptation and mitigation measures (MVOTMA, 2010). As the country is highly exposed to the impacts of sea-level rise, successful actions include the pilot program on adaptation measures in coastal areas, which combined governance measures, information, and biophysical interventions (Nagy et al., 2015).

3.24 Urban planners will need to take climate change into account as part of land-use planning and infrastructure solutions. This includes urban solutions that reduce exposure to climate impacts, mitigate risks, reduce interruptions of critical infrastructure services, and preserve the assets of the most vulnerable population segments (Santamouris and Cartalis, 2015). Examples of these actions are the land-use plans promoted by the Bank’s Emerging and Sustainable Cities Initiative.

D. Support institutional governance on climate change

3.25 There is evidence that the region of Latin America and the Caribbean has made gradual progress on its regulations to address climate change. In terms of climate change actions, the region is among the world’s leaders in producing general climate change laws. Four countries (Mexico, Guatemala, Brazil, and Bolivia) have enacted a climate change act with varying degrees of requirement, including the adoption of carbon taxes and emissions abatement targets, and the creation of interagency mechanisms. These framework climate change policies can use the creation of coordination mechanisms, such as planning committees, interministerial committees, and other institutional arrangements, as a tool to identify synergies between sectors and locales, build new collaborative networks in the public and private sectors, and reduce the frictions produced by interests opposed to a change in the development pathway (GGBP, 2014; ODI, 2013; Meadowcroft, 2011).

3.26 Climate regulations in most countries in the region have focused on policy instruments that include strategies, action plans for strategy implementation, or sector plans (Aguilar and Recio, 2013). These strategies have a wide range of coverages and approaches, and have mainly been prepared by the ministry of the environment in collaboration with other relevant ministries. In general, they lack mechanisms to verify implementation and compliance, as they mainly focus on providing a guide to setting priorities for mitigation and adaptation actions (Aguilar and Recio, 2013). Countries such as Mexico and Brazil have made progress on creating national and subnational strategies and interagency mechanisms, and on channeling their own resources. In Brazil it was found that the drivers of national climate change action are enabling rules and ideas, together with the availability of international climate resources which the various agents can access (Hochstetler and Viola, 2012; and Kasa, 2013).

3.27 However, implementing climate policies poses considerable challenges. Some of the main challenges to implementing climate policies in Latin America and the Caribbean are set out in Aguilar and Recio (2013) and include:

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48 Details of regulatory actions adopted in the region are available in the database of the Sabin Center for Climate Change Law at Columbia University.
a. **Mainstreaming of climate change across sectors.** Considering climate change in national development plans and strategies helps incorporate adaptation and mitigation actions in relevant sectors (e.g. 2010-2014 National Development Plan in Colombia, and the 2030 National Development Strategy in the Dominican Republic). Another way of considering climate change is through reform or amendment of planning or policy instruments at the sector level and the promotion and adoption of sector climate change plans and strategies (e.g. in agriculture, coastal management, water resources, etc.).

b. **Delays in the regulatory framework for adaptation.** Regulations on adaptation tend to be less advanced and more diffuse, as responsibility for the relevant issues is spread across several ministries.

c. **Lack of budget allocation to climate actions.** Difficulties are reported in obtaining resources due to the lack of integration of climate change mitigation or adaptation objectives in medium- and long-term national planning processes. This difficulty is even more evident in the context of fiscal constraints, which are recurrent in the region. Some of the countries that have made headway in this area are Brazil, Mexico, and Colombia.

d. **Complex systems for the distribution of competencies and jurisdiction over climate change-related matters.** Given their intersector nature, the design and implementation of climate change actions requires the involvement of the environment ministry as well as other key ministries, including finance, and the agency responsible for planning. To address this need, most countries in Latin America and the Caribbean have created interagency coordination authorities to facilitate the participation of the different ministries. Nevertheless, the creation of these new entities often entails difficulties in obtaining the budget they need to operate.

3.28 Thus, despite the progress on formulating climate change policies, shortcomings are apparent in the implementation and execution of these measures and in the lack of integration and coordination with other sector and macroeconomic policies, in operational terms and in terms of contradictory objectives (Ryan, 2012). The study by Ryan (2012), which looked at the farming and forestry sector in 10 countries of the region, pointed out that the existence of structures that are focused on climate change and have technical capacities and access to international resources, along with involvement of planning bodies and economy ministries, are crucial for progress on the climate agenda.

3.29 **It is necessary to strengthen institutional capacity and governance on climate change in the countries of the region.** Key actions include:

(i) strengthening governance and the institutional framework for climate finance;

(ii) improving regional governments’ technical and financial capacities;

(iii) mainstreaming climate change across sector policies and plans (Colombia – Palao Málaga and Felandro Llanos, 2014);

(iv) overcoming budget constraints and the lack of participation by finance and planning ministries (Bolivia – Dixit et al., 2012); and

(v) strengthening the institutional framework at the subregional level (Read, 2010). Moreover, the difficulties reported at the subnational level include coordination between different sectors and levels of government, limited participation of local governments and civil society, asymmetries in information
access, and the need for local information (Mexico City and Santiago, Chile – Romero-Lankao et al., 2013).

E. Increase access to and use of climate finance

3.30 Existing climate finance is insufficient to cover the region’s needs. Moreover, it is mainly focused on mitigation, and concentrated in certain countries and sectors. The transition towards climate-resilient low-carbon development requires investment of considerable additional resources in Latin America and the Caribbean. Annual investments of at least US$100 billion are estimated to be required in order to implement actions conducive to achieving the global climate stabilization goal (IEA, 2014; Vergara et al., 2013) and at least a further US$16.8 billion a year is needed to implement adaptation measures (Vergara et al., 2013). At the country level, this transition represents a major challenge, as not only are additional financial resources required, but the public budget is adversely affected by climate change. For example, by 2020 the cumulative impact of climate change in the countries of Central America could come to 2.99% of GDP, considering only agriculture, biodiversity, water resources, and extreme events (ECLAC, 2011). The possibility of the State’s raising resources and public spending quality are also decisive factors in addressing the challenges of climate change, by enabling more resources to respond to the impacts and ensuring that spending targeted on the necessary response actions achieve the objectives set.

3.31 Out of the climate finance resources available worldwide in 2013, US$23 billion was invested in Latin America (approximately 7% of the global total), with approximately 13% earmarked for adaptation (Buchner et al., 2014). This reflects the limited flow of resources for actions focused on increasing the region’s climate resilience. On a cumulative level, over the period 2003-2014 climate finance in Latin America and the Caribbean showed clear trends in terms of its focus and distribution: 78% of funds supported mitigation actions (44% energy, and 33% REDD+), and 55% of resources were concentrated in Mexico and Brazil (Canales Trujillo et al., 2014). This highlights the imbalances in access to finance at the country and sector levels.

3.32 The elements favoring the flow of multilateral and bilateral resources towards Latin America and the Caribbean include: potential to reduce large volumes of GHGs and implement projects efficiently; commitment to addressing the problem of climate change; ability to draw on cofinancing from various sources; institutional capacity to utilize resources; consistent policies and generation of synergies; learning from experience in other countries; existence of a central government.

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49 There are various studies on the investment needs to achieve climate stabilization targets equivalent to a global concentration of 450ppm of CO₂e. These analyses differ in the time frame they set for achieving this goal and the methodology employed. For example, for Latin America and the Caribbean, Vergara et al. (2013) estimate the costs at approximately US$100 billion per year by 2050 considering measures in the energy, agriculture, land use, and land-use change sectors (of this amount, US$63 billion involve activities focused on agriculture, land use, and land-use change). For Latin America, IEA (2014) concentrates solely on actions in the energy sector and projects additional annual investment needs of approximately US$185 billion by 2035.

50 Various estimates are available on the cost of adaptation for Latin America and the Caribbean by sector, topic, year, target, and climate change scenario type (see Agrawala et al., 2010; World Bank, 2010; UNFCCC, 2007).
body that acts as a focal point for climate change; and coordinated environmental governance (World Bank, 2013b). This same study also indicates that the lack of access to climate finance in Central America and the Caribbean (despite its high climatic vulnerability) may be attributed to limited knowledge of the available sources, limited capacity to prepare proposals and implement projects, and absence of strategies or plans to address climate change.\(^{51}\) Moreover, one of the major barriers in Central America to access to international financial resources is the existence of fiscal constraints, given that a local counterpart is required in order to access most international funds.

3.33 **The capacity to use climate finance needs to be strengthened.** Latin America and the Caribbean have limited capacity to execute climate projects, with reported disbursements at about 20% of the total approved by bilateral and multilateral donors in the period 2003-2015.\(^{52}\) This reflects the need to strengthen technical capabilities at the national and subnational levels in order to streamline the use of these resources. Moreover, in order to advance the climate agenda, detailed estimates of the impact of climate change are required that help define needs and target resources (Palao Málaga and Felandro Llanos, 2014).

3.34 **The diversification of sources of finance and promotion of innovative financing instruments and mechanisms are essential to facilitating investment in adaptation and mitigation actions.** To scale up climate investment in the region, new financing sources and models are critical. This is due to the magnitude of the additional resources needed to reduce the impacts of climate change, the limited availability of financing and the peculiarities of climate investments. Along these lines, national development banks in Latin America and the Caribbean are piloting financial and nonfinancial instruments that combine national and international resources as a way of promoting private sector participation in mitigation investments (Smallridge et al., 2012).

3.35 These innovative public sector financing arrangements in the region include: the creation of specific funds for climate change actions (National Climate Change Fund and the Amazonía Fund in Brazil, and the Adaptation Fund in Colombia); the development of mechanisms to attract investments in renewable energy (incentives program for alternative electricity sources in Brazil, liberalization of the electricity market in Chile, tax exemptions on the procurement of renewable technology in Uruguay, and a risk-mitigation mechanism for geothermal energy exploratory studies in Nicaragua); carbon taxes (Mexico and Chile); credit lines to support mitigation and adaptation projects (BNDES in Brazil); and green credit lines (NAFIN in Mexico). Moreover, specific needs have been identified regarding market instruments for financing and financial risk mitigation, and specific regulations considering the specific characteristics of renewable energy investments (IDB, 2014). Financial platforms, like capital markets, may also help channel funds to finance climate actions.

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51 To overcome these limitations, Central American countries launched climate finance dialogues in 2011. These dialogues have extended across the whole of Latin America and serve as a forum in which member countries can share information.

52 Estimate based on Climate Funds Update data [www.climatefundsupdate.org](http://www.climatefundsupdate.org) (May 2015).
F. Summary

3.36 The region has made progress in the consideration of climate change. However, the evidence presented suggests that it is necessary to consolidate and strengthen this process via an approach targeting three main areas: (i) availability, access, and use of information at the sector level; (ii) institutional governance; and (iii) financing. On the first point, there is an urgent need for climate information and sector studies on the impacts and causes of vulnerability. There is also a need to strengthen governance and institutional capacity in relation to climate change. The implementation of climate policies faces challenges with regard to mainstreaming the issue across sectors, allocating budgets, and ensuring an appropriate regulatory framework. As regards financing, there is a clear bias towards mitigation, and there is an obvious need for a stronger focus on adaptation and an increase in resource-utilization capacity. The private sector’s participation is essential, as is the leveraging of national and international resources. Innovation, both in technological terms and in terms of the design and implementation of instruments as well as methodologies facilitating finance, is also important.

IV. LESSONS FROM THE BANK’S EXPERIENCE IN CLIMATE CHANGE

A. Institutional progress in the Bank to respond to the sector’s needs

4.1 The Bank has supported the strengthening of climate change actions in various countries in the region since 2006, when it launched the Sustainable Energy and Climate Change Initiative “SECCI” (document GN-2435). It committed capital resources to support technical assistance through the Sustainable Energy and Climate Change IDB Special Program (IDB SECCI Fund) and the Multidonor Fund for the Sustainable Energy and Climate Change Initiative (document GN-2435-6). This initiative, together with climate funds channeled towards the region through the Bank, has so far financed 237 technical cooperation operations, for a total of US$136.8 million. In addition, the preparation of loans (including policy-based and investment loans) with mitigation and/or adaptation considerations in various sectors has been supported, with an average annual amount of US$1.5 billion over the period 2006-2015.53

4.2 In recent years the IDB has achieved considerable progress on the climate front by adopting various institutional mechanisms reflecting the Bank’s commitment to this agenda. At the operational level, in 2010 the Bank created a unit and in 2012 a specialized division, with staff and budget assigned to promoting the adoption of climate change actions in public and private sector operations. The decision of the Bank’s Board of Governors to increase the amount of loans targeting climate change, renewable energy, environment, and food security initiatives is further evidence of the institution’s commitment to addressing the sustainability issues affecting the region. The target was to increase financing from 5% of the total amount in 2010 to 25% by the end of 2015. The Bank also established its Climate Change Strategy and Action Plan as operational planning and action instruments

53 In this analysis, the joint multilateral development bank approach is used to classify loans under the climate change focus. Importantly, climate loans have increased considerably at the Bank, rising from a total of US$15 million in 2006 to close to US$2.5 billion in 2013, and US$5 billion in 2014.
in the sector, and these are still in force under this SFD.\(^{54}\) Lastly, the Bank was a pioneer in issuing safeguards directives for operations involving coal-fired power stations.

**B. Reports from the Office of Evaluation and Oversight (OVE)**

4.3 The Office of Evaluation and Oversight (OVE) has conducted three evaluations that are relevant for identifying the lessons learned from the Bank’s climate actions. In 2012, as part of the Mid-term Evaluation of the GCI-9 Commitments, OVE prepared a reference document titled “IDB Integrated Strategy for Climate Change Adaptation and Mitigation, and Sustainable and Renewable Energy” (document RE-430-3), which includes an analysis of progress on the implementation of climate change objectives. According to OVE (2012), the Strategy for Climate Change Adaptation and Mitigation, and Sustainable and Renewable Energy and its Action Plan present a good, in-depth analysis of the issues and challenges that need to be addressed in the region in relation to climate change. However, OVE points out that this strategy fails to prioritize sectors and has not managed to strengthen the Bank’s capacity to use technical cooperation grants to help countries prepare new investment operations and undertake the necessary institutional capacity building. Nor has it been possible to combine these interventions with loans based on more conventional investment projects and policies.

4.4 The document “Climate Change at the IDB: Building Resilience and Reducing Emissions” (document RE-459-1) evaluated the Bank’s climate change interventions and institutional arrangements (OVE, 2014). This exercise, carried out in 2014, sought to document efforts and outcomes achieved, and to identify lessons learned and formulate recommendations. As regards climate change mitigation, the evaluation highlights progress in various Bank sectors. Moreover, it identifies forest protection and management, and forging close ties between private sector renewable energy operations and energy policy frameworks adopted in the public sector, as work in progress. As regards adaptation, the document highlights the long track record of supporting natural disaster risk management, concerning risks that are exacerbated by climate change. Its portfolio is largely consistent with countries’ levels of vulnerability. Nevertheless, OVE considers that climate risk assessment is still limited and suggests that the Bank adopt tools to include this risk right from the operation design phase.

4.5 In the framework of the “Evaluation of Special Programs Financed by Ordinary Capital” (document RE-476-3), OVE (2014b) reviewed the portfolio of 139 technical cooperation projects financed with SECCI funds.\(^{55}\) OVE found that this fund had helped promote new topics generating knowledge, strengthening the Bank’s capacity, and ultimately, bolstering the IDB’s work in the specific area of climate change. The analysis emphasizes that these operations have been extremely valuable to borrowing member countries, and have also helped enhance the IDB’s technical capabilities in this field, while supporting initiatives aimed at


\(^{55}\) At this writing, no impact evaluation has been performed on these technical cooperation projects.
mainstreaming climate change considerations in its operations. OVE also indicates that internal capacity building and knowledge generation work have enabled the number of investments in climate change adaptation and mitigation to be stepped up and international climate resources to be leveraged.\textsuperscript{56}

C. Results of the Development Effectiveness Matrix

4.6 Since the financing of climate actions can be led from different Bank divisions, the Development Effectiveness Matrix (DEM) scores were analyzed based on a universe of projects approved between 2009 and 2014, including sovereign-guaranteed operations. These follow the guidelines for classifying operations set out in the Guidelines for Classifying Lending Program Priorities (document GN-2650) and conform to the climate action classification applied jointly by all multilateral development banks (MDBs).\textsuperscript{57} The results are presented in Table IV.\textsuperscript{1}.\textsuperscript{58}

4.7 The scores show that the Bank’s climate projects have been highly evaluable, rising from 44% in 2009 to 100% in 2013, in line with the Bank’s learning trend. The categories included in the evaluability classification were reviewed in 2014, and it was determined that projects receiving scores of over nine would be classified as “highly evaluable”. This year, the percentage of “highly evaluable” projects was just two percentage points below the Bank’s average. The dimensions on which climate operations have generally beaten the average are project logic and risk management. These scores demonstrate the strength of the incorporation of evidence on the problem to resolve in terms of low-carbon development and/or climate resilience, and the analysis of possible interventions and their effectiveness at solving these problems. Given the barriers to progress on climate actions (as discussed above in sections II and III), project team leaders have clearly placed the emphasis on reducing operational risks to ensure their execution.

4.8 Ex ante economic studies have regularly been incorporated in climate operations, and show how progress has been made in the types of methodology used for this analysis based on new baseline information. Moreover, monitoring and evaluation have been a bigger challenge for operations given the low level of development of evaluation methodologies for the climate area.

\textsuperscript{56} For example, in Colombia, SECCI technical-cooperation operations supported the development of new financial products by a local bank to address the effects of climate change. These operations facilitated the preparation of studies on sustainable transportation and the energy efficiency of hotels and hospitals, which the Bank used to create new credit lines to encourage climate change mitigation investments, backed by the IDB through the Clean Technology Fund. The technical cooperation operations were: “Hybrid Bus Test Program” (document RG-T1798), associated with loan CO-L1096, and “Development of an Environmental Management System and Green Line in Bancoldex” (CO-T1198), associated with loan CO-L1124.

\textsuperscript{57} The classification of climate actions includes activities to support climate change mitigation and adaptation actions (for more information see \url{http://www.iadb.org}).

\textsuperscript{58} DEM information for non-sovereign guaranteed operations is included in the Annex, Table 4.
Table IV.1. Summary of DEM results for climate change (CC) loan operations\textsuperscript{59}

<table>
<thead>
<tr>
<th>Dimension evaluated</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project logic</td>
<td>CC</td>
<td>Bank</td>
<td>CC</td>
<td>Bank</td>
<td>CC</td>
<td>Bank</td>
</tr>
<tr>
<td>1. Project logic</td>
<td>7.9</td>
<td>6.7</td>
<td>8.0</td>
<td>7.6</td>
<td>8.3</td>
<td>7.9</td>
</tr>
<tr>
<td>2. Monitoring and evaluation</td>
<td>4.8</td>
<td>5.0</td>
<td>5.6</td>
<td>5.9</td>
<td>6.7</td>
<td>6.9</td>
</tr>
<tr>
<td>3. Ex ante economic analysis</td>
<td>7.7</td>
<td>3.9</td>
<td>7.1</td>
<td>6.0</td>
<td>9.0</td>
<td>8.9</td>
</tr>
<tr>
<td>4. Risk management</td>
<td>7.8</td>
<td>7.3</td>
<td>7.8</td>
<td>7.7</td>
<td>9.4</td>
<td>9.2</td>
</tr>
<tr>
<td>Total evaluability</td>
<td>6.9</td>
<td>5.7</td>
<td>7.1</td>
<td>6.8</td>
<td>8.3</td>
<td>8.2</td>
</tr>
<tr>
<td>% projects highly evaluable</td>
<td>44%</td>
<td>22%</td>
<td>39%</td>
<td>41%</td>
<td>89%</td>
<td>86%</td>
</tr>
<tr>
<td>Number of projects</td>
<td>9</td>
<td>114</td>
<td>23</td>
<td>135</td>
<td>27</td>
<td>122</td>
</tr>
</tbody>
</table>

D. Lessons learned from the Bank’s projects in the sector

4.9 The main lessons learned from the Bank’s interventions, grouped by their priority approach to the barriers identified in section III, are set out below. Challenges relating to (i) improving the availability of and access to information, knowledge, and technology and (ii) strengthening consideration of climate change in the sectors are addressed jointly inasmuch as their close connection has generated operations focusing on these two areas simultaneously. The information presented was compiled with support from the Knowledge Management Division (KNL/KNM) through semi-structured interviews with project team leaders. Interventions in progress or recently completed were considered, including loans, technical cooperation operations, and operations financed with international climate funds.

1. Sector interventions and knowledge

4.10 The following points are important for the design and implementation of interventions on this topic:\textsuperscript{60}

a. Recognizing the peculiarities arising from the nature of the issue. Technical cooperation operations involving the generation of new knowledge or the testing of technology take longer to implement due to: (i) high levels of uncertainty in terms of availability of raw material, lack of information, and limited experience with implementation of the proposed measure; (ii) legal aspects concerning intellectual property and the importation of equipment to test the technology; and (iii) the frequent need to undertake multisector and interagency work. Moreover, adaptation actions present specific challenges because the concept may have different meanings within a multisector work group. This calls for a process of active dialogue between all project participants in order to reach a consensus. For example, the way resilience is measured is determined by the type of intervention, taking the local context, including socioeconomic and environmental factors, into account.

b. Giving priority to the intervention’s sustainability and the subsequent applicability of the knowledge generated. Involving local stakeholders, including beneficiaries, favors sustainability. Also, within the Bank it is important to have the active participation of the relevant sector(s) to ensure

\textsuperscript{59} Includes sovereign-guaranteed operations

\textsuperscript{60} Based on execution experience in, for example, RG-T1655, RG-T1657, BO-G1001, PE-T1297, and RG-T1901.
that the work done is used to advantage and given continuity. Through the SECCI Fund the Bank has financed the generation of expertise on climate change for the region. However, many of the outputs of technical cooperation operations are little known within and outside the Bank. Some of the lessons learned from the design and execution of projects of this kind include: (i) design the operation bearing in mind its applicability to specific local contexts, given that this ensures its subsequent adoption; (ii) encourage the sharing of successful experiences between different countries, by including a dissemination component in the design of technical assistance operations to enable the adoption of this knowledge by sectors in countries, and the Bank’s public and private sectors; and (iii) obtain validation by key bodies.

2. Institutional governance on the issue of climate change

4.11 Important considerations for this type of operation, geared towards policy reform,\textsuperscript{61} are:

a. **The involvement of the finance ministry\textsuperscript{62} and a multisector approach are essential.** Given that this issue is addressed by environment ministries, which generally have a fairly small staff and are dependent on international donations for financial resources, success and sustainability largely depend on the support of the finance ministry as a key actor in driving the transformation agenda towards resilience-enhancing low-carbon actions. Moreover, climate change needs to be integrated with planning in a strategic way, so as to amplify the co-benefits of these actions for the country’s development. The complexity of the responses to climate change also calls for interagency and interministerial coordination mechanisms to ensure the consistency of public policies and to involve experts in different disciplines who can promote and facilitate the dialogue conducive to achieving progress on cross-cutting actions. Operations on this subject have included activities with various ministries, including ministries of finance/economy/planning, environment, agriculture, and public works. These interventions have encouraged coordination between various donors and the dialogue between key stakeholders (national and subnational public sector, private sector, academia, and civil society), which helps ensure better use is made of the available resources.

b. **Capacities need to be strengthened.** Climate change requires a sector approach. In order to promote actions it is therefore essential that key ministries and institutions have staff with expertise on climate change mitigation and/or adaptation so they can identify opportunities and remove bottlenecks to the execution of specific actions. Key capacities include: preparing, interpreting, and using climate information; estimating economic, social, and environmental impacts of climate change; identifying possible climate action measures; establishing strategies and priorities based on interdisciplinary analysis; knowledge of available sources of finance;

\textsuperscript{61} Includes climate-focused policy-based loans (PBLs). These include operations in El Salvador (ES-L1071), Peru (PE-L1080; PE-L1108; PE-L1127), Panama (PN-L1070 and PN-L1074), and Bolivia (BO-L1104).

\textsuperscript{62} Refers to ministries of finance, the economy, and/or planning.
application procedures for access to funds and support for the submission of proposals. Some countries have begun to prepare State climate change action plans, which may turn into a very good vehicle for sharing ideas, concepts, and visions among key stakeholders.

c. **Policy measures require support for their design and implementation.**
Progress of these measures is furthered by the development and use of standardized management tools, methodologies for economic evaluation, sizing of costs and impacts, and consideration of linkages with other sectors.

3. **Access to and use of climate finance**

4.12 The lessons learned regarding this type of intervention are set out below.63

a. **Innovative financing mechanisms are essential to promote actions.**
Ignorance of the risks and returns of many climate investments is a major challenge. Approaches are needed that take these constraints into account, along with the specific characteristics of these actions, including the requirement for a larger initial investment and long-term returns. As an external validator, the Bank can play an important role in recommending nontraditional lending approaches, such as basing loan repayments on cash flow (cash-flow-based finance) or devising appropriate equity fund structures, and integrating them with debt markets.

b. **Supporting knowledge generation on climate issues in the financial sector is important to improve the availability of, access to, and use of resources.**
Actions geared towards increasing knowledge of the characteristics, risks, and returns of climate actions contribute to the design and formulation of risk management mechanisms and structuring of financing arrangements. Latin American financial markets are highly adverse to the risk that financing new sectors, markets, and projects implies. This highlights the importance of having risk management mechanisms and project demand structuring support mechanisms allowing the supply of finance to be made available to countries.

c. **Nonreimbursable and/or concessional resources enable investment in new technologies and work approaches that can facilitate the inclusion of climate change in development programs.**
The implementation of innovative interventions requires concessional resources or technical assistance to compensate for the uncertainty or possible losses associated with investments in innovative technologies and to include activities that help ensure the resilience of the investments. The Bank has a long track record in financing credit lines for national development banks and private banks, and in creating new financial products. This work has recently focused on granting new lines supporting mitigation actions, combining IDB resources with international loan resources that increase product concessionality or include technical assistance activities geared towards strengthening monitoring, follow-up, and evaluation capacities. Another important aspect of the use of international climate finance (e.g. the Climate Investment Funds) is the focus on monitoring and evaluation of the activities to determine their effectiveness.

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This contributes to the gathering of lessons learned and evidence that serve as an important input for making progress in the consideration of climate change in development activities.

d. **Stakeholders from the supply and demand sides need to be involved.** Considering a multidimensional approach to guarantee the sustainability of the intervention means linking the efforts of various stakeholders, and a full diagnostic assessment defining the type of mechanism or financial instrument to use, the implementing agencies or institutions, and the selection of beneficiaries. This will ensure that the design of the intervention integrates the participants’ needs and interests. Program success depends on devising innovative programs that require cooperation resources or concessional funds, and above all identification of the parts of the program that are aligned with the business model of firms that can make use of projects of this kind.

4.13 Additionally, the following factors have been found to be essential for interventions to take a cross-cutting approach:

a. **A comprehensive approach at various levels of government.** Progress on increasing climate resilience and/or reducing GHG emissions requires the participation of national and subnational governments, and also the clear participation and guidance of the central government’s planning ministries, to ensure coordination with development plans. To improve the outcomes of climate interventions, the coordination of various sector areas needs to be promoted (e.g. agriculture, environment, public works, energy, and finance). It is worth noting that this coordination should be at the level of sector strategies and policies, geared towards formulating a regulatory framework that helps tackle climate change through concrete actions. Implementing policies that establish incentives for climate-resilient low-carbon development, together with programs of low emission technological change and cost-effective adaptation measures is recommended. From operational experience in the region, it is possible to conclude that specific interventions to contribute to climate change mitigation and adaptation need to be executed by each sector and different levels of government, maintaining integrated coordination with other sectors through the framework of a national climate change strategy and action plans at the departmental or municipal level.

b. **Progress on climate change frequently entails special considerations that translate into an increase in the time taken for project design and execution.** Interventions implementing novel approaches such as the so-called energy-food-water nexus or cutting-edge technology require extra time for their implementation. This is often linked to technical aspects that have traditionally barely been addressed (such as interagency and interministerial coordination, intellectual property issues, establishment or update of legal or financial frameworks). In turn, the use of international climate finance requires the management of expectations, both inside and outside the Bank, inasmuch as the approval times and eligibility criteria for international funds are different from the Bank’s internal processes. Project team leaders wishing to use these resources need to know and take into account the times and requirements in order to be able to adapt to different sources’ processes and achieve better coordination with clients.
c. The Bank not only promotes low-carbon climate actions, but contributes to preparing guidelines safeguarding against higher emissions. The Bank can bring about technological change or a change in a country’s development path by applying guidelines such as those prepared by the Environmental Safeguards Unit (VPS/ESG) for all thermoelectric and coal investments.

E. The Bank’s comparative advantages in the region

4.14 The IDB is the leading MDB for climate finance in Latin America and the Caribbean and is an important facilitator of access to international climate funding. In 2014 the Bank provided more than half of MDB funding for climate finance in the region. This financing was characterized by: (i) significant use of international climate funding resources, with approximately one of every six dollars of investment coming from these sources; (ii) a primary focus on financing specific investments and technical assistance; and (iii) a strong orientation towards supporting mitigation actions.

4.15 Significant participation of the private sector with broad thematic and regional coverage. The private sector received 52% of climate funding resources channeled through the Bank in 2014 (Joint Report, 2015). This highlights the sector’s capacity and commitment to advancing activities on this issue. The Bank’s private sector has experience in the development and implementation of a wide range of regional and national climate solutions, including green credit lines, green bonds, concessional finance for mitigation and adaptation projects, guarantees to financial institutions to implement energy efficiency projects in commercial buildings, incentives to carry out climate actions (e.g. through interest rates, grace periods, longer repayment periods), and technical assistance programs to help develop the ability to adapt to climate change (ProAdapt). Tools have also been developed to support decision-making, such as regulatory framework quality indexes for private investment (Climatescope) and promotion of good practices (e.g. Infrascope and Envision).

4.16 Internationally recognized technical quality. The quality of the climate interventions supported by the Bank has been recognized on numerous occasions through awards and commendations: the UNFCCC “Momentum for Change” award for the innovative and transformative character of its programs; the “QUALIESCO” award for innovation in energy efficiency projects with guaranteed energy savings; the “Infrastructure 360” award for technical assistance for a concentrated solar energy project in Chile; mention—in the technical documents of the UNFCCC’s loss and damages working group—for the contingent lines the IDB prepared for Central America as examples for other international organizations to

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64 In 2014 total MDB climate finance for Latin America and the Caribbean (including only the IDB and the World Bank) was US$4.682 billion, of which US$2.461 billion was provided by the IDB (Joint Report, 2015). These amounts consider own funds, external funds from bilateral donors, and international climate funds.
follow; and a mention in the journal *Science*.\(^{65}\) Additionally, the program to strengthen climate modeling capabilities, jointly led by the IDB and the University of Nebraska,\(^{66}\) is being replicated in other countries.

4.17 **Interdisciplinary team engaged in mainstreaming climate change across sectors.** The Climate Change and Sustainability Division (INE/CSS) heads and supports mitigation and adaptation activities in the Bank, including financing, testing of technology and innovative mechanisms, and international negotiations.\(^{67}\) This allows activities to be coordinated and climate resilience and emissions abatement opportunities to be considered right from the start of public and private sector interventions, while taking a holistic national, subnational, or river basin approach. This has contributed to access to and use of resources for climate actions as well as the dialogue between stakeholders and the creation of synergies.

4.18 **Multilateral and bilateral climate funds implementing agency.** The Bank has facilitated access to a variety of international climate funds by countries in the region, through technical support for the formulation of proposals and the design and execution of projects that have received funding from the Adaptation Fund, Climate Investment Fund, and Global Environment Facility. It has also been selected by bilateral funds such as the UK, Denmark and Germany International Climate Fund to implement innovative projects in the region. In addition, the IDB was recently accredited by the Green Climate Fund.

4.19 **Convening power, dissemination of good practices, and generation of policy dialogue.** The Bank’s other important comparative advantages, reaching beyond its climate actions, include its ability to act as an “honest broker” between different national and private sector entities; its ability to pass on lessons, disseminate good practices between borrowing and nonborrowing member countries; and its ability to build policy dialogue, which furthers progress in the incorporation of climate considerations. These are critical features for channeling international resources for execution in the region, and for opening up the possibility of these resources being used by the private sector.

4.20 The Bank will give priority to its climate change response actions based on its comparative advantages and the challenges the region faces in making progress on climate change. The focus over the next three years will therefore be on addressing issues relating to: (i) improving the availability of and access to information, knowledge, and technology; (ii) promoting the consideration of

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\(^{65}\) The recognitions correspond to various operations. The UNFCCC award was for the ECOCASA program (ME-L1121, ME-T1201, and ME-T1202) and EcoMicro (RG-M1205); the QUALIESCO award was obtained by a project promoting energy efficiency in commercial buildings (BR-X1018); *Infrastructure 360* was awarded to the Cerro Dominador Concentrated Solar Plant project (CH-T1122); the mention in the UNFCCC reports (decision FCCC/SB/2014/4) refers to contingent facility operations (DR-L1045); and the mention in the journal *Science* discussed the project to adapt coffee cultivation to climate change (RG-T1655).

\(^{66}\) This was project RG-T1574, approved in 2008, which lasted for approximately five years. A continuation of the program is currently being prepared, with the participation of about 10 countries in the region.

\(^{67}\) For example, in this regard the Bank is taking part in the study by MDBs and regional banks on identification of the principles whereby financial institutions consider climate change a cross-cutting issue.
climate change in the sectors; (iii) strengthening institutional governance; and 
(iv) improving access to and use of climate finance. Actions associated with 
areas in which the Bank does not have comparative advantages will not be 
given priority.

V. GOALS, PRINCIPLES, DIMENSIONS OF SUCCESS, AND LINES OF ACTION TO GUIDE 
THE BANK’S OPERATIONAL AND RESEARCH ACTIVITIES

A. Target and principles of the Bank’s work in climate change

5.1 The Bank’s target is to promote sustainable development in Latin America and the 
Caribbean by mainstreaming adaptation and mitigation actions in its operations. To 
this end, the following principles will guide possible Bank interventions designed 
with climate change considerations in mind.

a. Coordination with sustainable development objectives. The Bank’s 
interventions will be oriented towards contributing to poverty reduction and 
equity enhancement goals taking a long-term view consistent with climate-
resilient low-carbon development, with particular emphasis on climate change 
adaptation.

b. Intersector and multisector coordination on various levels. 
Understanding that responses to tackle climate change and its effects involve 
various sectors and levels of government, multisector and intersector 
interventions will be promoted.

c. Incorporation of the climate change variable from the initial stages of 
the intervention. Considering the need to maximize the efficiency of 
resource use and to plan work strategically in critical areas for the region, 
climate change vulnerability and risk considerations will be taken into 
account, right from projects’ conceptual design, as a starting point for the 
identification of adaptation measures. The possibilities of contributing to low-
carbon development will also be evaluated.

d. Promotion of financial structures that enable coordination between the 
public and private sectors. Recognizing the importance of the private 
sector in the region and its potential role as a catalyst of change and 
innovation towards green growth, efforts will be made to optimize its 
participation independently or in cooperation with the public sector on 
emissions abatement and climate resilience programs.

e. Capacity strengthening. Bearing in mind that addressing climate issues 
requires specific technical and institutional capacities, support will be 
provided to various key national and subnational actors to improve them.

B. Dimensions of success, lines of action, and activities

5.2 The dimensions of success and lines of action that will guide the Bank’s work are 
focused on addressing and minimizing the barriers to progress on climate change 
adaptation and mitigation actions in Latin America and the Caribbean. These 
challenges were identified in section III. Given how closely connected they are, the 
barriers relating to (i) improving the availability of and access to information, 
knowledge, and technology, and (ii) strengthening consideration of climate change
in the sectors, will be addressed together. The dimensions establish the general outcome to be obtained from tackling each of the barriers, acting as a guiding framework for the Bank’s interventions, since their aim is to help achieve the proposed objective. For their part, the lines of action identify specific areas of a dimension in which operational and knowledge activities are defined that the Bank will prioritize during the period that this SFD is in effect. The priorities in terms of activities will be determined by the countries’ needs, using as reference the binding or voluntary targets they will have established in their Intended Nationally Determined Contributions (INDCs), policies, programs, plans, or strategies.

1. Dimension of Success 1. The countries make progress on including climate considerations in the sectors

5.3 The evidence presented shows that availability of and access to climate information and the capacity to visualize, analyze, interpret, and use that information are vital for planning and implementation of sector climate actions. It is also important to monitor and evaluate these climate actions in a way that makes it possible to determine the impact of the interventions and additional needs, thereby contributing to identifying effective interventions.

5.4 Given the need to tackle the challenge of climate change in a comprehensive and interdisciplinary way, this SFD links activities to which support is to be given that were previously addressed in other SFDs to each line of action presented (see Annex, Table 5). As an illustrative guide on actions in relevant areas, Table V.1 presents some examples of activities—validated by corresponding sector/area—for each line of action under Dimension of Success 1.

5.5 Line of Action 1. Improve the availability and use of climate information and data. The activities to implement this action are:

a. Support for the collection, analysis, interpretation, and use of climate data in the planning, design, development, monitoring, and evaluation of development projects and programs in the region.

b. Strengthening of capacities at the national and subnational levels for the generation, interpretation, and use of climate information in order to reduce emissions and vulnerability.

c. Design of analytical tools and methodologies to assist decision-makers, including the private sector—within and outside the Bank—in the identification or implementation of mitigation and adaptation actions from the initial stages of operation design.

5.6 Line of Action 2. Promote innovation in the implementation of climate actions. The activities considered in this action include:

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68 Covers data and information for mitigation and adaptation activities.

69 The term “innovation” in the context of climate change involves any new and additional actions that contribute to the cost-effective and socially feasible design and implementation of technologies, governance structures, and resource, land, and data management that lead towards climate-resilient, low-carbon development. It is important to note that innovation can also include the modification or combination of existing technologies or methods of analysis used for other purposes.
a. Promotion of development, transfer, testing, and adoption of technologies and innovative approaches for the implementation of mitigation and adaptation actions. 

b. Technical assistance for the testing, adoption, and implementation of innovative technologies and approaches.

c. Fostering of dialogue and sharing of experiences between countries to push forward innovation.

5.7 **Line of Action 3.** Implement and promote approaches aimed at monitoring and evaluating climate actions. To implement this line of action priority will be given to the following activities:

a. Strengthening of capacities for the development, validation, and implementation of methodologies, tools, and procedures to determine the effectiveness of climate actions in social, economic, and environmental terms.

b. Development of studies, dissemination activities, and training—including policy dialogue—to improve current knowledge about climate risk, costs and benefits of mitigation and adaptation options, and co-benefits of development associated with climate actions.

c. Technical assistance for the development, validation, and implementation of plans to monitor and evaluate adaptation and mitigation actions.

d. Compilation, analysis, and dissemination of evidence on the impact of climate interventions.

2. **Dimension of Success 2. The countries adopt or strengthen institutional governance measures that facilitate coordination and planning of actions in response to climate change and its impacts**

5.8 Strengthen institutional governance measures is crucial to the progress of climate change actions—in particular, those measures focused on mainstreaming climate change in development plans and taking a multisector approach. To support countries in this area, the Bank is focusing on the following lines of action:

5.9 **Line of Action 1.** Foster the mainstreaming of climate change considerations in development planning and advocating budgetary allocations, bearing in mind the commitments made. To fulfill this line of action, the following activities are given priority:

a. Support for reforms to the legal, regulatory, and institutional framework (in specific sectors and cross-cutting and fiscal areas) geared towards promoting the formulation and execution of plans, strategies, and actions for climate-resilient low-carbon development.

b. Strengthening of lead agencies and intersector commissions on the issue of climate change to enhance planning, prioritization, coordination, and dialogue activities, and the coordination, proposal, and implementation of public policies.

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70 Includes technologies based on traditional knowledge.
c. Technical assistance to support, promote, and implement climate action policies and formulate or revise legislation addressing development issues linked to climate change adaptation and mitigation.

d. Actions to facilitate dialogue between countries and sectors geared towards the sharing of experiences on climate change mainstreaming.

5.10 **Line of Action 2.** Promote a multisector and interdisciplinary approach to climate change. To fulfill this line of action, the following activities are given priority:

a. Strengthening of the technical capabilities of the main stakeholders at both the national and subnational levels and the public and private sectors to incorporate climate change in development actions.

b. Support for the configuration and operation of coordination and interagency dialogue arrangements between the national and subnational levels, and linkages between the public and private sectors.

3. **Dimension of Success 3. The countries improve their access to climate finance and diversify its use**

5.11 The evidence shows that existing climate finance is insufficient to meet the region’s needs. Consequently, resources from various sources need to be leveraged, synergies created, and innovative mechanisms used that facilitate access and use of these resources. To meet those objectives, the following lines of action are proposed:

5.12 **Line of Action 1.** Leverage resources to finance climate actions, particularly those focused on vulnerability reduction and adaptation. To fulfill this line of action, the following activities are given priority:

a. Promotion of participation in international climate funds (e.g. Climate Investment Fund, Global Environment Facility, Green Climate Fund) to increase access to and use and effectiveness of resources in the region.

b. Incentives for the participation of the private sector in actions addressing climate and its impacts, including setting up public-private partnerships and/or using international resources.

c. Support for the identification of priority mitigation and adaptation actions, particularly in climate-sensitive sectors,\(^{71}\) and determination of financing requirements to implement these actions and identify sources to finance the required investments.

5.13 **Line of Action 2.** Support the public and private sectors in the use of financial instruments and mechanisms that take the particular characteristics of climate investments into account. To fulfill this line of action, the following activities are given priority:

a. Support for policy reforms allowing incentives for investments in GHG emission reduction and climate resilience.

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\(^{71}\) Climate-sensitive sectors are determined by countries based on economic, social, and/or environmental criteria.
b. Design and execution of interventions promoting innovative financing mechanisms, incentives and instruments for investments in mitigation and adaptation (including identification, design, pilot trials, and implementation to scale).

c. Strengthening of key actors in the financial sector to improve their understanding of climate actions, focusing on how such actions require specific financing mechanisms, and education on climate risks and mitigation and adaptation opportunities.

d. Identification and dissemination of best practices for the distribution of risks associated with the use of new technologies and management of uncertainty between the public and private sectors.

5.14 It is important to underline that the actions in one dimension frequently contribute to at least one other of the dimensions identified. For example, actions concerning institutional governance (development of climate change strategies, plans, or programs and their incorporation in development plans) may foster inclusion of climate considerations at the sector level and facilitate access to and use of climate finance (e.g. by serving as an indication for international donors that these actions are part of a long-term policy). This reflects the feedback and complementarity between the various objectives, and the need for a comprehensive and multidisciplinary approach.

5.15 Lastly, these lines of action rely on certain basic prerequisites for access to resources, and in particular for adaptation actions. These prerequisites include mapping and strengthening domestic executing agencies that can use international resources; generating (even informal) forums for collaboration between national actors; and supporting the generation of local capacities to build a project portfolio.
### Table 2. Indicative activities per line of action under Dimension of Success 1: The countries make progress on including climate considerations in the sectors

<table>
<thead>
<tr>
<th>Issue</th>
<th>Line 1. Improve the availability and use of climate information and data.</th>
<th>Line 2. Promote innovation for the implementation of climate actions.</th>
<th>Line 3. Implement and promote approaches to monitoring and evaluation of climate actions.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>− Methodologies for analysis of vulnerability to and risk of climate change impacts on energy generation, transmission, and distribution infrastructure</td>
<td>− Regional programs to foster dialogue and the sharing of information and experience on the implementation of cost-effective mitigation and adaptation measures in the energy sector</td>
<td>− Design, preparation, fine-tuning, and quantification of climate resilience indexes in infrastructure, productive systems, and ecosystems that include, for example, measurement of the following: (i) speed with which an infrastructure or a natural system can recover from failures caused by a weather event and continue delivering service; (ii) measurement of the downtime due to a weather event; (iii) frequency of failure of infrastructure due to weather-related events*</td>
</tr>
<tr>
<td></td>
<td>− Methodologies for determining baselines and quantifying GHG emissions reductions, particularly in energy efficiency</td>
<td>− Promotion of the use of technology components contributing to the implementation of smart systems for the generation, transmission, distribution, and use of energy (e.g. smart energy systems should aim for operation that boosts resilience and have low GHG emissions)</td>
<td>− Design, preparation, fine-tuning, and quantification of vulnerability indexes</td>
</tr>
<tr>
<td></td>
<td>− Training/awareness-raising activities to improve understanding of the nature of climate change impacts on infrastructure and the service it provides, and training on the use of analysis and design tools for adaptation interventions</td>
<td>− Promotion of policies and technologies for the use of renewable energy systems and efficient energy use in both rural and urban areas</td>
<td>− Quantification of gross and net GHG emissions of IDB projects in specific sectors, using methodologies standardized with other development institutions, and participation in disseminating and improving these methodologies</td>
</tr>
<tr>
<td></td>
<td>− Regional programs to foster dialogue and information sharing regarding climate change impacts on hydroelectricity generation systems, particularly systems with shared water sources</td>
<td>− Market mechanisms for electricity systems with a high penetration of renewable energy sources, in particular intermittent technologies</td>
<td>− Development of tools for the evaluation of institutional and regulatory frameworks from the point of view of their effectiveness for climate-resilient low-carbon development</td>
</tr>
<tr>
<td>Generation and Use of Energy</td>
<td></td>
<td>− Regulatory and knowledge instruments to promote energy efficiency in the industrial, trade, public services, and residential sectors</td>
<td></td>
</tr>
</tbody>
</table>

* In particular, for adaptation, the literature indicates that effective monitoring and evaluation systems for response measures are based on three principles reflecting their iterative nature: (i) a design that allows learning; (ii) a stronger focus on the monitoring and evaluation of results and impacts than on outputs; and (iii) enough flexibility to handle uncertainties.
<table>
<thead>
<tr>
<th>Issue</th>
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<th>Line 2. Promote innovation for the implementation of climate actions.</th>
<th>Line 3. Implement and promote approaches to monitoring and evaluation of climate actions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water and Sanitation</td>
<td>Decision-making support systems including software tools for the efficient planning of water resources in a multi-use context and factoring in uncertainty as to the impacts of climate change on resource availability</td>
<td>Development of comprehensive watershed management plans including climate change considerations</td>
<td>Design, preparation, fine-tuning, and quantification of climate resilience indexes in infrastructure, productive systems, and ecosystems that include, for example, measurement of the following: (i) speed with which an infrastructure or a natural system can recover from failures caused by a weather event and continue delivering service; (ii) measurement of the downtime due to a weather event; (iii) frequency of failure of infrastructure due to weather-related events*</td>
</tr>
<tr>
<td></td>
<td>Cost-benefit analysis methodologies on adaptation measures considering various water systems' operating standards</td>
<td>Regional programs to foster dialogue and the sharing of information and experience on the implementation of cost-effective mitigation and adaptation measures in the water and sanitation sector, in particular for those regions in which water sources are shared by several countries</td>
<td>Design, preparation, fine-tuning, and quantification of vulnerability indexes</td>
</tr>
<tr>
<td></td>
<td>Training/awareness-raising activities for public sector and water-company employees to improve understanding of the nature of climate change impacts on infrastructure and the service it provides, and training on the use of analysis and design tools for adaptation interventions</td>
<td>Development of basin-wide monitoring systems to evaluate changes in local hydrology, with particular emphasis on glacial basins</td>
<td>Quantification of gross and net GHG emissions of IDB projects in specific sectors, using methodologies standardized with other development institutions, and participation in disseminating and improving these methodologies</td>
</tr>
<tr>
<td></td>
<td>Regional programs to foster dialogue and information sharing regarding climate change impacts on shared water sources, including rivers, lakes, and endorheic basins</td>
<td>Development of incentives to implement energy efficiency programs</td>
<td>Development of tools for the evaluation of institutional and regulatory frameworks from the point of view of their effectiveness for climate-resilient low-carbon development</td>
</tr>
<tr>
<td></td>
<td>Information and data on the observed and anticipated impacts of climate change for due consideration in: (i) planning tools such as master plans; (ii) national regulations on infrastructure design; and (iii) the environmental management systems of service providers, to enable them to respond to the impacts appropriately</td>
<td>Development of solid waste management projects, with particular attention to opportunities for GHG capture, storage, or utilization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Threat, vulnerability, and risk maps for extreme and slow-onset events, such as floods, droughts, and torrential rainfall, that may be used in the design of key infrastructure, such as urban storm drainage systems</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* In particular, for adaptation, the literature indicates that effective monitoring and evaluation systems for response measures are based on three principles reflecting their iterative nature: (i) a design that allows learning; (ii) a stronger focus on the monitoring and evaluation of results and impacts than on outputs; and (iii) enough flexibility to handle uncertainties.
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</tr>
</thead>
</table>
| Natural Resources | − Basin hydrology monitoring systems, integrating the role of natural capital in the water cycle  
− Determination of the baseline for the carbon locked up in natural capital  
− Development and training programs on the use of accounting tools to quantify stored carbon  
− Regional programs to foster dialogue and information sharing regarding climate change impacts on shared natural capital  
− Development of methodologies for the economic quantification of the benefits obtained from the services provided by natural capital | − Regional programs to foster dialogue and the sharing of information and experience on the implementation of natural capital conservation measures, particularly in the case of natural capital shared by several countries  
− Development of land titling projects in rural areas  
− Development of land-use planning programs that take climate change considerations into account  
− Development of comprehensive coastal management plans considering slow-onset climate change impacts, such as rising sea levels, and the impacts of extreme events  
− National capacity building programs for the monitoring of hydro-meteorological, physical, and chemical variables affected by climate change | − Design, preparation, fine-tuning, and quantification of climate resilience indexes in infrastructure, productive systems, and ecosystems that include, for example, measurement of the following: (i) speed with which an infrastructure or a natural system can recover from failures caused by a weather event and continue delivering service; (ii) measurement of the downtime due to a weather event; (iii) frequency of failure of infrastructure due to weather-related events*  
− Design, preparation, fine-tuning, and quantification of vulnerability indexes  
− Quantification of gross and net GHG emissions of IDB projects in specific sectors, using methodologies standardized with other development institutions, and participation in disseminating and improving these methodologies  
− Development of tools for the evaluation of institutional and regulatory frameworks from the point of view of their effectiveness for climate-resilient low-carbon development |
| Disaster Risk Management | − Development/updating of disaster risk estimation methodologies with climate change considerations  
− Development of a risk study incorporating the climate change scenario at the local and national levels  
− Development and maintenance of databases as a repository of results of studies that are accessible, reliable, and have continuous information | − Incorporation of the disaster risk management and adaptation to climate change dimensions in national/municipal development plans  
− Implementation of structural and nonstructural mitigation measures incorporating the estimated increase in the threat due to climate change  
− Implementation of early-warning systems, with emphasis on the increase in the threat due to climate change  
− Strengthening of the regulatory and institutional framework at the national and local levels to improve the performance of disaster risk management and climate change adaptation  
− Implementation of risk transfer mechanisms, such as insurance and other financial instruments | − Design, preparation, fine-tuning, and quantification of climate resilience indexes in infrastructure, productive systems, and ecosystems that include, for example, measurement of the following: (i) speed with which an infrastructure or a natural system can recover from failures caused by a weather event and continue delivering service; (ii) measurement of the downtime due to a weather event; (iii) frequency of failure of infrastructure due to weather-related events*  
− Design, preparation, fine-tuning, and quantification of vulnerability indexes  
− Quantification of gross and net GHG emissions of IDB projects in specific sectors, using methodologies standardized with other development institutions, and participation in disseminating and improving these methodologies  
− Development of tools for the evaluation of institutional and regulatory frameworks from the point of view of their effectiveness for climate-resilient low-carbon development |

* In particular, for adaptation, the literature indicates that effective monitoring and evaluation systems for response measures are based on three principles reflecting their iterative nature: (i) a design that allows learning; (ii) a stronger focus on the monitoring and evaluation of results and impacts than on outputs; and (iii) enough flexibility to handle uncertainties.
**Issue** | **Line 1. Improve the availability and use of climate information and data.** | **Line 2. Promote innovation for the implementation of climate actions.** | **Line 3. Implement and promote approaches to monitoring and evaluation of climate actions.**
---|---|---|---
Transportation | – Transportation infrastructure planning support systems (translating specific climate impact into a fiscal cost estimate)  
– Vulnerability and climate risk analysis methodologies  
– Review of transportation infrastructure design standards, particularly design elements for handling precipitation (e.g. modification of return times)  
– Training/awareness-raising activities to improve understanding of the nature of climate change impacts on infrastructure and the service it provides, and training on the use of analysis and design tools for transportation adaptation interventions  
– Regional programs to foster dialogue and information sharing on the management of vulnerability and risks affecting shared transportation infrastructure  
– Development of methodologies for estimating the benefits (climate, health, competitiveness, etc.) of urban and interurban transportation solutions | – Reduction of maintenance periods to address changes in temperature and precipitation  
– Update of design specifications for raising roads in response to future sea level rise and higher storm tides  
– Plan for the relocation of roads in coastal zones  
– Regional programs to foster dialogue and the sharing of information and experience on the implementation of cost-effective mitigation and adaptation measures in transportation systems shared by several countries  
– Change in the use of coastal land to turn it into a natural buffer zone  
– Use of improved asphalt/concrete for roads and highways; use flexible, expandable materials able to cope with above average temperature rises (>10%)  
– Support for the development of low-emissions urban transportation technologies and systems  
– Low-emissions transportation systems | – Design, preparation, fine-tuning, and quantification of climate resilience indexes in infrastructure, productive systems, and ecosystems that include, for example, measurement of the following:  
(i) speed with which an infrastructure or a natural system can recover from failures caused by a weather event and continue delivering service;  
(ii) measurement of the downtime due to a weather event;  
(iii) frequency of failure of infrastructure due to weather-related events*  
– Design, preparation, fine-tuning, and quantification of vulnerability indexes  
– Quantification of gross and net GHG emissions of IDB projects in specific sectors, using methodologies standardized with other development institutions, and participation in disseminating and improving these methodologies  
– Development of tools for the evaluation of institutional and regulatory frameworks from the point of view of their effectiveness for climate-resilient low-carbon development

* In particular, for adaptation, the literature indicates that effective monitoring and evaluation systems for response measures are based on three principles reflecting their iterative nature: (i) a design that allows learning; (ii) a stronger focus on the monitoring and evaluation of results and impacts than on outputs; and (iii) enough flexibility to handle uncertainties.
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<th>Line 3. Implement and promote approaches to monitoring and evaluation of climate actions.</th>
</tr>
</thead>
</table>
| Urban Development and Housing | − Review and fine-tuning of energy-use and construction standards  
− Development of threat, vulnerability, and climate-risk maps (e.g. heat waves and floods)  
− Methodologies for estimating the carbon footprint of various urban development models | − Development and implementation of urban land-use plans that consider the impacts of climate change  
− Development of programs to foster dialogue on policies leading to low-carbon, resilience-based growth  
− Low-carbon urban development, including local and national tax collection models, and models of incentives for private investment | − Design, preparation, fine-tuning, and quantification of climate resilience indexes in infrastructure, productive systems, and ecosystems that include, for example, measurement of the following:  
(i) speed with which an infrastructure or a natural system can recover from failures caused by a weather event and continue delivering service;  
(ii) measurement of the downtime due to a weather event;  
(iii) frequency of failure of infrastructure due to weather-related events*  
− Design, preparation, fine-tuning, and quantification of vulnerability indexes  
− Quantification of gross and net GHG emissions of IDB projects in specific sectors, using methodologies standardized with other development institutions, and participation in disseminating and improving these methodologies  
− Development of tools for the evaluation of institutional and regulatory frameworks from the point of view of their effectiveness for climate-resilient low-carbon development |
| Gender and Social Development | − Development of analysis of socioeconomic vulnerability to climate change with a gender perspective, clearly identifying the most vulnerable groups and determinants to define vulnerability reduction indexes. | − Development of mitigation and adaptation actions that are aligned with local development plans, promote gender equality and generate a measurable social benefit. | |

* In particular, for adaptation, the literature indicates that effective monitoring and evaluation systems for response measures are based on three principles reflecting their iterative nature: (i) a design that allows learning; (ii) a stronger focus on the monitoring and evaluation of results and impacts than on outputs; and (iii) enough flexibility to handle uncertainties.
FIGURES AND TABLES

GREENHOUSE GAS (GHG) EMISSIONS

Figure 1. GHG emissions by sector in 2012 (in MtCO$_2$e)

Figure 2. GHG emissions in LAC 1995-2012 (in MtCO\textsubscript{2}e)*

* GDP-PPP shows total emissions divided by gross domestic product (GDP) using purchasing power parity (PPP)

### Table 1. Global Climate Risk Index (CRI) 1994-2013 for Bank member countries

<table>
<thead>
<tr>
<th>1993-2013 Ranking (worldwide)</th>
<th>Country</th>
<th>CRI value</th>
<th>Deaths (average)</th>
<th>Deaths per 100,000 inhabitants (average)</th>
<th>Losses per unit of GDP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Honduras</td>
<td>10.33</td>
<td>309.70</td>
<td>4.604</td>
<td>3.300</td>
</tr>
<tr>
<td>3</td>
<td>Haiti</td>
<td>16.17</td>
<td>16.17</td>
<td>3.408</td>
<td>1.857</td>
</tr>
<tr>
<td>4</td>
<td>Nicaragua</td>
<td>16.67</td>
<td>160.15</td>
<td>2.979</td>
<td>1.705</td>
</tr>
<tr>
<td>9</td>
<td>Guatemala</td>
<td>31.17</td>
<td>83.20</td>
<td>0.682</td>
<td>0.622</td>
</tr>
<tr>
<td>12</td>
<td>El Salvador</td>
<td>35.50</td>
<td>33.70</td>
<td>0.558</td>
<td>0.933</td>
</tr>
<tr>
<td>21</td>
<td>Belize</td>
<td>42.00</td>
<td>2.35</td>
<td>0.841</td>
<td>4.018</td>
</tr>
<tr>
<td>31</td>
<td>Bahamas</td>
<td>50.67</td>
<td>1.15</td>
<td>0.363</td>
<td>2.681</td>
</tr>
<tr>
<td>33</td>
<td>Bolivia</td>
<td>52.17</td>
<td>36.95</td>
<td>0.405</td>
<td>0.374</td>
</tr>
<tr>
<td>38</td>
<td>Mexico</td>
<td>54.50</td>
<td>146.00</td>
<td>0.141</td>
<td>0.247</td>
</tr>
<tr>
<td>43</td>
<td>Colombia</td>
<td>58.83</td>
<td>103.25</td>
<td>0.245</td>
<td>0.164</td>
</tr>
<tr>
<td>45</td>
<td>Paraguay</td>
<td>59.33</td>
<td>7.70</td>
<td>0.135</td>
<td>0.919</td>
</tr>
<tr>
<td>48</td>
<td>Jamaica</td>
<td>61.17</td>
<td>4.45</td>
<td>0.169</td>
<td>0.995</td>
</tr>
<tr>
<td>50</td>
<td>Peru</td>
<td>61.50</td>
<td>108.15</td>
<td>0.404</td>
<td>0.123</td>
</tr>
<tr>
<td>51</td>
<td>Ecuador</td>
<td>62.17</td>
<td>38.50</td>
<td>0.285</td>
<td>0.197</td>
</tr>
<tr>
<td>54</td>
<td>Venezuela</td>
<td>62.83</td>
<td>61.40</td>
<td>0.239</td>
<td>0.155</td>
</tr>
<tr>
<td>60</td>
<td>Costa Rica</td>
<td>70.17</td>
<td>8.70</td>
<td>0.202</td>
<td>0.268</td>
</tr>
<tr>
<td>68</td>
<td>Uruguay</td>
<td>78.50</td>
<td>5.95</td>
<td>0.180</td>
<td>0.195</td>
</tr>
<tr>
<td>78</td>
<td>Brazil</td>
<td>85.67</td>
<td>159.45</td>
<td>0.088</td>
<td>0.060</td>
</tr>
<tr>
<td>80</td>
<td>Argentina</td>
<td>86.67</td>
<td>25.70</td>
<td>0.069</td>
<td>0.123</td>
</tr>
<tr>
<td>88</td>
<td>Guyana</td>
<td>94.33</td>
<td>0.30</td>
<td>0.039</td>
<td>1.281</td>
</tr>
<tr>
<td>90</td>
<td>Panama</td>
<td>95.33</td>
<td>9.00</td>
<td>0.287</td>
<td>0.071</td>
</tr>
<tr>
<td>100</td>
<td>Chile</td>
<td>101.33</td>
<td>7.70</td>
<td>0.048</td>
<td>0.109</td>
</tr>
<tr>
<td>135</td>
<td>Barbados</td>
<td>137.17</td>
<td>0.05</td>
<td>0.018</td>
<td>0.117</td>
</tr>
<tr>
<td>137</td>
<td>Dominican Republic</td>
<td>140.17</td>
<td>19.10</td>
<td>0.032</td>
<td>0.006</td>
</tr>
<tr>
<td>142</td>
<td>Trinidad &amp; Tobago</td>
<td>146.33</td>
<td>0.55</td>
<td>0.042</td>
<td>0.009</td>
</tr>
<tr>
<td>151</td>
<td>Suriname</td>
<td>156.83</td>
<td>0.15</td>
<td>0.030</td>
<td>0.003</td>
</tr>
</tbody>
</table>

Source: Kreft et al. (2014)
ND-GAIN INDEX

Figure 3. Vulnerability and readiness in Latin American and Caribbean countries in 1995 and 2013*

* Higher values on the vulnerability and readiness axes indicate greater susceptibility to the negative effects of climate change and greater capacity to respond to climate change impacts, respectively.

Source: Figure prepared using ND-GAIN data (http://index.gain.org, June 2015).
## DARA INDEX

### Table 2. Level of vulnerability due to climate change*

<table>
<thead>
<tr>
<th>Country</th>
<th>Level of vulnerability 2010</th>
<th>Level of vulnerability 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belize</td>
<td>Acute</td>
<td>Acute</td>
</tr>
<tr>
<td>Haiti</td>
<td>Acute</td>
<td>Acute</td>
</tr>
<tr>
<td>Jamaica</td>
<td>Acute</td>
<td>Acute</td>
</tr>
<tr>
<td>Bahamas</td>
<td>Severe</td>
<td>Acute</td>
</tr>
<tr>
<td>El Salvador</td>
<td>Severe</td>
<td>Acute</td>
</tr>
<tr>
<td>Guyana</td>
<td>Severe</td>
<td>Acute</td>
</tr>
<tr>
<td>Honduras</td>
<td>Severe</td>
<td>Acute</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>Severe</td>
<td>Acute</td>
</tr>
<tr>
<td>Bolivia</td>
<td>High</td>
<td>Acute</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>High</td>
<td>Acute</td>
</tr>
<tr>
<td>Suriname</td>
<td>High</td>
<td>Severe</td>
</tr>
<tr>
<td>Barbados</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Chile</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Colombia</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Ecuador</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Mexico</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Panama</td>
<td>Moderate</td>
<td>Severe</td>
</tr>
<tr>
<td>Paraguay</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Peru</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Uruguay</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Venezuela</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>Argentina</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Brazil</td>
<td>Low</td>
<td>Moderate</td>
</tr>
</tbody>
</table>

* Levels are categorized in decreasing order of vulnerability as follows: acute, severe, high, moderate, and low.

MAIN REGIONAL EFFECTS

Figure 4. Summary of main climate change effects

Source: IPCC (2014a)
Figure 5. Summary of main climate change effects in Latin American subregions

Source: Magrin et al. (2014)
### IMPACTS OF CLIMATE CHANGE IN LATIN AMERICA AND THE CARIBBEAN AND ASSOCIATED COSTS

#### Table 3. Estimate of annual monetary costs of some climate change impacts

<table>
<thead>
<tr>
<th>Impact</th>
<th>Region</th>
<th>Billion (2005 US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of net export income: wheat, soya, corn, and rice</td>
<td>LAC</td>
<td>26-44</td>
</tr>
<tr>
<td>Sea level rise (1m)</td>
<td>LAC</td>
<td>22</td>
</tr>
<tr>
<td>Coral bleaching</td>
<td>Caribbean</td>
<td>8-11</td>
</tr>
<tr>
<td>Intensification and increased frequency of extreme weather events</td>
<td>CARICOM</td>
<td>5</td>
</tr>
<tr>
<td>Health (increased incidence of diarrhea and malaria)</td>
<td>LAC</td>
<td>1</td>
</tr>
<tr>
<td>Amazon jungle die-back</td>
<td>Latin America</td>
<td>4-8</td>
</tr>
<tr>
<td>Glacial retreat</td>
<td>Peru</td>
<td>1</td>
</tr>
<tr>
<td>Hydroelectric generation</td>
<td>Brazil</td>
<td>18</td>
</tr>
<tr>
<td>Estimated total*</td>
<td></td>
<td>85-110</td>
</tr>
<tr>
<td>% LAC GDP</td>
<td></td>
<td>1.8-2.4</td>
</tr>
</tbody>
</table>

* Total reported to 2050. Must be considered a conservative range with significant limitations.  
Source: Vergara et al. (2013)
### DEM for Non-sovereign Guaranteed (NSG) Operations

**Table 4. Summary of the results of the DEM for NSG operations in Climate Change (CC)**

<table>
<thead>
<tr>
<th>Dimension evaluated</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CC</td>
<td>NSG projects</td>
<td>CC</td>
<td>NSG projects</td>
</tr>
<tr>
<td>1. Project logic</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>2. Financial and economic analysis</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>3. Monitoring and evaluation</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Total evaluability&lt;sup&gt;b&lt;/sup&gt;</td>
<td>8.8</td>
<td>9.1</td>
<td>9.3</td>
<td>9.2</td>
</tr>
<tr>
<td>Number of projects&lt;sup&gt;c&lt;/sup&gt;</td>
<td>11</td>
<td>32</td>
<td>10</td>
<td>31</td>
</tr>
</tbody>
</table>

<sup>a</sup> For the period 2011-2014, NSG project evaluability was based on the development effectiveness evaluation rating. It was not made up of the subsections on project logic, financial and economic analysis, and monitoring and evaluation.

<sup>b</sup> The evaluability rating of NSG operations began in 2011. The methodology changed drastically in 2014. As a result, the 2011-2013 evaluations are not directly comparable to those of 2014.

<sup>c</sup> Includes SCF and OMJ operations with DEM or evaluability assessment at the project level.

<sup>d</sup> 37 if two joint SCF-OMJ operations are counted separately.
SUPPORT AND LINKAGE TO OPERATIONAL ACTIVITIES DEFINED IN OTHER, APPROVED SFDs

Table 5. Dimension of Success 1: The countries make progress on including climate considerations in sectors

<table>
<thead>
<tr>
<th>Line of Action 1. Improve the availability and use of climate information and data.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational activities (a).</strong> Support for the collection, analysis, interpretation, and use of climate data in the planning, design, development, and monitoring of development projects and programs in the region.</td>
</tr>
<tr>
<td>− Modernization of information systems regarding agro-climatic information for producers, including studies on efficient mechanisms to transfer risks associated with climate change (Agriculture and Natural Resources Management SFD, Food Security SFD).</td>
</tr>
<tr>
<td>− Incorporation of climate change information in urban drainage, solid waste, and water resource programs that promote a multisector approach to interventions (Water and Sanitation SFD).</td>
</tr>
<tr>
<td>− Preparation and execution of investments and technical assistance for promoting integrated water resource management, risk management, and flood control. This means including climate change considerations in service delivery (from the design of infrastructure through to its operation and maintenance), to increase water security in the region and strengthen businesses’ environmental management (Water and Sanitation SFD).</td>
</tr>
<tr>
<td>− Design and implementation of comprehensive natural disaster risk management plans, including the effects of climate change, in vulnerable tourism destinations (Tourism SFD).</td>
</tr>
<tr>
<td><strong>Operational activities (b).</strong> Strengthening of capacities at the national and subnational levels for the generation, interpretation, and use of climate information relating to GHG emissions and climate vulnerability.</td>
</tr>
<tr>
<td>− Reduction of disaster risks, increase in the capacity of cities to adapt to climate change, and protection of the most vulnerable residents from its adverse impacts, and identification of opportunities for GHG emission reductions (Urban Development and Housing SFD).</td>
</tr>
<tr>
<td>− Regional training on new issues in international trade negotiations, including climate change (Integration and Trade SFD).</td>
</tr>
<tr>
<td>− Improvement of the resilience and adaptability of infrastructure in the face of natural phenomena and the effects of climate change (Transportation SFD).</td>
</tr>
<tr>
<td><strong>Operational activities (c).</strong> Design of analytical tools and studies to assist decision-makers in the identification or design of mitigation and adaptation strategies and actions.</td>
</tr>
<tr>
<td>− Design of tools for identifying the foreseeable impacts of climate change at the local level, and of more effective and efficient measures for adaptation (Water and Sanitation SFD).</td>
</tr>
<tr>
<td>− Development of data analysis and visualization tools (Transportation SFD).</td>
</tr>
</tbody>
</table>
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