This document was prepared by Néstor Roa (INE/TSP), Division Chief, who led a team consisting of Esteban Diez-Roux, Isabel Granada, Alejandro Taddia, Daniel Pérez, Antonia Bezanilla, Anna Camilo, Caterina Vecco, and Olga Mayoral (INE/TSP), with support from the team of sector specialists in INE/TSP and Juan Benavides (external consultant). Contributions and comments were provided by Tomás Serebrisky (INE/INE); Ellis Juan (CSD/HUD), Cesar Falconi, and Sergio Ardila (CSD/RND); Duval Llaguno Ribadeneira and Ana Elsy Cabrera (KNL/KNM); and María Lourdes Gallardo (KNL/KNL).

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<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ASAP</td>
<td>Asociación Argentina de Presupuesto [Argentine Budget Association]</td>
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<td>BRT</td>
<td>Bus rapid transit</td>
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<td>CAF</td>
<td>Andean Development Corporation</td>
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<td>CO</td>
<td>Carbon monoxide</td>
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<td>COP21</td>
<td>21st session of the Conference of the Parties (UNFCCC)</td>
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<tr>
<td>DRM</td>
<td>Disaster risk management</td>
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<tr>
<td>ECLAC</td>
<td>Economic Commission for Latin America and the Caribbean</td>
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<td>GHG</td>
<td>Greenhouse gas</td>
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<td>IATA</td>
<td>International Air Transport Association</td>
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<td>ICAO</td>
<td>International Civil Aviation Organization</td>
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<td>IIG</td>
<td>Infrastructure Integration Group</td>
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<td>IIRSA</td>
<td>Initiative for the Integration of South American Regional Infrastructure</td>
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<td>INDC</td>
<td>Intended Nationally Determined Contribution</td>
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<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>IRF</td>
<td>International Road Federation</td>
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<td>ITSs</td>
<td>Intelligent Transportation Systems</td>
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<td>LPI</td>
<td>Logistics Performance Index</td>
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<td>NSG</td>
<td>Non-sovereign guaranteed</td>
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<tr>
<td>OECD</td>
<td>Organization for Economic Cooperation and Development</td>
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<tr>
<td>PAHO</td>
<td>Pan American Health Organization</td>
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<td>PBL</td>
<td>Policy-based loan</td>
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<tr>
<td>PMTI</td>
<td>Plan Maestro de Transporte Intermodal [Intermodal Transportation Master Plan]</td>
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<tr>
<td>PPPs</td>
<td>Public-private partnerships</td>
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<tr>
<td>RCP</td>
<td>Representative concentration pathway</td>
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<tr>
<td>SAI</td>
<td>Strategic Agenda on Integration</td>
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<td>SFD</td>
<td>Sector Framework Document</td>
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<td>SO₂</td>
<td>Sulfur dioxide</td>
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<td>SPV</td>
<td>Special purpose vehicle</td>
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<td>TOD</td>
<td>Transit-oriented development</td>
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<td>TSP</td>
<td>Transport Division</td>
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<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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<td>WEF</td>
<td>World Economic Forum</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WRI</td>
<td>World Resources Institute</td>
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I. THE SECTOR FRAMEWORK DOCUMENT IN THE CONTEXT OF EXISTING REGULATIONS AND THE INSTITUTIONAL STRATEGY 2010-2020

A. The Transportation Sector Framework Document as part of existing regulations

1.1 Consistent with paragraph 1.20 of “Strategies, Policies, Sector Frameworks, and Guidelines at the IDB” (document GN-2670-1), which stipulates that Sector Framework Documents (SFDs) should be continuously updated, this document replaces the Transportation Sector Framework Document (document GN-2740-3) approved by the Operations Policy Committee in 2014.

1.2 This SFD falls within the framework of the Strategy on Sustainable Infrastructure for Competitiveness and Inclusive Growth (document GN-2710-5), the objective of which is to guide the Bank’s work in supporting improved competitiveness and fostering regional integration, thus enhancing inclusive economic growth.

1.3 This document is one of 20 SFDs prepared under the framework of document GN-2670-1, which together provide a comprehensive vision of development challenges in the region. The Transportation SFD is complemented by the SFDs on Climate Change (related to climate change mitigation and adaptation); Agriculture and Natural Resource Management (rural productivity and access to rural areas); Integration and Trade (the importance of infrastructure for regional integration and trade); Fiscal Policy and Management (fiscal considerations associated with projects and public-private partnerships); Urban Development and Housing (transportation interventions linked to urban development plans); Innovation, Science, and Technology (technology adoption in all sectors); and Gender and Diversity (to achieve the inclusion of the gender perspective in the sector).

B. The Transportation Sector Framework Document and the IDB Institutional Strategy

1.4 This Transportation SFD is consistent with the Update to the Institutional Strategy 2010-2020 (document AB-3008), which acknowledges social exclusion and inequality, low levels of productivity and innovation, and the impact of climate change as emerging structural challenges for development in the region. The Institutional Strategy also proposes three crosscutting development topics that may potentially be addressed by transportation interventions: gender equality and diversity, climate change and environmental sustainability, and, lastly, institutional capacity and the rule of law.

II. INTERNATIONAL EVIDENCE ON THE EFFECTIVENESS OF TRANSPORTATION POLICIES AND PROGRAMS AND IMPLICATIONS FOR THE BANK’S WORK

2.1 Transportation is a vehicle for development and economic growth. The level of production largely can be explained as a function of physical capital factors of production, including infrastructure1 (Esfahani and Ramírez, 2003). Interventions to increase the coverage, quality, capacity, and connectivity of transportation systems—and thus the stock of capital or infrastructure—are key to enhancing

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1 For the purposes of this document, infrastructure is considered to be integrated with the associated services for which it was designed. The importance of capital as a component of development can be understood with reference to the basic principles established by Solow (1957).
access to services, thus reducing poverty and inequality and/or improving the region’s productivity (World Bank, 2008; Esfahani and Ramírez, 2003). Accordingly, the availability of better transportation systems and networks facilitates the movement of people, goods, ideas, and services, allows better and more reliable access to markets and opportunities, and also enhances the quality of life (World Economic Forum, 2016; Holzer, Quigley, and Raphael, 2003). Transportation is linked to all other economic sectors and has the characteristics of a public good (as long as it does not reach a state of saturation or congestion) (Frischmann, 2012). In addition to direct providers or users, its benefits are shared by the public in general.

2.2 Based on a review of the literature, this section presents evidence regarding the effectiveness of transportation interventions in areas relevant to development and economic growth. The main findings are laid out in the subsections entitled “Dimensions of Success,” which will provide the framework for IDB interventions in the transportation sector: (A) interventions that raise the capacity, quality, coverage, and connectivity of transportation systems; (B) accessible, sustainable, efficient, and safe urban transportation; (C) logistics systems for competitiveness and regional integration; (D) robust institutional and regulatory frameworks that support sector management; and (E) technology in transportation as an engine of innovation.

A. Coverage, quality, capacity, and connectivity. Interventions that improve capacity, quality, coverage and connectivity and that have broad impact on the social, productive, and regional integration spheres, as well as at the environmental level.

2.3 Evidence shows that infrastructure interventions are essential for facilitating the integration of less-developed areas into local and regional economies (Pinstrup-Andersen and Shimokawa, 2006). Transportation projects in rural and interurban areas (including rehabilitation, new roads, and maintenance) benefit households in several ways: (i) they reduce the costs of transportation and production inputs and reduce the prices of basic consumer goods; (ii) they support improved access to markets and education and health services; (iii) they increase labor supply and productivity in both agricultural and nonagricultural activities; and (iv) they raise production volumes (and therefore household income) (Khandker et al., 2009).

2.4 Using dynamic panel data models, Khandker and Koolwal (2011) estimate the impact of an integrated road program in Bangladesh, finding a 10% increase in per

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2 Evidence is provided regarding the relationship between transportation interventions and the following dimensions, among others: social (poverty, social inclusion, and gender equality), environmental (benefits from infrastructure with adaptation and sustainable transportation systems), and efficiency and competitiveness (how transportation can drive productivity gains). This also illustrates the need to link transportation with different sectors (social, environmental, and other) (multisectorality).

3 Capacity refers to the extent to which infrastructure and services are capable of meeting demand (for example, vehicular traffic). Connectivity refers not only to the ability to connect destinations and points of origin, but also to intermodal connectivity (World Bank, 2006). Coverage can be understood as the degree of presence of infrastructure and services, or the ability to access these. Lastly, quality refers to the general performance of infrastructure—the level of service, efficiency, reliability, and productivity that it offers.

4 Transportation can play a key role in the accessibility of health services in both rural and periurban areas. Timely access to health centers as a result of improved transportation can reduce infant mortality and morbidity rates in general. It is estimated that 75% of maternal deaths could be prevented if transportation were available to allow timely access to childbirth care (World Bank, 2008).

5 Includes road rehabilitation, upgrading, and maintenance.
capita household consumption, as well as an increase in hours worked in nonagricultural activities. Similar results have been seen in the region. In the case of Peru, Valdivia (2011) concludes that as a result of a program of road rehabilitation and maintenance, heads of household switched their labor to higher-earning nonagricultural employment, and that those who had previously remained at home in nonremunerated self-employment began working in agricultural activities. Similarly, a road quality and connectivity improvement program financed by the Danish International Development Agency (DANIDA) in Nicaragua resulted in a 17% increase in the number of heads of household employed in the targeted areas, and an increase of between 9 and 12 working hours per household per week (Rand, 2011). These results are consistent with international evaluations, such as in the United States, where a study of a Los Angeles highway provided evidence of employment growth of 200% in the 1980-1997 period, compared to 10% in the control group (Charlempong, 2002).

2.5 Infrastructure can also play an important role in terms of social inclusion. According to Priyanthi and Porter (2002), improving women’s mobility could potentially expand their access to markets, education, and information. Moreover, the enrollment of girls in education could increase, or even triple, where a rural road is built (World Bank, 2008). Similarly, in an impact evaluation, Valdivia (2011) argues that the road rehabilitation and maintenance intervention studied had a significant impact on school attendance, mainly among girls under 12.

2.6 In addition to the aforementioned benefits of improved accessibility, sector-based interventions can boost productivity in rural and periurban zones. Specifically, infrastructure provision that is coordinated with transportation services has a positive impact on the factors of production, due to more efficient and effective access to markets and economic opportunities (for example, opportunities for technological advances and technology adoption) (Pinstrup-Andersen and Shimokawa, 2007). The literature confirms a positive correlation between investment in transportation infrastructure, competitiveness, and economic growth (Agénor, 2013; World Economic Forum, 2016; Esfahani and Ramírez, 2003; Calderón and Servén, 2003, 2010).

2.7 Fan, Hazell, and Thorat (2000) estimate a simultaneous equations model (SEM)\(^6\) for the case of an expansion in rural road infrastructure investment in India.\(^7\) They conclude that increases in road density have a positive and significant impact on total factor production, finding also that for each additional 1% of investment in roads, total productivity in the agricultural sectors increases by 5.7%. Likewise, other authors have used panel data models with spatial components to estimate the impact of travel time reductions on productivity in certain agricultural sectors. Using this approach, Kiprono and Matsumoto (2014) find that in the case of Kenya, each 1% saving in travel time generates an increase of 1.5% in crop yields.\(^8\) At the interurban level, one study analyzes the impact of roads in the United Kingdom and their relationship with business accessibility, establishing that the number of

\(^6\) Estimates using simultaneous equations estimate parameters recognizing that these may be determined by various mathematical expressions, thus resolving problems of endogeneity.

\(^7\) The period studied is 1970-1994.

\(^8\) Measured as kilos of output per hectare cultivated.
burgeoning industrial facilities increased substantially during the period studied (a 10% improvement in accessibility leads to a 3% increase in of business numbers and employment within a 30 km radius of the location of the improvement). Similarly, it suggests that the construction or upgrading of main roads leads to an increase in net value added per worker and that part of this productivity is also reflected in salary increases (Gibbons et al., 2012). These results are consistent with those obtained by Holl (2004) in a study analyzing road expansion in Portugal.

2.8 Similar conclusions have been reached with respect to other modes of transportation. For example, an evaluation recorded the effects of the high-speed passenger train in Japan on business performance and productivity, which in both cases were positive. The effects were measured in terms of sales revenues and sales revenues per employee (the companies’ sales per employee rose 42%) (Bernard, Moxnes, and Saito, 2014). The intervention reduced costs and travel times for passengers, but did not affect cargo transportation costs. According to the study, the positive effects observed were the result of companies’ new-found ability to find better suppliers, as a result of greater access and lower costs in searching for other markets.

2.9 The role of infrastructure with respect to climate change mitigation and adaptation should also be considered in order to secure the sustainability and potential benefits of infrastructure. Risk management, and the associated development of infrastructure based on resilience standards, can reduce the vulnerability of infrastructure to natural disasters. Proactive climate change adaptation measures result in lower fiscal costs and higher levels of connectivity (Schweikert et al., 2014). Similarly, a number of studies have shown that the incorporation of Disaster Risk Management (DRM) from the planning stage onward is highly profitable, as each dollar invested in DRM reduces losses by up to US$4 and has the additional advantage of safeguarding food security and other social objectives of transportation (United Nations Development Programme, 2011). Schweikert et al. (2014) indicate that although the cost of intervening in deteriorated infrastructure appears low in some countries (in absolute U.S. dollar terms), the medium- and long-term opportunity cost of failing to do so can be much higher. This is more critical for countries that have greater economic development needs in rural areas and fewer kilometers of paved roads.

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9 This involves a set of measures that range from reducing the risk to physical infrastructure (and therefore to people and the environment) to creating individual and institutional capacities.

10 Mechler, 2005; Moench, Mecheler and Stapleton, 2007; Godschalk et al., 2009; Michel-Kerjan et al., 2012.
2.10 The incorporation of adaptation criteria into infrastructure design is, in fact, more beneficial than any other mitigation measure (Pielke, 2007; Stern and Britain, 2006). Design modifications based on hydrological and climatological changes enhance infrastructure resilience and allow greater response capacity\(^\text{11}\) (Becker, Fischer, & Schwegler, 2011; Intergovernmental Panel on Climate Change, 2014). Moreover, reducing the vulnerability of infrastructure to hydroclimatic anomalies is of special importance for lower-income groups. In Bangladesh, a number of analyses have shown that the poorest segments of the population are most vulnerable to flooding. There is also evidence of a clear correlation between family income and exposure to flood risk (Brouwer, Akter, Brander, and Haque, 2007).

2.11 It should also be noted that the benefits of transportation infrastructure interventions are maximized where operation and maintenance are carried out effectively and efficiently. It is estimated that improvements in project planning and implementation, together with integrated asset management\(^\text{12}\) can boost infrastructure productivity by as much as 60%, among other things (McKinsey Global Institute, 2013). In particular, poor management of transportation infrastructure and associated services can lead to the early deterioration of this type of asset\(^\text{13}\) as well as to higher costs over the useful life of a project (given that less maintenance means higher spending on rehabilitation and reconstruction)\(^\text{14}\) (Labi and K.C., 2003).

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\(^{11}\) Key adaptation practices include designs with hydrological scenarios that allow for climate change; infrastructure with drainage; and, in the specific case of road development, the use of sustainable materials (asphalt mixes).

\(^{12}\) Refers to infrastructure maintenance that is consistent with the requirements of assets, both financially and in terms of timing.

\(^{13}\) Road management practices have included contracts with the private sector for the administration of maintenance tasks, and this has contributed to efficiency in infrastructure spending. At the same time, the creation of autonomous road funds for funding maintenance has shown mixed results; because the funds have access to guaranteed sources of funding, their administration has been affected by political interference, leading to departures from the original intention.

\(^{14}\) Greater investment in new capital (CAPEX) increases the demand for spending on operation and maintenance (OPEX). Good management of operation and maintenance spending is therefore a strategy for increasing the availability of future resources for new investments in physical capital.
B. Sustainable, efficient, and safe urban transportation. Urban transportation is a fundamental pillar of accessibility and social inclusion, environmental sustainability, and efficient and safe mobility in cities.

2.12 A city’s transportation is a key component of its economic growth, sustainable development patterns, and quality of life for its residents. Good coverage\textsuperscript{15} and quality in transportation management are essential to ensuring the mobility of residents, reducing congestion, and creating denser and more efficient cities (IDB, 2013). Urban transportation can help to mitigate climate change given the potential reduction in fuel consumption and the promotion of nonmotorized transportation. They also help to increase the resilience of the urban environment through the public green spaces\textsuperscript{16} associated with infrastructure in a context of transit-oriented development (TOD).

2.13 One of the most effective measures for optimizing urban transportation and improving the sustainability of cities involves the integration of urban planning and transportation planning. Application of the TOD\textsuperscript{17} concept has allowed more compact cities with mixed forms of land use to reduce individuals’ need to travel (Chatman, 2008; Crane and Crepeau, 1998), and the number of vehicles per household (IDB, 2013). In this same context, the Avoid-Shift-Improve (ASI) vision has emerged, which seeks to reduce the need to travel through urban planning, while encouraging change in modes of transportation and improving, among other things, the efficiency of the transportation fleet (GIZ, 2004).

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Transit-oriented Development in Latin America and the Caribbean

Public transportation in Curitiba, Brazil, is unique in the region in having a 90% coverage rate and accounting for 70% of all work-related travel—all thanks to an urban plan that is structured around interconnected arterial roads. By using a Bus Rapid Transit (BRT) System in separate corridors that encourage high population density, Curitiba has reduced congestion downtown and minimized low-density outlying development, even in the face of sustained population growth (UN Habitat, 2012; Suzuki et al., 2013; IDB, 2013).

2.14 The concept of good planning and the provision of transportation infrastructure as means of channeling social and economic benefits has proven an effective strategy for urban development, and it also has important network effects. For example, the construction of a metro line with intermodal transportation hubs not only reduces travel times for new users, but also benefits existing users by expanding destination options. Similarly, fare integration in public transportation systems offers economic benefits to users—particularly in the case of low-income groups that usually live in

\textsuperscript{15} In urban contexts, coverage should be understood as the supply of both inclusive physical infrastructure and complementary services (e.g. transit management and associated information).

\textsuperscript{16} Green spaces serve as rainfall storage areas and have thus become a measure for adaptation to climate change.

\textsuperscript{17} TOD is the process through which land-use planning tools are used to channel growth around mass transit centers or corridors (EMBARQ, 2013).
periurban areas and are forced to make several transfers either to get to work or to access basic services.

2.15 The development of transportation systems, in coordination with spatial planning, facilitates equal access to opportunities on the part of inhabitants while also improving quality of life through interventions in the urban environment; it also has the potential to play a key role in safer, inclusive mobility. For example, Cerdá et al. (2012) analyze improvements in quality of life among residents, estimating changes in violence levels in areas targeted by public transportation projects that meet the objective of connecting low-income, disadvantaged populations to economically vibrant urban centers. This study evaluated the impact of the implementation of Line K of the Medellín Metrocable. Based on data from both before and after the line’s launch, it was concluded that the reduction in the homicide rate was 66% higher in the targeted areas than in control areas. In North Carolina in the United States, a similar impact was observed following the implementation of a light rail rapid transit system (reduction in crime in neighborhoods close to new stations). Criminal activity declined in the wake of public and private investment decisions. These conclusions underline other important social benefits of investments in transportation infrastructure, in addition to the economic benefits already discussed (Billings et al., 2012).

2.16 Transportation interventions at the urban level also demonstrate potential gains in productivity and, consequently, competitiveness. These may be understood as increases in the productivity of mobility or of the transportation systems themselves (reduction in travel times, operating costs, etc.), and also as increases in the productivity and competitiveness of economic agents in the cities (firms are able to access production inputs and factors of production in a more effective and efficient manner).

2.17 In an ex post evaluation by Hidalgo et al. (2013) of the Transmilenio system in Bogota, Colombia, the benefit-cost ratio was found to be positive. Of the total benefits, 52% were attributed to reductions in travel times, 37% to savings from replacing the old system with the new one,18 and 8% from reducing gaseous pollutant emissions.

2.18 Fan et al. (2012) analyzed the outcome of a light rail system in the Minneapolis–Saint Paul (Twin Cities) area in the United States, and also found a significant increase in access to work opportunities. In their impact evaluation of a new Bus Rapid Transit (BART)19 line in the city of San Francisco, the United States, Holzer, Quigley, and Raphael (2003) found that companies and businesses close to the line employed more minorities living in areas that were distant from economic activities. They concluded that improved access to transportation systems leads to better access for disadvantaged areas and populations to improved employment opportunities, and that companies can obtain more factors of production.

2.19 In the specific case of public transportation, the literature covers the effects of combining infrastructure provision with subsidies as a strategy for reducing poverty and income inequality. According to Castro and Szenkman (2012), the subsidy

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18 These savings were generated by the reduction in operating costs in the new system relative to the old one.

19 Bay Area Rapid Transit.
policies employed in most countries are usually justified by the existence of inequalities in accessibility and the need for economic integration. Several developed countries offer high levels of subsidies for the provision of transportation services, such as in Brussels where there is a 69% subsidy, or in London and Madrid, where the figure is 49% and 57%, respectively (Andean Development Corporation (CAF), 2011). In developing countries, Estupiñán, Gómez-Lobo, Muñoz-Raskin, and Serebrisky suggest that demand-side subsidies (to the user) have the highest impact on income levels and equality.

2.20 The different policies and applications of transit demand management that encourage modal changes or regulate demand behavior throughout the day have a positive impact on efficiency and productivity, and not only at the urban level. Globally, the cost of using private vehicles is artificially low almost everywhere, as it does not reflect the value of associated negative externalities (congestion, pollution, and accidents). In the United States, the additional cost from negative externalities in urban environments (pollution, congestion, and safety) is estimated at US$2.28 per mile traveled (World Bank, 2013).

2.21 Congestion charges in urban areas have proven effective in this respect. This policy reduced traffic in London, while cross-subsidies under the system helped to finance investment in public transportation. Greenhouse gas (GHG) emissions and air pollution declined by an estimated 16% within the area of influence and the number of vehicles entering the charging zone fell by 14% (Transport for London, 2008). At the same time, policies that restrict vehicle use according to license plate number, implemented in several Latin American and Caribbean cities, have yielded mixed results. In the long term, these policies do not necessarily encourage the use of public transportation; rather, they encourage the purchase of additional vehicles.

2.22 Crotte, Graham, and Noland (2013) analyze the results of implementing a system of congestion charges in the Mexico City metropolitan area. The results suggest that implementation of a congestion charge (calculated based on the marginal social cost generated) could lead to a 14% reduction in congestion levels and substantially increase city government revenue.

2.23 The potential for introducing congestion charges and additional options for managing demand was assessed in a study of the feasibility of such a system in Mexico City, Bogota, and Santiago. This study concluded that congestion charging could increase average travel speeds by between 4.7 km/h and 8.4 km/h, reduce travel times by up to 10.2 minutes, and reduce daily emissions of carbon dioxide equivalent by up to 130.16 tons (IDB, 2015).

2.24 At the same time, the promotion of nonmotorized transportation has great potential to reduce congestion in cities and improve the quality of life for their inhabitants.

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20 In the case of Latin America and the Caribbean, motorization rates are less than 200 vehicles per 1,000 inhabitants, while in other countries such as the United States, rates exceed 800 vehicles per 1,000 inhabitants (International Road Federation, 2016). The costs associated with having a vehicle do not reflect the externalities generated by its use.

21 Congestion charges involve the payment of a charge for entering or traveling through a congested area, and are often found at the perimeter of a city center. Different types of congestion charges are used in cities such as London, Stockholm, Singapore, Milan, and Oslo, among others.

22 These results capture the effect of widening the charging zone in 2007.
Urban design that favors pedestrianization while promoting bicycle use has proven effective. Successful experiences in Latin America and the Caribbean in terms of incorporating bicycles into the transportation system include Bogota, which has built a major network of bicycle paths extending over 376 km (Bogota City Hall, 2013), and Mexico City, which has more than 2,000 public bicycles, 150 stations, and 35,000 members in its Ecobici program (CAF, 2012). At peak times, bicycle trips in urban areas can be 40% faster than car trips over the same distance. The cost of investments to encourage the use of nonmotorized transportation (such as bicycle paths and bicycle-sharing systems) is low (World Economic Forum, 2016). Moreover, the modal shift in favor of nonmotorized transportation is a relevant strategy for mitigating the impact of climate change (World Bank-Global Environment Fund, 2003).

2.25 In addition to the foregoing, transportation’s role in ensuring sustainable growth with low emissions needs to be considered. That role has been confirmed by a number of impact evaluations on reducing emissions and pollutants. For example, the evidence suggests a causal link between new BRT lines and reductions in the levels of certain gaseous pollutants and particulate matter. Using a difference model and quantile regressions, Bel and Holst (2015) conclude that implementation of a new BRT line in Mexico City reduced carbon monoxide levels by 16.6% to 20.4%; nitrogen oxides by 12.9% to 18.1%; PM$_{2.5}$ by 20.8% to 39%; and PM$_{1.0}$ by 9.6% to 24.2% in areas close to system corridors.

### Impact of BRT on emissions and modal substitution

#### Bogota.
The TransMilenio BRT system, implemented in Bogota, Colombia in 2000, currently has a network extending over 87 kilometers, with 115 stations and 1,080 articulated buses using dedicated lanes. TransMilenio was the first project to obtain Clean Development Mechanism credits, thanks to a reduction in GHG emissions per unit transported. According to the United Nations Framework Convention on Climate Change (UNFCCC), the Transmilenio project has the potential to reduce more than 500,000 tons of carbon dioxide equivalent annually. TransMilenio system operations generated a reduction of 1,719,428 tons of carbon dioxide equivalent from 2001 to 2012 (UNFCCC, 2012).

#### Mexico City.
The first BRT corridor in Mexico City—Metrobús—began operations along Insurgentes Avenue in 2005, with 97 articulated buses. The network was extended by a further 20 kilometers in 2008, with the inauguration of the corridor along Eje 4 Sur. CTS Embarq (2013) found a reduction of more than 22,000 car trips per day as a result of implementation—in other words, 6% of current Metrobús users previously traveled by car.

2.26 In terms of other policies to reduce pollutants, the evidence shows that in addition to addressing the proliferation of pollution in the sector due to gases such as black

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23 Other policies linked to urban transportation that are feasible and effective in reducing GHGs, for example, include tolls, the elimination of tax preferences for trucks, restrictions on the use of cars, improvements to passenger transportation systems, and improved metro lines (O’Ryan et al., 2001).
carbon, these may help to reduce global warming and, accordingly, the frequency and intensity of extreme climate events, as well as avoiding glacial melting and improving the quality of health in urban areas. There is evidence to suggest that activities such as the implementation of BRT systems may reduce black carbon and other short-lived climate pollutants (World Bank, 2013).

2.27 In the urban context, and as discussed in Section III.B, cities in Latin America and the Caribbean suffer from high rates of traffic-related accidents and fatalities. In this area, there are examples of effective interventions, including at the regional level. For example, it is estimated that road accident deaths in Curitiba, Brazil were reduced by 25% as a result of complementary policies to strengthen road safety (such as increased fines and confiscation of drivers’ licenses based on the number of infractions) (Huicho et al, 2012).

2.28 Other safety benefits are generated from implementing integrated transportation systems. In the case of SITM-Transmetro in Barranquilla, Colombia, introduction of the system had a positive impact by reducing the number of deaths and serious injuries due to traffic accidents in the metropolitan area. It was determined that a statistically significant reduction had been achieved in the number of deaths and serious injuries, concluding that implementation of the system might have prevented around 24 deaths and 529 serious injuries per year in the initial years of operation (Perdomo and Arzuza, 2015). Other evaluations have yielded similar results, such as in the case of Transmilenio in Bogota, where accident rates fell after phases I and II of the system were implemented (Bedoya Zapata, 2010).

2.29 In addition to safety issues in urban transportation, measures to promote inclusive, universal mobility that take into account gender, persons with reduced mobility, and seniors need to be mentioned. Some cities have instituted gender-segregated mobility in their public transportation, allowing women-only vehicles. In Mexico City, the Viajemos Seguros [Let’s Travel Safe] program has metrobuses exclusively for women, as well as cars on the metro, together with service and complaint centers. Dunckel-Graglia (2013) evaluated the program and found a substantial improvement in perceived safety in the systems and a narrowing of inequality gaps between women and men. Gender-segregated transportation can be seen as a controversial measure that does not appeal to some cities, however it can also be a good shock or short-term strategy in cities where women are vulnerable on public transportation, without necessarily committing the system to having women-only vehicles in the future. For persons with reduced mobility and seniors, some transportation interventions have been shown to have high benefits and low marginal costs (Roberts and Babinard, 2004). Some of these include color-coded signage, minimizing stairs in transportation facilities, building footpaths with guides, priority seating on public transportation, and training for operational staff in transportation systems.

24 Black carbon, another of the environmental pollutants present in cities, is produced by the incomplete combustion of diesel fuel by vehicles. It has been included in the category of short-lived climate pollutants. The main consequences of the presence of black carbon in the urban environment are related to the health of the population (increase in cardiopulmonary disease, asthma, and heart attacks). It is also one of the pollutants that contributes most to glacial melting, unleashing other major challenges related to water scarcity (World Bank, 2013).
C. Logistics systems for competitiveness and regional integration. Consolidating logistics networks and services is a critical ingredient for Latin American and Caribbean regional integration, competitiveness, and economic growth

2.30 Logistics networks are defined as the array of infrastructure and services that support the transported freight and that allow goods to be delivered to their final destination. Networks may refer to modes such as roads, air, rail, and inland water transportation, and even urban transportation systems. They may also include the array of logistics infrastructure (“hardware”) and services that, together with regulatory frameworks, influence logistics costs (which may be related to transportation, storage, or administration, supply, and inventory costs) (IDB, 2015).

Levels of logistics facilities and land-use planning

The Institute for Supply Chain and Logistics of the University of Victoria, Australia (2009) identifies the main activities and types of logistics facilities according to their function. These include freight terminals, cargo hubs, logistics villas, and logistics cities. Each type of facility plays a different role, relating to specific areas, locations, activities, and technologies.

Logistics villas and logistics cities are sophisticated logistics facilities. The role of the first is to exploit agglomeration economies in manufacturing and logistics, while the role of the second is to support additional integration with banking and financial services and urban activities.

Development of a logistics city provides an opportunity for public-private collaboration, with the potential to attract international investors and human capital and foster exports. The challenge for local governments in the region is to innovate with respect to land-use planning instruments in order to accommodate these facilities and achieve their effective integration with the other types of facilities.

2.31 Logistics interventions that seek to minimize travel times and operational costs require full identification of the value chains with greatest impact on economic growth in each country, as well as corridors, facilities, and services of a multimodal nature that respond to this demand. Reductions in logistics costs offer benefits in terms of productivity and regional integration. The integration and territorial cohesion functions of infrastructure allow countries in the region to achieve a greater degree of specialization in production and develop comparative advantages in global markets.

2.32 The development of hardware, or activities that improve the connectivity of infrastructure investments and related services at the national level, reduces the cost of cross-border transactions and facilitates regional integration. Similarly, the

25 “Software” components: interventions in areas such as regulation, which include transportation policies, logistics, national port and airport plans, the facilitation of cross-border transportation, etc.

26 Internal logistics costs are those involved in the process of transporting goods from the factory to the point of consumption or export (ports, airports, borders). They include costs related to transportation, licensing, permits, and customs procedures; inventories, storage, deterioration, or losses during transport; insurance, adequate procedures at ports, airports, or borders; financing; and administrative costs (Guasch, 2011).
complementary development of software is needed to improve linkages between
national systems and private sector agents in the world economy (IDB, 2013). Interventions
to optimize and simplify the movement of goods and people at border
crossings (land, sea, and air) are of particular importance in this regard (IDB, 2013).

2.33 Claims regarding the effectiveness of improving regional and global logistics
networks have mainly been studied using general equilibrium (DSGE) models, taking into
account the potential reduction in costs stemming from logistics interventions. Some studies estimate that a reduction of 10% in transportation costs could boost intraregional exports by 22% and real GDP in the region by 2.2% (Giordano, Guzmán, and Watanuki, 2012). Complementary studies, such as the one by Mesquita Moreira (2012), concur with these results and show that reductions in transportation costs would lead to significant increases in exports. In Chile and Peru, each reduction of 1% in transportation costs may allow an increase of between 4% and 5% in exports from the most remote regions. Similarly, a decline of 1% in transportation costs in Colombia could boost exports by 5% to 7%. A study of highway development in the United States, with similar results, shows that each 1% reduction in travel distances between trading partners yields growth of 1.4% in trade in value terms and an increase of 1.9% in volume terms. Similarly, a 10% increase in the stock of urban roads increases the share of exports by 5%, according to Duranton et al. (2014).

2.34 Granato and Moncarz (2010) reach conclusions that are consistent with the
integration of remote areas, arguing that in countries such as Argentina, investment in technological services and logistics chains can reduce transportation costs and boost competitiveness (particularly in regions far removed from customs facilities).

2.35 Interventions to improve logistical efficiency (at border crossings, ports, in urban
locations, etc.) are important not only for increasing trade volumes but also for
boosting value added in manufactured products. As an example, Hummels (2001)
estimates that each day saved at a border crossing is worth an additional 0.8% ad-valorem for manufactured goods.

2.36 Infrastructure for integration and logistics chains also has a potential impact on
regional employment creation. Lower transportation-related logistics costs raise
productivity at the firm level, boosting labor demand in agricultural and
estimate that a 10% reduction in transportation costs would create three million jobs
in Latin America and the Caribbean. This effect would be significant in landlocked
countries such as Bolivia and Paraguay, which are more dependent on efficient
access to markets. Moreover, Avetisyan et al. (2015) analyze the impact of improved
border efficiency on job creation, concluding that increases in staffing for cross-
border procedures (and other determinants of the efficiency of border crossings) can
create additional jobs in the two economies exchanging goods. In general, there is
a consensus in the literature that well-being increases broadly in economies that
improve the efficiency of trading goods and services (Fox, Francois, and Londoño-
Kent, 2003).

D. Institutional and regulatory strengthening. Institutional management, coupled with robust regulatory frameworks, is essential for ensuring that
infrastructure and complementary services drive social and economic transformation, as well as promoting private participation in the sector.

2.37 Clear and sound institutional structures, accompanied by binding regulatory frameworks between modes of transportation, allow planning in transportation systems and support the efficient and transparent use of public resources; they also encourage, among other things, private investment in the sector (Guasch, Laffont, and Straub, 2005), proper infrastructure management, and improved design, implementation, and operation of services. Effective organizational structures enable transportation solutions that look to the long term, as they are able to project demand more precisely, anticipate the challenges that will need to be faced, and yield a better understanding of the development of the system of activities and how this is linked to transportation systems. Available empirical data for countries belonging to the Organization for Economic Cooperation and Development (OECD) supports the notion that certain institutional and regulatory reforms (principally liberalization, where competitive markets for service provision exist) have had a beneficial impact on efficiency and consumer welfare measures.

2.38 Technical knowledge of subsectors and market functioning allows governments to prioritize strategic projects through different financing arrangements, with regulatory frameworks that are suitable for this purpose. A clear definition of responsibilities and the separation of policy, regulatory, and operational functions help to promote specialization and independent decision-making processes. Coordination between national and subnational levels of government also enhances the effectiveness of interventions in the sector (Cheon, Dowall, and Dong-Wook, 2010).

2.39 Despite scant quantitative evidence regarding the impact of institutional changes in interventions at the regulatory level, other experiences have been more closely studied and offer the chance to more clearly demonstrate a causal link in cases such as private participation in infrastructure and services with quality standards.

2.40 Specifically, a number of evaluations have further investigated the effects of private participation by estimating panel data models with indicators; these have concluded that government decentralization and changes in the ownership of infrastructure facilities (from an entirely publicly owned model to one with public-private partnerships and more decentralized development) have had a widespread, favorable impact on total factor productivity in economies worldwide (Cheon, Dowall, and Dong-Wook, 2010). Nonetheless, these studies suggest that for public-private partnerships (PPPs) to yield benefits, robust institutional frameworks need to be present before implementing regulatory reforms, as this prevents market structures from being created that reduce social welfare gains. PPPs also require clear regulations that cover possible financial risks to the vehicle companies created as part of the projects to be developed (Moore, Straub, and Dethier, 2013).

2.41 Other studies confirm the positive impact of private participation in the sector: optimal timing and scheduling of works under a lifecycle approach, as often obtained through private sector management, can reduce total road transportation costs (administrative and user costs) by 5% to 30% [...] (Talvitie, 1997). Private sector

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27 Logistics, for example.

28 See Section III-D for further detail regarding some of the issues that need to be considered in structuring PPPs.
participation could potentially help to increase both expenditure efficiency and service quality and access. It is also argued that the private sector can incorporate new technologies and operating arrangements, as well as improvements in the management and execution of projects. It can furthermore provide services that enhance the efficiency, quality, and reliability of transportation systems. Several countries have explored and implemented innovative alternatives for private sector participation in both infrastructure investment and maintenance and the provision of transportation services—for example, PPPs, results-based contracts, variable-term concessions, and minimum income guarantees. Nonetheless, Engel et al. (2003) conclude that pioneering road privatization initiatives have not yielded the expected results, as countries have followed a “privatize now, regulate later” approach. Moreover, most concessions have been awarded as fixed-term franchises, creating demand for guarantees and contract renegotiations. These results are consistent with the findings mentioned in paragraph 2.40—particularly the importance of sound institutions for introducing regulatory reforms, as in the case of PPPs.

2.42 Lessons learned early on from experience with concession contracts and the evolution thereof are summarized by Gómez-Lobo and Briones (2013), based on the case of London buses. The authors point out that after testing different arrangements, contracts based on service quality incentives turned out to be the most effective type of contract for the English capital. Under this arrangement, Transport for London measures bus performance, paying a financial premium to and extending the contracts of operators that meet or exceed minimum agreed performance standards, or penalizing those who fail to comply. This type of contract has led to visible improvements in service compared to years in which other types of contracts (such as gross cost) were used. However, these improvements have entailed higher subsidies, requiring greater allocations of public funds. Moreover, they were the result of more than three decades of trial and error on the types of contracts used (Gómez-Lobo and Briones, 2013).

2.43 In the case of infrastructure development, better ways of structuring contracts and procurement also need to be considered as a strategy for smart spending, allocating risks in a strategic manner according to the contract and addressing the need for optimum project compliance (within a specific budget and time frame and ensuring the sustainability of infrastructure assets). A study by Tran and Moleenar (2012) analyzes the occurrence of 39 types of risks in road projects, based on participant surveys. This study looks at three types of contracts (design-bid-build, design-build, and construction manager/general contractor), and concludes, among other things, that the four following risk factors should be analyzed at an early stage to ensure optimum compliance while developing projects using any of the contract types studied: (i) delays due to deliveries of inputs from third parties; (ii) additional geotechnical research; (iii) delays in reviewing and obtaining approvals for construction paperwork (for example, environmental licenses); and (iv) discoveries during excavation or earthmoving.

2.44 Innovation in contracts can help to align incentives in the preparation of design proposals for transportation infrastructure interventions. The state of Maryland in the United States has designed an innovative bidding process to solve congestion problems on one of its arterial highways connecting with the city of Washington D.C. The starting point for this is freedom of design in structuring the nature of the solution. The authorities set the price of the solution and determine the designer-
builder with a 65% design level, and they work together to finalize the design. The use of this process in Latin America requires: (i) great transparency in managing the process, which could include organized consultation processes and mechanisms for citizens to contribute; and (ii) the support of a high-level team of experts on the government side to engage in technical dialogue and extract the best proposals from bidding firms.

I-270: Innovative congestion management project in Maryland, United States

Interstate 270 is one of the arteries connecting Montgomery County in the state of Maryland, with the city of Washington D.C. To solve the problem of congestion along this 35-mile highway, the state government designed a bidding process in 2015 with a progressive approach towards selection of the final design solution, and a price that was fixed in advance (US$100 million) (Maryland Department of Transportation, 2015). Selection of the winning proposal was based on broad criteria, including mobility, safety, operability/maintainability/ adaptability, and the quality of the management proposal. The most important aspect of this approach—the first to be used in the country—is that there are few technical specifications, and all efforts are channeled into performance (the outcome of achieving more rapid traffic flow). In addition to not imposing restrictions in terms of the nature of the solution, it does not require minimum investment amounts within the state of Maryland or even within the United States.

2.45 As mentioned above, institutional structures play a critical role not only in terms of the development of infrastructure per se, but also in terms of decisions regarding operational issues and user behavior. Institutions use regulations and other policy actions to promote certain behavioral patterns by the population, linked not only to efforts to improve road safety, but also to the choice of mode of transportation, with the objective of making efficient use of available road and energy infrastructure and reducing environmental impact. In the area of urban transportation, demand management strategies such as congestion charges and parking regulations have been developed, while in interurban transportation, lanes have been reserved for high occupancy vehicles. Fujishima (2011) compares area-wide congestion charge strategies (London) with cordon-based ones (Singapore and Norway), finding that the former are better suited to cities with a large downtown area, and the latter to cities in which demand for long-distance travel for work- and study-related purposes is inelastic and prevails over short trips. Also in the field of congestion charges, Santos and Fraser (2006) draw lessons from the case of London, analyzing the social benefits of the system and evaluating the feasibility of using this policy in Paris, Rome, and New York. The main conclusions are that the system serves as a means of internalizing transportation externalities, even where design of the instrument is not perfect from the perspective of the policies that define it. The results of the model implemented show that congestion charges are successful in increasing social benefits.

2.46 The influence of institutional development and regulation on transportation safety should also be taken into account. The regulation of safety standards, transportation services, and vehicles sold in the region reduces traffic mortality rates. Road safety campaigns and information targeting road users aim to reduce traffic-related injuries by promoting safer conduct, although they are also generally used to provide information about rules enforcement. Evidence regarding the effectiveness of these
campaigns show that local and individualized campaigns have had the greatest impact, as well as those that have been accompanied by enforcement and education (particularly in terms of rules relating to driving under the effects of alcohol) (Elvik et al., 2013). Several examples of institutional strengthening have shown positive effects in the area of safety. Vision Zero programs in New York and Seattle and the State of Washington in the United States have been linked to reductions in road fatalities (Vision Zero NYC, 2015; City of Seattle, 2015; Thomas et al., 2015).

2.47 Trends in technology and the standardization of procedures and safety standards—e.g., in the air transportation segment—have supported a noticeable improvement in accident statistics and trends for this mode of transportation. One successful initiative in terms of reducing runway incidents has been the runway safety program developed by the International Civil Aviation Organization (ICAO). According to the ICAO (2013), runway-related accidents fell from 60% of total aviation accidents in 2016 to 48% in 2011. Similarly, the number of runway-related deaths as a proportion of the total number of deaths from aviation accidents fell from 18% to 1% over the same period (ICAO, 2013).

E. Transportation technology as an engine of innovation and efficiency. Technology transfer in the sector has been an engine of innovation and has the potential to help the region address its challenges

2.48 Innovation in and application of information technologies in transportation systems improve planning and increase operational efficiency, reduce travel times, and support environmental sustainability. Intelligent transportation systems (ITS), for example, facilitate the collection, integration, and analysis of data, while optimizing the management of operations, demand, and payment systems. They also allow information to be shared effectively with passengers in real time. Electronic toll charges, for example, mean that vehicles do not need to stop to pay, thus reducing travel times and emissions in areas of influence.

2.49 In the context of urban transit management, ITS offer a variety of applications that have shown significant benefits over the last decade in terms of mobility efficiencies, safety, and improvements in infrastructure capacity. These applications mainly involve adaptive traffic control and real-time information and traffic-shaping systems (IDB, 2015). According to the Regional Observatory of Intelligent Transport Systems for Latin America and the Caribbean (published by the IDB in 2015), adaptive traffic control systems reduce travel times by up to 29% and the number of stops by up to 32%.

2.50 ITS can also serve as a mitigation instrument for transportation. A number of studies suggest that ITS applications have a positive impact in terms of reducing emissions (e.g. electronic tolls) (IDB, 2015).

29 The ICAO is the main agency responsible for regulatory standards and the harmonization of safety standards (IDB, 2015). It was responsible, for example, for launching an audit program in 1999 known as USOAP (Universal Safety Oversight Audit Programme) (ICAO, 2013). Other programs, such as runway safety, aim to achieve the objective of “implementing strategies to continually reduce the number and severity of runway safety-related accidents and incidents” (ICAO, 2015). The ICAO works closely with partners in the fields of regulation, operations, and aircraft design and construction (ICAO, 2013).

30 Technology has become the main tool for eliminating infrastructure underutilization.
2.51 In addition, ITS applications help the region address its road safety challenges. These applications are mainly related to urban and interurban traffic management—specifically, real-time communication with users and the enforcement of violations (speeding, red lights at intersections, and illegal U-turns). According to the Research and Innovative Technology Administration of the U.S. Department of Transportation, automatic detection has reduced the number of red light violations in that country by 20% to 60%, and the number of accidents by 22% to 51% (IDB, 2015). Specific examples include the case of Chicago, where automatic detection systems at intersections helped to reduce the number of accidents by as much as 33% from 2005 to 2012. In the region, the case of Medellin, Colombia demonstrated that speed detection systems helped reduce accident rates by 18% over a period of two years (IDB, 2015). Interurban applications such as real-time information signs can make transportation safer, reducing traffic speeds by up to 2 km/h in the locations where they are installed (IDB, 2015). In addition to the foregoing, Thomas et al. (2015) conducted an impact evaluation to measure the result of radar speed enforcement in Washington State. The evaluation concluded that the campaign to strengthen radar enforcement on interurban highways resulted in a 6% reduction in all types of accidents at night, and it estimated the benefit-cost ratio at 8.12/1 in favor of campaign implementation.

2.52 The growing use of telecommunications networks and the internet in recent years has given rise to an expansion of applications and platforms for services that previously faced significant technological restrictions. Shared mobility platforms are one example; these allow users wishing to travel to make contact with vehicle owners that want to use their vehicles to earn additional income. These platforms can have a positive impact on the use of public space and on congestion in urban centers. A study that analyzed travel patterns and intentions in Bogota, Colombia, in the first half of 2015 (Grupo SUR, 2016), concluded that around 40% of those using the technological platform owned vehicles and yet still preferred to use the platform for travel. It also found that the platform can reduce the demand for parking spaces by as much as 5,000 m² per hour over the span of one day.

2.53 Technological advances have also facilitated the intelligent management of parking systems and the development of platforms that facilitate services such as parking payments. These types of services are already available in various cities throughout the world, such as New York, San Francisco, and Los Angeles in the United States. Technological applications allow today’s users to make payments from their cell phones, extend usage periods by making payment from the application (without having to return to the parking space), and even reserve a space prior to arrival. Some automakers are even developing technology to incorporate these platforms into their private vehicles.

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31 In Latin America and the Caribbean, the number of Internet service subscribers per 100 inhabitants grew by 44% between 2010 and 2014 (from 33 in 2010 to 47 in 2014), while in OECD countries it grew by 15% (from 68 in 2010 to 78 in 2014) (World Bank, 2016).
2.54 Worldwide, initiatives have been under development to create smart, sustainable, digital cities with respect to various dimensions: housing; energy efficiency; modern, low-carbon urban transportation; and the extensive use of platforms that stimulate citizen participation to gather useful information for solving urban problems (crowdsourcing). This type of approach—associated, for example, with traditional problems of urban mass transit—can support comprehensive solutions that take into account both shifts towards energy- and environmentally efficient vehicles, such as the use of ITS platforms to reduce total numbers of vehicle trips and increase the number of passengers per trip (sum of the dimensions of climate change mitigation and environmental sustainability, and technological innovation).

IESE Cities in Motion

The IESE Business School's recently published Cities in Motion Index is based on an analysis of more than 130 nations, and it consists of a list of the world's smartest cities.

A smart city makes coordinated and prudent use of all of its resources to develop integrated, habitable, and sustainable urban centers.

This type of city meets four main conditions: (i) it fosters an ecosystem that is sustainable from both an economic and an environmental perspective; (ii) it encourages and supports innovative and creative activities; (iii) it facilitates a land space that is connected both internally and externally; and (iv) it promotes social cohesion and equity between its inhabitants.

Attaining these four conditions requires a holistic vision in which the citizen is at the heart of the process (Smart Governance).

The advantages of Latin American cities include their high economic potential, international visibility, and environment. A number of cities, such as Santiago, have improved substantially in terms of urban planning.

2.55 Transportation interventions under the banner of Smart Cities will benefit from a framework in which the decision-making unit consists of the city and its citizens (rather than the transportation sector and its agencies in isolation). An early example of a Smart City—Melbourne, Australia—highlights the importance of interactions between agents using technology and telecommunications networks, as part of a strategy to improve mobility and prioritize activities towards a common objective. Future Melbourne includes citizens in urban planning by means of an online platform which has the participation of more than 15,000 residents and institutions (IDB, 2016).

2.56 The use of information technologies has also helped to meet some needs in terms of gender equality in transportation. Although there are still cases of harassment and aggression against women on the roads and in metro, bus, and taxi systems in Latin America and the Caribbean, this challenge has provided an opening for the development of ITS to provide services that support safety, monitoring women during their journeys using cell phone applications with different functionalities. Technology platforms have been designed to allow individual public transportation services to be requested (using cell phone applications) in which both drivers and passengers are women. These applications seek to not only make women feel less vulnerable, but also to expand their role as drivers and offer them well remunerated work opportunities in an area that is typically reserved for men. At the same time, applications have been created to install alert systems on cell phones, using different
2.57 Technological advances and innovations in the sector have the potential to change how people (and even goods) are moved, primarily in urban centers. Autonomous vehicles are one example of such innovative trends that major companies like Apple, Uber, Tesla, and Google are working hard to develop. These cars have major potential to reduce accidents, cut pollution, and optimize transportation systems and spaces in urban centers. A 2015 OECD study on full replacement of traditional vehicles by autonomous ones (with or without a driver) found that the absorption of this type of mobility could make it possible to have the same volume of trips in cities with just 10% of the vehicle fleet, and would increase available space by significantly reducing the area for parking (OECD, ITF). Moreover, even with an increase in trips, the drop in accidents would improve transportation safety conditions and, depending on factors such as efficiency and motorization technologies, could produce gains in terms of pollution and GHG emissions.

2.58 The use of new, more efficient (clean) technologies in vehicles heightens the benefits of sustainable transportation in cities. Some of these technologies translate, for example, into the use of hybrid buses as substitutes for standard diesel buses. Although electric passenger vehicles cost more than traditional ones, a life cycle evaluation shows that adoption of such technologies reduces total costs to cities and/or operators over the long term, in addition to yielding potential benefits by reducing emissions (IDB; C40 Cities Clinton Climate Initiative, 2013).

III. MAIN CHALLENGES FOR THE REGION AND PROBLEMS THE BANK WISHES TO ADDRESS

3.1 With GDP growth projected at 1.7% per year on average over the 2014-2020 period, the region currently faces a scenario of lower growth than during the period of high commodity prices (2003 to 2013), and even compared to the 1990s (IDB, 2016). These economic prospects impose a general challenge in terms of ensuring continuity in infrastructure development.

3.2 The new reality in the region encompasses not only the economic outlook but also social considerations and, above all, growing attention to measures that help improve climate resilience as part of a long-term process of transformation—taking into account, in particular, the results of the 21st session of the Conference of the

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32 Uber is currently testing trips with autonomous vehicles that have a human driver on board, in Pittsburg, United States (The Economist, 2016).

33 It uses Lisbon, Portugal as a model (OECD, ITF, 2015).

34 With Euro II technology.

35 While prospects are mixed among countries in the region, limited debt-carrying capacity and pressures on fiscal revenue mean that, in general, countries adjust public spending mainly at the level of capital expenditure (IDB, 2016); this has the potential to affect the continuity of investments in transportation infrastructure.
Parties (COP21) in Paris.\textsuperscript{36} Based on the results of this conference, the parties have committed to make investment flows consistent with low greenhouse gas emissions development, and this represents a challenge and an opportunity for the sector given the long useful life of infrastructure projects (a call to place greater emphasis on adopting mitigation and adaptation measures). IDB activities in the transportation sector draw on all of these global trends with a view to offering a flexible response that is tailored to the circumstances of countries in the region. This section presents the sector challenges for transportation in the region, illustrating the current outlook and needs upon which the target, dimensions of success, and lines of action presented in Section V will be based.

**A. Infrastructure remains deficient, with low coverage, quality, and capacity, and inefficient connectivity**

3.3 The region needs to improve the quality, coverage, connectivity, and capacity of transportation systems. Low road density and poor road quality in Latin America and the Caribbean restrict access to education and health services, as well as social mobility and competitiveness, and this limits social and economic benefits such as those mentioned in Section II.

3.4 Only 32\% of the region’s highway network is currently paved (International Road Federation (IRF), 2016)—far below levels in Europe and Central Asia (86\%) and the world average (58\%) (World Bank, 2013). Coverage of the paved network also varies across the region. While approximately half of the road network in countries such as the Dominican Republic is paved (CAF, 2012), the proportion is less than 15\% in Brazil, Bolivia, Nicaragua, Peru, Uruguay, and Haiti (IRF, 2016). Moreover, according to the IRF, road density in the region stands at 0.45 km per km\(^2\) of land. This level varies from country to country, with Paraguay and Bolivia having the lowest density (less than 0.10 km per km\(^2\)). It also contrasts with countries such as the United States (0.67 km/km\(^2\)) or some Central Asian countries, which have densities above 0.60 km/km\(^2\) (IRF, 2016).

3.5 The Global Competitiveness Report by the World Economic Forum (WEF) for the 2015-2016 period finds a significant gap in the quality of infrastructure compared to OECD countries.\textsuperscript{37} The greatest disparity is in the quality of roads and, to a lesser extent, in airports. Compared to previous years, the gap in infrastructure quality has not only persisted but has widened with respect to the OECD countries.

\textsuperscript{36} The results of COP21—particularly that mentioned in Article 2(c)—reiterate both the need to support mitigation and the lack of financing for climate change adaptation, even defining plans at the sector level (UNFCCC, 2016). One example of a response to COP21, the sustainable development goals, and the Intended Nationally Determined Contributions is the NDC Invest platform the IDB has developed to identify programs with reimbursable and nonreimbursable resources, promote investment portfolios, and finance projects that are top priorities for the countries and their INDC in terms of sustainability.

\textsuperscript{37} The gap is defined as the difference between the scores for the OECD as a whole for each indicator and those for the group of Latin American and Caribbean countries. Quality indicators are measured on a scale of 1 to 7.
Table 1. Gaps in the quality of transportation infrastructure in Latin America and the Caribbean (WEF, 2016)

<table>
<thead>
<tr>
<th>Gaps 2015-2016</th>
<th>Latin America and the Caribbean</th>
<th>OECD</th>
<th>Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>General infrastructure quality</td>
<td>3.56</td>
<td>5.33</td>
<td>1.77</td>
</tr>
<tr>
<td>Road quality</td>
<td>3.53</td>
<td>5.15</td>
<td>1.62</td>
</tr>
<tr>
<td>Port infrastructure quality</td>
<td>3.84</td>
<td>5.16</td>
<td>1.32</td>
</tr>
<tr>
<td>Air transportation infrastructure quality</td>
<td>4.17</td>
<td>5.43</td>
<td>1.26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gaps 2011-2012</th>
<th>Latin America and the Caribbean</th>
<th>OECD</th>
<th>Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>General infrastructure quality</td>
<td>3.86</td>
<td>5.57</td>
<td>1.71</td>
</tr>
<tr>
<td>Road quality</td>
<td>3.61</td>
<td>5.20</td>
<td>1.59</td>
</tr>
<tr>
<td>Port infrastructure quality</td>
<td>3.91</td>
<td>5.30</td>
<td>1.39</td>
</tr>
<tr>
<td>Air transportation infrastructure quality</td>
<td>4.49</td>
<td>5.68</td>
<td>1.19</td>
</tr>
</tbody>
</table>

Note: Ratings go from 1 to 7, where 1 represents the lowest quality and 7 the highest, according to the Executive Opinion Survey carried out by the World Economic Forum.

3.6 The region continues to face challenges of isolation, lengthy travel times, and restricted access in both periurban and rural areas.36 Those living in periurban areas spend several hours traveling to centers of economic activity, such as their place of work (World Bank, 2008). It is estimated that low-income residents in outlying areas of Rio de Janeiro, Brazil, spend up to 22% of their day traveling (World Bank, 2013). Additionally, low-income residents of outlying areas in São Paulo, Brazil, spend between 18% and 30% of their income on travel, despite taking 70% fewer trips than those in the highest income group (Carruthers, Dick, and Saukar, 2005). In the cases of Bogota, Lima, Mexico City, and São Paulo, a typical trip takes more than one hour and twenty minutes39 (IDB, 2014). Without infrastructure or services to support connectivity, population dispersion affects the economy and social development (Webb, 2010). In both urban and rural contexts, a lack of connectivity particularly affects women and minority groups, such as indigenous and Afrodescendant populations.

3.7 Women, in particular, have different transportation priorities and needs, and may bear the greater share of responsibility for transportation in the family (World Bank, 2008). Similarly, the deficit in transportation infrastructure and services has the greatest impact on vulnerable groups such as the indigenous and Afrodescendant communities, who usually live further away from centers of economic activity. These population groups are isolated by topographic obstacles, the sparseness and poor condition of roads, and a lack of adequate means of transportation.

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36 Around 120 million people live in isolated rural areas, where poverty levels are usually higher (CAF, 2012).

39 In the case of Bogota, 50% of people take over one hour and thirty minutes to make a trip, while in São Paulo and Mexico City the proportions are 40% and 44%, respectively.
3.8 Sector challenges in the region also involve the sustainability of infrastructure assets. The importance of road management should not be seen merely as an issue of routine maintenance, but rather as one of comprehensive management of assets throughout their lifecycle. Travaglianti and Schwarzer (2015) demonstrate the timeliness of implementing comprehensive road management and argue that allowing a road to deteriorate into an unsatisfactory condition increases the cost of maintenance as much as sixfold compared to that of maintaining a road in good operational condition. This underlines the importance of including components to support comprehensive asset sustainability as a strategy for capital expenditure efficiency and economic sustainability.

3.9 Although many countries in the region have publicized their intentions to reduce sector emissions, and have even presented specific strategies to meet these commitments, adaptation measures have been scant. This has been evident from the requirements and suggestions made by the United Nations Framework Convention on Climate Change (UNFCCC) since the COP21 in Paris. One of COP21’s conclusions concerned the urgency of supporting less-developed countries with financing for national adaptation plans (UNFCCC, 2016), and it also reiterated the importance of transportation to climate change mitigation and adaptation actions (Dalkmann, Lefevre, Enriquez, and Yadav, 2015).

3.10 Adaptation is relevant to the design of hydraulic and drainage infrastructure that makes allowance for hydrological projections. Changes in the intensity and frequency of precipitation are a critical factor for the design of sustainable infrastructure that is resilient to the impact of climate change (Becker, Fischer, and Schwegler, 2011). In both rural and urban contexts, a failure to incorporate analysis of natural disaster risk and vulnerability from the project planning stage onward can magnify the destructive effect of these phenomena. Weaknesses in the design, location, and construction of roads, containment walls, and dykes, among other things, magnify the destructive power of natural disasters. According to disaster impact evaluations carried out by ECLAC, such disasters in Latin America and the Caribbean carried average annual costs of 0.63% of GDP from 1970 to 2008, and of more than 3.5% in the case of the Caribbean specifically (ECLAC, 2010).

3.11 Scenarios involving hydrological and climatic anomalies underline the need to make allowances for climate change not only in road design and in the management of catchment basins for transportation projects, but also in the design and protection of transportation infrastructure in coastal areas, islands, and low-lying regions. Even under a conservative scenario for emissions (medium-low emissions, or RCP 4.5), an increase in sea levels of 0.5-0.6 meters is forecast for the Caribbean region, accompanied by more frequent flooding and high rates of coastal erosion (Intergovernmental Panel on Climate Change (IPCC), 2014). According to the IPCC, adaptation measures for regions such as the Caribbean may create development synergies where coordinated with government planning. A number of adaptation practices are highlighted with respect to transportation infrastructure, such as early

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40 Intended Nationally-Determined Contributions (INDCs) even have targets for reductions in the transportation sector.

41 As a proportion of 2008 GDP.

42 Scenario RCP 4.5 (medium-low emissions) for the 2081-2100 period, compared to the 1986-2005 period (IPCC, 2014).
warning systems, transportation infrastructure improvements that allow for climate change scenarios, vulnerability mapping exercises, and improved drainage structures.

3.12 In addition to mitigation and adaptation criteria, the influence of infrastructure (mainly roads) on future land use needs to be considered. While the development of new roads (or the rehabilitation or expansion of existing ones) may be motivated by a particular sector, area, or production purpose, infrastructure can encourage new types of land use that were not part of the original intent (Laurance, 2015), or that were not envisaged during project planning. In this respect, planning has been weak and infrastructure expansion has surpassed the capacity of the environmental authorities to control it. Accordingly, work needs to begin to identify prioritization mechanisms that take into account the future impact of shifts in land use triggered by projects (Laurance et al., 2014).

3.13 A number of general assertions can be made regarding road safety as a component of quality infrastructure. Although this issue is of particular interest in the urban context (see paragraphs 3.25, 3.26, and 3.27), the high rate of road fatalities in Latin America and the Caribbean—which can exceed 20 deaths per 100,000 inhabitants—needs to be acknowledged. According to the Pan American Health Organization, the average fatality rate for the Americas is 15.9 per 100,000 inhabitants, which is below the world average of 17.4 (PAHO/WHO, 2016). The average for the Latin Caribbean is 16.6 per 100,000 inhabitants, with rates of 14.4 in the non-Latin Caribbean, 23.4 in the Andean subregion, 13.6 in Mesoamerica, and 21.0 in the Southern Cone region. Traffic-related injuries inflict not only physical and emotional harm on victims and their families, but also entail significant expenses, which can sometimes aggravate conditions of poverty in households in Latin America and the Caribbean. Traffic accidents therefore represent a great burden in terms of social and economic costs to the region. The International Road Assessment Programme estimates economic losses due to accidents at as much as 5% of GDP in low- and medium-income countries. Statistics for the region are no different: an IDB study (2013) estimates that the burden of traffic accidents involving motorized vehicles in Latin America and the Caribbean may range from 2% to 4% of GDP. In Colombia, for example, losses due to traffic accidents vary between US$4.5 billion and US$8.8 billion (between 1.6% and 3.1% of national GDP) (IDB, 2013). According to The Economist (2014), traffic accidents are the leading cause of death among the population aged 15 to 29, surpassing even HIV mortality rates.

B. Transportation in urban contexts: a scenario of sustainability, efficiency, and safety challenges

3.14 Transformation and economic growth in major cities in Latin America and the Caribbean has resulted in the increased use of private vehicles, creating pressures on the supply of infrastructure and transportation systems. In general, the latter have been developed with a bias toward this mode of transportation and in isolation from urban planning processes. This has created major disincentives to the use of public transportation, generating congestion and pollution externalities among its many consequences. (Transportation currently accounts for 32% of GHG emissions in

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43 A study in Bogota, Colombia, concluded that road accidents imposed costs of 530 billion Colombian pesos in 2014 (more than US$150 million) (Grupo SUR, 2016).
Latin America and the Caribbean, of which 90% is caused by automotive transportation.)

3.15 The region must respond to the challenges of urbanization, motorization, congestion, and pollution with measures aimed at consolidating sustainable, better-planned, and more efficient cities. In recent decades, cities in the region have experienced significant demographic growth linked to economic expansion, and this has exerted pressure on public services, including transportation. While in 1950, 41.4% of the Latin American and Caribbean population was urban, by 2010 this percentage had surpassed 79%—far higher than in Asia (45%) and Africa (40%), and slightly higher than in Europe (73%). It is estimated that this percentage will reach 84% by 2025, as shown in Figure 2. Cities also determine economic performance in the region. According to the McKinsey Global Institute (2013), the 10 largest cities in Latin America account for 30% of regional GDP. However, although urbanization has helped to reduce poverty in a number of cases, the results in terms of inequality levels have been less positive. In 2014, 10% of the population held 71% of the wealth; if this trend continues, then within six years 1% of the population will have accumulated more wealth than the remaining 99% (ECLAC, 2016). This outlook underlines both the opportunity and the need to improve people’s access to opportunities (employment, health services, education, technology adoption, recreation, etc.) as a mechanism for social inclusion, poverty reduction, and increased productivity. Transportation thus has great potential as a means of social transformation and as a tool for ensuring inclusive economic development through improved accessibility.

Figure 2. Proportion of urban population by major cities
Source: Adapted from CAF (2012) and IDB (2013).

3.16 Within this urban context, and as part of an accessibility strategy, public transportation projects need to address challenges in the area of fare structures, preferably so that the service can be progressive.44 Affordability in some cities in the region can be assessed by calculating the share of income dedicated to the use of public transportation. In cities such as Brasilia, São Paulo, Buenos Aires, and Mexico City, the average household belonging to the lowest income quintile dedicates as much as 59%, 63%, 26%, and 19% of its income, respectively, to public transportation (Estupiñán, Gómez-Lobo, Muñoz-Raskin, and Serebrisky, 2007).

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44 Progressive means that lower-income people benefit more—in other words, that the service is more affordable for those who need it most.
Subsidies can have a major impact in developing countries, but if the objective is a progressive approach, subsidies in public transportation projects should preferably be structured from the demand (user) side, rather than the supply (operator) side.

3.17 The challenges for transportation subsidy and incentive policies are not exclusively felt in developing countries. At the global level, countries in North America and Western Europe, also have heavily subsidized public transportation systems (Drevs, Tscheulin, Lindenmeier and Renner, 2014; Pucher, 1988) and even have higher subsidy percentages than in countries in Latin America and the Caribbean (Basso and Silva, 2014). The need to implement subsidy policies stems primarily from high transportation infrastructure and operating costs, and they have objectives with regard to social/environmental aims (discourage vehicle use to produce positive social impacts), income distribution (offering an inclusive service, as described in paragraph 3.16) and meeting the financial needs for system performance. Among other things (Nelson, Baglino, Harrington, Safirova, and Lipman, 2006). In general, subsidy arrangements at the global level and in developed countries have yielded positive results, achieving the objectives for which they were set (Basso and Silva, 2014) and have been the response to the operational/financial difficulty of implementing systems. Countries in Latin America and the Caribbean are facing a growing expectation or demand with respect to the level of service in public transportation systems due to generalized increases in income, which tend to drive up operating costs, making it difficult to exclusively self-finance with user fares, suggesting a more relevant role for subsidies in financing the operation of such systems. This scenario is also consistent with the experience of public transportation systems in developed countries, where the burden of subsidies for the sector and mainly for the provision of services is significantly higher (Nelson et al., 2006).

3.18 In response to economic growth (and the increase in per capita income), and in the context of urban processes, there has been a progressive increase in the number of vehicles in Latin America and the Caribbean. This trend has also been accompanied by deficiencies in public transportation, a lack of coordination between transportation systems and urban planning, and the geographical dispersion of high-income population groups that make intensive use of private vehicles (CAF, 2012). According to the most recent data from the IRF (2016), the level of vehicle ownership in the region exceeded 120 per 1,000 inhabitants, with the overall motorization rate (including all types of vehicles) exceeding 170 per 1,000. Although these numbers are still lower than in the developed countries (between 500 and 700 vehicles per 1,000 inhabitants in Europe, the United States, Canada, and Australia), the rate of growth is high (IDB, 2013; CAF, 2012). This situation is important given that a lack of mobility reduces household productivity, with negative externalities equivalent to almost 15% of average urban household income and almost 30% in the case of cities such as Lima, Peru (Hidalgo and Huizenga, 2013). Figure 3 shows that annual growth in the use of motorcycles in Brazil exceeded 35% from 2000 to 2010, while in countries such as Colombia and Mexico the rate of growth is approximately 15%.

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45 Subsidies can discourage private vehicle use, by making the travel cost lower than the marginal cost of vehicle use (Nelson, Baglino, Harrington, Safirova, and Lipman, 2006).

46 Among the countries of the region, the Caribbean nations have higher-than-average motorization rates, with Barbados, Suriname, and Trinidad and Tobago all having more than 300 vehicles per 1,000 inhabitants.
3.19 According to Jirón (2011), each new resident in Mexico City adds two new vehicles. The residents of the 15 largest cities in Latin America and the Caribbean can dedicate an hour per day on average to intraurban travel (BID, 2016). Adding to this is the fact that traffic control measures (such as restrictions on use based on plate number, or reductions in gas subsidies) do not necessarily encourage the use of public transportation⁴⁷ (ECLAC, 2015). These measures need to be accompanied by better urban planning for the optimum configuration of vehicle infrastructure.

3.20 Growth in the vehicle fleet, as mentioned above, is the result of increased incomes and reductions in automobile prices (Acevedo, et al., 2008; BBVA Research, 2013). The establishment of different manufacturers, assembly operations, and retailers has also channeled the growing dynamism in vehicle sales.⁴⁸ Some analyses suggest that vehicle markets in Latin American countries such as Colombia are far from reaching saturation point. Nonetheless, the pace of growth highlights the need to question the traditional approach to urban transportation interventions, in which public transportation systems have been seen as a solution to mobility problems. Acevedo et al. (2008) suggest that the consequences of a sustained increase in per capita income (as part of economic growth in the countries) will translate into a higher number of people with incomes above the threshold necessary to afford a vehicle (and/or motorcycle). These increases will lead not only to higher rates of motorization, but also to a larger number of trips per person per day using motor vehicles. For example, in Santiago the number of trips using motor vehicles increased by 75% between 1991 and 2001. Over the same period, GDP per capita grew on average by 6.3% per year (Acevedo et al., 2008). Growing congestion in cities is therefore a multidimensional problem that requires a broader approach in policies governing spatial planning and land use, in terms of how to encourage the use of both public transportation and nonmotorized transportation, and how to align

⁴⁷ Partly due to the low quality and supply of public transportation services and other, alternative modes of travel.

⁴⁸ In Colombia, for example, annual motor vehicle sales have exceeded 290,000 units since 2011 (BBVA Research, 2013).
incentives for sustainable mobility and greater multimodality (BBVA Research, 2013).

3.21 As a result of increased motorization, the region faces higher levels of congestion, accidents, atmospheric pollution, and GHG emissions (Projected GHG emissions in the region point to a future in which transportation will be the main source of such emissions.). Increased congestion causes significant economic losses and affects the welfare of transportation users. CO$_2$ emissions from the sector rose at a higher rate over the last decade than in any other energy-using sector, while the transportation sector is also the main source of air pollution (particulate matter, nitrogen oxide, carbon monoxide, hydrocarbons, sulfur oxide) in cities. Cities, in turn, are responsible for around 70% of the region’s emissions (UN Habitat, 2015). Toxic gas and particulate matter concentrations, as measured in Mexico City, are higher in traditional bus and minibus systems than in the new BRT lines or integrated systems that use infrastructure more efficiently (Wöhrnschimmel et al., 2008). This confirms the need to create more efficient transportation systems in urban centers in Latin America and the Caribbean, making optimum use of infrastructure capacity.

3.22 Given patterns of urban transformation, Latin American and Caribbean cities today account for 15% of the world’s urban population, and are responsible for 7% to 10% of global emissions (Rodríguez, 2015). This value, while low, does not mean that climate change should be ignored, as its effects on the region’s cities are potentially high (International Council for Local Environmental Initiatives, 2015). The transportation sector also has a profound responsibility for GHG emissions originating in cities, given that urban mobility accounts for between 20% and 40% of total urban emissions (ECLAC, 2015).

3.23 In the case of the 26 countries in the region, CO$_2$ emissions from the transportation sector account for 32% of the total, on average, while the figure for OECD countries is 28% (World Resources Institute (WRI), 2015). Although this figure is in proportion to total emissions, it takes on a particular importance given that other countries have similar or even lower levels despite higher motorization rates and a similarly intensive use of nonrenewable sources for power generation$^{49}$ (World Resources Institute, 2015). This is particularly significant in the case of a number of Caribbean countries and islands. Although the energy sector in this group accounts for a similar share of emissions to that in the OECD,$^{50}$ the share of the transportation sector in a number of Caribbean countries can exceed that of the OECD group by more than 5%.

3.24 From a similar perspective,$^{51}$ and with a view to broadening the analysis, the weight of sector emissions relative to available infrastructure (kilometers of roads) in some

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$^{49}$ According to WRI statistics (2015), the contribution of the energy sector in some OECD countries (such as France, Belgium, and Canada) is similar to the average for Latin America and the Caribbean. Nonetheless, the share of transportation in total emissions is the same as or less than in Latin America and the Caribbean, particularly if the Caribbean islands and countries are taken into account.

$^{50}$ According to WRI statistics, the energy/thermal sector accounts for 39% of CO$_2$ emissions in OECD countries, while the transportation sector accounts for 28%.

$^{51}$ Although transportation emissions account for a significant share of the total in some countries in the region (even taking into account the substantial contribution of power generation), other indicators need to be looked at that avoid the possible bias introduced by the sector’s high share, given a clean energy matrix. To this end, the sector ratio of tons of CO$_2$ to kilometers of roads or GDP can be analyzed.
countries in the region is higher than that in the United States and the European Union (EU15).\footnote{Refers to member countries prior to May 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.} Figure 4 shows the ratio for several Latin American and Caribbean countries.\footnote{According to WRI statistics (2015), transportation sector CO\textsubscript{2} levels may be calculated as a proportion of GDP (2005 base year), measured as tons of CO\textsubscript{2}/GDP. Levels in Latin America and the Caribbean are more than 30\% higher than those in the United States, for example.}

**Figure 4. Ratio of transportation sector CO\textsubscript{2} emissions to available infrastructure (kilometers of roads)**

Source: Adapted from WRI (2015) and IRF (2016).

3.25 Mitigation challenges are addressed, even down to the sector level, in the Intended Nationally Determined Contributions (INDCs) that were made public before COP21 in Paris. Some countries, such as Brazil, Colombia, Argentina, Ecuador, Costa Rica, and Guatemala, have defined quantifiable targets for reducing transportation sector emissions; some of them identify the development of public mass transit as a measure for achieving them. Table 2 presents a summary of transportation externalities for a number of metropolitan areas in Latin America. These include travel times, traffic accidents, and pollutant emissions.\footnote{The study does not give average overall values or willingness-to-pay surveys that can be used for the countries analyzed. Given these limitations, the cost of pollutants and CO\textsubscript{2} was estimated using the costs per contaminant (in U.S. dollars) used by Brazil’s environmental authorities. The data serves as a point of reference and for comparison among cities; it is not for the calculation of the rigid monetary values that would be needed to support policy making.} Large variations can be seen among the cities. The city with the lowest overall level of externalities is Curitiba, at US$591 per person each year. This reflects average travel times of 40 minutes per person per day, 4.2 deaths per 100,000 inhabitants each year, and aggregate emissions costs of US$52 per person per year. The city with the highest level of externalities per person is Mexico City, at US$1,326. In the case of Santiago, emissions and deaths are relatively low, but travel times are long, leading to high overall externalities.

3.26 As in the case of road and port infrastructure, the region’s cities need to develop transportation infrastructure based on standards that reduce vulnerability to the impact of climate change. Cities in Latin America and the Caribbean are subject to a high risk (combination of vulnerability factors and climate change impacts) of natural disasters and climate change impacts (UN Habitat, 2011; IPCC, 2014).
3.27 Safety in urban transportation. There is wide recognition of the importance of transportation safety, with a comprehensive approach across the different subsectors and at the rural and urban levels. The poor quality of infrastructure and a lack of operating and service standards increase the risk of incidents and endanger society. Rapid urban growth often results in cities that expand road network capacity to the detriment of user safety, resulting in increased risk exposure (particularly for the most vulnerable users—motorcyclists, cyclists, and pedestrians). Moreover, gaps in road coverage, quality, and capacity endanger the safety of passengers and goods transported.

3.28 In LAC, the annual traffic accident rate is 15.9 per 100,000 inhabitants—almost double the level in high-income countries (10 per 100,000 inhabitants). A large number of these accidents occur in urban centers. Studies by the IDB and the Spanish Road Association indicate that Argentina, Brazil, Colombia, Mexico, Peru, and Venezuela account for approximately 80% of road traffic deaths, and that between 50% and 70% of deaths occur in urban areas (IDB, 2012). Figure 5 shows that the Dominican Republic, Belize, and Brazil have the highest traffic fatality rates, while Panama, Mexico, and Chile have some of the lowest. Differences in the results obtained for each country are largely the result of the motorization rate and country size, as well as the implementation of road safety policies.
In addition to transportation safety issues, promoting gender equality in urban areas means developing initiatives and actions that make allowance for the specific mobility needs (travel patterns) of women. This involves analyzing their travel times taking into account not only the need to minimize cost and time, but also factors such as overcrowding and safety that affect women to a greater extent and limit their mobility. In Latin America and the Caribbean, particularly in the cities, the most vulnerable population has limited mobility, leading to fewer employment and education opportunities and more restricted access to health services. A recent survey published by the Thomson Reuters Foundation (2014) for 16 of the world’s mega-cities indicates that several of Latin America’s transportation systems are ranked by their users as the most unsafe. The need for safer, more accessible transportation for women is part of a general mobility challenge in the region’s transportation systems (with emphasis also on the disabled\textsuperscript{55} minority groups, low-income groups, etc.).

C. Logistics networks need to be more efficient, allowing lower transportation costs and fostering competitiveness and regional integration.

Latin America and the Caribbean face the challenge of expanding, rehabilitating, and maintaining transportation logistics infrastructure\textsuperscript{56} with adaptive capacity, focused on value chains and network connectivity. Given the approach of providing hardware and software for regional integration, the optimization of border-crossing performance is also of particular relevance. Despite being the main means of internal transportation in the region, there are persistent challenges related to data and the availability of information for analysis (Barbero, 2011).

As a result of low levels of investment in transportation networks, Latin America and the Caribbean is behind the curve in terms of constructing a dense interurban network that facilitates the transportation of goods. Despite the region’s economic growth over the last decade, there are significant gaps in the availability of transportation infrastructure (roads, ports, airports, rail) and the provision of world-

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure5.png}
\caption{Road traffic fatality rate (deaths per 100,000 inhabitants)}
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Note: 2013 data.

\textsuperscript{55} In the case of the disabled, the challenge is clear: only 20% to 30% of children with disabilities go to school. Similarly, a high percentage of adults with disabilities are unable to find jobs. One of the main limitations in this area is poor access and a lack of universal mobility in cities (World Bank, 2013).

\textsuperscript{56} Includes, rail, waterway, port, airport, and road infrastructure.
class logistics services (logistics areas and platforms, multimodal transportation, and storage services).

3.32 International trade and integration require infrastructure and associated services to move in the same direction. There are barriers to connectivity and to the operation of air, land (urban and interurban), and port terminals that hinder the consolidation of infrastructure networks and logistics services. The availability of modern dry ports is limited, there are weaknesses in cold chain infrastructure, and cargo transportation services exhibit low levels of productivity. The identification of value chains is of particular importance in this context, as are improvements to infrastructure, the performance of logistics networks, and border crossings, all with a view to meeting the challenges of international trade, the geographical diversification of production, and food security.

3.33 The International Logistics Performance Index (LPI),\textsuperscript{57} which is scored on a scale of 1 to 5 (with 5 the best), provides evidence of infrastructure gaps that affect costs and times in logistics chains. As can be seen in Figure 6, only three countries in the region achieved an LPI score over 3. In the case of the lowest-ranked countries in 2014, these tend to score worst in relation to the quality of infrastructure; the best-ranked countries, however, tended to score worst on logistics services (World Bank, 2014). Based on the LPI indicator, the region has a significant gap in terms of aggregate logistics performance. The regional average is just 2.72, compared to 2.85 for East Asia and the Pacific and 3.67 for OECD member countries (World Bank, 2016).

Figure 6: Logistics performance index for various countries in the region

\textit{Source: World Bank (2016).}

3.34 **Maritime transportation and port operations.** Maritime transportation represents more than 80\% of trade in volume and value terms, with ports in the region handling approximately 9%\textsuperscript{58} of world container traffic (Barbero, 2010; ECLAC, 2015). Not only does the port sector lie at the heart of trade links, but it is also an engine of economic growth and employment in its own right. In the case of small island states

\textsuperscript{57} The indicator is broken down into scores for customs procedures, infrastructure quality, logistics services, etc.

\textsuperscript{58} Port infrastructure and maritime transportation are of special relevance for the Caribbean and Central American region, where shipping traffic totals more than 14,000 ships per year (traveling to and from the Panama Canal). In 2012, there were 16,000 freighters registered in Latin America and the Caribbean, accounting for 20\% of the worldwide fleet and 29\% of tonnage (ECLAC, 2015).
such as those in the Caribbean, it also plays an important role in terms of food security. The high degree of correlation with regional economic performance has led to a rise in container port traffic in recent years.

3.35 Figure 7 shows the growing trend in port traffic in Latin America and the Caribbean, which reached almost 50 million containers in 2014—9 million more than in 2010. A disaggregation of the historical data shows that high volumes and growth rates were experienced in the Caribbean (CAF, 2012). The causes of this growth may include operational improvements in the Panama Canal, port investments, the expansion of industries such as mining and agriculture, and the consolidation of port operators and shipping lines (CAF, 2012).

Figure 7: Container port traffic (twenty-foot equivalent units, or TEUs)

3.36 Despite the growth in cargo traffic through the ports, port logistics performance remains deficient. This can be seen in port infrastructure quality gaps with respect to other regions (Figure 8). In 2015, Latin America scored only 3.84 in the category of port quality, while the OECD scored 5.16 (WEF, 2016). The main reasons for or classifications of these differences are the weight-to-value ratio and port efficiency, followed by the level of competition between shipping companies and, to a lesser extent, trade volumes (Mesquita Moreira, et al., 2008). The foregoing is particularly important for Caribbean countries, which have small, specialized economies and are highly dependent on imports of consumer goods and unfinished materials for local production. According to Sánchez and Gordon (2009), states belonging to the Caribbean Community (CARICOM) have improved extra-regional connectivity, but this has been achieved mainly through an increase in freighter capacity, rather than the modernization of port infrastructure.¹⁵⁹

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¹⁵⁹ One of the strategies adopted by port cities to reinforce the competitiveness of their services and environments is expansion of the “hinterland”—what comes before ports in interacting with the world. This set of services, economic dynamism, and production centers can play a dual role: (i) modifying/increasing trade flows and improving geographical disadvantages; and (ii) generating economies of scale in value and logistics chains to reduce transportation costs (ECLAC, 2005).
The aforementioned factors lead to extended transportation times and higher operating costs in freight transportation. In the case of the Caribbean, transportation and insurance costs are particularly high (30% higher than the world average). Moreover, logistics costs account for 20% of production costs, compared to a world average of 10% (Moreira, Volpe, and Blyde, 2008). A number of worldwide measurements show that logistics costs as a percentage of GDP are between 50% and 100% higher in Latin America and the Caribbean than in OECD countries (Barbero, 2011). Though the countries of the region have placed greater priority in recent years on efforts to enhance port efficiency, achieving the latter remains a challenge. Productivity growth in Latin American and Caribbean ports was quite mixed from 2000 to 2010, and was mainly the result of changes in efficiency rather than improvements in scale or technological progress. The main factors needed to enhance port efficiency include the development of better government capacities, improvements in connectivity, and the existence of intermodal hubs (Suárez-Alemán, Sarriera, Serebrisky, and Trujillo, 2016).

The foregoing is coupled with the challenge of improving multimodal integration (consisting of improving the management, optimization, and regulation of ports in coordination with other stakeholders in the logistics chain). An expansion of port capacity should be based on comprehensive measures and the development of complementary means of transportation (such as the rail network) where these are found to be feasible (IDB, 2013). This process should be accompanied by reforms and policies that promote investment and efficiency in the sector (CAF, 2012).

As a model for port management, landlord ports (in which the port authority awards a concession for the right to develop specialized private terminals on land) have proven most effective, particularly where the volume of demand is sufficient for the development of competitive markets. The development of new, greenfield ports has faced greater challenges in the region, mainly owing to inadequate legal frameworks that limit the development of new ventures. The creation of port cities in Latin America and the Caribbean (or the development of centers of production, related services, and economies of scale around the ports) represents a potential benefit in terms of improving competitiveness in world and interregional trade (ECLAC, 2005).
3.40 **Freight logistics and modal dependency and/or vocation.** Trucks account for approximately 70% of freight volume transported internally in developing countries, and 80% in terms of value. Despite their importance, the proportion of the region’s roads that are paved is low, and the density and quality of transportation infrastructure is lower than in other middle-income countries and in the OECD (Fay and Morrison, 2007; CAF, 2012).

Transportation master plans provide a long-term vision that can create consensus regarding the nature and size of networks, relationships between different modes of transportation, the proportion of the budget dedicated to maintenance and expansion, the importance of logistics, and cofinancing between different levels of government. They also support the development of financing strategies.

**Colombia’s Intermodal Transportation Master Plan (PMTI) (2015)**

The PMTI is a commitment by the Colombian state to organize the country’s growth efficiently and strategically based on an infrastructure network that connects cities, regions, borders, and ports, prioritizing projects that will have the greatest impact on the national economy. The PMTI is an evolving, methodological process aimed at guiding long-term efforts in the infrastructure and transportation sector. It aims to strengthen the country’s capacities to address the challenges of foreign trade; to integrate the territory by creating better opportunities for the inhabitants of more remote regions; and, lastly, to be a platform for Colombia to leave decades of underdevelopment behind and grow in an orderly fashion consistent with the needs of today’s world, paving the way for a prosperous future in a globalized economy.

The PMTI addresses infrastructure needs and focuses on raising service levels in a basic multimodal network that connects the most important agglomerations in the city system to international trade, while taking significant steps towards expanding the transportation network in isolated and/or disadvantaged regions. It also proposes institutional and long-term financing initiatives. The PMTI is a backbone that needs to be supplemented by logistics services, strengthening of institutions, and multimodal development.

3.41 Challenges in the area of road logistics can also be seen in the LPI results. The 2014 report indicates that emerging nations have made progress in terms of consolidating their logistics networks and infrastructure; however, it underlines that satisfaction with the roads as a means of transportation is especially low in Latin America and the Caribbean. While the OECD countries received a score of 3.70 with respect to the quality of transportation infrastructure for international logistics performance, Latin America and the Caribbean achieved an average score of only 2.49—lower than the global average of 2.76 (World Bank, 2014).

3.42 Road transportation services also face a number of problems that affect competitiveness. Data from the IDB Regional Observatory of Freight Transport and Logistics point to inefficiencies in the productivity of truck fleets, with rates of usage that are far below the average for developed countries. In Latin America and the Caribbean, trucks travel 61,700 kilometers per year, compared with 110,000 kilometers per year in countries such as France and the United States. Furthermore, rates in the region tend to be considerably higher than in developed countries. The average rate in Mesoamerica is 40% higher than in the United States (US$2.50 per kilometer compared with US$1.50). Lastly, the average age of the fleet is 53% higher. While the average age in the United States is just under seven years, in the
region it can be over 15 years, with the consequent impact on unit profitability, fuel consumption, and transportation fares.

3.43 Road transportation inefficiencies also translate into high GHG emissions due to the use of diesel motors with low environmental standards. The countries in the region generally have higher emissions for cargo transported by land than do countries like the United States (IDB, 2016). Progress needs to be made towards implementing cleaner technologies such as Euro V and Euro VI, which are superior to older diesel motors and have the potential to avoid gas emissions such as black carbon in both urban and interurban logistics vehicles (World Bank, 2013; Barbero J. A., 2011). One of the most important challenges for road freight transportation is finding a balance between ensuring efficiency in transportation and, at the same time, minimizing externalities (such as congestion, pollutant emissions, noise, and accidents). Improving the efficiency of road transportation can not only help to reduce emissions, but also reduce vulnerability to the negative impacts of climate change (UN Habitat, 2013).

3.44 **Rail freight.** Rail accounts for a relatively small amount of freight transportation in the region, but there is significant potential for growth. Rail freight traffic, which accounts for more than 90% of all traffic units transported by this means, grew significantly from 1995 to 2008. Over this period, transported tonnage (mainly mining products) doubled to reach 626 million tons (Kohon, 2011).

3.45 Despite renewed interest in rail infrastructure, trains still account for a much smaller share of freight transport than roads, and they face difficulties in integrating with other modes of transportation and logistics infrastructure, such as ports. Brazil is the country in the region with the highest amount of rail freight, with a modal share of 26% (measured in tons per kilometer). In Mexico, the share is 17%, and in Argentina, it is 5% (IDB, 2014); this compares to 40% in the United States (Barbero, 2011). Latin America’s railways have played an important role, mainly for commodities such as minerals and grains. According to a 2012 report by the World Economic Forum, the quality and coverage of the region’s rail transportation falls far behind that of OECD countries, and this translates into lower sector productivity (tons transported per kilometer). Even within the region, while countries such as Brazil transport 297.8 million tons per km, others such as Argentina show significantly lower levels of productivity, at 10.6 million tons per km (IDB, 2013).

3.46 The rail sector also faces the challenge of diversifying the types of freight transported, and of creating more efficient, multimodal logistics chains (in which it can serve as a supplementary mode that is also efficient in terms of GHG emissions) to enhance the competitiveness of goods transported over long distances. There are also challenges in terms of improving the quality of operational management, safety, freight facilitation in urban environments, and the creation of a regulatory framework to promote private sector financing. Depending on the type of freight transported,

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60 The Avoid-Shift-Improve (or ASI) focus can also be applied to road freight transportation as a tool for improving the sector’s contribution to emissions and the inefficient use of resources. Specifically, land use planning and urban and interurban logistics coordination can make trips more efficient (Avoid); some types of goods may have the potential to be transported by other modes (Shift); and renewal of the vehicle fleet, technologies such as Eco-Driving, and designs that reduce aerodynamic and rolling resistance will improve emissions efficiency (Improve) (IDB, 2016).

61 Millions of tons per kilometer, and millions of passengers per kilometer.
and given the growing importance of sustainable transportation, the rail network is becoming a possible substitute for road transportation owing to its superior energy efficiency. Although the development of new freight rail lines in the region is limited by the high cost of land acquisitions needed to establish right of way, the rehabilitation of lines and resolution of specific bottlenecks (particularly in terms of port access and city-port arrangements through the hinterland)\(^{62}\) can be extremely profitable in markets with high demand. Among the pending challenges for the region is the ongoing need to improve technical and economic regulatory frameworks with a view to facilitating integration among the different networks, as well as the regulatory frameworks facilitating multimodal transportation.

3.47 Waterways. There is great potential for waterway development in the region. The watersheds, with their hydroclimatic and geomorphological characteristics, represent an opportunity to address different logistical challenges (such as, for example, reducing logistics costs or supporting food production chains and meeting the region’s food security needs). A number of watersheds and areas are of particular interest for their hydrographic potential, including the Amazon and Orinoco river basins and the Paraguay/Paraná, Tocantins, and Magdalena river basins. The three most important basins (Orinoco, Amazon, and Rio de la Plata), together with other watersheds in the Hemisphere with navigable rivers, cover more than 12 million square kilometers (just under 70% of South America’s land surface)\(^{63}\) (CAF, 2016). Inland water and rail transportation are also low-GHG emission alternatives for freight transportation that, alongside the need to diversify and coordinate the different modes of freight transportation, represent sustainable and efficient modal alternatives in light of the saturation and insufficiency of other transportation systems.

3.48 Air transportation in Latin America and the Caribbean While the region’s share of air traffic and flight departures\(^{64}\) is low (less than 10%) (ICAO, 2013; Perutti and Sánchez, 2011), the Latin American market is experiencing significant growth. The number of passengers transported is expanding faster than the world average, rising from around 80 million in 2003 to approximately 150 million in 2012. This trend has continued in recent years, despite sometimes unfavorable economic circumstances in countries considered to be major destinations or sources for travel (e.g. Brazil). Annual recorded growth in the number of flight passengers in 2016 was 8.9%—higher than worldwide growth of 7.1% (International Air Transport Association (IATA), 2016) (Figure 9). In addition to this, air cargo volumes have risen constantly in recent years (5.7% from 2007 to 2011). Projections indicate that sector activity in the region could triple over the next 20 years (Ricover, 2012).

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\(^{62}\) Refers to the supply of supporting services and infrastructure prior to the systems responsible for outbound port operations (“foreland”). This concept is particularly relevant in the case of port cities (ECLAC, 2005).

\(^{63}\) The potential benefits in terms of integration are clear given that 75% of water resources are shared between countries in the South American region.

\(^{64}\) Worldwide flight departures by air transportation companies registered in a country include both domestic and international departures by those companies.
Figure 9: Growth in international airline passenger numbers by region (IATA, 2016)

Challenges for regional integration: the Caribbean and its logistics challenges

The states that make up the Caribbean community (CARICOM) move around 90% of their freight by sea. Air transportation accounts for similar proportion of passenger transportation. Challenges in the areas of ports and airports are therefore especially important for countries such as Guyana, Suriname, Trinidad and Tobago, Belize, Barbados, and Jamaica. The liner shipping connectivity index (scored on a scale of 0 to 100) measures the level of a country’s connectivity to international maritime freight transportation routes. The countries listed above receive scores of 4.1, 4.5, 18.9, 10, 4.8, and 21.6, respectively. The Bahamas and Jamaica have the highest scores due to their importance as transshipment hubs (IDB, 2013).

Airport infrastructure is a pillar of tourism activity in the Caribbean region. Some of the countries still do not belong to the high quality categories endorsed by aviation bodies (such as the Federal Aviation Administration’s Category 1 rating). These categories are based on the compliance of facilities with technical, safety, and management standards, and they also help countries to access the benefits of airspace liberalization.

A number of key challenges need to be addressed to improve maritime and air logistics performance in the Caribbean, as follows: (i) improve customs operations and border management; (ii) strengthen institutions involved in the sector; (iii) avoid monopolistic structures in cargo transportation; (iv) systematically gather information to allow evaluation of the performance of logistics chains; and (v) invest in the modernization of port and airport infrastructure and the purchase of equipment.

3.49 If growth targets for the sector are to be met, challenges need to be addressed in the following areas: (i) air transportation policy and sector institutions; (ii) air transportation integration, connectivity, and regulation; (iii) energy efficiency and the use of alternative fuels; and (iv) airport construction, expansion, and operation (Barbero, 2011).

3.50 In the area of air transportation safety, challenges persist in the region. Aviation accident rates in the region are higher than the global average (IDB, 2015). There are four accidents per million departures in Latin America and the Caribbean,

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66 Includes the need for greater integration through open skies agreements, for example.
compared to a figure of 2.7 in regions such as Asia and North America (ICAO, 2013). Moreover, 66% of accidents and 70% of accident-related deaths occurred on airport runways (IDB, 2015). The three main risk factors for air transportation are as follows: (i) the safety of runway operations (the category that accounts for the highest proportion of accidents) (ICAO 2015); (ii) loss of aircraft control; and (iii) ground collisions (which include only those cases in which the aircraft were under control).

### 3.51 Urban logistics

Congestion in cities—caused by population growth and concentration, rising average incomes, and high growth in motorization rates—poses a challenge for moving goods and delivering them to the end consumer in an efficient and competitive manner. In addition, over the last few decades companies have generally opted to reduce inventories; this has translated into an increase in urban freight movement (although with lower volumes) and a greater need to synchronize and connect different stakeholders involved in the production value chain. Some cities are also intermediate hubs for cargo transportation, a factor that is particularly relevant in the case of port cities. The last mile, or cargo transportation in cities, can represent a productivity loss, resulting in notable logistical costs for freight transportation. Barbero (2011) suggests that in Brazil the “last mile” accounts for approximately 28% of the cost of transporting goods.

Other analyses have found that in cities like Santiago, Barranquilla, and São Paulo congestion can drive up logistics costs by 47%, 151%, and 108%, respectively, over free-flow scenarios (IDB-2015). This is coupled with recent growth in urban commercial vehicle fleets, which has exacerbated congestion and threatens social welfare in cities, compromising their sustainable development and drop in emissions (UN Habitat, 2012; Jirón, 2013). Although the negative effects of inefficient urban logistics have been acknowledged, they have not been addressed in depth in developing countries (ECLAC, 2015).

### 3.52 Spatial coordination of logistics interventions at different territorial levels

A comprehensive list of recommendations for logistics policy in Latin America, compiled by Guasch (2011) places considerable emphasis on urban and suburban land use. Although the region has made progress with respect to urban planning methods, pressure to use land for commercial or residential purposes can inhibit the development of logistics platforms, financing of ring roads, or effective connections between modes or between different levels of logistics management. The next generation of territorial planning models in the region needs to develop innovative urban and suburban land management instruments that address the growing need to eliminate bottlenecks that prevent overall logistics costs from being reduced. At the other extreme of the territorial scale, the National Strategic Planning Center (CEPLAN) in Peru has launched a spatial planning and occupation exercise aimed at supporting logistics development. This takes a spatial integration strategy for South America as its starting point and helps to identify key interventions that will allow world trade opportunities to be exploited. Interventions should be prioritized by

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67 In the Caribbean region, data availability limits diagnostic assessment at the urban level. The IDB is currently working to consolidate relevant information through sector observatories.

68 Also known as the “last mile problem,” which relates to the complexity of the last steps in a product’s value chain due to urban congestion.

69 Although logistics systems require interventions to boost competitiveness, any efficiency gain in logistics chains can go unnoticed if there is deficient urban logistics or there are “last mile” logistical difficulties.
finding points of overlap between global and local needs, aligning rules governing land use with cofinancing from different levels of government.

3.53 **Logistics infrastructure is not immune to climate vulnerabilities.** The need to expand adaptation criteria for the construction and upgrading of infrastructure extends to port facilities on coasts and close to water courses. This type of infrastructure will be affected by hydrological and climatological anomalies such as severe storms, flooding, rising sea levels (coastal erosion), and drastic changes in precipitation frequency and intensity (Becker, Fischer, and Schwegler, Considering Climate Change: A Survey of Global Seaport Administrators, 2011).

### D. Challenges persist in the region in terms of institutional capacity-building and sector-level regulation

3.54 Institutional weaknesses are perhaps one of the most persistent problems in the region. They are manifest in the technical, fiduciary, environmental, and social areas—particularly in projects that are high risk and/or high impact. Institutional challenges can be analyzed in terms of the characteristics of the public entity itself (institutional capacity, management efficiency, the degree of success of its policies or public services/goods, transparency) and in terms of regulatory characteristics (including more specific challenges for the sector, such as the lack of a regulatory framework for PPPs or the absence of public policies governing infrastructure asset management).

3.55 In the social and environmental areas, there is a clear need to identify possible impacts on the environment and on populations in the area of influence of interventions, from the earliest project stages onwards. Together with robust institutions that offer this capacity, there is a need to reinforce tools such as consultations with civil society, direct beneficiaries, and different governmental and nongovernmental organizations, ensuring the principle of inclusion and, accordingly, the broad participation of the different population segments.70

3.56 The region faces the challenge of strengthening data generation mechanisms, consolidating information, and deepening sector analysis. The availability and quality of transportation data are important for public sector planning and regulatory decisions, as well as for corporate decisions regarding the production, marketing, or transportation of goods, and for the movement of passengers. Nonetheless, an IDB study of eight Latin American countries revealed considerable disparities among those countries in terms of the availability of data and the kinds of variables and modes of transportation covered. Other general assessments of transportation in the region, such as CAF (2012), and individual analyses such as Barbero (2011, logistics) and Serebrisky (2012, air transportation) yield similar results.

3.57 Owing to a vacuum in the compilation of quality sector information and systematic data collection, there is also a lag in the formulation of sector public policies. This provides an opportunity for the Bank and other development organizations to support the countries in improving the availability of information, generating knowledge, and further developing methodologies that allow causal links to be established between interventions and expected benefits.

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70 In the particular case of the Caribbean region, the experience of working with Civil Society Consultative Groups has contributed to the process of public acceptance of the projects.
3.58 Given the general challenges of building state capacity, some tasks—such as the need for private participation in financing the sector and the introduction of new technologies (or trends in innovation)—impose a significant challenge in terms of sector regulation. For example, the experience in cities in Latin America and the Caribbean has been that the creation of shared mobility platforms requires close attention to the regulation of individual public services and shared transportation, given its tendency to create conflict between transportation interest groups (Grupo SUR, 2016). Informality in transportation is a problem throughout all countries in the region, and it requires regulatory attention to safeguard the ultimate objective of transportation systems (IDB, 2015). Other examples of support needs in the area of regulation include the implementation of technology systems, such as electronic tolls in transportation systems.

3.59 Financing needs and efficiency in infrastructure spending. Against the backdrop of fiscal constraints and widespread and persistent gaps in infrastructure in the region (financing challenge), institutional strengthening can play a critical role in prioritizing funding, establishing satisfactory regulatory frameworks, and planning, executing, and managing sector investments.

3.60 A number of estimates show that additional investment of between US$120 million and US$150 million would need to be mobilized each year to close the infrastructure gap in the region71 (Serebrisky, Suárez-Alemán, Margot, and Ramírez, 2015). However, given the current fiscal environment and low public investment in infrastructure, as well as the consequent difficulty of securing financing from multilateral banks, it is clear that private investment can play a significant role in coming years. If public investment is 2% of GDP, private investment would need to triple (from 1% to 3% of GDP) to meet the 5% threshold required to eliminate the infrastructure gap. There is also a need to ensure efficient and well-planned public expenditure (Clements, Faircloth, and Verhoeven, 2007; Serebrisky, Suárez-Alemán, Margot, and Ramírez, 2015).

3.61 Figure 10 shows the composition of investment72 in recent years and indicates that although private participation is growing on average, the public sector is (and will continue to be) responsible for a substantial share of infrastructure financing. This conclusion is relevant when considering the current macroeconomic outlook faced by governments in the countries of the region.

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71 Countries in Latin America and the Caribbean need to invest around 5% of the GDP in infrastructure, implying an additional spending effort of between 2% and 2.5% of GDP (Serebrisky, Suárez-Alemán, Margot, and Ramírez, 2015). More specifically, Kohli and Basil (2012) project that on current trends, Latin American and Caribbean countries will need to invest a minimum of 1% of GDP annually in transportation infrastructure in order to support expected economic growth over the 2011-2040 period (0.29% in ports, 0.015% in airports, 0.24% in rail, and 0.44% in roads).

72 Though average public investment in the sector is above 1% of GDP, some of the countries analyzed fall below this level (Guatemala, El Salvador, Mexico, Brazil, Uruguay) (Infralatam, 2016).
3.62 Faced with all of this, governments need support to strengthen regulatory, institutional, and technical frameworks that help to expand and improve interaction in traditional concession arrangements, as well as in other types of private participation and financing models. There are challenges in operational management between the national and subnational levels of government that hinder the implementation of more efficient mechanisms for infrastructure and services with private participation. The strengthening of technical and regulatory capacity would facilitate development of new projects, as well as day-to-day interaction with concessionaires.

3.63 Regulation of private sector participation has been modest, and common challenges persist regarding the distribution of risks in projects linked to each transportation subsector. In the region, a number of countries such as Colombia, Brazil, Chile, Mexico, and Peru have a high level of institutional development and substantial experience with PPPs. Other countries in the region are at a less advanced, or even incipient, state of development with respect to PPP regulatory frameworks (IDB, 2014). The vast majority of countries that have had some experience in structuring PPPs have focused mainly on the transportation sector (IDB, 2011).

3.64 As mentioned in Section II, private participation can be positive for infrastructure development, mobilizing resources and offering optimal project compliance in terms of scope, budgets, and time frames. This can also be seen in the growing trend since the 1990s towards including the private sector in infrastructure financing. Nonetheless, it should be acknowledged that while private participation can assist in maintaining infrastructure development trends, fiscal balances will be the ultimate determinant of future investment in the stock of physical capital (Serebrisky, Suárez-Alemán, Margot, and Ramírez, 2015)

3.65 For this and other reasons, the creation of special purpose vehicles suggests a number of important considerations in establishing specific regulatory frameworks.

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73 Countries included in the calculation of average infrastructure investment: Argentina, Brazil, Chile, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Uruguay.

74 This challenge is particularly significant for some Caribbean countries.
Institutional frameworks surrounding PPPs need to be robust, with evaluation of fiscal sustainability risks and design of strategies that are tailored to the sectors concerned.\textsuperscript{75} To this end, deeper analysis of technical risks and monitoring of project development are both strategic and necessary, and may improve the capacity to adapt contractual terms in the event of contingencies with a low impact on project budgets (Aslan and Duarte, 2014). In addition, the structure of these partnerships contains incentives for a high level of leverage on the part of private stakeholders. This type of SPV leveraging tends to be of a lesser degree under solid regulatory frameworks (Moore, Straub, and Dethier, 2013).

3.66 This conclusion is consistent with some of the points suggested by De la Torre and Rudolph (2016), which mean that PPPs can be a weak instrument for developing infrastructure. For example, they mention the excessive awarding of government guarantees (that do not solve information asymmetries or are not used in priority, high-benefit projects), or the tendency to cede in renegotiations between contractors and agencies (given the conflict of interest created by assigning adjudication and supervision tasks to the agency that prepares the bidding process). The structure of PPP projects should also take into account hidden costs to governments and possible triggers for fiscal sustainability risks. Fernández, Ferreira, and Moura (2016) suggest that, in some cases, the hidden cost of PPPs means that this mechanism can be more costly than issuing public debt, concluding also that transaction costs are a significant factor in this additional expense.

3.67 In determining particular investment needs, consideration should be given in any context to available fiscal resources and the population’s ability to pay in each country. Medium-term expenditure frameworks are one tool that may be used for this purpose. Project implementation should maximize expenditure efficiency and increase the supply and quality of services through effective asset management. Risk allocation and the prioritization of transportation projects should be based on robust benefit-cost analyses that reflect the social and environmental implications of projects and ensure resources for conservation and maintenance.

3.68 The nature of infrastructure projects, particularly in transportation, exposes the widespread challenge of implementing measures to control risks and estimate potential cost overruns as strategies for spending efficiency. Cost overruns are more the norm than the exception in infrastructure projects and are an issue not just in developing countries (Flyvbjerg, Skamris, Holm, and Buhl, 2003; Love, Ahiaga-Dagbui, and Irani, 2016). Some major causes of increased costs include changes in project scope, inadequate estimates or preliminary project breakdowns, difficulties with communities affected or served by the project, exogenous factors related to potential price changes (exchange rate or interest rates), and environmental factors (Jackson, 2002). Nonetheless, the evidence shows that project cost estimates tend to skew in one direction, generally underestimating an initial budget for project execution (Flyvbjerg, 2005). This could be due to

\textsuperscript{75} As argued in Section II, private participation can generate productivity gains in countries and can be key for infrastructure development. Nonetheless, as mentioned in the IDB’s Fiscal Policy and Management Sector Framework Document (published in 2015), the accounting, institutional, and regulatory weaknesses present in some countries (as described in that document) can give rise to abuse or deficiencies, as demonstrated by the circumvention of fiscal expenditure controls. For this reason, there should be a healthy balance between promoting investment through PPPs and mitigating the risks to public finances.
psychological factors (an optimism bias among proponents) or political, economic, or strategic factors (Flyvbjerg and Cowi, 2004; Flyvbjerg, Holm, and Buhl, 2002; Flyvbjerg, Skamris, Holm and Buhl, 2005). In this context, project contracts, procurement arrangements, and maintenance policies can take on an important role in allocating risks and securing optimal compliance in infrastructure development. Optimal compliance may be understood as the completion of projects within estimated budgets and time frames while ensuring the sustainability of the assets throughout the lifecycle of the project. To improve execution, there is a need to expand information, data, and lessons learned as points of reference for selecting the best type of contract depending on the specifications of the particular project.

3.69 Dulleck et al. (2015) suggest that national and local authorities are responsible for developing infrastructure projects, but they are typically unable to match the ability of construction companies or concessionaires to specify the characteristics of those projects in detail. The difficulties of achieving effective contracts in a context of asymmetrical information and capacities have been widely discussed, and they can lead to contract renegotiations, cost overruns, or inefficient performance. In standard design-build contracts, the design phase takes place after the contractor has won the bidding process and the price has been set. Given that design efforts cannot be observed and future performance is not verifiable, the incentives for good design are minimal (moral risk). This type of contract sacrifices both design quality and innovation. There are alternatives for solving these two problems, which involve processes and incentives for identifying the best feasible design. Dulleck et al. (2015) propose a multi-stage process that begins by requesting designs and costs from a group of contractors. The request is repeated until there is a consensus regarding the design, and the project is then awarded to the lowest bidder.

3.70 One of the greatest challenges for transportation and logistics financing is that of optimizing and developing new payment sources in projects or creating innovative financing mechanisms that are also beneficial in periods of low borrowing capacity and limited expansion in fiscal spending. A first possible source involves user charges, which include tolls or fees for using a road. This category includes (i) dynamic pricing for road network segments or hubs with the highest congestion levels, thus improving efficiency in the short term and reducing investment needs in the medium and long term; (ii) taxes on fuel and vehicles: average taxes in Latin America are US$845 for light-duty vehicles and US$9,647 for heavy-duty vehicles (Colombian Ministry of Transportation, 2015), which are very low compared to the cost of covering the private component of network deterioration; and (iii) perfecting instruments to capture land value arising from infrastructure and logistics interventions and the sale/leasing/auction of public assets or development rights. These sources of payment are particularly relevant in the urban context, where agglomeration and density lead to significant increases in values. Again, they require coordination between development and spatial plans and urban infrastructure and logistics improvement plans.

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76 It should be noted that user fees are not always sufficient to ensure the sustainability of urban transportation systems. As a result, subsidies are a recurring topic in the discussion surrounding urban public transportation policies. According to Gómez Ibáñez (1999, cited in ASAP, 2014), the existence of subsidies can be justified as a means of aligning the supply of transportation with its optimum social level.
3.71 Another element to be considered in relation to subsidies is that they should target specific groups (low-income populations, students, retirees, and women) in order to be more efficient. However, lower fares for all users will help to promote use of public transportation systems.

Urban land value capture as a strategy for financing urban transportation

The Johns Hopkins School of Advanced International Studies discusses the experiences of the cities of Washington, D.C., Bogota, and São Paulo in the area of urban land value capture. In the case of Washington, D.C. a total of US$250 million was captured through 33 interventions of this kind in the period to 2010, associated with the Metro. In São Paulo, the amount of US$420 million was raised through the auction of rights to a building in 2012, in addition to US$2.5 billion obtained through previous capture operations. In the period to 2011, Bogota raised US$1.1 billion through value capture operations.

The challenges of capturing value include the need for highly skilled legal and technical staff to negotiate with the private sector; the modernization and harmonization of land-use regulations, which can inhibit high-density urban development; the indiscriminate use of value capture as a substitute for property taxes, which can undercut tax receipts; and the use of value capture to resolve equity problems, thus distorting revenue objectives (which should take precedence).

3.72 Once a project has been launched, there is a trade-off in the management of project assets between maintenance spending and investment in new assets, as maintenance activity increases useful life of road assets (thus reducing their rate of depreciation) (Labi and K.C., 2003). The challenge for countries in the region is to create clear frameworks (sector regulations and public policies) for estimating the optimum value of investment in road maintenance, as well as allocating funds and protecting maintenance tasks against changes in government, with a view to resisting the natural tendency to prioritize road expansion over preservation.

E. Trends in technology and innovation constitute challenges and opportunities for the transportation sector

3.73 Growth in the use of broadband and telecommunications technologies have allowed technological applications to be incorporated into mobility and interurban and urban transportation systems, and even into logistics systems, giving rise to intelligent transportation systems (ITS). Although Internet and broadband usage rates are lower in the region than in advanced economies (such as the OECD countries), growth trends have been much higher in Latin America: broadband and Internet usage grew by more than 40% between 2010 and 2014, but did not exceed 15% in the OECD) (World Bank, 2016).

3.74 Some of the externalities associated with transportation, such as congestion, pollution from urban agglomerations, road safety, and inefficiency (and weak competitiveness due to the condition of logistics networks), can be addressed using ITS technological solutions. Figure 11 shows the interplay between ITS applications and the problems that can be overcome by using them.
3.75 **ITS** are a means of optimizing existing capacity with minimum investment in expanding physical infrastructure. Progress in terms of implementing these systems in the region has been mixed. Brazil, Mexico, Colombia, Chile, and Argentina are among the countries that have seen the greatest progress, while in the Caribbean and other Central American countries, such as Nicaragua, the penetration of these technologies has been weaker.

3.76 **Electric vehicles.** There are currently several types of electric vehicles: Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), pure Battery Electric Vehicles (BEVs), and Fuel Cell Electric Vehicles (FCEVs). Frost and Sullivan (2015) estimate the share of these vehicles in auto industry sales in various Latin American countries, concluding that they could reach 2.5% of the overall market by 2023. The importance of these vehicles for the region lies in the opportunity to expand sustainable mobility alternatives in the face of a scenario of growing motorization or acquisition of private vehicles. Nonetheless, effective penetration of these vehicles in Latin America and the Caribbean faces several challenges. Firstly, sales prices for electric vehicles are higher than for those with internal combustion engines, and in countries such as Mexico, Argentina, Brazil, Chile, Colombia, and Peru, taxes generally impose an additional cost over and above the purchase price. The promotion of low-emission vehicle technologies should also be accompanied by demand management measures in order to avoid vehicle congestion problems and, potentially, disincentives to the use of public transportation.

3.77 Even with the positive outlook for electric vehicles, governments are responsible for the success of market penetration. Regulatory reforms (in the form of financial and...
nonfinancial incentives) could have a major impact, such as for example: (i) designating exclusive parking spaces for electric vehicles, with charging stations; (ii) regulating or harmonizing standards for charging devices; (iii) promoting initiatives (such as electric taxi pilot projects) to build awareness of the topic in cities; (iv) introducing dynamic pricing for charging vehicles, fostering optimum power use; and (v) introducing regulations to expand charging stations to shopping malls and other public spaces (Gómez Gélvez, Mojica, Kaul, and Isla, 2015).

3.78 **Transportation in collaborative economies.** The phenomenon of sharing productive assets is not a new concept for the transportation sector. In many cities throughout the region, such as Bogota, Colombia, excess road infrastructure capacity is used to create recreational spaces on public holidays, when the demand for road use by vehicles is lower. Nonetheless, the Internet, social networks, and technological advances have taken the use of excess capacity to another level. According to Robin Chase, founder of Zipcar, sharing platforms have joined companies and partners together, allowing the companies’ economies of scale to be combined with asset-sharing needs and the advantages thereof (making use of excess capacity) (Chase, 2015).

3.79 This trend towards platforms that address the intention to share productive assets is especially relevant in the region. According to the WEF (2015), a survey of online consumers (carried out by Nielsen) confirmed that 70% of those surveyed in Latin America were willing to share their own assets and 73% wanted to use the assets of others through collaborative economies.

3.80 **Mobility in shared economies is not new to the region.** According to the Urban Sustainability Group at Universidad de los Andes (2016), demand for one of these platforms has risen to 20,000 trips per day. Despite the regulatory difficulties faced by this innovative trend in the sector, people are opting to use it on an increasing scale as a solution to the high relative costs of having a vehicle (in terms of time, money, and space) (Grupo SUR, 2016).

3.81 **Transportation safety and shared economies.** Safety is a challenge that can be met through the innovation of shared mobility platforms. A study in Bogota, Colombia, confirmed that more than 300,000 shared mobility trips occurred in the first half of 2015, in areas and at times when accident rates are usually high due to alcohol consumption.

### IV. LESSONS FROM THE BANK’S EXPERIENCE IN THE SECTOR

#### A. Lessons learned from Project Completion Reports and Project Monitoring Reports

4.1 **Background.** As of July 2016, the IDB’s active sovereign-guaranteed loan portfolio in the transportation sector totaled US$12.993 billion. This portfolio consists mainly of interurban and rural highway projects, but also includes financing for urban mobility systems, airport and logistics infrastructure, and institutional strengthening programs.

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80 According to Chase (2015), excess capacity represents latent value in the case of a productive asset. In the case of vehicles, this asset can be left unused 95% of the time.
4.2 Project Completion Reports (PCRs) approved between 2014 and 2015 were analyzed with a view to identifying lessons learned. Similarly, findings and recommendations for 29 operations belonging to the Transport Division (TSP) were reported in Project Monitoring Reports (PMRs). The section below lists the lessons learned that were mentioned most often in these reports. As a complement to this, this document includes a number of lessons learned derived from analyses by sector specialists and other areas of the Bank that work in an integrated manner with TSP on projects in execution and preparation.

1. **Strategic lessons**

4.3 **Transition processes between administrations.** Infrastructure works and/or public transportation reform processes require execution periods that exceed the duration of a government’s term in office, often meaning that executing and coexecuting agencies experience ongoing leadership changes, reorganizations and shifts in their priorities.

4.4 To mitigate the impact that these changes of administration can have on the execution of a given program, it is recommended that the country’s policy-making processes be analyzed in order to evaluate the political sustainability of interventions and to provide executing units with the tools needed to coordinate transition processes with new administrations, thus ensuring continuity in the programs. In the design phase, an analysis of the main institutional processes should be carried out where possible, and institutional strengthening components should be included where necessary to support stability of the works. In addition, permanent interaction involving all participants is highly recommended for providing continuity in interventions (including stakeholders that play a more stable role within national agencies).

4.5 **Contracting and bidding processes.** Some projects reported delays and difficulties in preparing terms of reference and bidding documents, due to the fact that the scopes initially defined by the executing units were not aligned with the technical and environmental safeguards requirements and standards for Bank-financed projects. The recommendation drawn from the PMRs analyzed is to provide technical support to the executing agency team, with assistance from expert consultants in the topics or types of works to be tendered. In addition to providing experience in preparing bidding documents, these consultants help to build technical capacities in these units for the implementation of projects that are generally of high value and complex from an engineering standpoint throughout their entire lifecycle.

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4.6 **Execution of maintenance works.** Periodic and routine maintenance works are needed to ensure infrastructure sustainability. Accordingly, governments need to ensure continuity in these maintenance activities, concluding the relevant contracts and allocating sufficient resources to ensure that the works will last after the project has been finalized.

4.7 On the Bank’s side, the sustainability of road investments has been promoted as a requirement in loan operations. In addition, the Transport Division has prepared seminars, work sessions, regional dialogues, and other knowledge activities regarding this topic with the aim of highlighting the importance of asset management as a strategy for infrastructure sustainability and providing technical assistance to countries in implementing better maintenance arrangements. Experience has shown that technical assistance can replicate successful results on maintenance issues from one country to another. 82

4.8 In the case of performance-based maintenance, experience has demonstrated the importance of planning the actions necessary to achieve maintenance of a similar or higher quality to the performance levels already agreed, with the aim of avoiding higher maintenance costs.

4.9 It is important that maintenance activities be carried out, to the extent possible, using associated local labor with the necessary qualifications, and under the supervision of the municipio or local government.

4.10 **Beneficiary participation.** Interactions with beneficiary entities and communities should be ongoing. For example, surveys of perceptions regarding improvements in targeted roads, as well as the level of user satisfaction, facilitate an understanding of whether projects have attained their planned targets and outcomes. Similarly, clarity regarding the beneficiary population’s needs and realities allows initial cost estimates to be aligned with the real value.

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82 The example of performance-based contracts (CMC) under a single contractor (who is also responsible for the investment project in prior civil works in a segment of the total program) has proven to be successful where there has been an effort to provide technical assistance, which has also resulted in these models being replicated in operations in other countries needing to set up better maintenance arrangements. This type of contract reduces the possibility of budget fluctuations affecting road maintenance and creates incentives to contractors to adequately preinvest in maintenance.
Accordingly, it is advised that surveys be included as standard practice in sector projects, while ensuring that principles of inclusion and equality\(^{83}\) are observed therein, in accordance with Bank policies.

4.12 **Socioenvironmental risk management.** The satisfactory management of risks associated with the execution of transportation projects—particularly displacement of persons—has proven critical for mitigating the impact of such risks on the execution of works, which has also become a key characteristic of the IDB for its clients. Displacements related to the construction of infrastructure works are not unique to road-financing operations, but operational experience has demonstrated that they are of particular importance in this type of project. The legislation and implementation systems applicable to displacements in each jurisdiction need to be analyzed and, based on this information, decisions taken regarding how to manage the measures (for example, expropriations, either by the government or the private sector). The IDB Group, through its environmental and social safeguards teams, does difficult multisectoral work to prevent and mitigate adverse socioenvironmental impacts from operations.

4.13 **Information gathering systems. Monitoring and evaluation.** Problems have been reported in projects with respect to the implementation of monitoring systems and the attainment of results. Moreover, the introduction of indicators and the effective evaluation or estimation of project impact are hindered by the absence of solid data collection systems, the scarcity of financial and human resources, and executing units’ data analysis and processing capacities.

The introduction of institutional strengthening components in programs paves the way for the design of data collection and processing protocols, ensuring the consistency and quality of information. These improvements in data collection systems allow executing units to implement mechanisms for the monitoring and evaluation of direct project impacts.

4.15 **Policy-based loans (PBLs).** Experience in the sector has shown that these operations can be beneficial in all transportation subsectors (logistics, airport infrastructure, road infrastructure, among others), resulting in regulatory, institutional, and operational reforms in the countries, allowing for better sector planning and resource allocation. In addition, PBL operations have proven to be an opportunity to include crosscutting issues like support for private participation in infrastructure development. Some of the recommendations for these operations suggest that the ideal scenario is, to the extent possible, to structure hybrid loans that involve both institutional reforms and channeling investment in the framework of the operation. PBL operations structured in parts or stages can also be strategic as they can be better tailored to changes in government guidelines and enable reform conditions to be established or structured in a more dynamic manner.

2. **Technical lessons learned**

4.16 **Outdated designs, engineering studies, and budgets.** Designs, engineering studies, and established time frames for satisfactory project completion all need to

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\(^{83}\) As part of a strategy of gender equality in projects, greater opportunities should be provided for women to participate, with emphasis on ensuring that: (i) women’s opinions are sought as part of consultations in the design phase of works; (ii) women are taken into account in compensation payments for those affected by projects; and (iii) job creation opportunities are encouraged for women in nonconventional types of work.
be duly updated when the execution of works begins. Programs that have been subject to excessive delay in the period between the contract’s effective date and its final awarding and signature have had to adjust the technical details of the initial designs.

4.17 In the case of several projects, initial cost analyses have ended up being altered by adjustments to standards or volumes owing to technical problems or the execution of works not envisioned in the original design. In urban contexts especially, final costs may diverge from estimated costs as a result of traditional uncertainties in contexts that are already well-established. This underlines the importance of analyzing risk scenarios and uncertainties, and of including these analyses in project preparation and corresponding budget structures. It also reinforces the importance of having historical data on sector projects with different scopes, as a point of reference for comparisons and control.

Cost overrun manual for infrastructure projects

In 2016, TSP prepared a manual for estimating and monitoring the final cost of infrastructure programs. The objective of the manual is to provide public agencies, other multilateral institutions, and any other stakeholders with the tools needed to prepare more realistic budgets from the early stages of infrastructure programs.

The document was motivated by the fact that almost all infrastructure programs experience cost overruns compared to their initial budgets (according to Flyvbjerg, 9 out of 10 projects experience overruns).

The manual presents two approaches to estimating cost overruns. Firstly, it describes the contingency-driven variations method for estimating differences between executed and projected budgets. This methodology focuses more on reducing the subconscious cognitive biases of bidding firms between the different program phases (design, office-based budget, bidding, award, and program execution/construction), and on resolving data insufficiency problems. Estimations are generated using simulation techniques (e.g. Monte Carlo) to detect cost overrun probability functions for a given program.

Secondly, the manual includes a price variation approach for estimating the potential impact of price variations on a project. Based on historical data, the document proposes that price variations be estimated using autoregressive integrated moving average (ARIMA) models, transfer functions, or vector autoregression (VAR) models.

4.18 Complexity in program design. In the PMRs analyzed, various issues are mentioned that complicate design implementation, such as traffic management during the construction process (as in the rehabilitation of a roadway financed under operation BO-L1093, to mention one example); using new technologies such as hybrid or electric buses in integrated transportation systems; structuring public-private partnerships; securing the release of route easements; expropriations; and managing environmental and social impacts on communities where the main mitigation mechanism is the risk analysis that accompanies the design of all stages of operations, along with the due diligence processes carried out by the Bank in conjunction with the safeguards unit.

4.19 In loan operations for multiple works programs, due diligence and work by the Environmental Safeguard Unit have been useful and effective in avoiding risk factors
beyond those already contemplated. Additional projects that emerge in the framework of the approved operation tend to have the same characteristics and those in the representative sample.

4.20 At the same time, investigations by the Bank’s Office of Institutional Integrity in relation to Bank-financed programs in the transportation sector highlight the importance of strengthening the capacity of staff in executing agencies to conduct due diligence on bidding firms, and to monitor and supervise the construction of infrastructure works, with the objective of reducing the likelihood of contract rescission, cost overruns, or poor-quality work attributable to the contractors’ lack of financial or technical capacity.

3. Operational lessons learned

4.21 **Sector-specific technical capacity of the executing team.** This issue is frequently mentioned in the PMRs, and it affects the preparation of the technical documents needed for studies and bidding processes, as well as supervision of the works. Recommendations are to strengthen teams with expert consultants and to include institutional strengthening activities as part of the project.

4.22 **Budget allocations.** Some projects face the problem of annual budget allocations that are less than the amount necessary to meet physical and financial targets for the year. This raises the risk of delays in execution and, ultimately, extensions to the disbursement period. The recommendation derived from the PMRs is to work with government authorities to either increase allocations or establish more realistic physical progress benchmarks.

4.23 **Analysis of institutional capacities and skills.** It is critical that the institutional capacity analyses in all sector projects establish the minimum required professional skills base, so that key technical staff are involved in initial project conception and also in execution.

4.24 **Others.** Other issues mentioned in the findings and recommendations section of the PMRs include increases in budgets for the works; expenditure reimbursements; and non-IDB sources of finance. These should be addressed as central topics in the risk workshops that are held during the project preparation phase.

B. Results of the Development Effectiveness Matrix

4.25 The Bank approved 26 transportation operations in the period from January 2014 to August 2016, of which 77% were investment loans and the remaining 23% were policy-based loans. Of these, three operations were approved in 2016. The subsectors with the greatest weight in the pipeline are transportation network connectivity (which also includes main roads and road maintenance), institutional strengthening, urban transportation (which includes urban public transportation and transportation infrastructure), and rural roads. The annual trend in portfolio performance is similar, with a focus on transportation network connectivity in both 2014 and 2015. The projects show that a high level of evaluability has been maintained, as measured by the program rationale, economic analysis, and monitoring and evaluation components.

4.26 Economic analysis has traditionally been one of the most evaluable categories in transportation projects, due to the tendency to conduct benefit-cost evaluations in this type of intervention. In terms of impact evaluations, the division has been
working together with the Office of Strategic Planning and Development Effectiveness and relevant government bodies to design evaluations for different types of projects, from urban transportation projects to rural roads. These activities have entailed the preparation of workshops, presentations, and (in some cases) meetings with the private sector. Each project worked on is at a different stage of implementation—some already have questionnaires ready for baseline surveys and others are working with data that is already available. Some of these projects are receiving not only Bank financing, but also cofinancing from other multilateral banks, and this has allowed work to be coordinated with other relevant stakeholders in the sector. This represents a strategy for improving the evaluability of interventions, while also providing support for future operations in the sector.

4.27 The Development Effectiveness Matrices for the projects analyzed show that the interventions have a medium level of risk on average. The data also show that further progress is needed towards including crosscutting issues such as gender, the environment, and labor.

C. IDB Group lessons learned from private sector financing of infrastructure

4.28 Background. As of December 2015, the IDB Group’s active portfolio of non-sovereign guaranteed (NSG) loans in the transportation sector totaled US$998 million, with 21 clients and 23 projects. The active portfolio of syndicated (B) loans was US$464 million. Priority subsectors include (i) airports; (ii) canals; (iii) mass transit systems; (iv) ports; and (v) roads.

4.29 Lessons learned. Based on the exercise undertaken, lessons learned have been drawn from the business models that have been financed and from structuring and execution processes. The lessons learned from approved projects are as follows:

4.30 The difficulty of making precise long-term traffic projections is a significant risk that has affected some NSG road-financing operations. Road traffic projections can be based on GDP growth in an economy, given their high level of correlation. However, short-term GDP projections are constantly being revised and can skew demand estimates; it is therefore essential to strengthen medium- and long-term estimates. This difficulty has been observed in the great majority of operations, which show that traffic has differed in many cases from projected levels. Some projects have sought to mitigate this risk by using public sector guarantee mechanisms. For example, a public body can guarantee minimum concession revenues; in this case, the guarantee is triggered if effective traffic demand is lower than projected demand and revenue.

4.31 Operational experience shows that NSG operations benefit from the institutional management and dialogue that the IDB Group provides, through TSP, in the early design stages of transportation projects. Coordination between the IDB and the IIC in the area of public-private partnerships also supports the design of operations through clear risk allocations and bankable projects, and it helps to mitigate political risks in operations. The IDB Group’s

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84 Four impact evaluations are currently underway for projects approved in 2014 and 2015. TSP also has five operations under preparation that will include impact evaluations. The evaluations include the Lima Metro Lines 2 and 4 project and the Nicaragua Road Integration Program.

85 These lessons learned are based on interviews with the staff responsible for NSG operations in the Inter-American Investment Corporation (IIC).
ability to engage with the public sector is a source of value added in its work with the private sector in transportation infrastructure projects. In some cases, this engagement includes the opportunity to provide inputs at the regulatory development stage for private sector participation in transportation projects. This upstream work supports the development of contracts with clear and fair mechanisms for protecting the interests of all stakeholders, enhancing the likelihood that the loan and the project will be successful. Operational experience has shown that IDB Group participation in preparing bidding processes for transportation projects has added technical value and helped to ensure successful outcomes from the bidding processes themselves.

4.32 In some cases, this engagement has also helped in the management of political risks that have arisen, and has facilitated speedy and satisfactory resolution. In general, experience shows that in jurisdictions subject to political risk, it is important to be able to identify that risk and—to the extent possible—quantify it with support from the IDB.

4.33 The challenge of coordinating sovereign- and non-sovereign guaranteed transportation operations has been overcome where time and effort have been invested in organizing and motivating the teams on both sides. Based on operational experience, the following critical factors have been identified that have helped to ensure effective teamwork and create synergies between the sovereign-guaranteed and NSG areas: (i) the clear definition of team members' roles; (ii) the recognition that the work of each team member is critical for the operation; (iii) transparent information flow between team members; and (iv) opening clear lines of communication with IDB Group Management and with the client. Coordinated work between the sovereign-guaranteed and NSG areas has led to a better product and the enrichment of team members.

4.34 The quality of the authority granting the concession and that of private sponsors is a key determinant of success in transportation projects. In concession projects—particularly those involving PPPs—the existence of solid grantors and sponsors is critical. The grantor should be capable of managing concession agreements, PPP documentation, liabilities, and highly complex relationships. It should also have good corporate governance and be able to meet its contractual obligations, in addition to having demonstrated its ability to do so. Sponsors' capacities are equally critical and should be of the same level; they should also be sufficiently solvent to cope with contingencies without requiring support from the grantor. The technical quality, financial soundness, and ability of sponsors to manage issues that arise during construction (delays, cost overruns) and operation are all key to a project's success.

4.35 It has not been standard to use local currency in NSG transportation projects, but it has occurred in countries where this capacity exists. A lack of product flexibility has limited operational scope in the sector. In the case of most transportation projects in the region, revenues are in local currency. Where there is a currency mismatch between financing and revenues, hedging mechanisms need to be found that protect the project from currency fluctuations that increase costs. To mitigate this risk, the IIC is working to increase the availability of local currency financing in addition to that already available.
4.36 The IDB Group’s ability to mobilize resources in addition to its own has been a catalyst in certain jurisdictions and projects with limited access to international financing. A recent example of the IDB Group’s catalytic role in enabling projects through its syndication program is the Kingston Freeport Terminal Limited project in Jamaica. Under this project, the IIC, in addition to providing US$94 million in financing, mobilized US$141 million by leveraging funding from three multilateral institutions and three commercial entities.

4.37 Leveraging technical assistance has helped to mitigate risks in transportation operations. Many NSG transportation projects have benefited from technical cooperation operations supporting issues of environmental sustainability. In most cases, the recommendations prepared through these operations were incorporated into project design, helping to improve the latter and enhancing IDB Group additionality.

D. Lessons learned from reports by the Office of Evaluation and Oversight

4.38 The Office of Evaluation and Oversight (OVE) has completed three evaluations that identify lessons learned from Bank transportation projects. In 2016, it prepared the document “Urban Transport and Poverty: Mobility and Accessibility Effects of IDB-supported BRT Systems in Cali and Lima,” which analyzes the impact of BRT systems in the cities of Cali and Lima. Its purpose was to build upon a 2015 OVE evaluation of BRT systems in Lima, Cali, and Montevideo (Comparative Case Studies of Three IDB-supported Urban Transport Projects, document RE-454-1).

4.39 The 2016 OVE report presents certain findings that should be taken into account in the design and operation of BRT systems under future Bank-financed operations, for example: (i) expanding spatial coverage and optimizing the integration and quality of trunk, feeder, and supplementary lines; (ii) further developing policies and strategies for targeting subsidies towards low-income users (consistent with the challenges mentioned in paragraph 3.16); (iii) exploring mechanisms that facilitate dialogue and reinforce coordination among stakeholders and in planning institutions; and (iv) supporting mechanisms aimed at strengthening the technical capacity of public transportation authorities, so as to ensure greater general effectiveness.

4.40 The evaluation of specific BRT systems in Lima, Cali, and Montevideo (OVE, 2015) was the first to analyze IDB support for these projects. The document highlights, in general terms, difficulties in obtaining expected benefits due to design deficiencies; risks related to the implementation of complementary measures to support infrastructure investments (PPP contracts, pedestrian planning, and bus decommissioning programs, etc.); and obstacles encountered in achieving environmental objectives and financial stability.

4.41 Similarly, in 2014, OVE produced the report “Climate Change at the IDB: Building Resilience and Reducing Emissions” (OVE, 2014), which analyzed Bank interventions in the transportation, energy, and resource management sector from a climate change perspective. In this evaluation, OVE examined Bank interventions with potential benefits for climate change, in terms of both mitigation and adaptation. Regarding mitigation, the document underlines the fact that urban transportation projects in support of BRT systems have resulted in reductions in GHG emissions, even though they have fallen short of their full potential due to weaknesses in complementary policy measures. The OVE evaluation emphasizes that even though
road projects have also led to reductions in emissions compared to those that would otherwise have occurred, initial projections for reductions may be excessively optimistic in cases where project designers have underestimated induced demand or the possible implications of deforestation.

4.42 In terms of results in the area of climate change adaptation, Bank intervention in the sector is incipient.\(^{86}\) Adaptation strategies in the transportation sector may be separated into three main categories: (i) those seeking to identify risks and vulnerabilities; (ii) those that aim to protect and strengthen vulnerable infrastructure; and (iii) those with the objective of creating other means of improving the resilience of the transportation system. However, the work done in this area is still limited and the OVE evaluation indicates that the Bank needs to explore innovative ways of integrating risks and opportunities in activities to promote adaptation as part of infrastructure development.

E. IDB experiences in generating sector knowledge and other value-added activities

4.43 The following are a number of the activities developed under the umbrella of the dimensions of success included in the 2014 transportation sector framework.

1. Road safety

4.44 With a view to improving safety levels in transportation systems, the Bank worked alongside eight multilateral banks to develop road safety guidelines that establish the type of road safety intervention to be carried out in transportation projects. Road safety indicators were also created.

4.45 Road safety assessments were prepared for 25 countries in the region with the objective of supporting the design and preparation of operations incorporating road safety components. In addition, the Bank completed a report highlighting the problem of traffic accidents involving children in the region and best practices in the use of child restraint systems. Similarly, a study was undertaken in partnership with the Spanish Road Association in which 109 successful experiences with road safety practices in the region were cataloged. Based on this, four reports were prepared connecting these experiences to four essential elements of road safety: human, vehicle, infrastructure, and legal/institutional.

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\(^{86}\) One example of efforts to support climate change adaptation (at the institutional level) is the experience of technical assistance operation ES-T1194. Under this operation, the Bank has worked with the Ministry of Public Works, Transportation, Housing, and Urban Development to develop climate vulnerability indicators for public infrastructure. The intention is to implement the outputs of this assistance on a larger scale in the country, and to use them as core inputs for the modification and/or updating of existing regulations in this area.
2. Logistics

In the area of freight logistics, the Bank has prepared knowledge products that have helped to move the development of national logistics plans and national agendas forward, as well as supporting national institutional development and public policy tools. National logistics plans were prepared for Panama, Costa Rica, Honduras, Guatemala, and the Dominican Republic, and are underway for El Salvador and Belize. The portal for the logistics observatory was further developed and an annual statistical report on freight logistics was published. The latter compiles and harmonizes data from public sources and includes statistical estimates of relevance to the logistics sector. The indicators developed for the statistical report include road, rail, air, inland waterway, and maritime transportation, as well as other general indicators, with the objective of supporting the creation of efficient logistics networks and multimodal networks that help to improve the competitiveness and trade capacities of countries in the region. In 2015, additionally, the Bank developed a logistics manual that addresses logistics issues from a theoretical, practical, and operational standpoint.

3. Sustainability

The IDB has sought to provide its transportation specialists with useful tools for evaluating the inclusion of sustainable transportation and urban mobility in their projects. This includes the review, implementation, and development of a system for evaluating project sustainability based on the Asian Development Bank’s STAR rating system, which seeks to generate economic, social, environmental, and risk indicators for facilitating objective assessments of sustainability in transportation projects. This evaluation methodology was implemented on a pilot basis across half of the project portfolio in 2013. The results showed that BRT projects achieved higher scores on environmental and social criteria, while road projects achieved higher scores in relation to economic indicators. The long-term objective is to use...
this type of tool\textsuperscript{87} across the board for evaluation purposes during the preparation phase of transportation operations.

4.48 TSP has published a manual for promoting bicycle use in Latin America and the Caribbean, with the aim of developing useful knowledge for the sector. It is hoped that this manual will serve as a point of reference for cities in need of guidelines for promoting cycling-inclusive policies that encourage the use of bicycles as a means of urban transportation. A document has been prepared to provide details of the methodology used by TSP to address the challenges that climate change presents for the transportation sector; this document will be published in 2016.

4. Intelligent transportation systems (ITS)

4.49 With a view to promoting the use of ITS, TSP has worked together with the Competitiveness and Innovation Division (CTI) to create a regional Observatory on ITS that collects information on the status of ITS in the region.

4.50 In terms of support for projects in the region, TSP approved several operations containing ITS elements. These include PE-L1147 (which included control and information systems for the Lima Metro); BO-L1095 (toll systems and weigh stations and mechanisms for communication between them); BR-L1333 (provided resources for Fortaleza’s Sustainable Urban Mobility Plan, including components to support definition of the mobility problem, analysis of the most suitable technologies for implementation, and the design and projection of ITS architecture); and UR-L1087 (the components of which finance real-time control technologies and the administration thereof).

5. Regional integration

4.51 The Infrastructure Integration Group (IIG) has promoted and participated in activities that foster dialogue with and between national and regional counterparts. These activities have focused on: (i) administering Bank support for important regional integration initiatives; (ii) disseminating information regarding integration; and (iii) identifying potential infrastructure integration interventions. The IIG administers IDB technical and financial support for the Initiative for the Integration of South American Regional Infrastructure (IIRSA)—one of the largest infrastructure integration initiatives in the region.\textsuperscript{88} The IDB performs a dual role within IIRSA: (i) it is part of the Technical Coordination Committee; and (ii) independent of this, it places financial, technical, and human resources at the service of the countries to support the preparation and development of regional integration projects, such as nonreimbursable technical cooperation funds.

4.52 Some of the most notable results of IIRSA include: an indicative spatial planning methodology for South America, which helps to identify the regional synergies of projects in each country and position them throughout the territory; an integration

\textsuperscript{87} Other tools used by the IDB for environmental evaluation include: INVEST (by the U.S. Department of Transportation) for analyzing project sustainability in Paraguay, and ENVISION in the Rodoanel project in São Paulo, Brazil.

\textsuperscript{88} Since 2009, IIRSA has been attached to the Union of South American Nations (USAN) through its South American Infrastructure and Planning Council (COSIPLAN). The IDB’s contribution to IIRSA has been differentiated by the knowledge it has imparted along with its project financing, as well as its role as honest broker and consensus-builder in the dialogue between countries.
portfolio made up of 581 projects valued at US$187 billion (of which 22% have been completed and 30% are under execution); and the identification of a Priority Agenda for Integration Projects (API, made up of 31 structured projects for a total of US$20 billion) and a Regional Management System (SIGE). The Bank has also promoted flexible institutional frameworks grounded in technical criteria, with support for subregional initiatives such as border-crossing studies, navigability studies, and bi-oceanic corridors. IDB support under IIRSA includes participation in the funding of 36 projects for a total of more than US$11 billion; creation of the Fund for the Financing of Technical Cooperation for Initiatives for Regional Infrastructure Integration (FIRII) (through which financing has been provided for 25 technical cooperation operations totaling more than US$21 million); financing and development of specific regional methodologies; and more targeted studies to support the design and implementation of complex regional projects such as border crossings between Argentina and Chile, and the Agua Negra binational trans-Andean tunnel.

4.53 Various knowledge products have been prepared through the IIG to promote logistics-based regional integration. These include a practical guide to freight logistics, a manual covering the regulation and economics of air transportation, a desk study of transportation and integration in Haiti, and a study regarding the modernization of land border crossings.

4.54 Technical cooperation operations have also been designed to facilitate entry into national and regional productive markets, as well as public, economic, and social services. Examples include a Study of the Management Control System for the Cristo Redentor Border Crossing, Support for the Preparation and Implementation of Air Transport Projects in Latin America and the Caribbean, and Increasing Maritime Trade and Transport Efficiency and Connectivity in the Caribbean.
**Mesoamerican Integration and Development Project**

The Mesoamerican Integration and Development Project (or Mesoamerica Project) is a mechanism established by the Mesoamerican countries to facilitate the design, financing, and execution of regional integration projects in the areas of infrastructure, connectivity, and social development. It was established in 2001 under the name Puebla-Panama Plan, and it facilitates the management and execution of projects aimed at improving the quality of life in 10 countries in the region: Belize, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, and the Dominican Republic.

In the transportation sector, the Mesoamerica Project seeks to further an agenda that includes all modes in an integrated manner (road, rail, maritime, air, inland waterway), thus facilitating operational and commercial combinations between them and optimizing the quality of services and logistics costs.

**Evolution of the vision for the transportation sector in the context of the Mesoamerica Project**

Within the framework of the transportation sector in the Mesoamerica Project, the Bank’s most noteworthy activities have involved technical and financial support, which have helped to define and prioritize key initiatives in the sector: the initiative to accelerate the Pacific Corridor (investments totaling US$948 million); prefeasibility studies for border crossings in the corridor (the basis for the current Border Management Program); regional freight and trade logistics studies for Mesoamerica (which have given rise to National Freight Logistics Plans); national observatories and the Regional Freight Logistics Observatory; initiatives to promote multimodal transportation; climate change adaptation and mitigation programs for regional infrastructure; and technical inputs for the preparation of regional regulations and technical manuals (harmonization of the weights and dimensions system, transportation safety).

In the Northern Triangle countries (Guatemala, Honduras, and El Salvador), the Bank has committed to support the design and development of logistics corridors as a central component of the production pillar in a plan aimed at fostering social and economic development in the most disadvantaged areas of these countries.

4.55 It should be noted that the Bank is supporting development of a Framework Policy on Regional Mobility and Logistics (as mandated by the presidents at the summit of the Central American Integration System, SICA). Actions related to this policy will be laid out in a regional investment plan that will allow a prioritized portfolio to be determined and agreed between the countries, based on the main regional logistics corridors.

4.56 In relation to the Caribbean region, the Bank has reaffirmed its commitment to the objectives of regional integration and economic growth. In 2014, the Caribbean Strategic Agenda on Integration (SAI) was approved. This is a regional programming document that combines simultaneous actions with respect to the software (regulatory frameworks) and hardware (physical infrastructure) of integration, as well as promoting coherence between national and regional interventions. The objective
of the SAI is to support the Caribbean countries in identifying a portfolio of projects in the main thematic areas of regional integration. The SAI identifies and proposes four key sectors in which the Caribbean countries and the Bank can expand operational collaboration in support of economic integration in the region: (i) trade, (ii) tourism, (iii) energy, and (iv) transportation. In the transportation sector, specifically, three lines of action are prioritized: (i) improving the quality and connectivity of air and maritime transportation infrastructure, as well as its operational efficiency, with a view to improving the distribution and flow of goods and passengers; (ii) incorporating information and communication technologies into practices in airports and ports, in order to improve efficiency in transportation operations; and (iii) consolidating the physical connection of the Guiana Shield axis to strengthen transportation links that facilitate trade flows between Guyana, Suriname, Brazil, and Venezuela.

4.57 The SAI has been very useful for guiding discussions between the Bank and Caribbean national governments regarding strategy and programming in the area of integration, promoting greater ownership of challenges related to integration and fostering communication and collaboration at the regional level. The SAI has also been a critical input in terms of orienting the preparation of country strategies in Jamaica, Suriname, and Trinidad and Tobago.

6. Sector institutions

4.58 Since early 2015, the Bank has been conducting research into the relationship between institutional characteristics in the road sector and the performance of that sector. The first stage is focused on gathering data regarding performance indicators and relevant institutional characteristics in 10 countries in the region: Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Panama, Paraguay, Peru, and Uruguay. The results of this research will be published over the course of 2016 and 2017.

7. Gender

4.59 The inclusion of a gender perspective in transportation has been considerably strengthened over the last three years and has been established as a priority in Bank interventions in the sector. To this end, an internal working group was created in TSP to focus on these issues, with the ongoing participation of the Gender and Diversity Division (GDI). The work began with the implementation in 2015 of three pilot projects with a substantial gender focus. Since then, the working group has endeavored to identify potential opportunities for including gender components in operations at an early stage of project development. The importance of this topic was also identified as a priority by transportation specialists during the 2015 Transportation Week, an event in which discussions primarily addressed the relationship between gender and transportation (IDB, 2015). This approach will also be the foundation for expanding the concept of inclusive transportation, in the framework of transportation operations. This includes attention to measures for universal mobility, which allows better access for persons with a disability, seniors, and others.

89 The activities carried out in collaboration with GDI are another way to bolster the effectiveness of the Division's multisector initiatives.
Gender and transportation: Implementing the gender perspective in transportation interventions

In 2015, TSP designed three pilot projects to promote the participation and hiring of women for heavy machinery operation and other nontraditional positions in the transportation sector. To achieve this objective, the IDB—in collaboration with the Governments of Bolivia, Nicaragua, and Paraguay—is supporting the training of women in these activities under the umbrella of three loan operations approved in 2015. Once the women have been trained, the IDB will finance apprenticeship programs in construction companies so that the women can put their new skills into practice, gain experience in the sector, and improve their chances of securing long-term work. As a result of this training, more than 50 women are expected to benefit under the pilots, and the industry is expected to show greater openness to the participation of women in nontraditional positions in the long term.

4.60 Given the difficulty of obtaining data and knowledge regarding gender and transportation, and as a complement to loan operations, technical cooperation operations are being executed that will provide key information about the role and perspectives of women, both as users and as part of the labor force in the sector.90 In addition, a regional public good is being launched to provide a platform for the exchange of gender knowledge, experiences, and practices between TSP and its government counterparts in four cities in the region. The objective is for the counterparts to take ownership of this topic, thus facilitating its inclusion in transportation projects.

4.61 Prioritization of the sector focus. Given the Bank’s experience in the sector and the interventions that add value, less emphasis will be placed on types of projects the countries promote autonomously and very efficiently, or in which the private sector in the country shows optimal execution capacity. Specifically, there will be less emphasis on projects like inter-urban passenger transportation where generally efficient, competitive markets for service delivery are being developed and on road infrastructure interventions that do not include maintenance components. In addition, as part of the interventions involving private participation, the Bank will not promote the structuring of investment projects where the level of sophistication of regulatory and institutional frameworks represents a risk for the sustainability of the investments, or where regulation does not adequately distribute risk between public and private actors.

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90 A technical cooperation operation relating to safe transportation has been prepared, the aim of which is to improve women’s access to safety information, as well as their participation in early warning systems for system faults. The results of another technical cooperation operation in the area of gender encompass an assessment of the role of women in the sector value chain, an analysis of the costs and benefits of including gender in transportation (both perspectives), and the consolidation of mechanisms to promote the gender perspective in the sector.
V. TARGETS, PRINCIPLES, DIMENSIONS OF SUCCESS, AND LINES OF ACTION THAT WILL GUIDE THE BANK’S OPERATIONAL AND RESEARCH ACTIVITIES

A. Target and principles of the Bank’s work in the transportation sector

5.1 Given the importance and effectiveness of transportation as a means of development (Sections II and III), the overall goal will be to improve accessibility\footnote{Improvements in accessibility refer to better opportunities for reaching destinations that are highly valued by individuals or economic stakeholders: jobs, recreation, health, education, etc. This term involves placing a value on time and the cost of travel (Brookings, 2016).} in the region by means of inclusive, safe, sustainable, efficient, and competitive transportation. Sector interventions will be governed by four principles:

(i) **Principle of accessibility and inclusion:** In recognition of the role of transportation infrastructure as a vehicle for social transformation and economic growth, all interventions in the sector will seek to enhance communities’ access to centers of economic activity, health and education services, and employment and technology adoption opportunities. Efforts will be made to ensure that interventions create opportunities for isolated communities in particular, and support their quality of life.

In addition, interventions will approach gender equality from two perspectives—the first involving women as users of transportation systems, and the second focusing on them as part of the sector labor force (from the design phase through to execution of the operation).

(ii) **Principle of safe transportation:** As a general and crosscutting principle in all interventions, the Bank will seek to strengthen safety in transportation systems/networks and complementary services. The transportation safety approach will encompass not only safety in road transportation (in urban, interurban, and rural contexts), but also safety in logistics transportation and other modes (such as, for example, security in airports, border crossings, rail transportation, etc.).

(iii) **Principle of sustainability:** Transportation interventions will be compatible with climate-resilient development and low greenhouse gas emissions, with a view to maintaining world temperature increases below $2^\circ$C compared to preindustrial levels (as established in the Paris Agreement). Support will be strengthened for transportation projects that are aligned with the countries’ Intended Nationally-Determined Contributions, including projects with components to support new technologies for more efficient public transportation systems; the consolidation of integrated mobility systems; rehabilitation and construction of rail- and inland waterway-based freight transportation networks; interurban transportation; and policies to encourage the use of public transportation. This update places special emphasis on strengthening adaptation measures in the sector, creating infrastructure that is more resilient to hydroclimatic anomalies, with the objective of creating more reliable transportation networks and services. To this end, support will be reinforced for investment, regional...
dialogue, institutional support, and knowledge generation in the area of climate change adaptation.

As part of the principle of sustainability, the projects that result from sector operations will include asset management as a critical component for ensuring their economic sustainability. Lessons learned, international experiences, and best practices in the area of conservation will all be incorporated.

(iv) **Principle of efficiency and competitiveness:** sector interventions will foster infrastructure development with efficient services that promote productivity gains in Latin America and the Caribbean and foster regional integration and competitiveness.

5.2 At the same time, the heterogeneity of fiscal conditions and investment needs among borrowing member countries will be taken into account. It is also understood that some countries (Colombia, Brazil, Chile, Mexico, and Peru) already have significant experience in relation to private participation in infrastructure financing, while the other countries require regulatory support to encourage private investment in transportation. Accordingly, the emphasis in countries with greater experience with PPPs will be on strengthening private participation within a comprehensive vision that includes institutional strengthening and the structuring of projects in cooperation with the private sector (upstream and downstream approaches, respectively). In the other countries, priority will be placed on interventions with greater emphasis on institutional and regulatory development (upstream approach).

5.3 From an institutional perspective through to a fully operational one, innovative approaches will also be used in the sector. These may encompass the use of ITS applications; new technologies for public transportation; the promotion of intermodality in the transportation of people and freight; and institutional support for policies and regulations governing the use of technologies and innovation in the sector. Information regarding internal experiences will also be gathered systematically, with emphasis on the results achieved, difficulties in project execution, and lessons learned. This will allow a set of best practices to be compiled, providing the Bank with a foundation for continuous improvement of its sector actions in the region.

5.4 Given the heterogeneity of transportation issues in the different countries of the region and the different macroeconomic scenarios that they face, interventions will be tailored to the specific needs of each one, consistent with their context and the characteristics of beneficiary groups.

5.5 In response to the limited availability of rigorous data for the transportation sector in the countries of the region, the Bank will make efforts to improve the availability of information while also advancing the development of ex post socioeconomic evaluation methodologies, including quasi-experimental studies or impact evaluations. Evaluation methodologies will include those effects on targeted

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92 This approach does not exclude structuring key projects in collaboration with the private sector where these are based on good practices and can demonstrate the benefits of private participation; this would also serve as a foundation for regulatory strengthening surrounding PPPs in these countries.
populations that can subsequently help to justify and align future operations in accordance with development challenges and crosscutting areas, such as those set out in the Update to the Institutional Strategy.

5.6 Interventions in the sector will also employ a multisectoral approach. Operations and interventions with transportation-related components (urban motorized/nonmotorized transportation, interurban, logistics, investments to improve complementary services or even institutional strengthening) may draw on the guidelines set out in this Sector Framework Document and may also rely on the support of TSP. The objective of multisectoral work is to meet needs for comprehensive programs, particularly in the case of rural and isolated locations and for small countries.

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

1. Dimension of success 1. The countries of Latin America and the Caribbean continue to consolidate improvements to the coverage, capacity, quality, and connectivity of infrastructure and associated transportation services

5.7 The Bank will support efforts to improve accessibility and connectivity, reduce the generalized costs of transportation, and enhance the productivity and competitiveness of national economies. By enhancing the accessibility of markets and services, particularly for isolated communities, support will be provided for efforts to reduce poverty and enhance equity. The Bank will also promote the inclusion of climate change adaptation criteria in the design, construction, and management of transportation infrastructure.

5.8 Lines of action. Lines of action will include: (i) expanding the coverage of transportation networks (mainly the network of trunk and secondary roads); (ii) boosting connectivity between isolated communities, rural areas, production centers, areas of commercial exchange, and cities; (iii) expanding the capacity and improving the quality of road, port, airport, and rail transportation networks and associated transportation services (with emphasis on infrastructure with problems of congestion due to excess demand or with strategic impact for regional development and integration); (iv) supporting the adequate rehabilitation and maintenance of road systems and other degraded infrastructure, with a view to regaining operational capacity; (v) improving the resilience of infrastructure to natural phenomena and the effects of climate change; and (vi) improving the safety of transportation systems, including vehicle safety standards.

5.9 The following operational and knowledge activities are proposed, to achieve these lines of action:

(a) Operational activities. Activities will include: (i) investment programs for the development of transportation infrastructure and associated services with

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93 Some priority dimensions for evaluations (particularly impact evaluations) cover poverty, resilience and environment, productivity, and gender equality. There are few impact evaluations in the sector because they are expensive and also because it is hard to implement the methodology, given the difficulty having counterfactual scenarios that are representative given project characteristics (treatment selection is not random; selecting a control group can sometimes be difficult).

94 Includes global credit operations with transportation components.
either public financing and/or private sector participation, particularly in areas with accessibility, connectivity, or congestion problems and/or that are linked to strategic production chains; (ii) investment programs for the rehabilitation of road systems, ensuring full utilization of existing assets; (iii) promotion of maintenance mechanisms that prolong infrastructure service life (for example, through contract modalities that align incentives with results, such as performance-based maintenance contracts and maintenance planning and monitoring systems); (iv) structuring operations with mitigation and adaptation components, with particular emphasis on adaptation and, therefore, incorporating climate vulnerability criteria and scenarios in infrastructure design and construction (seeking to reinforce resilience to climate change-induced hydroclimatic anomalies); (v) promote regional dialogue on climate change adaptation; (vi) investments in projects with components on transportation safety, promoting transportation safety strategies, and evaluating vehicle safety standards; and (vii) projects that optimize freight transportation services and national–regional logistical performance.

(b) Knowledge activities. Activities will include: (i) impact evaluations that take into account the factors described in paragraph 5.5, and evaluations of the macroeconomic (GDP growth, exports, job creation, fiscal etc.) and/or microeconomic (e.g. impact on logistics costs, travel times, speeds, etc.) benefits of investments in national and/or regional logistics corridors; (ii) studies to prioritize investments in transportation networks and priority national and/or regional logistics corridors; (iii) studies concerning climate vulnerability and the consolidation of best practices and recommendations for adapting infrastructure to climate change; (iv) transportation safety strategies; (v) analysis of opportunities for private participation in infrastructure financing mechanisms; (vi) analysis of strategies to reduce transportation and logistics costs; (vii) analysis of the feasibility of using ITS and other innovative applications in projects; (viii) consolidation of the Bank’s experiences in developing transportation infrastructure projects (including issues of gender, transportation safety, etc.); (ix) consolidation of experiences and good practices as an input into regional dialogue and positioning in the area of road infrastructure asset management; and (x) development of national and/or regional logistics platform systems.

2. Dimension of success 2. The region is making progress in the development of accessible, efficient, and safe urban transportation systems, and is also promoting mitigation and adaptation measures as a strategy for sustainability.

5.10 Urban transportation projects will be implemented in cities as part of a strategy of planned, sustainable, and inclusive spatial development. Interventions will facilitate connectivity and will improve access for disadvantaged population groups, leading to better access to labor markets and health and education services.

5.11 The Bank will promote collective public transportation and foster climate change mitigation through the streamlining of services, fuel savings, energy efficiency, and reductions in pollution. Interventions will be planned in close coordination with aspects of urban planning (particularly regulations governing land use) so as to facilitate planned urban expansion and maximize use of the systems developed.
5.12 **Lines of action.** Lines of action will include: (i) developing urban mass transit systems (BRT, metro, etc.) with the objective of providing improved and expanded opportunities for accessibility; (ii) supporting the implementation of measures that improve mobility for persons with a disability and/or seniors, together with measures that promote gender equality for inclusive mobility; (iii) improving road systems in cities, implementing projects to support efficient demand management; (iv) integrating interventions with other public organizations (particularly in relation to spatial planning), and performing the functions of technical, operational, and economic regulation of urban transportation; (v) promoting formal multimodal integration in urban transportation; (vi) promoting comprehensive safety in transportation in urban contexts (including safety in vehicle standards); and (vii) promoting energy efficiency, clean technologies, nonmotorized transportation, and more efficient designs as sustainability measures in urban transportation.

5.13 The following operational and knowledge activities are proposed, to achieve these lines of action:

(a) **Operational activities.** Activities will include: (i) the streamlining, construction, renovation, rehabilitation, reorganization, expansion, and maintenance of urban transportation systems; (ii) the construction, rehabilitation, and maintenance of urban infrastructure, including roads, bicycle routes, and pedestrian infrastructure; (iii) the consolidation of urban transportation plans in coordination with spatial planning, regional dialogue on urban planning, and technical assistance in urban transportation programs; (iv) the development of public mass transit projects coordinated with spatial plans; (v) analysis and preparation of plans and projects that integrate modes of transportation with formal mobility programs; (vi) the development of initiatives, project components, and assistance in areas related to transportation safety, including support for systematic evaluation of vehicle safety standards; (vii) the incorporation of components in operations, development of initiatives, and other activities regarding inclusive transportation (gender equality and inclusive transportation for persons with a disability and seniors); and (viii) the development of interventions to support multimodality and nonmotorized transportation.

(b) **Knowledge activities.** Activities will include: (i) ex post analysis of urban projects, including impact evaluations that measure changes in accessibility, gains in system efficiency (including positive environmental effects), and other socioeconomic impacts relevant to alignment with the Updated Institutional Strategy; (ii) analysis and recommendations to improve the accessibility of transportation services for the most vulnerable populations, including persons with a disability, seniors, the indigenous and Afrodescendant communities, and gender equality considerations; (iii) evaluation of the effects that informal services have on the mobility of low-income populations and analysis of potential policies for having greater formal integration of means of transportation; and (iv) a compilation of Bank experiences in both motorized/nonmotorized urban transportation interventions and the coordination of projects with spatial planning.
3. **Dimension of success 3. The region has efficient logistics systems** that allow deeper regional integration and improved competitiveness

5.14 Logistics interventions will be aimed at promoting transportation infrastructure and services of a multimodal nature, focused on value chains and promoting productivity and competitiveness in productive sectors in the countries of the region.

5.15 Support will be provided for practices, programs, and technologies that reduce logistics costs in the countries, as well as policy, regulatory, and institutional frameworks with the same objective. In particular, the Bank will start from a perspective of integration and complementarity between modes of transportation, with a substantial focus on associated regulatory frameworks that can boost private sector participation and promote investment to improve the efficiency and sophistication of national-regional logistics corridors and hubs.

5.16 **Lines of action.** Lines of action will include: (i) improving physical infrastructure, particularly known bottlenecks in logistics networks (such as intermodal hubs, and border crossings—land, maritime, and air—based on the concept of coordinated border management; (ii) developing strategies to urban logistics more efficient; (iii) developing efficient logistics services, including services focused on the coordinated relationship between port areas and the related municipalities or hinterlands, to promote multimodal integration; (iv) developing sector institutional capacity for the management and coordination of agencies involved in logistics; (v) supporting the implementation of climate change adaptation strategies; (vi) modernization and harmonization of national and regional frameworks for freight transportation and associated regulations; and (vii) addressing needs for infrastructure and associated services to enhance the efficient and safe flow of goods and people at the intraregional and international levels.

5.17 The following operational and knowledge activities are proposed, to achieve these lines of action:

(a) **Operational activities.** Activities will include: (i) investments in specific infrastructure for priority national and regional logistics corridors that constitute bottlenecks to logistics chains in nonurban areas (including interventions in ports, port access, multimodal transfer hubs, road stretches that complete connectivity, and logistics platforms); (ii) programs supporting the development of effective, efficient, and competitive transportation services that promote improved competitiveness in those economic sectors that are most dependent on logistics networks and services for intra-regional and extra-regional trade (this includes regulatory reforms and investments); (iii) interventions in urban logistics, including action plans, policy recommendations to improve the efficiency of urban freight transportation, and projects that promote better urban freight transportation systems (these may include intermediate intermodal transfer stations and passenger and cargo terminals in cities); (iv) interventions to promote the inclusion of climate change adaptation criteria in logistics infrastructure (including investment in projects with adaptation.

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95 Logistics systems refer to infrastructure and complementary services.

96 The interventions will encompass logistics related to port, airport, and rail facilities, as well as urban freight transportation.
components) and dialogue and the dissemination of regional knowledge regarding recommendations for creating resilient logistics infrastructure; (v) support for improvements in national and regional policy and regulatory frameworks in the area of logistics and multimodal transportation; (vi) the provision of infrastructure and services that facilitate integration; and (vii) interventions to enhance transportation safety.

(b) Knowledge activities. Activities will include: (i) data collection and the development of surveys regarding freight logistics in urban, interurban, and regional contexts and with a modal approach (this will provide continuity to information platforms such as the regional and Mesoamerican freight logistics observatory, as well as tools to measure impacts on the logistics performance of corridors); (ii) studies of logistics performance in the countries (with emphasis on the analysis of logistics costs as a share of value added in goods) and of the performance of logistics networks with private sector participation; (iii) the design of data analysis techniques (national logistics costs, calculation of emissions from urban freight distribution, analytical models for logistics corridors, and estimates of the impacts of urban congestion on logistics chains for goods); (iv) the development of national logistics plans and support for the development of national institutions and public policy tools; (v) regional studies projecting trade and freight logistics flows, and multicriteria analysis for the development of prioritized investment plans (prioritization based on value chains that are important for competitiveness) and plans for the localization of logistics platforms (including analysis of the feasibility of providing incentives for effective private sector participation in logistics initiatives using different public-private partnership arrangements); and (vi) studies of the benefits of investments in logistics corridors in terms of economic growth, exports, imports, intraregional trade, job creation, etc.

4. Dimension of success 4. Countries continue to strengthen their institutions and regulatory frameworks in the sector, while also promoting alternative and innovative financing mechanisms

5.18 Transportation interventions will support the strengthening of public entities in the countries, improving public policy design, recommending practices to enhance the efficiency of institutions and public spending, and promoting greater coordination between institutions with the objective of improving transportation provision as a public service or good. More specifically, and to address other sector challenges, support will be provided for data collection by the countries; formalization of transportation systems; regulatory strengthening for the management and maintenance of infrastructure assets; the consolidation of regulatory frameworks governing private participation in the sector (this institutional approach will be emphasized to a greater extent in countries with little experience with PPPs); and the definition of plans, regulatory frameworks, or strategies for contributing to climate change mitigation and adaptation at the sector level.

5.19 Lines of action. Lines of action will include: (i) supporting the consolidation of transportation in public agencies (institutional strengthening for efficiency, transparency, and interaction with citizens); (ii) consolidating sector information and data to strengthen policy design; and (iii) addressing regulatory and planning needs
for fostering private participation in infrastructure. This line will focus more on institutional strengthening in countries with [less] mature PPP regulatory frameworks, while adopting a more operational approach (through specific projects) in countries with regulatory frameworks that are already well developed; (iv) encouraging innovative financing mechanisms (new payment sources, etc.); strengthening expenditure efficiency measures in infrastructure; (v) addressing other, specific regulatory needs such as informality in transportation; and (vi) strengthening institutional vision in the sector regarding climate change.

5.20 The following operational and knowledge activities are proposed, to achieve these lines of action:

(a) **Operational activities.** Activities will include: (i) sector policy-based loans that foster improved efficiency in sector institutions and greater competitiveness in productive sectors through transportation infrastructure; (ii) encouraging the development of required institutional arrangements and including management components in financed projects to ensure optimum benefit from road assets throughout their entire useful life; (iii) supporting data collection and ex post project evaluations; (iv) supporting the development of national adaptation plans and analysis of the climatic vulnerability of infrastructure; (v) providing technical assistance to strengthen regulatory guidelines for transportation systems in different cities in the region; (vi) promoting the creation of institutional and regulatory frameworks for private participation in infrastructure development, particularly in countries with little experience in PPPs (upstream approach to PPPs) and at the subnational level. In the case of countries with more advanced institutional regulatory frameworks, the approach will emphasize support for prioritizing and structuring projects, and also participation in financing those projects together with the private sector (downstream approach). Support will also be provided in the different countries for strengthening planning processes to include both clear criteria defining private participation and fiscal and financial aspects (such as contingent liabilities, future commitments, etc.); (vii) fostering innovative financing strategies, recognizing the importance of seeking sources of payment for the projects; and (viii) support for the design of plans to ensure optimum compliance in project development, through contract strategies, procurement and maintenance policies, regional dialogues, and the strengthening of public agencies responsible for contracts and procurement in transportation infrastructure projects.

(b) **Knowledge activities.** Activities will include: (i) lessons learned in policy-based loans; (ii) analysis of the impact of institutional reforms on productivity; (iii) recommendations for sector policy and institutional reforms; and (iv) the exchange of knowledge regarding contracts, procurement, and maintenance policies, as well as regional dialogue events on these topics.

5. **Dimension of success 5.** The region implements new technologies and innovative trends in the transportation sector in an efficient and timely manner.
5.21 Support will be provided for technology adoption in the sector as a strategy for improving productivity, competitiveness, safety, and environmental conditions. It is also understood that technologies and other innovative trends are often adopted in advance of the institutional/regulatory reforms required for them to function properly.

5.22 **Lines of action.** Lines of action are divided into the following: (i) supporting technology implementation in the sector based on a multimodal approach, in urban and interurban contexts and in contexts involving infrastructure for logistics and integration; (ii) offering institutional and regulatory support to ensure that new technologies and trends in innovation function properly in conjunction with transportation systems; (iii) maximizing the utility of information and telecommunications technologies to generate value added in operations; and (iv) supporting the introduction of nonmotorized transportation technologies (such as the different types of electric vehicles).

5.23 The following operational and knowledge activities are proposed, to achieve these lines of action:

(a) **Operational activities.** These comprise the following activities: (i) investment in projects with ITS components, encompassing urban, interurban, and logistics infrastructure projects; (ii) regulatory support for the implementation of ITS in road infrastructure (urban and interurban) and logistics infrastructure; (iii) support for the regulation of innovative trends in the sector (for example, shared mobility) through best practices and policy recommendations; (iv) diversifying alternatives for creating value through technology, such as conducting evaluations with the assistance of partners and a major technological and telecommunications component, investigating or analyzing project alternatives in the early stages,97 and using apps to disseminate the division’s knowledge; and (v) supporting the introduction of electric mobility through technical assistance and regional dialogue.

(b) **Knowledge activities.** These will include the following activities: (i) evaluations of the effectiveness of ITS based on Latin American and Caribbean case studies, specifically in areas such as the improvement of environmental conditions (e.g. reduced emissions), mobility efficiency (reductions in travel times, stops, congestion), improvements in transportation safety, contributions to the reliability of the system, and social impacts (in terms of inclusion in transportation service delivery); (ii) analysis of the status of regulations governing technology and innovative mobility platforms in the region, as well as recommendations to strengthen the regulatory framework for these; (iii) analysis and experiences with respect to the coordination of intelligent systems with the different modes of transportation and areas of interest for sector development (relationship of ITS with gender equality, sustainable transportation, transportation safety, etc.); and (iv) analysis and knowledge dissemination regarding electric mobility and the prospects for Latin America and the Caribbean in this area.

97 Examples: Use drones for pre-analysis of projects.
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