

Infrastructure in the Comprehensive Development of Latin America

Strategic Diagnosis and Proposals
for a Priority Agenda



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Strategic Diagnosis and Proposals for a Priority Agenda

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Foreword

For Latin America to achieve a more relevant role in the global economy and substantially improve the quality of its people, it must achieve a higher and better quality growth rate that is sustained over time, efficient, inclusive, sustainable, and respects cultural diversity and the environment. Infrastructure must be part of this model of comprehensive development, together with the orderly management of public finances, innovation, and regional integration.

Infrastructure contributes to this development objective in a number of dimensions: it helps to improve the quality of life, social inclusion, and opportunities for isolated communities while, at the same time, it promotes economic growth and the competitiveness of its businesses. At the same time, it facilitates national integration, regional interconnection, decentralization, and internal mobility. By the same token, it may contribute to the diversification of the productive fabric through the promotion of development and the internationalization of national or regional businesses linked to infrastructure and its services.

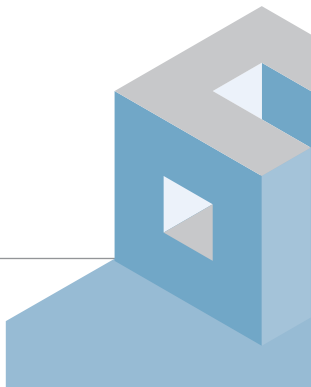
Throughout its more than forty years of operations, CAF —development bank of Latin America— has provided strong support to the development of infrastructure in the region. This reflects the view that the level of infrastructure of a territory is intimately related with the development of the society that inhabits it, and that its insufficiency constitutes a severe restriction for possible improvements in the material welfare of society. CAF currently allocates 54% of its loan portfolio to infrastructure projects. During the period 2000-2010, CAF has been the main source of infrastructure financing in Latin America, with loan approvals that exceed USD 28 billion and include 57 projects of regional physical integration. However, this support has not been limited to financing projects in the areas of transportation, electricity, gas transportation, water and sanitation, but also is reflected in the permanent analytical effort carried out to better understand the infrastructure needs of

the region. The analytical work carried out by CAF in the infrastructure area is reflected in multiple studies and publications that cover practically all of its components: roads, electricity sector, urban mobility, telecommunications, railroads, river transportation, water and sanitation, and the social and environmental safeguards for their sustainable management.

On occasion, the studies have been of a national scope, while in others the scope has been regional, with a focus on the infrastructure situation in a group of countries —such as the Andean Region or South America— or in Latin America as a whole. This is particularly the case of initiatives promoted for regional integration such as the Initiative for the Integration of the Regional Infrastructure of South America (IIRSA, in Spanish) and the Mesoamerica Project. The current situation in the region is a particularly good moment for CAF to review the infrastructure sector with a strategic approach. This implies identifying the areas of greatest need and the challenges to be faced, so that an agenda that places infrastructure as one of the pillars of social progress and regional economic growth may be proposed.

CAF's goals coincide with the request from the Ibero-American General Secretariat (SEGIB, in Spanish), to prepare a Strategic Diagnosis of Infrastructure in Latin America, that includes the analysis of the current situation and recent developments in regional infrastructure, the identification of the main obstacles for its development, and propose priorities for its agenda. The present document, prepared by CAF in response to that request, is presented to the countries that participate in the XXI Ibero-American Summit of Heads of State and Government on October 28 and 29, 2011 in Asuncion, Paraguay.

L. Enrique Garcia
Executive President of CAF





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Executive summary

Infrastructure: key variable in a model of comprehensive development

In coming decades, Latin America will have the opportunity of consolidating its progress toward comprehensive development. This opportunity is the result of the new configuration of the world economy and the resource endowment of the region. Progress toward comprehensive development will be confirmed only if countries are able to achieve just and equitable societies that promote opportunities and inclusion, as well as a more diversified insertion in the world economy, with greater value added. To confront these challenges, there need to be substantial improvements in a number of factors such as education, innovation capacity, the quality of institutions, and the quality of infrastructure and its associated services.

Why is infrastructure a key variable for development? Beyond all the academic knowledge that supports this view, it is believed that infrastructure may contribute to the consolidation of the comprehensive development process in the region through four key dimensions: i) by favoring the improvement in the quality of life, social inclusion, and opportunities for isolated communities; ii) by supporting economic growth and the competitiveness of enterprises; iii) by facilitating integration within the national boundaries and regionally, decentralization, and internal mobility; and iv) by contributing to the diversification of the productive fabric by promoting the development and internationalization of national or regional companies specialized in the production of goods and services linked to infrastructure.

Notwithstanding its relevance, infrastructure in Latin America lags behind that of other regions of the world—even with other developing regions—and the lags are more acute in some sectors and countries. Although there is no single “hard” indicator that can reflect the situation of all infrastructure sectors, the available indices show that Latin America’s comparative performance is weak, and only exceeds that of Africa. The situation is quite

diverse by sector (more positive in telecommunications, electricity, and ports; more negative in water and sanitation, and in various transportation modes), by country, and even by region within countries.

The future scenarios available to Latin America will depend, on the one hand, on the international environment (economic growth, trade dynamism, peace), and on the other hand, on the quality and competitiveness that societies achieve (social inclusion, competitiveness, institutional quality). The desired scenario combines a favorable international environment with a constant effort to improve in social inclusion and competitiveness in the region. A less favorable international environment leads to an intermediate scenario in which Latin America takes advantage of the limited opportunities and protects itself from an unstable situation. The strategic agenda for infrastructure must be founded in the aspirations for comprehensive development and on these expected scenarios. At the same time, it must be based on an understanding of the situation of the infrastructure sectors, and the challenges they face, to extend and improve their services. The following sections deal with these issues.

Current situation of the main infrastructure sectors

Transportation

The most significant fact of this sector is the growth experienced by the demand for mobility of people and goods. During the past twenty years, trade volumes of Latin American countries grew at twice the rate of GDP, which created strong pressure on the foreign trade nodes (ports, border crossings, airports), and on the road networks, as road transportation is the dominant mode of domestic transportation (approximately 75%). The movements of people have also increased rapidly, boosted by the growth of cities toward low density suburban areas, and by the increased rate of motorization (automobiles and motorcycles).

The modal matrix of the region shows a clear distortion in favor of road transportation, which presents significant challenges in terms of sustainability. With the exception of Brazil and Mexico, where railroad transportation of cargo has a share of around 20%, in the other countries of the region that have railroads the figure does not exceed 5%. This distortion in the modal matrix is reflected in an elevated consumption of fossil fuels, high congestion in cities, excessive emissions (the transportation sector has the highest increase in the emission of greenhouse gases), and deaths from traffic accidents that double the world average.

In the area of the mobility of people, there has been a change toward a paradigm of sustainable transportation, particularly in large cities, and its

implementation presents numerous challenges. The countries of the region are still in debt regarding the mobility of the least favored sectors, which conditions their inclusion in society. Thus, development requires a wide ranging and flexible vision regarding sustainable transportation that is not restricted exclusively to emission reductions.

- As far as roads are concerned, the challenge is to overcome the structural gap of a network with low standards and missing sections while simultaneously expanding capacity in critical sections to deal with vehicular traffic, mitigate congestion, and provide secure conditions.
- Railroads are a strategic mode for transportation of cargo and urban passengers in high density corridors. Their expansion will require an active role of the state.
- Ports have become critical logistic nodes. The private sector has demonstrated that it can make significant investments, but the public sector must ensure adequate access by water and land by exercising leadership in organizing the city-port relationship. The growth of the size of ships and the restructuring of routes that incorporate transshipments constitutes a strong challenge for the competitiveness of countries in the region.
- The air traffic infrastructure faces growth rates without precedence; the entry of the private sector has in general had a positive effect, although it requires adequate regulatory frameworks and efficient control capabilities.
- Urban transportation is facing the challenge of stepping up to a new model that prioritizes public transportation, pedestrians, and bicycles, while considering the general traffic and urban logistics. In recent years, there has been a trend toward the reform and modernization of public transportation through integrated systems that include mass modes in the sectors with the highest densities. These projects have important requirements in terms of institutional capacity, regulatory frameworks, and financing mechanisms. The large cities of Latin America require a new model of urban transportation, as the current one, characterized by congestion, contamination, and accidents, has proven to be unviable.

Electricity

Electricity service in Latin America covers 93% of the total population, 99% in the urban areas, and 74% in the rural areas. Although the general situation of the sector is not unfavorable relative to the world average, a number of countries and areas are lagging behind. The region has experienced a sustained growth of demand for energy and power: between 2000 and

2010, the increased was of 36% and 25%, respectively. The main source of generation is hydroelectric, reaching 56% of the installed capacity, while thermal sources represent 40%.

Other relevant characteristics of the sector are the reduction in the reserve margins in the face of dry spells, and the high costs of the transmission infrastructure, as the region combines low consumption density with vast geographic spaces.

The trend to incorporate renewable sources, such as aeolic energy, to reduce greenhouse gas (GHG) emissions, has recently strengthened. This has required government support, creating conditions for development of these sources that energy markets have been unable to sustain on their own.

There are a number of management models in the electricity sector that combine public and private sector participation, in addition to market mechanisms with public planning. Private participation is significant, particularly in the area of generation. The sector faces technological changes as it moves toward an intelligent network, which implies production and consumption nodes with various energy injection points instead of unidirectional grids. In this new model, rates can be dynamic, with prices changing as a function of demand. In the classic model, the network does not adjust easily to renewable energies, as these, with their variability, change the direction of the flows.

The development of the energy sector in Latin America requires the introduction of important changes in the way electricity is produced and consumed, so as to promote sustainable modalities that include the conservation of the environment. The main objectives of the sector are to maximize the population's access to electricity services under economic and sustainable conditions to achieve an improvement in the quality of life and in equity, achieve quality conditions in the service, a reliable supply, and competitive prices that support economic development. It will be necessary to promote greater efficiency in supply and demand by means of improving the effectiveness of expenditure, reducing the losses, and regional integration. It will also be necessary to promote the rational use of energy through adequate incentives and awareness among users.

Transportation of natural gas

The consumption of natural gas in the region has increased at a rate of 3.3% over the world average, and represents 25% of the consumption of energy in Latin America's primary energy matrix, although with an uneven distribution both in terms of consumption as well as the location of reserves. In fact, probable and possible reserves continue to increase as a result of the

application of new technologies for the development of deposits. Intraregional trade has also grown, mostly by shipments of liquefied gas—in ships and distributed by trucks or barges— rather than the use of gas pipelines. Prospects are that consumption will continue to increase, especially due to electricity generation, which finds in this fuel the best response to climate change in the context of fossil fuels, as well as its use in refineries and the petrochemical industry.

Demand and supply of gas is expected to continue growing in the region. The use of natural gas is no longer limited only to those countries that own the resource and have the reserves to develop it and produce it, and eventually export it to neighboring countries. Technological advances have expanded the boundaries and the market so that today, natural gas may be exported through pipelines, ships, and trucks in different states until its regasification for consumption.

This is a sector that requires large investments that mature slowly and carry considerable risk, which must deal with factors such as the adoption of a culture for its consumption, the need to connect large consumers to justify the construction of pipelines, and the engineering of a financing/rates system that diminishes the risk of an important investment in transportation and distribution. The development of this infrastructure must be protected by national policies. Social and environmental issues that make the development of natural gas sustainable are of the greatest importance, and constitute a key condition for the availability of financing for future projects.

Telecommunications

During the past twenty years, there has been a significant dissemination of information and telecommunications technologies in Latin America. The penetration of fixed telephony went from 6% in 1990 to 18% in 2010, while that of mobile telephony reached 99% in 2010. Currently, the region is at a middle stage of development in fixed telephony and at a level similar to that of developed countries in the mobile sector. The accelerated growth of the sector has been boosted by the privatization of the fixed line operators and the liberalization of markets in the mobile sector. The availability of Internet and of personal computers has grown, albeit much slower than telephony, reaching levels of 36% and 17%, respectively.

The dissemination of broad band is still in its early stages, close to 7% compared with 24%-30% in developed countries, representing a growing challenge for social inclusion and competitiveness in the region. The comparative analysis of the telecommunications sector in the region, be it between countries, internal regions, or social economic levels, shows stark contrasts in the adoption of mobile telephony and Internet.

The multiplier effect that technology provides over the whole economy underlines the need to unfold infrastructure that satisfies the needs of information transmission of the different economic sectors. The migration to mobile networks of third and fourth generation (3G and 4G), needed to satisfy the growing traffic will not only require a greater capacity of trunk networks but also of a greater assignment of the radio electric spectrum. The greater the availability of infrastructure, the more efficient productive processes will become, and the generation of positive externalities will increase. To deal with the current gaps, the key goals of policy should be the universalization of coverage, the promotion of demand of the least favored sectors, and the promotion of their use by small enterprises by providing assistance to develop their management practices. These actions would lead to the adoption and greater use of ITT in the activities of the population, productive processes, and in the public administration.

Water and sanitation

Latin America is a region with an abundance of water, but it is unequally distributed in space and time, relative to the population and economic activity (urban demand). In addition, there is a marked variability of rainfall. In the past fifty years, the coverage of water and sanitation networks in the region has increased significantly, from 40% of the urban population in 1950 to more than 80% in 2008, but without providing quality services to the population in informal urban settlements. The problems in the cities can be structured around three elements: the informal settlement of urban land and the consequent poor housing conditions, the low quality of public services, and the degradation of the urban environment (most urban rivers have intolerable levels of pollution).

Industrial demand for water will grow even faster than urban demand, and will require a more efficient use, a high percentage of recycling, and the internalization of the cost of new developments. The demand from the agricultural sector will compete increasingly with urban use and will need to be rationalized significantly with productivity increases, best practices in land management, reduction of the unitary water footprint, and reuse. Extractive mining competes with agricultural and urban use in areas of low availability. At the same time, the disposal of waste material and residual waters are sources of pollution. Moreover, the combination of scarcity and pollution is a potential source of social conflict in some countries in the region.

If the current scenario were to prevail, Latin America will be a region with an economic scarcity of water approximately in the year 2025. Not so much due to the lack of liquid, but rather as a result of the deficit in infrastructure and the weaknesses in sectorial governments. Water companies, with few exceptions, whose performance indicators are comparable to the best in the

world, are a heterogeneous set of more than one thousand companies with low levels of operational efficiency and high dependency on fiscal resources to finance their investments and, in some cases, the cost of their operations.

The main challenges to achieve the sectorial goals include the resistance to effective transformation processes in each of the phases of service management; the weakness (or absence) of mechanisms of economic regulation and the quality of services in many countries of the region; and the absence of public policies that consider the negative externalities of pollution as well as the weakness of the instrument for applying and controlling those policies.

Elements that make infrastructure development viable

The analysis of the infrastructure sectors allows identifying the main challenges faced by each one of these areas to adapt the supply of services to the needs required by the desired scenario of high, sustained, and quality growth that benefits from a favorable international environment. To prepare for a scenario of possible deterioration in the external environment, infrastructure must also contribute to maximize the potential of the Latin American domestic market, prioritizing the facilitation of intra-regional trade and the integration of national areas. This implies building a robust regional infrastructure strategy that should include a decisive support to regional integration projects.

The analysis of the infrastructure sectors also allows the identification of the main cross cutting elements that ensure the conditions for growth and improvement of its services. These elements may be summarized as follows: financing needs, improvements in policies and institutions, and an adequate consideration of environmental and social aspects in the planning and execution of infrastructure projects.

Financing needs

A review of the existing analysis on infrastructure needs to cover the regional deficit and to accompany a process of sustained growth, indicates that a level of investment in the order of 5% of GDP is required in coming years —without considering maintenance costs—, which represents annual investment levels of between USD 200 and USD 250 billion. This level of investment is 50% higher than the current one, which in turn is considerably higher than the level prevailing at the beginning of this decade. Neither the public nor the public sectors by themselves could ensure the provision of the required resources. To do so, countries will have to combine both sources, clearly

assigning the role to be played by national governments, local governments, and private investors in the provision of infrastructure.

Currently, the capacity for public investment is relatively strong, at least compared with previous decades. While a fiscal context that facilitates the increase of public investment may be expected, it should be noted that the proposed development model will generate multiple demands on public finances, particularly aimed at promoting social inclusion and educational policies. Therefore, the use of public resources in infrastructure will have an opportunity cost that must be appropriately considered.

The challenge for governments in the region will be to transform the macroeconomic and demographic strengths into a source of attraction for private investment in infrastructure. To this end, it is necessary to advance in a number of areas such as the capacity for planning, financial evaluation and analysis, regulatory frameworks, promotion of transparency, and deepening of local financial markets —by taking advantage of the “demographic dividend” to promote medium and long term saving mechanisms that allow financing productive and infrastructure investments. The wide variety of financing sources available makes it necessary to carefully analyze the allocation of projects to each one of them, so as to make full use of their potential. Latin America will need to develop financing strategies that take the most advantage of the following seven sources of resources (originating both in domestic savings and in private foreign investment): the domestic market, stock exchanges (issue of titles that represent assets), international banks, multilateral organizations, the climate finance instruments, natural resource corporations, operators of transportation and logistics, and sovereign funds or state owned companies.

Institutions and policies for infrastructure development

Institutions (the rules of the game, the organizations, and their procedures) constitute one of the determinants of performance in the infrastructure services sectors. Looking at the institutional cycle as a process allows for the identification of the most common deficiencies in each one of the sectors. These have been organized into four groups:

- The policies and plans that cover all projects, whatever their means of financing. The lack of strategic planning of infrastructure duly aligned with development objectives stands out, as do the difficulties in coordinating policies with other areas of government such as environmental management or urban development.
- The capacity to formulate, evaluate, execute, and maintain projects, particularly those financed with public resources. This includes the

negative impact generated by initiating projects that are not sufficiently mature, or the lack of care regarding maintenance, by concentrating attention exclusively on the execution of new works.

- The capacity to structure projects and coordinate actors, in particular projects that are executed with private participation or that require the involvement of different jurisdictions. The main weaknesses are found in design problems, management of risks and guarantees, and in the generation of financial burdens for the state due to future obligations and contingent liabilities.
- The capacity to promote a better use of the infrastructure. The policies are not aimed exclusively at increasing supply but increasingly aim at acting on the demand side to reduce the need for resources. To “close” the infrastructure cycle, knowledge management and continuous improvement are of the utmost importance. The ex post analysis of projects is little practiced in the region, and monitoring, as a means of following up and permanently evaluating the social and economic impact of projects, is not sufficiently established.

Integrating environmental factors and social actors in policies and projects

The analysis of the sectors shows that the execution of projects frequently stumbles over environmental and social issues. There are abundant examples in the region and the prospect of expanding infrastructure into environmentally sensitive geographic areas, suggests that tensions will increase. The areas responsible for supplying the infrastructure must seriously reconsider the ways in which they conceive their development, including the sustainability criterion into the project cycle from its beginning. Rather than considering environmental and social aspects as an obstacle, policies must balance the multiple objectives and include sustainability goals.

Good environmental management is also a key element in the competitive differentiation of Latin America and will come to be an element of its competitiveness, by measuring the carbon footprint of the products its exports. This adds an important incentive to include that element in infrastructure policies and projects. At the same time, citizen participation in planning and implementing infrastructure projects is a distinctive trend of a society that includes the development model to which it aspires in the infrastructure projects. Therefore, opportune communication with the community must also be a part of the project cycle.

The international agenda surrounding climate change is especially relevant to the infrastructure sectors, and proposes both mitigation and adaptation

actions. These actions are becoming a pressing need for countries in the region and, currently, the agenda for adaptation is less developed than the agenda for mitigation. Countries face the challenge of responsibly joining the global effort to reduce greenhouse gas emissions generated by infrastructure sectors (particularly energy generation and transportation), without ignoring the contribution that those sectors could make to satisfy the needs of social and economic development. In addition, the region must step up its efforts to generate a strategy for adaptation to the challenges of climate change.

Infrastructure plans and their link to the development model

For Latin America to achieve a more relevant position in the global economy and allow a substantial improvement in the quality of life of its inhabitants, it must maintain a sustained growth rate. This growth must be of quality, efficient, inclusive, sustainable, and respectful of cultural diversity. Infrastructure must be a part of this development model together with other key public policies, such as the orderly management of public finances, innovation, inclusion, and regional integration.

The analysis of the performance of the infrastructure sectors and their challenges, as well as the recognition of the factors that condition the growth and improvement of their services, allows the identification of a number of issues that make up the strategic infrastructure agenda proposed for the region. In addition, the analysis has enabled the identification of certain priority issues in the short term that will require special attention on the part of governments, as a result of the relative shortage of infrastructure or to their direct impact on social inclusion and the quality of life of the population.

Issues that require priority attention

- Investment efforts in infrastructure must be aimed primarily at especially critical areas.
 - » Increasing the coverage and quality of **water and sanitation** services that have a high social impact.
 - » Promoting and supporting **urban public transportation** by prioritizing it over the use of private vehicles.
 - » Improving **road safety** policies in cities and highways. Traffic accidents are the first cause of death among Latin American youths and adults of productive age.

- » Strengthening **road maintenance**, which is as important as building new roads. Therefore, the low priority generally assigned to road conservation programs, regardless of the management model, must be overcome.
 - » Expanding the **broad band** which has a strong multiplier effect as it influences quality of life and productivity in the economy, and promotes integration in the State's productive and administrative processes.
 - » Developing **infrastructure for regional integration**, which is critical for reducing the dependence of economic growth on changing international conditions.
- The development of new housing —particularly social housing— must be accompanied by a **comprehensive planning of urban development and mobility**. The purpose is to avoid the need for simultaneous trips, typical of bedroom communities. The informal occupation of urban land and poor housing conditions make it difficult to provide quality infrastructure services.
 - The adoption of a policy of **energy efficiency**, focused on actions to increase the efficiency of expenditure, to reduce losses, and to increase regional integration —together with the development of renewable generating sources—, is part of the immediate challenges of the energy agenda in Latin America.
 - The development of **river transportation** and **coastal** shipping, which may contribute to improve the transportation matrix in the region, by making use of the extensive navigable routes available particularly in South America.
 - Investments in infrastructure must be planned and executed over territorial lines through the use of **"packages" of basic services** to take advantage of synergies, especially in rural areas.
 - Increase the **rational use of infrastructure**, not only by expanding capacity and coverage but also by generating policies that influence demand. Governments have a number of policy instruments available to achieve this task, such as the price of services or restrictions on circulation.
 - **Adaptation to climate change** and attention to the **management of natural disasters**, which due to their significant social impact deserve urgent attention. To overcome the challenge of improving infrastructure in the region, it is critical to strengthen the capacity for **project preparation** of Latin American countries in the short term. The creation of a pre-investment Latin American program with the participation of the development banks, ministries of planning, economy, and finance, with

the support of CAF and other multilateral entities will generate new ways of guaranteeing quality results. It is also necessary to review urgently the infrastructure **planning and building standards** for their adaptation to the challenges of climate change. CAF proposes creating a network of professionals and institutions of the whole continent to exchange best practices and generate new proposals.

The continent has a solid experience regarding planning, coordination, and execution of **infrastructure for integration** projects. This effort must be continued through regional working groups that will identify and design the best lines for integration in the coming decade.

Six lines of action for implementing a strategic agenda

To advance toward the implementation of a medium and long term agenda, six key lines of action are proposed, whose main elements are described below. This agenda constitutes a proposal to help countries in the region in considering the multiple elements that allow infrastructure development to be carried out in a systematic way.

Significantly increase investment in infrastructure

To realize its aspirations, Latin America must continue increasing its investment in infrastructure: investments close to 5% of GDP annually will be needed to cover the existing deficit and accompany the continuous growth expected to reach development. Increasing the stock of infrastructure will generate a greater need of resources for maintenance, which in turn, will require stable financing modalities.

Frame policies and projects in a paradigm of sustainable development and territorial vision

Investments must be implemented within the framework of a vision that incorporates productive, social, and environmental aspects, in addition to a territorial and not only a sectorial perspective. It will be necessary to adopt a more comprehensive definition of infrastructure than the one currently in use, to emphasize the expansion of telecommunication services, the comprehensive management of water, and infrastructure of high social impact. The new paradigm must not be limited to increasing the supply of infrastructure but must also include demand management and promote the responsible use of the associated services.

Strengthen institutions in their various dimensions

The infrastructure planning process must be clearly established in the national sphere, within a framework that ensures compliance with the public strategies and enables the development of private initiative. It will be necessary for the countries to promote the coordination of infrastructure policies with other policies to overcome the “island mentality” that has dominated governmental organizations and, thus, facilitate coordination among jurisdictions, providing for the fact that subnational entities will have a growing responsibility in the provision of infrastructure. It is highly convenient to advance in the regional coordination of integration projects, to continue with the efforts undertaken in programs such as IIRSA or the Mesoamerica Project.

Optimize the use of multiple financing sources and modalities

The region will face a strong need of funds for investment in infrastructure. Faced with new sources of financing such as: specialized institutions, natural resource operators, sovereign funds, funds linked to climate change, pension funds, etc., countries must develop their ability to manage and guide the multiplicity of resources and ensure their optimal use in the different projects or institutional situations.

Promote the development of enterprises in businesses linked to infrastructure

A strong impulse to investment generates the opportunity to promote the development of world class companies in a wide range of businesses linked to infrastructure. The countries may provide incentives for the development of companies that participate in the value chain of service provision for infrastructure within a reasonably competitive environment, in addition to promoting the development of truly viable enterprises, which are not rent seekers.

Promote the exchange between governments, regions, and cities.

Permanently monitor best practices and develop mechanisms for research, exchange of information, and institutional development. The region’s bilateral and multilateral fora, such as IIRSA, COSIPLAN (within UNASUR), and the Mesoamerica Project, constitute valuable initiatives in this direction.

A call for action

The coming decade may be definitive in the progress toward comprehensive development, and one of the large challenges is to significantly improve the availability and performance of infrastructure and its associated services. Infrastructure is one of the necessary conditions for advancing toward a more inclusive and equitable society; it is also the support for economic competitiveness, and the development of the domestic market; it constitutes the main mechanism for regional integration, and may generate important opportunities for business development. The key factors for confronting this challenge depend on the public policies that countries implement. Now is the time to adopt the decisions to implement an aggressive development agenda and make the most of the opportunity. Throughout its forty years of existence, CAF has provided strong support to the development of infrastructure in Latin America and constitutes the main multilateral source for its financing.

CAF provides its support to work closely with the governments and the private sector of countries in the region, with the aim of confronting these challenges and provide support, both in financing as well as knowledge management and the dissemination of best practices.





Introduction

Motivation

Infrastructure and its associated services constitute a necessary condition for the development of countries due to its contribution to social inclusion, quality of life, competitiveness of the economy, and territorial integration. Latin America is lagging considerably with respect to the provision of infrastructure, while at the same time it experiences an accelerated economic growth and improvements in the life conditions of its populations. The countries of the region face the double challenge of covering the structural gaps in the diverse components of infrastructure while simultaneously expanding the provision so as to avoid that the insufficiencies in quality and quantity become obstacles for development.

The goal of this document is to provide a strategic diagnosis of infrastructure in the Latin American countries, by analyzing the main components without leaving aside the strong disparities between countries, infrastructure sectors, and even regions within the same country. It is expected that this strategic diagnosis contributes to recognize the current situation, identify and determine the scope of the needs for its development, and propose a strategic agenda for coming years. The works is focused in the transportation infrastructure in all its modalities, electricity, telecommunications, natural gas transportation, and water and sanitation.

Organization and scope of the document

The document starts by identifying the role that infrastructure can perform in the current moment in Latin America, especially because the international environment generates a unique opportunity to access development. Chapter two briefly describes this environment and the new opportunities

it offers, and recognizes infrastructure as one of the key factors to achieve a comprehensive development. When analyzing and comparing the situation of infrastructure to other regions of the world, the conclusion is that it presents a considerable deficit.

In order to achieve development, it is necessary to close that gap and increase the provision and quality of infrastructure and its associated services so they do not become an obstacle. This same chapter reviews the role of infrastructure as a driver of development, the methods to estimate the amount of infrastructure that is necessary, and concludes by presenting the scenarios that may be expected in the region to advance in its development goals.

Chapter 3 presents an analysis of the situation of the main sectors that integrate the economic infrastructure. It tries to identify the main problems in each area and the challenges faced by the increase in demand, and the diverse trends in this context, such as the increasing urbanization, technological changes, and a consideration of environmental and social aspects in the infrastructure policies and projects.

This chapter presents a brief summary of the performance of each sector and the main challenges faced. CAF requested five studies on each one of the sectors to recognized specialists, which are available electronically. These studies detail the performance of each area and have been the base of this document¹.

Building on the analysis of the sectors analyzed, Chapter 4 focuses on identifying the challenges to be overcome so that infrastructure can provide the necessary support to attain the desired scenario. These challenges are: i) The financing requirements of the needed investment, ii) the policies and institutions to carry out the planning and implementation of the projects, and iii) the incorporation of environmental factors and social actors in the preparation of policies and the implementation of projects.

Chapter 5 contains the priorities of a strategic infrastructure agenda for Latin America, aimed at reaching the desirable scenarios proposed in Chapter 2. It first presents a set of issues that seem of high priority in the near term, which should be the object of special attention on the part of governments in the region due to their large relative gaps, their strategic importance, or their direct impact on social inclusion and quality of life of the population. Then, the main lines for implementing the strategic agenda are presented. Two final annexes include a set of selected indicators on infrastructure in Latin American countries, and a list of the regional integration projects financed by CAF.

It should be noted that the scope of this work is that of a strategic diagnosis: it does not pretend to examine in detail the subjects it deals with—which are many, quite diverse, and each one of great complexity—but rather to identify the key challenges so as to contribute to establish public policies for infrastructure in the region.

1 The base documents are available at www.caf.com. They have been promoted by CAF considering they constitute a valuable contribution for debate. The ideas and approaches contained in these documents are of the sole responsibility of the authors and do not compromise CAF's official position.



1

Chapter 1



Infrastructure:

key for taking advantage of development opportunities

The opportunities of Latin America

A favorable international environment

In the framework of a slow recovery of the global economy after the great recession of 2008-2009, emerging countries and, in particular, Latin American countries, show a hopeful scenario. While the latest projections from the International Monetary Fund show a global economy recovering at rates of close to 2% per year, and only recovering a growth rate of 4% per year toward 2016, emerging countries will continue growing at rates around 6% per year in the next five years. In this context, Latin America should grow at rates between 5% and 6% per year to maintain its share in the global economy and firmly advance toward economic and social development.

The next two decades will show a significant redistribution of world economic activity. The emergence of a “two-speed” economy will lead to the progressive consolidation of three large global consumption poles: North America, the macro region that includes Western and Eastern Europe and the Mediterranean, and China and the countries surrounding it. Each one of these three consumption and growth poles will represent approximately 20% of the global economy. Beyond these three large poles, new regional areas will begin to consolidate, with shares of between 2% and 6% of global GDP, which will be led by an economy that will establish a dynamic regional area (OECD 2010). In Latin America, Mexico and Brazil will probably be the countries that will play the role of “regional engines”.

In addition, a group of high middle income emerging countries is positioning itself to achieve development within the next two decades. Various studies converge on a list that includes countries such as Poland, Turkey, Malaysia, as well as a number in Latin America. The reconfiguration of world and regional growth poles implies that the global economic geography will be profoundly

modified by a new combination of factors: the joint action of business decisions and the differential evolution of consumer groups.

Multinational enterprises of developed countries and the new segment of multinationals from emerging countries show a growing trend toward a model of productive disaggregation and the establishment of international value chains. They evolve toward “network” models, where they tend to maintain the decision and innovation centers in their countries of origin, but take wide ranging decisions regarding productive plant localization to regions with cost advantages or market potential, subcontracting productive activities or service centers, and the relocation of research and development (R&D) and innovation activities. All of these movements present opportunities for emerging countries: competition is not only to attract foreign direct investment, in the form of factories, but also to attract service centers and regional decision centers. The quality of infrastructure will be an important competitive factor that will play a significant role in the evaluation of alternative locations for these investments. At the same time, multinational enterprises from emerging countries are becoming increasingly important players in the global economy and will become large international investors which must be attracted.

With respect to consumers, the evolution of developed countries will give rise to a contrast between the consumption styles of the “winning” classes of globalization and the middle classes challenged, and even impoverished, by the restructuring of the productive processes and the welfare state. In these countries, opportunities will arise for the sale of products with a good price-value relationship for the more challenged classes. However, it will be in emerging countries where the greatest opportunities will arise: the new affluent classes, the new middle classes, and the millions of inhabitants that will increase their consumption will generate high growth markets. The growth potential of the middle classes has been estimated at more than 2.8 billion people by the year 2030, of which 2.7 billion will be in Asia Pacific, with Latin America incorporating more than 130 million of its inhabitants into the middle class (OECD 2010).

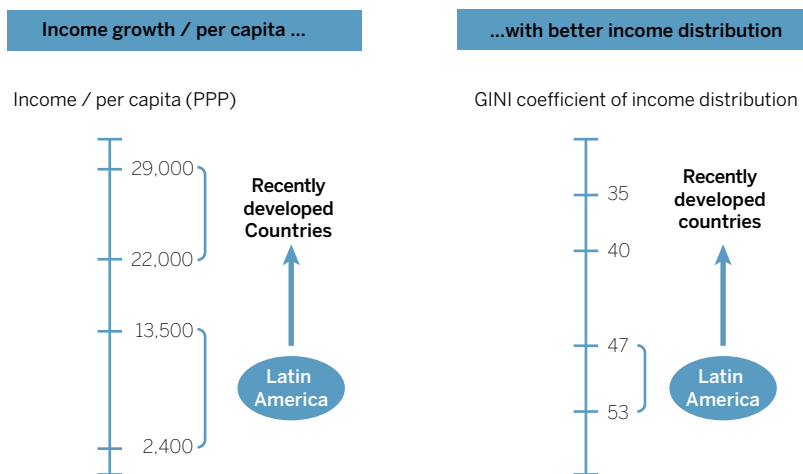
Latin America faces a unique opportunity in this new international scenario:

- It produces the natural resources and food to supply the growth in consumption of the new dynamic areas of the world. It has the largest reserves in the world of key elements: 20% of the forested surface, 7 mega diverse countries, one third of the world’s arable land and sweet water reserves, 31% of the world production of biofuels, 13% of the world production of oil, 47% of the world production of copper, and 48% of the world production of soybean².
- It may attract a significant proportion of foreign direct investment (FDI) that will look for new markets or production bases.

² ECLAC, 2011.

- At the same time, the region is adopting growth models that lead to an increase of its middle classes (130 million additional middle class consumers toward 2030), which contributes to the growth of its domestic markets.
- It has advanced in economic integration, which is reflected in the high growth rates of intraregional trade in the past 10 years. The impact of world growth and the economic policies adopted by Latin American countries is already visible. During the decade 2000-2010, the region has grown at the highest rates in its recent history and has been able to improve its social indicators. The current situation presents opportunities and challenges: a high percentage of the countries of the region are already considered “middle income” and could achieve development in the next 20 to 40 years³. A number of countries of the region could reach the levels of per capita income of countries recently developed, around USD 25,000 per capita, if they continue growing at current rates. They would continue to improve their income distribution, which could be expressed in terms of lowering the Gini coefficient to about 0.40 (see Graph 1.1).

Graph 1.1. The challenge of development



Source: author compilation with World Bank data.

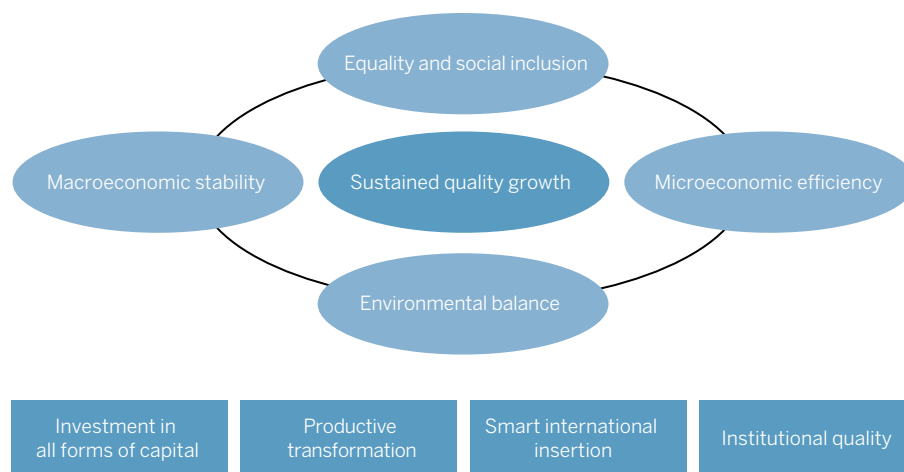
³ Middle income as defined by the World Bank.

The two key questions that arise are: Is Latin America able to sustain and perhaps increase its current growth rates? Will Latin America be able to transform these years of growth into a true process of economic and social development? In considering the opportunities, the challenges to development must also be weighed. The review of the experience of countries recently developed and the comparison with the more dynamic countries of Eastern Europe and Asia leads to focus the analysis on the following five major challenges:

- i. *Develop societies that promote opportunities and inclusion. The region is making progress in reducing absolute poverty and in the growth of its middle classes, but its income distribution indicators are still unsatisfactory.*
- ii. *Advance toward a more diversified and greater value added insertion into the world economy. Latin America has a stable share of international trade. When its share grows, it is mostly due to Price effects (clearly in grains and minerals), and less so due to quantity effects. The structure of its exports is highly concentrated on natural resources, food, and manufactures of low-medium technology intensity. The region has not been able to significantly increase its share in the dynamic service sectors, such as information, tourism, and education.*
- iii. *Increase the competitiveness of its private sector. In contrast with Asian countries, with a few exceptions, there are no countries in the region within the group of 35-40 most competitive countries in the world (according to the World Economic Forum or the IMD)⁴. In Latin America there are a few large scale multinationals, but these represent a small minority of the 2,000 largest companies in the world (according to the Forbes ranking), and in general, they are concentrated in natural resources. Of the 100 most valuable trademarks in the world, Latin America has created very few, while countries like Korea have consolidated trademarks of global importance.*
- iv. *Improve the quality of its institutions. The region has consolidated its democracies in recent decades, but large gaps remain in institutional development. At the same time, the business climate in most countries of the region needs to be improved.*
- v. *Strengthen its innovation capacity and the quality of education. Latin America has few innovation activities, it spends little in research and development, and generates few patents. At the same time, the region is improving the quality of its education, but at a slower pace than is needed; the countries of the region with the best performance in the OECD PISA tests are losing positions relative to the Asian countries.*

In summary, it may be said that Latin America, as a result of the new configuration of the world economy and its own resource endowment, in coming decades faces the unique opportunity of consolidating its progress toward economic and social development. To achieve that goal, it must ensure sustained growth, which will require overcoming significant challenges that are summarized in Graph 1.2, together with the elements needed to attain it.

Graph 1.2. The challenges of high, sustained, quality growth



Source: CAF (2011).

Infrastructure: key variable for taking advantage of opportunities.

Progress toward development will be confirmed if countries in the region are able to consolidate a position in the global economy that is built on its undeniable advantages in the production of natural resources, but that at the same time, migrate toward a production model that systematically incorporates knowledge and differentiation of its primary, secondary, and service production. Five major challenges have been enumerated; overcoming them will require substantial progress in the current levels of four key factors: i) institutional quality and business climate, ii) the quality of education and the development of skills for continuous employment, iii) the capacity to innovate and create differentiated products and services, and iv) finally, but not less important, a high quality infrastructure and logistic systems.

Infrastructure as driver for development

Why do quality infrastructure and efficient logistics constitute one of the key factors for development? Beyond the academic work that supports this statement, it is believed that infrastructure and logistics will be able to contribute to the consolidation of the development process in the region through four dimensions:

- They favor a better quality of life, social inclusion, and opens opportunities for isolated communities.
- They support economic growth and the competitiveness of enterprises.
- They facilitate national and regional integration, decentralization, and internal mobility.
- They contribute to diversify the productive fabric through the promotion of development and the internationalization of national or regional companies that provide engineering and construction equipment, together with their associated professional services.

In spite of the long presence of its components, the concept of infrastructure is relatively new. Until recently, toward the end of the 80s, the concept was included as a subset within capital. It is not infrastructure as such which generates an impact, but rather the service it provides. Roads and ports make transportation services possible; telephone plants and fiber optic make communications viable; and so on with energy, water and sanitation, irrigation, elimination of residuals, and others. The impact of infrastructure is first produced when works are under execution through the generation of employment—that varies significantly according to the type of project—and the development of the companies that provide goods and services. However, the greatest impact occurs during the long period of exploitation in which the services contribute to development in the four dimensions listed above, and which are described below.

Social inclusion, equity, and quality of life

Access to infrastructure and its services constitutes a key factor for improving the quality of life of individuals, facilitate social inclusion, and move increase equity. The quality of infrastructure and its services has an effect on the health and education of lower income individuals, and is critical to improve their access to employment opportunities. Access to water and sanitation is crucial for good health; the diseases acquired from drinking contaminated water, or due to the lack of water and sanitation, are

among the main causes of infant mortality⁵. The availability of electricity, the access of people to goods and communications favor inclusion and opportunities for isolated communities in urban and rural areas.

Competitiveness and development of the domestic market

There is wide consensus that infrastructure is one of the determinants of productivity and economic growth. The consensus arises from numerous empirical analysis and surveys that compare their results. This nexus is stronger the lower the income levels⁶. Infrastructure is an intermediate input for enterprises, in proportions similar to those of their use by households and constitutes one of the keys of productivity⁷: an adequate infrastructure contributes decidedly to the international competitiveness of enterprises and of economies. In the case of Latin America, transportation infrastructure, electricity, and telecommunications play a decisive role in the competitiveness of the main value chains, such as the production of bulk products (grains, minerals), agribusiness, manufacture, tourism, or services. The impact on productivity is not linear; there are network effects that give rise to relevant indirect impacts.

Territorial cohesion and regional integration

In addition to its traditional objectives of supporting growth and quality of life, infrastructure is also an instrument for territorial organization. It facilitates the integration and cohesion of the national territory, the development of productive nodes and intermediate cities, and the commercial and productive integration between countries of the region.

Business development to provide works, equipment, and services

The growth of infrastructure and its associated services also presents an opportunity for the development of enterprises and the associated human capital, in the sense of increasing the knowledge, abilities, and skills of the people that provide them. Building companies, suppliers of equipment and capital goods, engineering services, technology, and other multiple activities that make up the value chain that supports the infrastructure works and services, may find opportunities for development and growth. Active industrial policies may maximize the impact of infrastructure plans.

⁵ Mejia, A. 2011.

⁶ See, for example, Calderon and Servén (2006), Estache and Fay (2007).

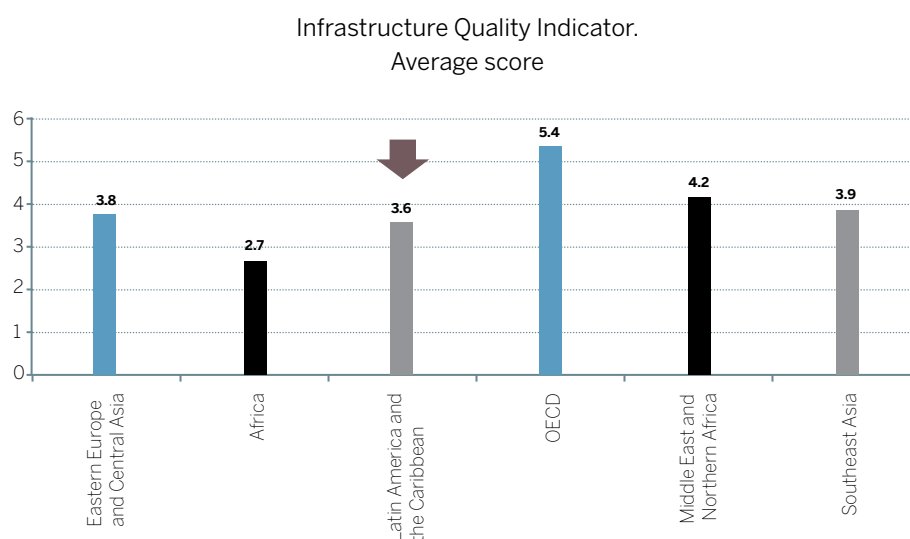
⁷ Prud'homme (2004).

Infrastructure gap in the region

The relative backwardness of Latin America

Infrastructure in Latin America shows a generalized lag relative to other regions, even some developing ones, which is sharper in some sectors and countries. Although there is no one (hard) indicator that reflects conditions in all infrastructure sectors, the survey of the World Economic Forum (WEF) is a good approximation. That study ranks the quality of infrastructure in 140 countries, assigning a value of 1 through 6 to the different components of the sector. As shown in Graph 1.3, the general performance of infrastructure in the region is weak, and only exceeds that of Africa.

Graph 1.3. Comparative general performance of infrastructure (2010)



Source: compilation of WEF data (2010).

Disparity in the performance of its components

The analysis by subsectors, on the basis of the WEF survey, and some hard indicators available, shows uneven results. Electricity and telecommunications tend to have an acceptable development in comparative terms, showing good evaluations in the WEF survey and high levels of fixed and mobile telephony, respectively. As shown in Graph 1.4 (b), the region has an intermediate performance in electricity services, above that of Africa and just above that of Southeast Asia.

However, compared with OECD countries, there is a large difference of almost two points. The supply of water and sanitation shows a certain lag;

a more detailed analysis will show that it is greater than it appears at first sight. Although the levels of access to water and sewage networks reached 80% of urban populations in 2008, the sanitary quality of water is very low, and there are deficiencies regarding the continuity of services⁸. In addition, the treatment of residual waters is insufficient, as less than 30% is subject to some type of treatment. In transportation, ports show an intermediate position and a large dispersion in the performance across countries. The situation is similar regarding airports, with some countries in good positions. Roads and railroads appear as the weakest subsectors, achieving in both cases unfavorable valuations compared with other regions.

As shown in graph 1.4 (a), the valuation achieved by regional roads is far below that of developed countries, and is even below other developing regions, such as the North of Africa and Southeast Asia.

How much infrastructure is necessary?

Over more than two decades the impact of infrastructure on the economy has been evaluated, so as to establish the optimal level to which countries should generally aspire as well as the subsectors that make it up. Two views have been developed: achieving equality in some key indicators of a country that is considered an example (benchmarking), or establishing absolute goals to be attained, for example, universal coverage in the supply of certain services, or providing for the demands of enterprises and families based on a prediction of GDP growth. The results are usually expressed as the provision of infrastructure in physical terms (coverage, quality, etc.), or as the annual investment flows needed to achieve the proposed targets. This type of analysis presents some difficulties. “Deciding how much must be invested in infrastructure is not an easy exercise, but it is convenient to do it and it may offer a basic reference point.”⁹ Quantifying the needs for infrastructure through benchmarking is a useful procedure to establish orders of magnitude, but it can hardly be adopted as the basis for a national investment policy.

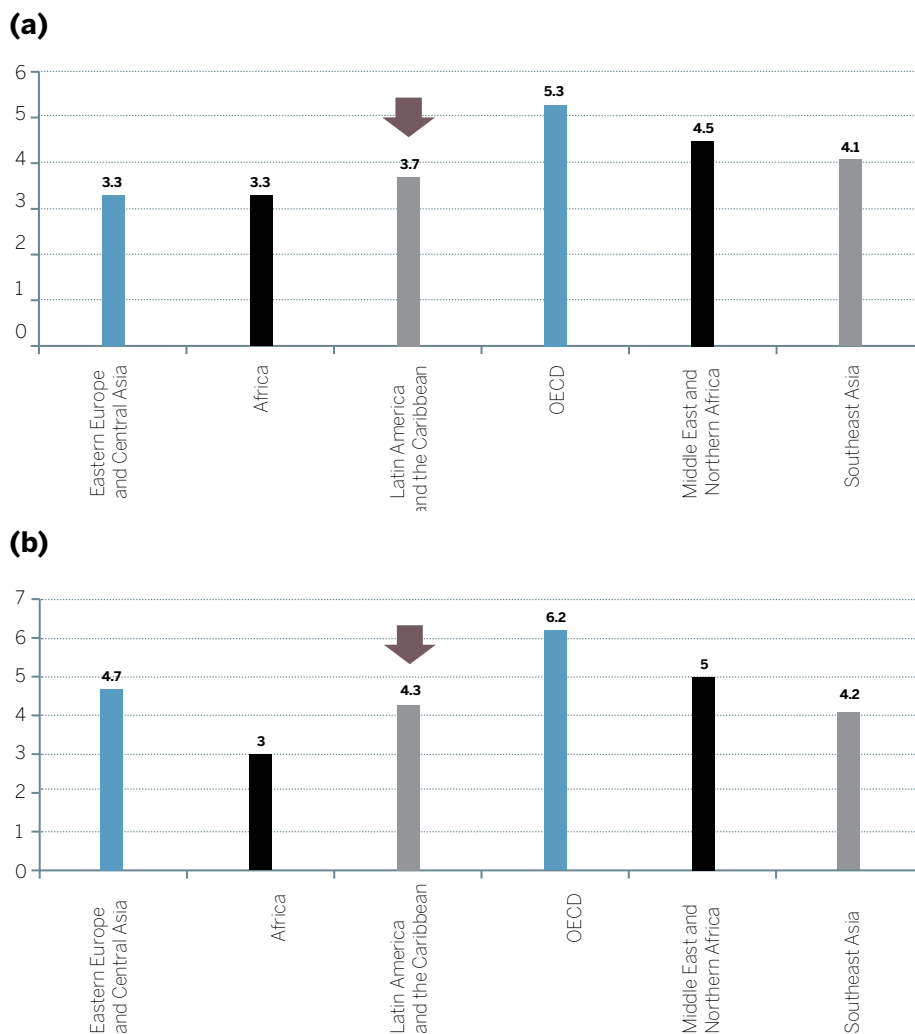
“Best practices:” aligning infrastructure plans with the vision

“Best practices”: aligning infrastructure plans with a vision of Latin American has developed a valuable institutional experience in planning and building infrastructure. The strategic infrastructure plans prepared in Brazil are a good example. In that instance, on the basis of a strategic vision for the country and as a function of that vision, lines of action and regions of growth were established, as well as the infrastructure projects necessary to achieve two key

⁸ Latin American and Caribbean Demographic Centre (CELADE in Spanish), 2009.

⁹ Estache and Fay (2007), page 14.

Graph 1.4. Comparative performance of (a) roads and (b) electricity



Source: compilation of WEF data (2010).

objectives: the appropriate insertion in the global economy, and the territorial integration for the consolidation of new productive areas and expansion of the domestic market.

Another relevant example is the IIRSA process, in which a strategic vision was established and then the areas for integration and development were defined together with the associated projects. The IIRSA initiative has been operating for more than ten years and represents a positive experience of developing planning capacity, institutional development, and coordination between countries. The activities initiated within IIRSA are currently being carried out by the south American Infrastructure and Planning Council (COSIPLAN in Spanish), within the UNASUR framework.

In the current international scenario, both regions and countries assign growing importance to the role of infrastructure, which is considered a key element to differentiate development positions, improved competitiveness, ensure inclusion, and support sustainable economic models. Among recent experiences of interest for Latin America, it is useful to comment the following three cases: the 2050 infrastructure development strategy of the European Union; the (Asia Interconnected) process, led by the Asian Development Bank; and the infrastructure strategy “A New Beginning” of Australia.

Other regions plan infrastructure as a key variable for development

The European Union, its transportation infrastructure development strategy

In 2011, the European Union published a White Paper which presented its Strategy for the Transportation Sector through 2050¹⁰. The document begins with a harsh diagnosis: the European transportation system has allowed a period of great economic growth and improved mobility and security, but it is reaching its limits.

The projections for 2030 show increases in costs and a deterioration in the levels of mobility that would present a grave problem for European competitiveness and welfare. The document points out that, “The future prosperity of our continent will depend on the ability of all its regions to full integrate into the global economy...Efficient transport connections will be vital to achieve these objectives; limiting mobility is not an option...”

These challenges open a great opportunity for 2050: structural changes are proposed in the transportation system that allow simultaneously for improvements in the quality of life and environmental quality, preservation of the freedom of individuals to move, and strengthen the competitiveness of the European industry. The White Paper proposes a vision for 2050: “A system of mobility that is integrated, sustainable, and efficient.”

This vision is expressed in four strategic areas: i) a transportation system that is integrated and efficient, ii) a European policy of research and innovation in transportation, iii) modern infrastructure and “intelligent” financing, and iv) the international dimension (included in the promotion of European transportation technologies).

The “Seamless Asia” Program combines the regional, sub-regional, and national levels

The Asian Development Bank has prepared a document outlining a vision of a Seamless Asia that proposes the development of “an integrated region,

¹⁰ European Commission (2011).

linked by world class networks, and of high environmental quality, that connects national markets, promotes high and sustainable growth, satisfies the basic needs of the population and, therefore, contributes to the reduction of poverty.”¹¹

To achieve this vision, it will be necessary to develop both “hard” as well as “soft” infrastructure, that must include the development of high quality and low environmental impact transportation networks; the development of multinational energy projects that promote an adequate supply of fuels and new forms of energy; the provision of policies, systems, and processes that improve the efficiency of regional transportation networks, and the development of stable and efficient financial markets that channel Asian and international savings toward productive investments, such as those in infrastructure.

The institutional development framework for Seamless Asia is made up of three main components: i) the initiatives to develop networks at the Pan-Asian, sub-regional, and national levels; ii) an Asian infrastructure fund that uses resources from multilateral and bilateral, national governments, and private sector resources; and finally, iii) institutional development initiatives, at the Pan-Asian level, with sub-regional programs, and between national organizations.

Australia and its “New Beginning” strategy

Starting in 2008, the Australian government organized an inter-state and inter-ministerial working group to ensure that transportation, defined as the “engine room” of the economy, would allow achieving the objective of keeping the country “in movement.” Faced with growing demands for transportation linked to the rapid growth of the country, the authorities recognized the need to confront a new stage of reforms based on a comprehensive vision of the transportation network, new forms of leadership, participation, and a new policy design paradigm¹². In this context, 10 priority areas were defined, covering issues ranging from transportation market regulations, planning of infrastructure and investment, the environment and energy, social inclusion, and planning for human resources and worker training.

For each of the ten strategic priority areas, a diagnosis of the challenges faced by the country was prepared, and the desired results were established. For example, the strategy seeks to provide a safe transportation system that contributes to the national mobility objectives without fatalities or accidents to its users; that promotes social inclusion by connecting remote or disadvantaged communities; and that improves access to the transportation network to ensure an equitable enjoyment of the resources by the community. At the same time, the strategy seeks to protect the environment and improve health by investing in a transportation system that minimizes emissions and the consumption of resources and energy, while

¹¹ Asian Development Bank Institute (2009).

¹² Australia National Transport Commission (2011).

providing the greatest transparency in its funding and charges. To advance in the implementation of this new strategy and strengthen the institutional capacity, a national transportation vision was established, consistent with the Australia National Vision, which provides for a unified policy framework and includes an agreement between all the States and establishes inter-state and inter-ministerial working groups in charge of implementing the vision.

Aspirations and scenarios for the region

The key issues: quality of the international environment and of our societies

The countries in the region are mostly in the intermediate income range, which provides the opportunity for advancing toward development in the coming 25 to 40 years. This aspiration can be expressed in indicators such as an income per capita of over USD 25,000, income distribution with Gini indicators of around 0.40, higher levels of access to education, universal access to health and sanitation, and R&D expenditures of around 2%-4% of GDP.

In thinking about the possible evolution of Latin America, it is useful to work with the technique of scenario construction, or alternative and plausible futures. The scenarios combine variables linked to the evolution of the international environment and those linked to the capacity of our societies to construct competitive and inclusive models, which will allow them to perform adequately in the face of international uncertainties. As a relevant example, it should be mentioned that recently the WEF has carried out scenario creation exercises for China and India that provide images of alternative futures for these countries, and offers a framework and language that allow public and private leaders to develop shared strategic agendas aimed at accelerating development¹³.

The key variables for the proposed future scenarios for Latin America are two: what will be the quality of the international environment, and what will be the quality and competitiveness of societies in the region. The first involves factors such as global growth or recession, the dynamism of trade and international investment, trade opening or protectionisms, and the status of peace and security. The second includes competitiveness, inclusion and opportunities, and institutional quality.

The desirable scenario and the role of infrastructure

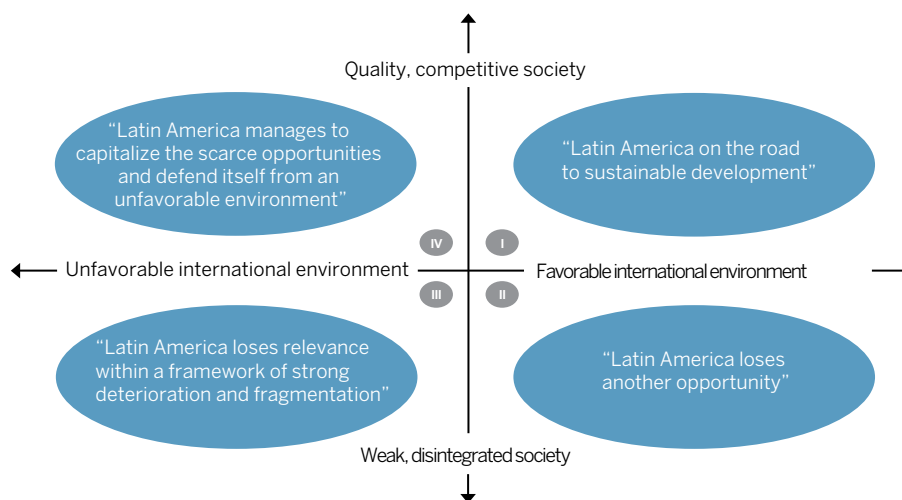
By combining these two elements, four possible scenarios have been developed, which are illustrated in Graph 1.5. Scenario I is the preferred one.

13 World Economic Forum (2009).

It combines a favorable international environment with a continuous effort to build inclusion and competitiveness in the region that will allow progress toward competitive and quality societies. Scenario IV is an intermediate one, which results from a less favorable international environment in which the region takes advantage of the limited opportunities and protects itself from an unstable external environment. These two scenarios should be seen as a continuum for which we should be prepared. At the same time, they constitute the basis on which a strong strategy regarding infrastructure is proposed, taking into account the different ways in which infrastructure can contribute to comprehensive development:

- Favoring a better quality of life, social inclusion, and opening opportunities for isolated communities.
- Supporting economic growth and the competitiveness of enterprises.
- Facilitating national and regional integration, decentralization, and internal mobility.
- Contributing to diversify the productive fabric through the promotion of development and the internationalization of national or regional enterprises that provide engineering and construction equipment, together with their associated professional services.

Graph 1.5. Possible scenarios for Latin America



Source: CAF.





Chapter 2



The state of the infrastructure sectors and the challenges they face

Transportation

Ensure increasing mobility and control negative externalities

The region has experienced a strong and sustained increase in the demand for transportation, boosted by the growth in the movement of cargo and people. In the past twenty years, trade volumes in the countries of Latin America grew at higher rates than economic activity as a whole. Between 1990 and 2011, the GDP of countries in the region grew at an annual average rate of 3.3%, while the volume of exports and imports grew at rates of 6.6% and 9%, respectively. This generated strong pressures on the foreign trade nodes and on the road networks, as road transportation is the dominant mode in domestic flows. The growth of intra-regional trade in recent years has further increased the demands on roads and land border crossings. An example is the exchange between the countries of the Latin American Integration Association (ALADI in Spanish), which grew by close to 26% between 2010 and 2011, with trade between countries such as Ecuador and Peru growing at rates exceeding 40% (ALADI, 2011).

The movement of people has also increased rapidly, driven by the growth of cities toward low dense suburban areas and by the increase in car ownership. According to ECLAC data, between 2000 and 2006 the increase in the total number of vehicles has been very high in Brazil (54%), Colombia (40%), Mexico (60%), Peru (44%) and Venezuela (42%), with annual growth rates of between 4% and 8% (ECLAC, 2007). The higher number of trips associated to automobiles has had significant effects in terms of congestion, particularly in large cities. The growth in the stock of motorcycles is also noteworthy: in Colombia, between 2006 and 2007, 700,000 new units were incorporated, more than during the whole of the 20th century. As a result, since 2006 the total number of motorcycles exceeds that of automobiles in the national total (Montezuma, 2007).

The region's modal matrix shows a notable distortion in favor of road transportation, which presents significant challenges in terms of its sustainability. With the exception of Brazil and Mexico, where railroad transportation of cargo represents around 20%, in the other countries of the region that have railroad infrastructure, its share does not exceed 5%. The high consumption of fossil fuels¹⁴ and the exponential growth of negative externalities make this structure highly vulnerable. This allocation of transportation modes leads to a number of negative consequences, of which urban and road congestion, in areas of intensive circulation, is the most visible. In addition, transportation is one of the sectors whose contribution to emissions has grown the most in developing countries: between 1990 and 2004 emissions from road transportation increased by 61%, twice the rate of developed countries (International Energy Agency, IEA, 2006).

Regarding the impacts on the health of the population, the region registers 17 deaths from traffic accident for every 100,000 inhabitants, representing almost twice the world average (Barbero, 2010).

Both cargo and passenger transportation are undergoing changes. With respect to the first, since the 1980s transportation activity has become integrated in the comprehensive management of supply chains, as part of modern logistics. The importance of this change lies in the decisions adopted by those who generate cargo: they no longer seek the lowest freight costs, but rather the lowest logistic cost, which also involves storage, inventories, losses, and other factors. This has led to the preeminence of smaller and more frequent dispatches, in which the synchronization of operations is key.

These changes have placed strong pressure on the cargo transportation operators, many of which have become logistic operators, strengthening the demands on the sector both in terms of infrastructure as well as services.

The area of mobility of people is undergoing change toward a paradigm of sustainable transportation, particularly in large cities. The implementation of this change appears to be very desirable, but presents significant challenges. Although the main objective of transportation is to ensure the mobility of people and goods, society assigns other objectives as well: minimize emissions and other adverse environmental effects, reduce the consumption of energy, reduce accidents, support regional and urban development policies, and generate employment. On occasion these multiple objectives may be conflicting. Therefore, it is necessary to achieve an adequate balance between them, without losing sight of the most urgent needs in each context. The countries of the region are still in debt regarding the mobility of the poorest sectors, which limits their inclusion in society. Therefore, development requires a broad and flexible vision regarding sustainable transportation, which is not limited exclusively to the reduction of emissions.

14 Currently, transportation explains 32% of energy consumption in the region.

In a context of growing complexity, institutions of the transportation sector are generally weak and with a strong tendency toward modal fragmentation. The public sector segmentation by mode tends to reduce managerial efficiency and hinder the design of adequate policies in the face of cross cutting agendas, such as urban mobility or logistics. The scarcity of qualified human resources should be added to these difficulties, explaining many of the problems in the sector. These problems are expressed in the weaknesses of policy formulation, the design and execution of investment projects, and in the implementation of regulatory or organizational reforms. The lack of data regarding the sector and of tools to organize them, are also weaknesses that make planning difficult. Strengthening public capacities would allow government organizations a more solid leadership, through the formulation of comprehensive policies, especially necessary in a sector where the issues of political economy are quite complex.

Roads: overcome the structural deficit, increase capacity, and guarantee security

The Latin American road network has a relatively weak performance. In terms of geographic coverage, its density is low: 156 km of roads for every 1,000 km² compared with the world average of 240 km; the levels are lower in South America than in Central America. The difference is wider with respect to OECD countries, which have network densities in the order of 600 to 3,000 km per 1,000 km². In terms of quality, the region has a low proportion of paved roads, 16% on average, with a lower proportion in South America. The world average is 57% and in developed countries paved roads represent almost 100% of the network. The availability of indicators that would allow comparisons regarding the state of the network in various countries is very limited, as they are prepared on the basis of different methodologies which produce results that are not comparable. However, the data available indicate that the regional network presents a poor state of maintenance, lower than developed and developing regions such as the Middle East and North Africa (Barbero, 2010).

The improvements made to the road network in recent years have occurred together with a strong growth in the demand for circulation, promoted by increases in economic activity, trade, and the number of motor vehicles. Thus, the challenge of overcoming structural deficits is superimposed with the need to increase the capacity of the networks to satisfy growing traffic demands and reduce congestion. These requirements affect not only the trunk network but also the secondary and tertiary networks. The latter are key for increasing access of rural communities and strengthen the value chain of the primary and agro industrial sectors. The dominant role of road transportation in the internal mobility of people and cargo make maintenance a key management issue, which requires large amounts of investment.

Starting in 1990, the region incorporated private participation in the sector with varying results, but public sector investment continues to dominate. Therefore, strengthening the technical capacity of state institutions is key to the improvement of the sector's performance, and must be based on comprehensive policies and financing mechanisms that are both solid and stable.

Railroads: a strategic mode for cargo transportation

The share of railroads in the transportation of passenger and cargo is very small in the region. Except for Brazil and Mexico, where railroads have a 20% share in the movement of cargo, in the other countries of the region that have railroad, this share does not exceed 5%. Cargo transportation is the most relevant and growing activity in the railroad sector: between 1995 and 2008, the number of tons transported doubled. The activity is mostly in the hands of private operators that work on the basis of commercial criteria, and have improved the efficiency and quality of operations. The transportation of urban and suburban passengers is the second activity in terms of volumes, but it is limited to only a few cities. Only three (São Paulo, Buenos Aires and Río de Janeiro) concentrate over 95% of this traffic. In this area, there are private and public operators with significant differences in terms of performance. Long distance passenger services were drastically reduced during the 1990s, and currently represent less than 1% of inter-urban passenger movement (Kohon, 2011.a) *(See Table 2.1).*

Increasing the share of railroads in cargo transportation requires an active role of the state in the sector, as well as changes in commercial and operating practices of the concessionary companies. The cargo concessionaries made important investments to improve services but, in general terms, they did not make structural improvements to the railroad systems as this type of investment, due to its size, is beyond their financial capacity and requires public financing¹⁵. A greater state presence is also required to deal with the impact of railroad operations in urban areas, such as the establishment of rights-of-way, the construction of urban ring roads, and crossings with the road system. At the same time, operators must capture mass traffic which is still not serviced, and enter massively into the general cargo market. This implies the development of an intermodal infrastructure that facilitates the access of railroads to ports and storage centers, and a change in the operating culture of these companies which have mostly focused in bulk transportation¹⁶.

15 More than half of the railroad concessionary companies in the region have revenues of under USD 100 million per year.

16 Railroads in Mexico are an exception, as they have developed a massive and efficient container transportation operation.

The development of suburban railroads in the region faces a number of obstacles. The first of them is the lack of integration between transportation planning and land use. The disorganized creation of new urban and suburban development, scattered and of low density, promotes the use of private

Table 2.1. Railroad traffic (a) of cargo (main systems) and (b) of suburban passengers in Latin America

(a)

Country	1999		2008		Variation (Ton-km) 2008/1999	Average distance 2008 (km)
	Tons (Thousands)	Tons/km (Thousands)	Tons (Thousands)	Tons/km (Thousands)		
Argentina	17,488	9,102	23,619	12,025	32%	509
Bolivia	1,572	829	1,831	1,021	23%	558
Brazil	305,100	162,300	459,700	267,700	65%	582
Chile	4,810	1,032	10,804	1,967	91%	182
Colombia	5,869	1,434	25,537	4,869	240%	191
Mexico	77,062	54,109	99,845	77,170	43%	773
Peru	1,963	546	3,179	659	21%	207
Uruguay	1,321	239	1,393	304	27%	218

(b)

Country	1999	2008	Variation(%)
	<i>Millions of passengers</i>		
Argentina	479.4	450.0	-6
Brazil	531.9	679.1	28
Chile	11.5	21.1	83
Mexico	----	8.6	----

Source: IADB (2011).

vehicles instead of mass transit systems, among which railroads have great potential.

Financial factors have been an additional challenge. Railroad projects require large initial investments and usually have difficulties in paying their operating costs. The weaknesses in coordinating with other modes, especially with the schedules of preexisting motorized public transportation that operate along the railroad or near it, have also had negative effects. Long distance passenger projects have high cost and low demand, so that decisions regarding their implementation must ensure that the desired social objections are attained.

Ports: key logistic nodes for international insertion and competitiveness

The ports of the region are relatively small on a global scale and show good levels of productivity. In terms of operating scale, in general cargo, only 10 ports in the region move more than 1,000,000 TEU annually (Twenty Foot Equivalent Unit, the unit of movement of containers)¹⁷. This reflects the importance of bulk in the region's exports. There are numerous terminals specialized in this type of cargo, generally operated by the private sector. The entry of private operators into the sector during the decade of the 1990s had a positive impact in terms of efficiency. Productivity, measured on the basis of indicators of equipment and docking space use, shows good levels in a comparative perspective. However, in terms of operational efficiency, indicators are widely scattered with many cases of very poor performance.

Trends in the shipping business, which is moving toward a significant concentration, have a strong impact on the prospects for developing ports. The use of ever bigger ships that stop in few places and concentrate their operations in terminals able to receive them, with high levels of efficiency, promotes the establishment of a trunk fed system. This scheme has promoted cargo transfers (mostly containers) and has unleashed competition among ports that seek to become hubs that receive larger ships that offer shorter travel times and improved freight rates. This phenomenon has an adverse impact on the relative logistic costs of smaller ports, forcing traders to transfer goods. The coming expansion of the Panama Canal is not only a large infrastructure work in the region, but will also have a strong global and regional impact as it will change the dimensions of ships and the configuration of maritime routes.

The trend in global demand for primary products (such as minerals or soybean) has promoted a proliferation of private initiatives to exploit the resource and the infrastructure works to ensure their logistics. The developments proposed typically consider the needs of the project, promoting initiatives that are not always aligned with a strategic view (multiple ports close to each other, railroads of exclusive use). The dynamism of the sector underlines the need to reinforce the technical capacity of the public actors to ensure clear guidelines for their development.

Recent analysis regarding the evolution of the sector indicates that the region's terminals will experience strong pressures on their capacity during the period through 2016, as a result of increasing demand¹⁸. The private sector is able to carry out the necessary investments, and the public sector must ensure adequate conditions in the waterfront, through dredging, and on land it must lead in the organization of the city-port relationship, and in coordinating the actors of the port community.

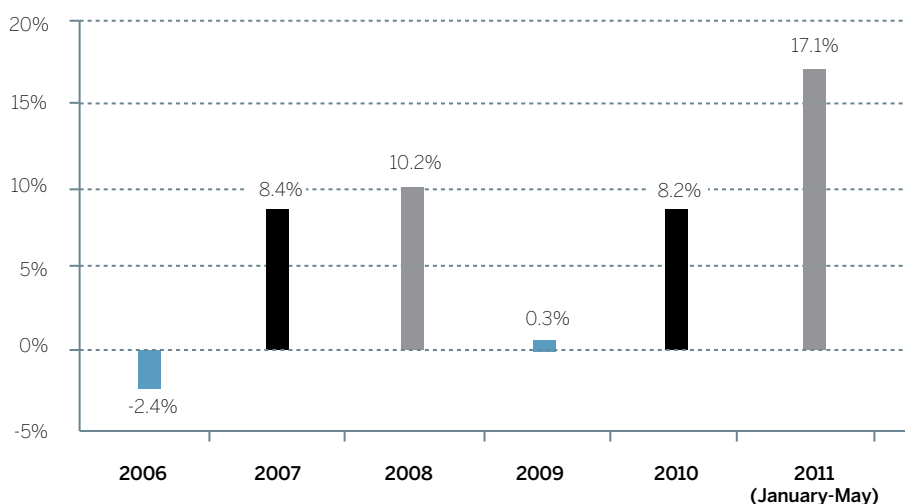
17 Santos, Brazil; Colon and Balboa, Panama; Kingston, Jamaica; Buenos Aires, Argentina; Freeport, Bahamas; Cartagena, Colombia; Manzanillo, Mexico; Callao, Peru; and Caucedo, Dominican Republic.

18 Global Container Terminal Operators Annual Review and Forecast 2011, quoted in The Journal of Commerce. Available at: <http://www.joc.com/portsterminals/drewrysees-tightening-terminalcapacity>.

Air traffic infrastructure: the challenge of unprecedented growth

The demand for air transportation has registered strong growth, resulting in a high use of the air traffic infrastructure and airplanes. In 2011, passenger traffic in Latin America grew by 17%, twice the world average, while capacity offered by the airlines grew by 12%, also above the world average. Given that propensity to consume air travel by developing markets is considerably higher than that of mature markets, it is expected that demand will continue increasing rapidly in coming years as economies grow and the quality of life improves. In this context, with the exception of Chile, Costa Rica, Ecuador, Peru, and Uruguay, the levels of airports services are relatively low. Regarding air transportation services, the region has experienced the same consolidation process seen around the world and, within the region, it is interconnected almost exclusively by local airlines: 73% of the interregional traffic is operated by five airlines. The most successful of those are mostly owned by the private sector and have reported positive results in recent years. (see Graph 2.1).

Graph 2.1. Growth of passenger traffic in Latin America (2006-2010, paying passengers-km)



Note: January-May 2011 is compared to the same period in 2010.

Source: IATA Air Transport Market Analysis.

The entry of the private sector into airport management had a generally positive effect on the performance and quality of the infrastructure. It should be noted, however, that rates charged to passengers and airlines (that finance maintenance, operation, and investment in airports) have increased significantly. In the future, the renegotiation of concession

contracts will have to reach balances that without discouraging of the private sector, harmonize the interest of the concessionaires with those of the passengers, airlines, and the state. In this regard, one of the relevant aspects for private sector participation in the management of airports is the quality of the institutional and regulatory framework in the region that, in general, is weak. The complexity of airports and their monopolistic character require monitoring the concessionaire regarding compliance with the terms of the contract, and a clear definition of economic regulations on matters of tariffs and access charges.

Urban transportation: the need for a new paradigm

Transporting people constitutes one of the main challenges faced by the main urban centers of developing countries. The growth of cities leads to a sustained growth of the demand for mobility that, associated with rapidly increasing stock of motor vehicles, generates growing congestion. In many cases, this process is combined with the deterioration of public transportation, which promotes individual trips in automobiles or motorcycles, further increasing congestion. All of this has negative consequences for the economy of the city, its environment, and the quality of life of its inhabitants, particularly those with less resources and greater vulnerability.

In recent years, there has been a growing trend in Latin America toward the reform and modernization of public transportation that seeks to reorganize the conventional systems, characterized by their fragmentation, for integrated systems that include mass modes in the sections of greater density. Restructuring the mass transportation networks has been one of the main formulas implemented in numerous cities of the region, integrating trunk corridors —which consolidate mass flows of passengers— with feeder routes increasing the links between services, incorporating new transportation technologies, and coordinating the payment systems.

The public transportation of passengers is key in this new sustainable urban transportation model. Improving it requires a modernization of services and implies very large projects in large cities (subways, BRT, streetcars). As the systems are integrated, the new projects make important demands on institutional capacity, regulatory frameworks, and financing mechanisms that ensure their efficiency and efficacy. The objective of the new designs is not limited to providing mobility, but also aim at establishing a better environment in the cities, which implies achieving coordination between jurisdictions and in urban development policies, the use of land, and housing.

Electricity

Growing demand requires continuous expansion

Electricity services in Latin America have reached 93.4% of the population, with an urban coverage of 98.8%, and in rural areas, of 74.0%. Although the general situation does not compare unfavorably with the world average, and particularly with other developing countries, a number of countries in the region are lagging particularly behind.

The sector has experienced sustained growth in the demand for energy and power, which between 2000 and 2010 increased by 36% and 25%, respectively. This growth was more pronounced in the Andean countries (50% and 29%, respectively)¹⁹. The dominant generation source is hydroelectric, representing 56% of installed capacity, while thermal sources explain 40%. The development potential for hydro generation is quite large, and it is estimated that it could quadruple current capacity. However, the projects must be designed and operated within a framework of sustainable development, and may affect important ecosystems and displace vulnerable groups (see Table 2.2).

Table 2.2. Electric service coverage (2009)

Region	Population without service (millions of residents)	Coverage		
		Total	Urban	Rural
Latin America	31	93.4	98.8	74.0
Developing countries	1,438	73.0	90.7	60.1
OECD and transition economies	3	99.8	100.0	99.5
World	1,441	78.9	93.6	65.1

Source: World Energy Outlook, IEA, 2010.

The balance between generation supply and demand shows that reserve margins in the region range between 30%-60%, but during dry spells, the effective reserve declines significantly, as many of the hydroelectric dams do not have a significant reservoir capacity. In the case of the South Cone, the generation reserve has declined considerably due to increased demand, and it stands at minimum levels. The limitations are not in the availability of power

¹⁹ The analysis of the electricity sectors considers three sub regions: Mercosur (Argentina, Bolivia, Brazil, Chile, Paraguay, and Uruguay); the Andean region (Colombia, Ecuador, Peru, and Venezuela); and the Central, North, and Caribbean (Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama; and the Spanish speaking Caribbean islands: Cuba, Santo Domingo, Puerto Rico, and others).

but rather on the energy generated. Energy integration in the sub regions, which has been advancing, allows sharing of reserves that contributes to improve the quality and availability of the service. Box 2.1 describes the case of Central America, the most electrically integrated region in Latin America.

The provision of transmission infrastructure is particularly costly in Latin America, as the region combines a low consumption density with a large geographic space. In terms of kilometers of line relative to energy consumed, the length is three to four times higher than in developed countries. This implies larger investment requirements than in more developed regions, so that its regulation and planning constitute an issue of the greatest importance (*see Table 2.3*).

Table 2.3. Supply-demand balance

	MERCOSUR	Andean	C, N&C
Maximum demand	92,310	34,920	49,254
Hydroelectric	119,238	31,287	15,839
Geothermal	0	0	1,560
Nuclear	3,025	0	1,365
Thermal	44,702	19,184	44,304
Total	166,965	50,471	75,068
Theoretical reserves	45%	31%	34%

Source: CAF.

Coverage has reached high values in urban areas, but the rural population that still lacks service is high, the coverage is costlier, and probably will require the combined use of connection to networks and extra network solutions. In general, projects are co-financed between the state, the private sector, and consumers. There is a trend toward the creation of specific state institutions to develop rural electrification projects in response to the demonstrated lack of interest by distributors. Frequently, the creation of the institution is accompanied by a fund allocated to rural electrification, which is managed by the same institution or by a separate entity (*see Box 2.1*).

The trend toward renewable sources and the new network designs

In the region there is a strong trend to incorporate non-conventional renewable sources to reduce dependency on fossil fuels and emissions of greenhouse gasses, in particular, toward aeolic generation. Doing so has

Box 2.1. Central American electricity integration: a successful case

One of the most important electric interconnections in Latin America is the one in Central America. It went through a complex integration process whose success was possible due to the decision and attitude adopted by the countries. The presidents of the six Central American nations agreed to give maximum priority to the project named “Electric Interconnection System of the Central American Countries” (SIEPAC in Spanish), and subscribed in December 1996, the Framework Treaty for the Electric Market of Central America, which was ratified by the six countries and became the basis for the creation of a regional electricity market (MER in Spanish). Regional institutions were created: CRIE, the regional regulator; the EOR, responsible for the regional operation; and EPR, the transmission company responsible for the regional interconnection network. Currently, the six countries that make up the MER are physically interconnected by the so-called “Regional Transportation Network” (RTR in Spanish). Energy exchanges among the Central American countries took place prior to the operation of MER in the year 2002. Until then, there were two subsystems that operated independently as there was no link between them. With the entry in operation of the interconnection of the electricity systems of El Salvador and Honduras in 2002, together with the operation of the MER, the technical and regulatory conditions were created to allow for energy exchanges of imports and exports between the six countries. In addition, the region is connected with Mexico through a México-Guatemala interconnection and is advancing in the interconnection between Colombia and Panama.

requires state support, which has created the conditions for development that the dynamics of energy markets have not achieved. Promotion activities have been more important the greater the gap between the market cost of energy supply with traditional sources, and the cost of developing renewable technologies. The high international prices of liquid fuels in recent years have been an additional motivation for the development of renewable energies as they have significantly reduced the price gap. In recent years, a number of Latin American countries have begun to promote the development of nontraditional renewable energy technologies in larger scale, for which the region has abundant resources. The installed capacity of aeolic generation in the region, although still marginal, has been doubling every year (*see Table 2.4, page. 60*).

The evolution of new technologies is reaching all sectors and now it appears to be the term for an important change in the electricity sector of Latin America and the Caribbean. The sector needs new models that will allow a more efficient use of energy to respond to the challenges that the environment, the new generators, and the new consumers present. The classical model of transmission from generation to demand does not easily adjust to renewable energy, as these, with their variability, generate changes in the directions of the flows that require the development of an intelligent and integrated

Table 2.4. Aeolic generation capacity in Latin America and the Caribbean

Country	MW Early 2008	MW 2009
Argentina	27	29
Brazil	247	600
Chile	20	58
Colombia	20	20
Costa Rica	70	98
Cuba	7	12
Ecuador	2,4	2
Mexico	88	320
Nicaragua	0	39
Peru	0,7	1
Uruguay	0,7	21
Caribbean	53	53,2
Total	536	> 1250

Source: LAWEA – November 2009.

network (an important challenge for the region), where in each node, there may be generation and demand, and in which the tariffs must be dynamic to adapt to this environment.

Managing the sector: balancing planning and regulation

There are various management models for the electricity sector that combine the participation of the public and private sector, and market mechanisms with public planning. In most countries generation has been organized as a free access market in which prices lead to the addition of new capacity, creating a very efficient sector, even in those countries which have not organized the area under a market scheme. In transmission, the role of planning has proved to be critical for its expansion, more so in the face of the development of non-conventional sources. The growth of transmission shows a number of public private association models that in many cases, has succeeded in attracting investors and reducing costs. In general, distribution is the responsibility of private companies, albeit with some important exceptions. The retribution

for its services —linked to rate tables and social policies that deal with the capacity to pay of consumers and the important externalities that justify the universalization of the service— is important to ensure quality and the expansion of supply. The design of subsidies that includes consumers with relatively high incomes may divert necessary resources for the development of the system and increased coverage.

In several countries of Latin America, the non-technical losses of energy constitute a very important problem, which must be faced and considered in the strategic design of the sector because they may pose a threat to the sustainable development of the electricity sector. Success in resolving this issue will depend in the end on the conviction of the government regarding its importance and the need to introduce a change in the payment culture of consumers.

The need for change in the production and consumption of electricity

The development of the energy sector in Latin America requires the introduction of important changes in the way electricity is produced and consumed, promoting sustainable modes, which naturally include environmental conservation. The main objectives are: i) maximize access of the population to electricity services under economically and environmentally sustainable conditions so as to improve the quality of life and equity, and ii) achieve quality of service, reliability of supply, and competitive prices that support economic development.

The main obstacles to be overcome are the low coverage in a number of regions, especially rural areas; the scarcity of economic resources relative to investment needs (that may double the requirements of developed countries per inhabitant); rates that are not representative of costs; high energy losses and subsidies not targeted on low income consumers; an inefficient use of capital resources; and weak institutions and regulations of the services assigned to private companies.

The challenges faced by Latin America in the electricity sector may be summarized as follows:

- Generate strategic long term plans consistent with the rest of the energy sector, and institutions to ensure that implementation will be coherent with the regulatory regime to be adopted.
- Improve the efficiency of public expenditure on certain key processes, such as contracting, concessions, and risk management.
- Establish rates that reflect costs and ensure that subsidies are assigned and focused efficiently.

- Improve the efficiency in the use of existing and new infrastructure through: i) the efficiency of public expenditure on infrastructure, the award processes, the design of concessions, and the allocation and management of risks; ii) the investments required to achieve an optimal level of losses and improve the relationship between the suppliers of service and consumers; iii) improving regional integration to allow a better use of the generation infrastructure.
- Ensure the necessary financing for the expansion of the required infrastructure seeking the most efficient sources.
- Establish environmental policies that allow the sustainable development of the sector.
- Ensure, at the same time, the Access of the lower income population to the supply of electricity.

The annual investment needs will depend on the growth of demand. In a scenario of sustained growth, these needs have been estimated at USD 60 billion a year on average, through the year 2020, equivalent to 1.2% of current GDP. In a conservative scenario (implying a growth of GDP not greater than 3% per year), the necessary investment would approximately be cut in half.

Natural gas transportation

Growing demand and greater weight of gas in the regional energy matrix

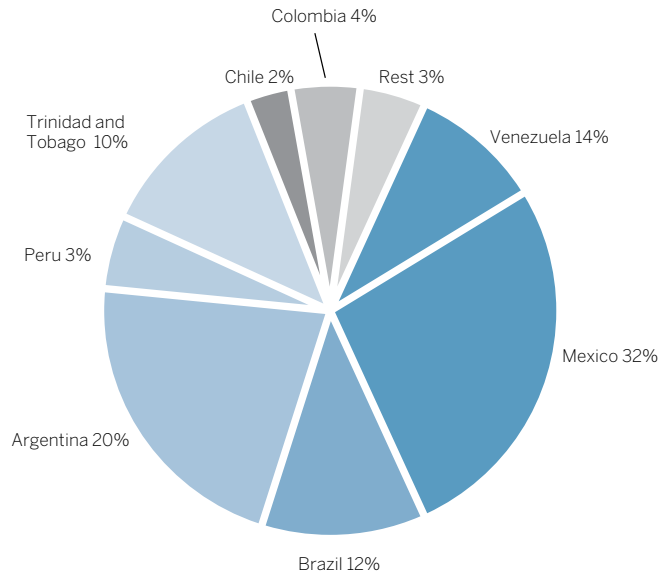
The last two decades registered an increase in primary energy consumption throughout the world, albeit lower than the growth of the gross domestic product, which led to a drop in the intensity of energy at a global level. Within this context, in Latin America energy consumption grows strongly, together with energy reforms that could eventually lead to energy exchanges. Natural gas emerges particularly strongly within the region's energy matrix, with its per capita consumption increasing at a rate of 3.3% annually between 1990 and 2010, exceeding the growth rates observed in other regions such as the European Union, the OECD, and the world total. The rapid expansion of natural gas consumption in Latin America has resulted in a 25% share of the consumption of energy in the primary matrix, seven percentage points over the level registered in 1990. The market share of this hydrocarbon is similar to that of the OECD, the European Union, and the world.

The distribution to consumers of natural gas in Latin America is uneven, with Mexico being the largest consumer, representing almost one third of the region's gas consumption, followed by Argentina, Venezuela, and Brazil. At the same time, proven gas reserves in the region are found mostly

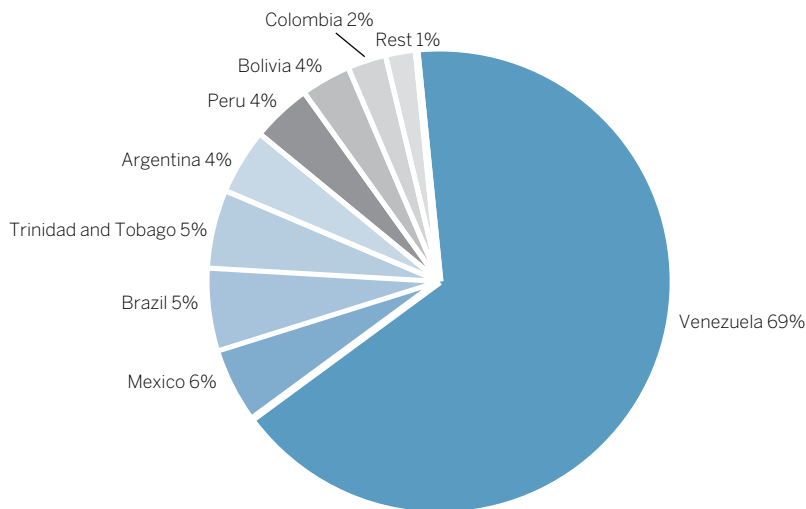
in Venezuela (69%), while the remaining 31% is scattered. Probable and possible reserves continue generating attention in the light of the application of new technology applications for the development of shale gas deposits, and the recent discoveries in the pre-salt layer (underwater geological formation) in Brazil (see Graph 2.2).

Graph 2.2. Distribution of consumption and proven natural gas reserves in Latin America and the Caribbean

Consumption



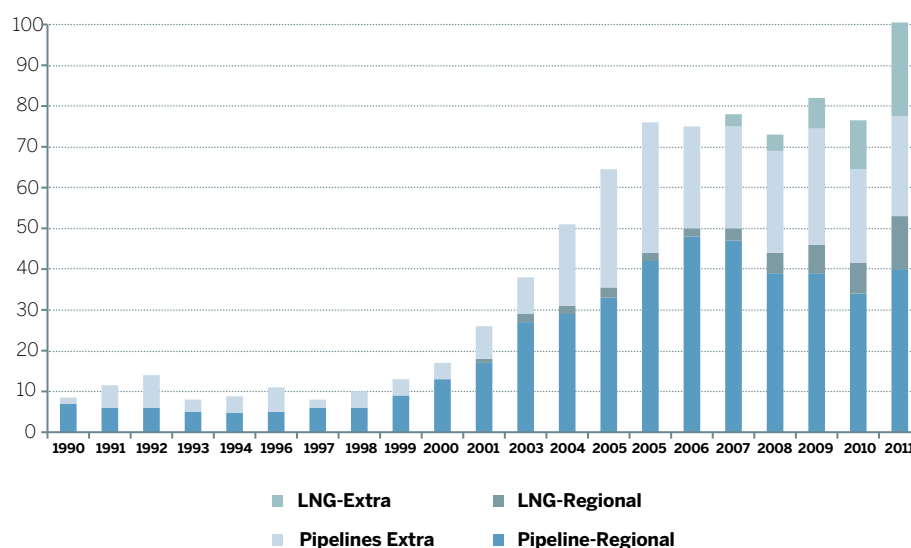
Proven reserves



Source: compilation based on British Petroleum data.

Together with the growth in consumption, regional gas trade expanded significantly. Intraregional gas flows grew by a multiple of eight in the past twenty years. During the decade of the 1990s, trade took place only through gas pipelines, with the South Cone as the main actor. Starting in 2005, trade through gas pipelines began to decrease to be displaced by imports of liquefied natural gas (LNG). Currently, a number of trends stand out: (i) imports represent 20% of Latin America's consumption; (ii) 50% of imports come from intraregional trade; and (iii) almost 40% of the region's imports are of LNG. Trinidad and Tobago and Peru (the only LNG exporters in Latin America), supply 30% of the requirements, and the remaining 70% comes from other regions in the world (*see Graph 2.3*).

Graph 2.3. Regional and extra-regional imports via gas pipeline and LNG



Source: compilation based on BP and EIA.

20 Argentina, which has a developed gas industry, will become a net natural gas importer through pipelines and ships (LNG) as it has shown a notable decline in its production and reserves of conventional gas. The government has implemented a policy to stimulate the exploration, development, and production of non-conventional natural gas (compact sand gas and shale gas).

Growth of trade in liquefied gas modifies the infrastructure demands

Within this framework, it is expected that demand for natural gas in Latin America will grow at rate of 3% annually through 2025. Growth will be led by countries that are developing their gas transportation infrastructure and that have a significant volume of hydrocarbon resources, such as Brazil, Peru, and Venezuela. Countries with mature natural gas markets, such as Mexico, Argentina²⁰, and Colombia, will show a lower growth rate in demand, and emerge as net importers of gas in the medium term, be it through gas pipelines or LNG. It is expected that countries that export natural gas, such as Trinidad and Tobago and Bolivia, will continue their efforts to find new reserves and will increase their exports, as the performance of this group

of countries is subject to great uncertainty due to the level of gas resources required for their own consumption as well as their interest in generating higher exports.

In general terms, gas production in Latin America recently showed an important growth cycle, which has stabilized in recent years, but which could increase again as a result of more intense explorations. In this regard, Venezuela's potential to grow in its regional role through its projects to export LNG, which would become operational starting in 2015, stands out. Both Brazil and Argentina may strongly increase their domestic supply of gas as a result of the new discoveries in the pre-salt area and non-conventional gas, respectively. Colombia and Mexico have a significant potential of gas resources in the offshore platform, but their commercial potential must be confirmed.

A sector with high potential for regional integration and emission reductions

Natural gas is the best answer to climate change in the context of fossil fuels. The new technologies that use natural gas, such as the combined cycle thermal plants, have had an important expansion due to their efficiency. The electricity sector will continue to be an important consumer of natural gas in Latin America, and will be the engine for the creation of new transportation infrastructure. In Mexico, for example, it is expected that 60% of the growth of natural gas demand between 2011 and 2025 will be supplied by this type of plants. The possibility of accessing LNG on the part of electricity generation plants allows achieving the energy security objectives, while the supply of LNG is flexible and allows its use mostly during generation peaks. In other sectors, the situation is dissimilar. An increase in the consumption of gas is expected in the petrochemical industry and refineries. Gas consumption in the residential sector is relatively low in Latin America; only Argentina and Colombia show an important market of residential consumption. The share of natural gas in the transportation matrix depends mainly on relative prices between natural gas and gasoline, and the conversion of public transportation from diesel to Vehicular Natural Gas (VNG).

The expected growth in the supply and demand of natural gas in Latin America will result in an important increase in the transportation infrastructure requirement. However, it should be noted that with respect to the sector's long term planning, the coordination among the institutions that participate in the design of energy policies must be addressed, taking into account social, environmental, and energy security objectives. This is already the practice in almost all countries. Investments in the expansion of gas transportation infrastructure in Mexico, Argentina, Colombia, Brazil and Peru, is estimated at

around USD 15,000 million in coming years. This will enable the achievement of the targets for internal demand and export commitments (Peru). Of the total, Argentina and Peru represent 70%. None of the countries in Latin America is planning the construction of integration pipelines, in the short or medium term, except for the completion of the Argentinean Northeast Gas Pipeline (GNEA in Spanish), to receive greater volumes of gas from Bolivia. The trend that is taking shape today is the import-export of LNG. The “virtual” transportation of LNG within regions —through the use of trucks and barges— provides an additional opportunity to tend to smaller and eventual consumers. These technologies, if they grow further, would enable an improved regional distribution of gas without requiring large investments to build gas pipelines.

The trends outlined mean that the use of natural gas for different purposes is no longer circumscribed to countries endowed with the resource and the reserves to develop and produce it, and eventually export it to neighboring countries. Technological advances in the transportation of natural gas have expanded the borders and the market, and currently natural gas may be exported through ducts, ships, and trucks in different states until its regasification for consumption. The region has participated in these changes and is going through a rich experience regarding alternative business structures, public and private collaboration, and the scope of planning, to create or strengthen the natural gas industry in some of the countries.

The different experiences of countries in the development of the infrastructure for natural gas markets allow the identification of three challenges faced by the region:

- This is a sector that requires substantial investment, which matures slowly, and carries considerable risk. The case of Camisea, in Peru, is illustrative, since the country had to deal with the introduction of a natural gas consumption culture, the need to connect important consumers to justify the construction of a pipeline and, in addition, develop the financial/tariff structure that would reduce the risk of a substantial investment in transportation and distribution.
- The development of infrastructure must have the characteristics of state policy. The commitment of governments through different administrations is an element that strengthens sustained development and provides confidence to consumers, operators, and investors in their long term decisions.
- Sustainable development and financing. This is a general term that brings together technical and economic aspects with social and environmental issues. The accumulated experience regarding the approval of the required environmental and social studies through the life of this type of project varies, pointing to problems related to processing time, unnecessary bureaucratic delays, and political factors at times without

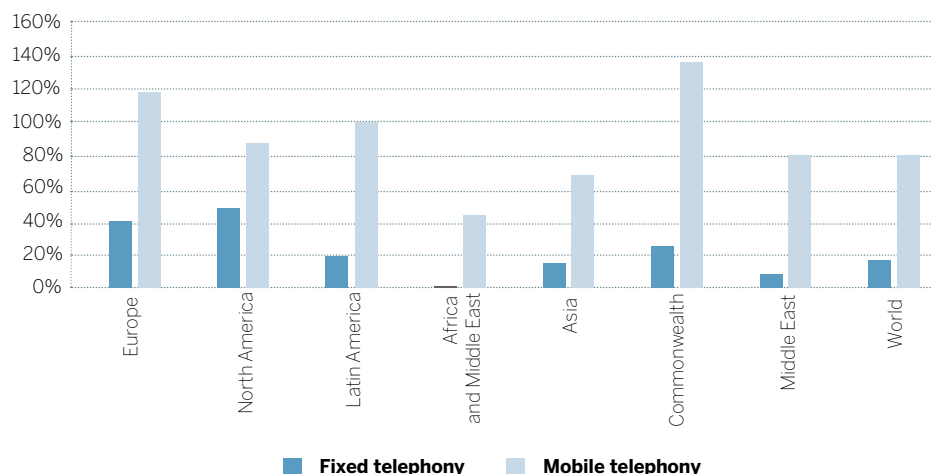
consideration for social realities. The presence of multilateral credit institutions in infrastructure projects facilitates their implementation in a number of ways, as it attracts private finance by requiring commitments from governments, and requires approved environmental and social studies for the disbursement of loans. Thus, transportation planning goes through a first “strategic” phase, in line with the wider ranging objective of sustainable development. Then it goes through a second stage in which investment needs in infrastructure are established starting from a business model that is adequately structured and sustainable in all its aspects. Transportation is not only a nexus for developing the market, but it must also allow, in the medium and long term, for the establishment of competitive markets.

Telecommunications

Advances in mobile telephony, growing gap in broadband

During the past two decades, information and communication technologies (ICT) have expanded significantly in Latin America. The first wave of dissemination has been in fixed telephony: the number of fixed telephone lines has increased by 79 million, so that coverage has gone from 6.3% in 1990 to 18.4% in 2010. Subsequently, mobile telephony reached an average coverage of 99% in 2010, only 20 years after its introduction. As a result of this process of rapid adoption, the region is currently at a middle level of development in fixed telephony, and at a level similar to that of industrialized countries in the case of mobile telephony (*sees Graph 2.4*).

Graph 2.4. Comparative adoption of telecommunications (2010)



Sources: ITU; UN and Katz (2011); author’s analysis.

These developments have been based on public policies that concentrated on the privatization of fixed line operators, on the promotion of mobile telephony, and on the promotion of competitive structures for providing these services. Investment levels in fixed telephony were in the order of USD 224 billion between 1990 and 2007.

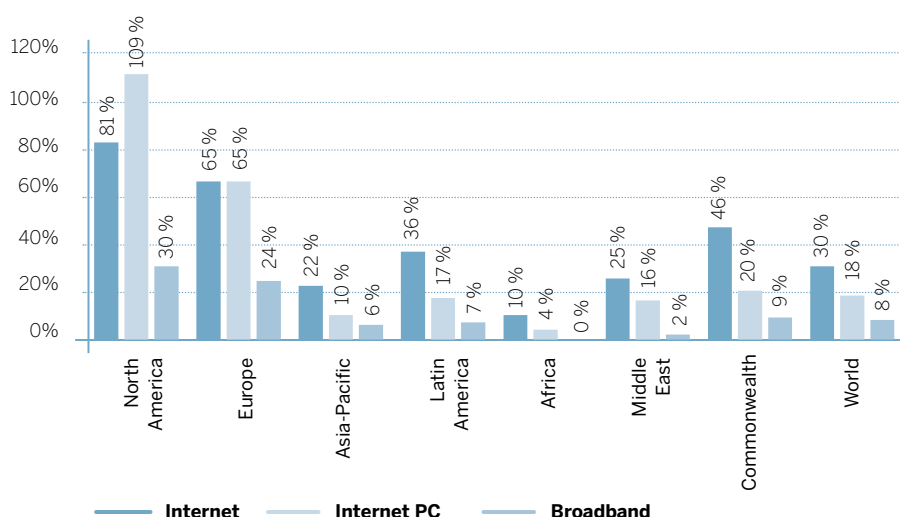
The second wave of ICT development was related to the adoption of personal computers and the Internet. Computer use is reaching almost 17% of the population, and the use of Internet reached 36% in 2010. The region finds itself in an intermediate development stage regarding Internet and personal computer use. The third wave consists in the adoption of broadband services, both in homes as well as companies and public administration. In this area, Latin America is growing more slowly. The average use of broadband in the region is 6.8%, compared with levels of 24% to 30% in developed countries (Graph 2.5). As broadband adoption grows faster in developed countries than in the region, the utilization gap is growing with the consequent negative effects on the competitiveness of our economies (*see Graph 2.5*).

At the same time, a within the region analysis shows significant gaps in broadband use between countries and, within countries, between regions and social groups. These gaps represent a significant obstacle for the development of these regions and for the inclusion of the less privileged socioeconomic groups. National and provincial capitals and primary urban centers show a significant development of networks, while smaller urban centers and rural areas are not yet efficiently served by the telecommunications networks. In the specific case of broadband, the geographic duality must be added to the socio-demographic differences, owing to the high cost of adopting the technology.

The multiplier effect of the technology on the whole economy underlines the need to unfold infrastructure that satisfies the needs for information transmission of the different economic sectors. The greater the availability of infrastructure, the more efficient will be the productive processes and the generation of positive externalities. This implies stimulating the adoption in companies and less supplied sectors, specially the micro and small MSMEs, through entrepreneurial training, subsidies to microenterprises, and support to this sector to allow the accumulation of intangible capital (organizational changes and the adoption of business practices to take advantage of the technology's potential).

In summary, the comparative analysis between Latin America and other emerging or developed regions shows a mixed picture: a level of mobile telephony comparable to that of its peers, but a more limited progress in the development of broadband. The resulting gaps may be defined according to two dimensions: supply gaps (that represent the relative importance of the territories or populations not covered), and demand gaps (which measure the cases in which there is inadequate use of the available infrastructure due to restrictions on access, cultural limitations, or weak managerial practices).

Graph 2.5. Comparative adoption of Internet and broad band (1990-2010)



Source: Euromonitor; International Telecommunication Union.

Table 2.5. Mobile phone adoption in companies (2010)

Country	Large and medium sized enterprises (%)	SMEs (%)	Microenterprises (%)	Year
Argentina	100	76,70	63,30	2007
Brazil	90	80	61	2009
Chile	100	43		2008
Peru	100	45		2006

Sources: Argentina (Prince & Cooke); Brazil (CETIC); Chile (Entel); Peru (Propyme).

The road toward universalization of services

Development policies should establish two types of objectives: initially, cover the supply gap and, particularly relevant in the case of region, reduce the demand gap; that is, increase coverage and use of ICT in households, productive processes, and public administration. In the case of mobile telephony, the supply gap must be covered by promoting the expansion of networks. In the case of broadband, the challenge will be to cover a supply gap in the order of 10% but, above all, to cover a demand gap of 80%, which is concentrated mainly in the small and medium sized enterprises.

To overcome the current gaps, the key policy goals should be to achieve full coverage, promoting demand from the least favored groups, and stimulate

the incorporation and more generalized use of ICT in small enterprises by assisting them in the development of their managerial practices.

In view of the growth aspirations of the region, presented in the previous chapter, significant investment levels should be maintained. In the period through the year 2016, the region must install approximately 174 million additional broadband lines to achieve levels comparable to those of other emerging countries. Furthermore, these lines should provide access speeds far superior to those currently available. Achieving these objectives will require investments of around USD 7.8 billion during the period 2011-2016, to achieve a modest broadband coverage target of 9.6%. To attain the recommended target of 20%, investment would have to reach USD 34.7 billion. To these investment levels, the necessary acquisition of spectrum and the construction of mobile networks should be added, which could reach up to USD 14 billion through 2016. These figures are comparable to those which have been invested by private operators in recent years. The private sector will need to continue investing at this rate to address the development objectives, although there are opportunities to share infrastructure between operators to optimize the investments.

At the same time, the public sector will have to act to resolve the potential market failures and ensure universal coverage both in telephony as well as broadband. The migration to third and fourth generation mobile networks (3G and 4G), needed to satisfy the growing traffic, generates two important pressure points on existing infrastructure: greater trunk capacity and greater allocation of the radio electric spectrum. To respond to the growing network capacity needs, the industry of mobile telecommunications will need to access more of the radio electric spectrum²¹. The benefits of allocating a larger segment of the radio electric spectrum include not only efficiently accommodating data traffic, but also, in view of the greater band width required (700 MHz), will allow the unfolding of broadband networks in rural areas of the continent, with the consequent positive social impact, and will improve signal reception inside buildings in urban areas. If the growing needs for spectrum are not satisfied, the quality of mobile services will be subject to degradation, particularly in large urban concentrations, which generate data traffic.

Countries should advance in developing telecommunication national plans and the construction of planning and regulatory institutions, which should coordinate with the institutions needed for the whole infrastructure sector.

²¹ The Inter American Telecommunications Commission (CITEL in Spanish) estimates that Latin American mobile operators will require an additional 712 MHz by the year 2020 in low demand areas, and an additional 1161 MHz in high demand areas (CCPII/Rec.70-XXII-02).

The challenge of integrating ICTs in productive and administrative processes

There is a growing consensus in the region regarding the new role that must be assumed by the state in the formulation and implementation of policies for the telecommunications sector. Beyond the plans to develop the

broadband, there is a need for governments to adopt decisions and promote framework programs to generate effects on education, on the adoption of telecommunications, and the practical adoption of technology on the part of MSMEs, so as to integrate them with the large enterprises and increase their production by selling to the state and increasing their exports. To achieve these objectives, access speeds are critical.

Water and sanitation

Water: an abundant resource with unequal distribution and inefficient use

Latin America is a region with an abundance of water, but it is unequally distributed in space and time relative to the population and economic activity (especially regarding urban demand), and with an extreme variability of rainfall. For example, there is a large season variation: more than 50% of the annual rainfall is concentrated in three months. At the same time, 23% of the Latin American territory is arid or semi-arid, implying levels of rainfall of under 500 mm. per year. In countries such as Mexico, Chile, and Argentina, the proportion of arid or semi-arid territory exceeds 50%. Added to this, every five to ten years there are big droughts and floods due to the La Niña/El Niño phenomena. Moreover, catastrophic droughts and floods are becoming ever more recurrent, with serious impacts on the quality of life—including the loss of life and property— with highly negative consequences on economic flows.

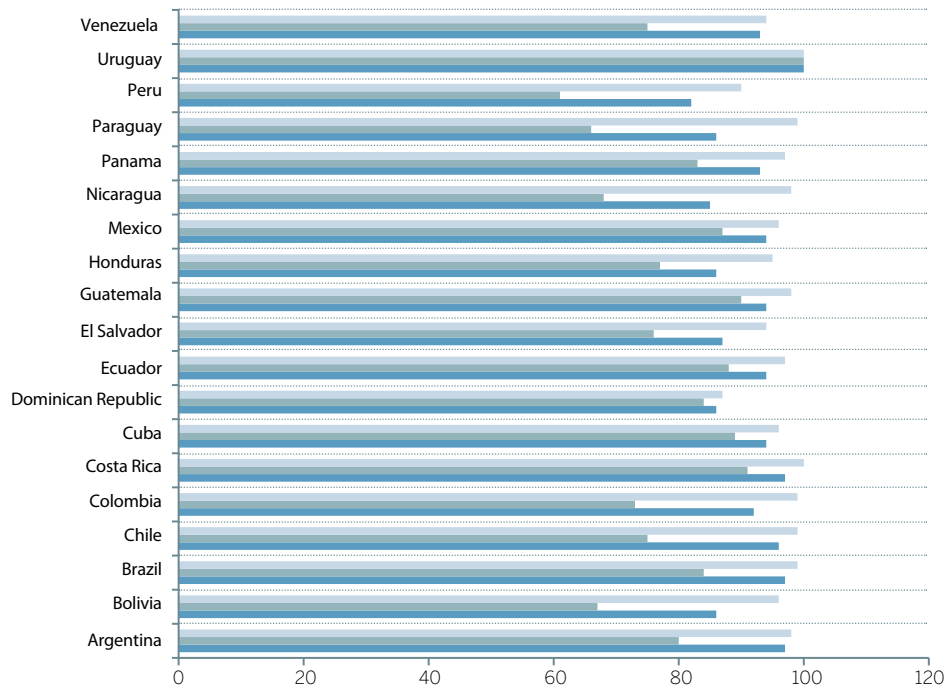
In the past fifty years, coverage of water and sanitation networks in the region have increased significantly. On average, coverage increased from 40% of the urban population in 1950, to more than 80% in water in 2008 (CELADE 2009). Coverage with quality services did not include the population in informal urban settlements, which represents 27% of the total. In spite of the high levels of coverage of water and sanitation networks (*see Graph 2.6, p 72*), the quality of services at the domicile level is low regarding water sanitation and continuity. In addition, treatment of residual waters is insufficient as less than 30% receive some type of treatment. Moreover, there are significant deficiencies in the urban drainage infrastructure.

The difficulty in providing quality services in the face of informal land use

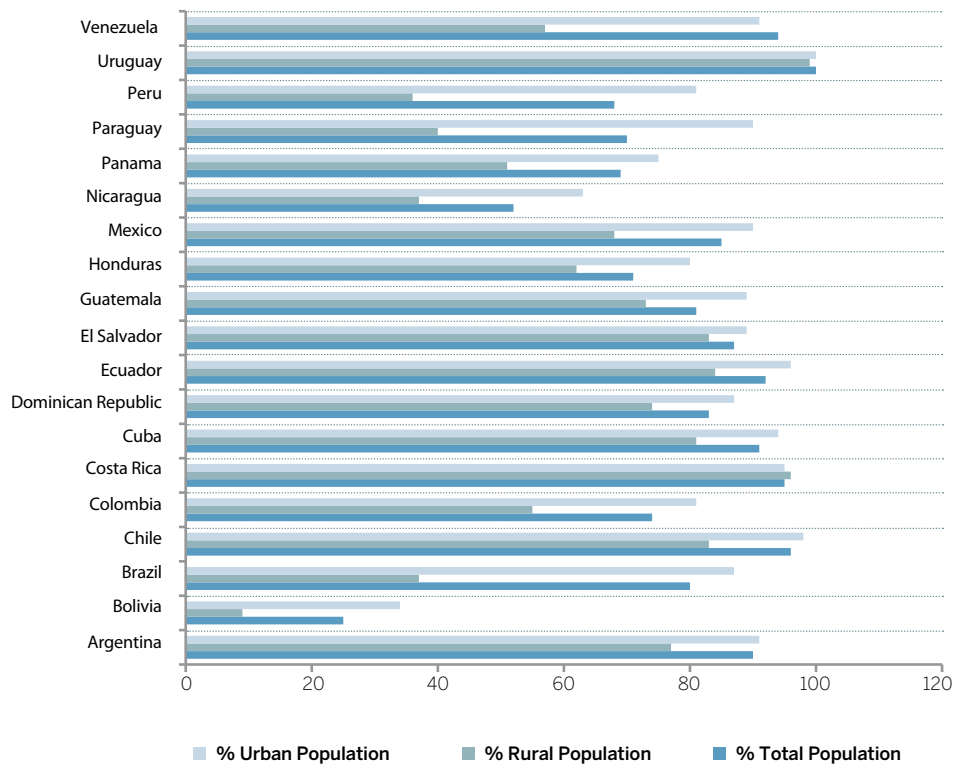
Currently, Latin America is the continent in which the greatest proportion of the population lives in urban settlements (approximately 85%). The urban population will grow from 460 million to 590 million inhabitants between 2010 and 2030, especially in medium and small cities. To satisfy the incremental domestic demand that arises from these projections, and eliminate the deficit prevailing in 2010, it would be necessary to reduce

Graph 2.6. Improved sources of water (a) and sanitary installations (b) (2008)

Improved sources of water (a)



Improved sanitary installations (b)



consumption to less than 200 liters per day per person, reduce losses from 40% to 20%, and develop approximately 30 million m³/day in new water sources. The key problems of the cities of the region and their relationship to urban water management revolve around three issues that require coordinated solutions within a comprehensive approach: i) the informal occupation of urban land and the consequent precariousness of housing; ii) the low quality of public services, especially water and sanitation; iii) the degradation of the urban environment, especially air quality, the pollution of water bodies, and the deficient management of solid residuals. Most urban rivers have intolerable levels of pollution.

There are more than 1,000 water and sanitation companies in Latin America. With the exception of some, whose performance indicators are comparable to the best in the world, the rest is made up of a heterogeneous set of companies with low levels of operational efficiency and a high dependency on fiscal resources to finance their investments and, in some cases, operational costs (World Water Council, 2003). On average, more than 40% of treated water is lost in broken pipelines, poor functioning of equipment, and waste in households due to a combination of the lack of meters, defective operation, low tariffs that do not promote efficient consumption, and measurement errors. In addition, many of these companies face serious problems of overdue payment of water bills, and also have high indices of excess employment (World Bank, WSP, 2011). The region uses less than 20% of the available water, of which 75% goes to agriculture, 15% to domestic uses, and the remaining 10% to industrial uses. Although the Millennium Development Goals for water and sanitation have been reached, this coexists with a deficient quality of access regarding potability and continuity. The region also registers a high morbidity due to the poor water quality, resulting in an estimated health cost equivalent to 1% of GDP.

In 2010, revenues from water charges and sanitation companies were sufficient to cover operating costs, estimated at approximately USD 5.2 billion, but not investment that were mostly financed with fiscal resources. The cost of inefficiency in the delivery of water services (water not invoiced, overdue payments, and excess employment) is estimated at 30% of water revenues, which is equivalent to 5.78 billion. This inefficiency in the supply of water services is reflected on averages of 40% of water not invoiced, 20% in overdue payments, and 50% of excess employment.

Industrial demand will grow even faster than urban demand and will require more efficient use, a high rate of recycling, and the internalization of the cost of new developments. Demand from the agricultural sector will increasingly compete with urban uses and will have to be rationalized significantly by increasing productivity, improving land management practices, reducing the unitary water footprint, and through reutilization.

Extractive mining in Latin America is an activity of growing importance that

consumes between 100-200 m³ of fresh water per ton of final product. This consumption competes with agricultural and urban uses in areas of low water availability, such as the North of Chile and the Peruvian Sierra. In addition, waste materials and residual waters are sources of pollution with heavy metals, toxics, and sediments with serious impacts on health and ecosystems. The combination of these two problems, scarcity and pollution, is a potential source of social conflict in some countries of the region.

The need for a comprehensive approach to water resources

Water scarcity is not only a physical phenomenon, there is also the lack of infrastructure and of essential institutions and policies to satisfy demand for water related services (FAO 2010). In this regard, by the year 2025 many countries in Latin America will be unable to satisfy water demand and, therefore, will face water shortages. If the current scenario prevails, Latin America and the Caribbean will be a region with economic water scarcity approximately by the year 2025, resulting from a deficit in infrastructure and the weaknesses in sectorial governance. In this sense, the infrastructure deficit in marginal urban areas (27% of the population) is the greatest drag on the sustainable development of cities.

The estimated investment needs for the period 2010-2030, so as to close the investment gap in urban services, reaches USD 249 billion, which include USD 30.5 billion in investment in household connections for water and sewage in low income urban areas, which have to be integrated with the formal city. In annual terms, the necessary investment to close the infrastructure gap in urban services reaches USD 12.45 billion.

The necessary average annual resources to cover urban investment in water could be obtained from various sources. These sources respond to a number of criteria: the payment for services, fiscal contributions with equity objectives and compensation for environmental and climate externalities, and international donations to countries with a high incidence of poverty. Investments in water and sanitation needed to cover this gap appropriately, are equivalent to 0.25% to 0.30% of the GDP of countries in the region in 2010, and could reasonably be managed with the economic growth estimated by ECLAC for the region. These investments include the rehabilitation and renovation of the existing network infrastructure and the formalization of household connections to 20 million housing units between 2010 and 2030. They do not include rain drainage, waste water treatment, or the development of new sources. Investment needs in rehabilitation and renovation of infrastructure are lower.

Since the year 2000, there has been a substantial investment in the expansion of networks but very little —not following the logical sequence— in trunk, treatment, and drainage infrastructure, and the development of sources to guarantee water security. Investments rarely follow long term strategic plans, they utilize deficient information, and fiscal financing does

not generate strong incentives to adequately calculate the size of projects or to promote the transparency of public bidding processes. In this regard, scant attention is paid to the logical sequence that seeks to achieve a balance between investment in water and sanitation infrastructure and social and environment objectives. At the same time, low priority is assigned to investments in improving operational efficiency, reducing losses, and maintenance.

The main challenges to overcome the problems described, and reach the sectorial goals are: i) the resistance to sectorial transformation processes in each one of the activities regarding management of water and sanitation services (operational, commercial, community relations, extension of coverage, and control); ii) the weakness or absence of economic regulations and mechanisms for controlling the quality of services in many countries of the region; iii) the weaknesses of sectorial information systems to feed a planning process that considers the hydrologic cycle, the environment, and climate change, and to provide information for social monitoring and control over the quality and effectiveness of water related services, iv) the absence of public policies that consider the negative externalities of pollution and the weaknesses for applying and controlling the application of those policies; and v) the lack of a sustained commitment on the part of governments, to the allocation of fiscal resources to the water sector, that ensures the efficiency and transparency of investments.

8

Chapter 3



Key elements to ensure the sustainable development of infrastructure

Main requirements for responding to the challenges

The analysis of various infrastructure sectors summarized in the previous chapter, allows the identification of the challenges faced by each one of them to increase coverage, quality of services, and adapt to technological changes. Responding to these challenges will be infrastructure's contribution to the transit toward comprehensive development with high, sustained, and quality growth, in the terms proposed by Scenario I —the one desirable for the region— as has been defined in Chapter 2. To cover Scenario II, so as to prepare for a possible deterioration of the international environment, infrastructure must also contribute to maximize the potential of Latin America's domestic market, by assigning priority to the facilitation of intraregional trade and the integration of national spaces.

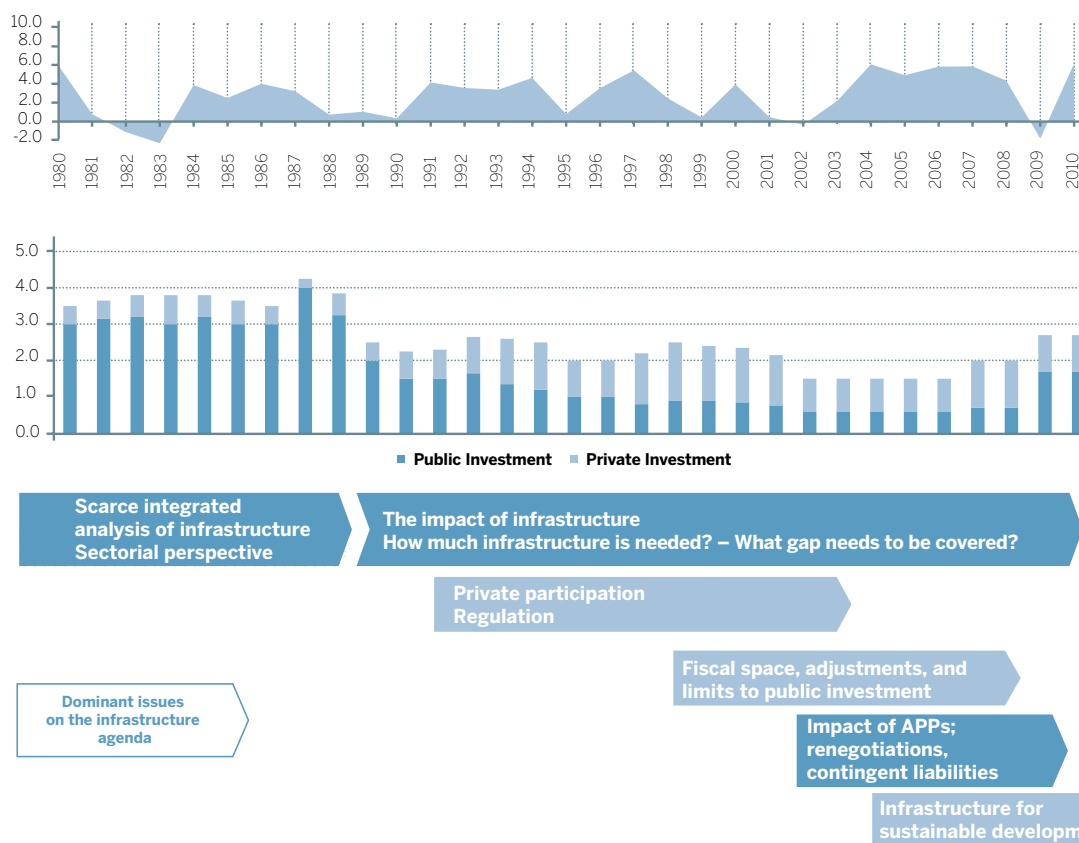
This implies developing a regional strategy for infrastructure that must include a decisive thrust to regional integration projects. The sectorial analysis presented in the previous chapter also enables the identification of the principal issues it will be necessary to resolve or improve, to achieve the expansion and improvement of infrastructure and its services. These elements may be summarized in three dimensions:

- The financing requirements to satisfy the investment needs, through the different available sources and modalities.
- The improvements in policies and institutions that regulate infrastructure sectors in areas such as planning or inter-institutional coordination.
- The adequate consideration of environmental and social aspects in planning and implementing infrastructure projects, paying due attention to the mechanisms for citizen participation.

In the perspective of the past two decades, the lack of financing has probably been the main constraint for the development of infrastructure, but it is a constraint that has become less binding. The quality of policies and institutions, on the contrary, is becoming the major weakness: currently there are situations in which there are more financial resources available (public and private) than capacity to use them. Managing social and environmental issues, in turn, is increasingly becoming a critical factor for the development of projects, and unless there is a change in the way the infrastructure areas address them, it is likely they will become the main problem in the medium term.

Graph 3.1 shows GDP growth in Latin America, investment in infrastructure (public and private), and the ideas that dominate the agenda, which in general terms, have responded to their context.

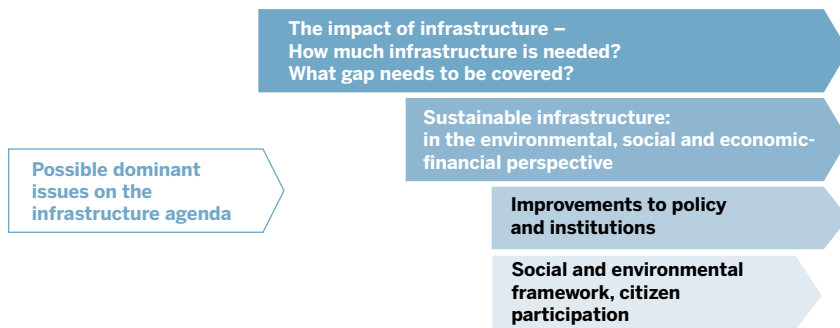
Graph 3.1. Evolution of GDP, investment and dominant issues on the infrastructure agenda (1980-2010)



Source: author's compilation based on CAF data (2009), Calderón and Servén (2010), and Databank.

Graph 3.2 presents a look into the future of the same variables, to offer a view of the possible development of infrastructure in Latin America in coming years. In the desired scenario, the graph shows a period of sustained economic growth, increasing investment in infrastructure —both public and private—, and a steady change in the topics that dominate the agenda. This provides an aggregate perspective for the whole region, which undoubtedly will present specificities in each country.

Graph 3.2. A view of growth, infrastructure investment, and dominant issues on its agenda (2011-2020)



Source: author's compilation.

Financing: needs and sources

Required investment is at least 50% higher than today

A recent estimate prepared by ECLAC, based on a number of the available analysis and models, concludes that expenditure on infrastructure through the year 2020, to support a relatively modest growth of GDP (3% a year), must be equivalent to 5.2% of regional GDP annually (Perrotti and Sanchez, 2011). The sectors with the highest requirements, according to this estimate, are: telecommunications with 2.2%, electricity with 1.7%, transportation, with 1.1%, and water and sanitation with 0.2%. The estimate is considered a “minimum” that does not take into account the current deficit, replacement, nor all infrastructure sectors, but includes expenditure on maintenance (of 2.5% compared with 2.7% for new investments). An aggressive strategy aimed at improving infrastructure, according to the same source, could require annual investment levels that exceed 7% of GDP. These projections would lead to a change in the composition of the infrastructure stock in the region; the main component, roads, would reduce its share from 55% to 39%, while electricity would increase from 30% to 36%, and telecommunications from 7% to 20%.

A World Bank study for Latin America and the Caribbean (Fay and Morrison, 2007), estimates that to achieve universal coverage in basic services and allow for a moderate 3% annual growth of GDP, the required annual investment in infrastructure has to be equivalent to at least 3% of GDP. If the objective is to achieve a significant improvement in standards, the investment requirements could be in the order of 4% to 6% annually, including maintenance (which in this study is estimated at 1% of GDP per year), without considering replacement. It should be noted that the infrastructure that came into service in the decade of the 1980s will require replacement in the near future.

In a similar vein, estimates prepared by the Centennial group for CAF (Centennial Group, 2010) conclude that investment needs in infrastructure in Latin America may reach 5-6% of GDP, including maintenance and rehabilitation, to support an annual growth rate in the order of 6% to 7% annually.

The review of these studies allows an estimate that investment in infrastructure to cover deficits and accompany expected growth, assuming a 5% annual growth of GDP (which reflects the aspiration of sustained growth), would be in the order of 4% to 5% of regional GDP. These figures are equivalent to between USD 200 -250 billion per year²². In addition, growing resources will be required for maintenance, as the stock of infrastructure increases with investment. As a reference, toward the middle of the recent decade investment in infrastructure in Latin America was in the order of USD 60 billion annually, and increased to USD 130 billion in 2009 and 2010. Thus, the estimated financing needs imply not only maintaining the growth

22 Considering a GDP growth rate of 5% a year in coming years, the studies analyzed—the most complete on the subject—allow inferring that the necessary investment to achieve it and to recover the structural deficit (known as the vertical and horizontal gaps, respectively) would range between 3.5% and 4% of GDP. The inclusion of infrastructure sectors not included and the need for rehabilitation could add between 0.5% and 1%, so that the necessary investments would be in the range of 4% to 5% of GDP per year, without considering expenditures on maintenance.

rate of investment achieved in recent years, but also increasing it by no less than 50% over its current level. A detailed analysis carried out recently for Peru, shows results consistent with these estimates (*see Box 3.1*).

Box 3.1. Estimating the infrastructure gap: the case of Peru

Considering the expected demands from economic growth (6% a year) and unit costs, the vertical gap in infrastructure (the needs to accompany economic growth) was estimated for Peru at around 3.5% of GDP annually, on average, between the years 2011 and 2020, declining through time). The horizontal gap (the accumulated deficit) averages 2% during the same period. Thus, reducing the deficit together with the requirements from growth would need investments for an amount equivalent to 5.5% of GDP, without including maintenance. Within these investment needs, the high share of electricity and paved roads stand out. Source: Bonifaz (2011).

Similar analysis carried out for other developing regions, estimate investment needs in infrastructure of similar size. Recent studies carried out by the Asian Development Bank, which cover the whole Asian continent, estimate amounts of USD 800 billion a year during the next ten years (ADB 2009), or approximately 7% of GDP. A study limited to developing countries of East Asia indicates that they should invest the equivalent of 6.2% of their GDP (4% for investment and 2.2% for maintenance) (Yepes 2010). For 2012, this would imply USD 165 billion per year in infrastructure investment in electricity, telecommunications, roads, railroads, and water and sanitation. Of these, USD 132 billion correspond to China. According to this analysis, the electricity, telecommunications, and roads sectors will demand the highest share of the investments (3.4%, 0.9% and 1.3% of GDP, respectively). Finally, railroads will require an estimated 0.1% of GDP, while water and sanitation will demand 0.6%.

The private sector has had a very limited participation, basically because the regulatory framework has not been attractive. There is a reasonable expectation that the situation will change, and that private investment will become a relevant opportunity (Tahilyani, 2011). It is likely that the models to be considered will propose investments for sectors larger than those considered in the sectorial studies. However, the differences tend to compensate, as the former do not consider many sectors of infrastructure (such as irrigation works, urban drainage, flood control), nor do they consider changes in sectorial strategies and technologies. The minimal investments proposed by these models for the railroad systems are an example in this regard.

In summary: it will be necessary to increase the level of investment in infrastructure in no less than 50% over the current level. This level is, in turn, considerably greater than the one observed at the beginning of the 2000-

2009 decade. The investment policy in infrastructure necessary to make possible the growth aspirations of the region, will require ensuring sources of finance that are both sufficient and stable. To achieve the required levels of investments, countries must review the role of private investors, national governments, and local governments in the supply of infrastructure.

Optimize public and private financing

Neither the public nor the private sector could by themselves ensure access, quality, and the resources needed to cover infrastructure requirements. The necessary investments should adequately combine both sources of financing, and the roles of both sectors should be evaluated according to clear definitions of the externalities and risks associated to the projects. For example, investment projects financed by Public-Private Partnerships (PPPs) schemes may offer the opportunity to introduce market mechanisms that appropriately assign resources and risks among investors, consumers, and the government. The wide ranging experiences of private participation in infrastructure in the region —with mixed results— provides ample data to guide private participation toward those sectors that have greater probabilities of achieving satisfactory results.

Within the wide spectrum of infrastructure projects, there are cases in which inevitably financing will be public, even though the private sector may be involved in the execution and operation. Rural roads, urban mass transportation systems, and the expansion of sanitation works constitute clear examples where public financing is required. At the other extreme, there are areas in which the private sector has demonstrated its ability to respond by providing financing and management. Telecommunications is probably the emblematic area of private investment in infrastructure. It should be noted that even in this highly dynamic sector, some responsibilities will require public investment, such as providing mobile telephony or broadband services to remote populations. Other infrastructure sectors which have shown capacity to attract private financing are the electricity generation plants, container port terminals, gas pipelines, and urban road accesses. Between the two extremes of the spectrum, there is a “grey area” in which the advantages of one or other form of financing are not obvious, which is normally associated to the provision and operation of the services. There is a wide range of projects in which the private sector may contribute only partially to their financing, which lends itself to the use of PPPs. It should be noted that the advantage –or not– of private participation is not limited to the viability of financing, but also to the possible addition of efficiency into the life cycle of the projects, and of the externalities –positive or negative– that they may generate.

Therefore, progress should be made in the design of planning mechanisms and institutional evaluations that guarantee that the available resources will

not only be channeled to the projects with greater social returns, but also that allocate the available financing sources and modalities in the most convenient way, both in the public-private dimension as well as among the different levels of the public sector.

Address the inevitable role of public financing rationally and efficiently

Currently, the potential for public investment is favored by a relatively comfortable fiscal position, at least compared with previous decades. Average inflation in Latin America stands at 4.7%, the average fiscal deficit is 2.5% of GDP, and no country in the region has levels of public debt that exceed 50% of GDP. While a fiscal context that facilitates an increase in public investment may be expected, it should be noted that the proposed development model will generate multiple demands on public finances, particularly aimed toward social and education policies. Thus, the use of public resources for infrastructure will have an opportunity cost that should be carefully considered.

The decentralization of infrastructure services management (and the associated funds) is quite extensive in the region, as a result of the greater demand for local participation. Peru is an example that illustrates the relevance of this trend: the share of subnational governments in total public investment has increased significantly, going from 26% in 2004 to 58.5% in 2010.

Attract the private sector to the infrastructure sectors where it adds the most value

Currently, the main challenges regarding financing of infrastructure have two main dimensions: i) regulatory frameworks that are deficient regarding juridical security or the risk of returns on investment, which partially explains the low rate of participation of the private sector in infrastructure investment; and ii) little developed financial systems in the region, with the exception of a few countries. This situation is explained mainly by the macroeconomic history of the region, the lack of long term savings instruments, and the limitations of capital markets

The challenge for Latin American governments will be to transform the macroeconomic and demographic strengths into an effective force for the attraction of private investment in infrastructure. To this end, it is necessary to advance in the following areas:

- Strengthen planning, evaluation, and analysis of financing capacities to ensure the rationality of investments to avoid duplication or external

diseconomies that may arise from concentrating exclusively on private returns;

- Improve the regulatory frameworks, and promote transparency and respect for the law;
- Provide effective and efficient guarantees for the reduction of political risks associated with the supply of infrastructure and long term contracts; and
- Deepen local financial markets making use of the “demographic dividend” to promote medium and long term savings mechanisms that enable financing productive and infrastructure investments.

Latin America has a vast experience regarding private participation in the construction and provision of infrastructure services, which constitutes a source of knowledge to learn about the circumstances in which it adds value. Box 3.2 shows a number of successful experiences of private participation in various sectors and countries of the region, together with their institutional arrangements.

Box 3.2. Examples of best practices of private participation in the supply of infrastructure services. Securitization of roads in Mexico

In August 2004, the company Carreteras de Cuotas Puebla (Puebla Toll Roads, CCP in Spanish) of the State of Puebla in Mexico, issued a municipal bond backed by the future flows from toll collections of the state road Via Atlixcayotl. The revenues financed the construction of a new road in the same state. The agreement was structured by creating a special vehicle (SPV), which was used to issue the municipal bonds and to manage the cash flows of the structure. Under the agreement approved by CCP, the SPV has the right to collect and receive the revenues from tolls. Thus, the operation was structured as a sale of assets from the trust fund. The bonds issued by Via Atlixcáyotl were the first toll road securitization executed in Mexico, with a partial loan participation by a local agent. It was also the first occasion in which development banks participated in the issue of guarantee bonds. The project was securitized and was awarded a “AAA” local rating by both Fitch Ratings and Standard & Poor’s.

Maritime container terminals

The growth of container movements in ports has led financial and maritime transportation markets to structure transactions under a hybrid model of Project finance (as loans have as only collateral the assets and shares of the terminals) and leveraged finance (as it seeks the highest multiples over the EBITDA financial indicator). Some recent cases include a 33 year contract for USD 992 million with the government of Costa Rica to design, finance, build, operate, and maintain the new Moin Container Terminal (MCT) in the Caribbean coast, and a loan for USD 679 million from the International Finance Corporation to build a terminal in Santos, one of the fastest growing ports in Brazil.

Water in Guayaquil

In October 2000, the government of Ecuador called for public bids through which it granted to Cantonal de Agua Potable y Alcantarillado de Guayaquil (ECAPAG) the administration, operation, rehabilitation, and expansion of the water distribution, sewage, and drainage systems for the Canton of Guayaquil, which corresponds to the area under concession. In December 2000, ECAPAG ceded the concession to Empresa Internacional de Servicios de Agua. The concession contract will allow this company to improve services and the quality of water, as well as to expand water and sewage pipelines by approximately 30% and 40%, respectively. During the 30 years of the concession, the capital expenditure program includes investments for USD 500 million.

Aeolic energy generation in Brazil

In September 2011, it was announced that, in the energy auction in Brazil, a company obtained supply contracts with three aeolic projects that total 193 MW of installed capacity. The aeolic parks will be built in the Brazilian State of Bahia and, due to their location in semi-arid areas, will benefit from incentives aimed at infrastructure development. The Power Purchase Agreement (PPA) constitute purchase agreements in which the investor builds a generation plant, and an energy distributor pays a pre-established and indexed rate, for a period of 15 to 20 years. The promotion of aeolic generation using competitive mechanisms for establishing the sale price of electricity is a regulatory experience that has accelerated investments in this type of electricity generation since 2009. The resulting auction prices per KW have declined drastically.

A fund to finance mass transportation in Mexico

The Program in Support of Mass Transportation (Protram in Spanish), which is part of the National Infrastructure Fund (Fonadin in Spanish), provides financial support for mass urban transportation projects with a high social return, complementing investments by local governments and maximizing investment by the private sector. The program provides support to public entities or private concessionaires through nonrefundable contributions for studies and project preparation (up to 70%); non reimbursable contributions or subsidies for investment (up to 50% of the project's investment) or refundable support (subordinated debt, guarantees, and capital). In parallel, the Program for the Transformation of Urban Transportation was established with Funds from the Clean Technology Fund and multilateral banks, to provide loans for sustainable urban transportation projects of local authorities and concessionaires. Thus, national public resources are combined with local resources, support from multilateral banks, and carbon financing projects in the framework of PPPs that incorporate the private sector.

continue

Transmission lines in Brazil

An example of financing for electricity projects is the case of the IE Madeira transmission line in Brazil, granted to a consortium made up of Colombian and Brazilian enterprises. The National Electricity Agency (ANEEL) held a public bidding, and the regulatory institutions becomes offtaker, or long term payer, and becomes the buyer for a period of 20 years, significantly reducing the risk of the project. The consortium was awarded two concessions in 2008, committing to a total investment of R\$ 320 million: the transmission line was 70% financed by BNDES, and 30% by private parties with long term loans of between 5% and 6% in local currency. The same scheme of public bids and guarantees to reduce the cost of financing and attract capital and investors is used in Chile, Guatemala, and Peru.

The variety of financing sources that are currently available makes it necessary to carefully analyze the allocation of projects according to the financing modalities. Some of the critical aspects that should be considered in this evaluation include the following:

- The appropriate allocation of risks between the public and private sector; not doing so may generate considerable obligations and contingent liabilities to the States.
- The pressure of private initiatives: these have increased together with the availability of private resources, the lack of public projects, and the requirements of large productive projects (mining, agricultural, etc.). As a result of these pressures, the State runs the risk of losing its planning role, or end up arbitrating among private initiatives.
- To the extent that PPPs increase their participation in projects that public financing and originate from private initiatives, their acceptance increasingly compromises budgetary resources and reduces the ability of the State to plan investment priorities according to its own strategies.

Exploit the potential derived from the numerous sources of financing

To obtain the necessary funds, it will be necessary to increase the adoption of mechanisms that include the private sector. These resources may originate in private foreign investment or in domestic savings, making it necessary to development financial markets and institutional investors. Latin America must develop financial strategies that take advantage of the seven sources of available resources:

- i. The domestic market. Generate domestic sources through the expansion of the financial system and by stimulating the growth of

the banking system in the economy. Countries which have reformed their pension systems toward defined contribution structures are in a better relative position. Countries in the region will have a period of approximately 20 years of increasing domestic savings as a result of their “demographic dividend”. To this end, they require long term savings mechanisms and institutional investors that can manage these savings and allocate them to the sector.

- ii. The securitization (issue of titles backed by assets) of infrastructure is an efficient way to obtain resources: it can be done by creating a specific purpose vehicle (SPV) that is used to issue bonds (national, state, municipal) and manage the infrastructure’s cash flow. In the case of road projects, the SPV has the right to collect and receive the revenues from tolls.
- iii. International banks are another relevant channel for financing infrastructure with foreign resources. However, experience with their operations in Latin America demonstrates that, until now, foreign banks have not channeled enough resources toward domestic investments.
- iv. Multilateral organizations. Between 2000 and 2010, CAF was the main source of financing for infrastructure in Latin America, with approvals that exceed USD 28 billion; this strategic sector represents 54% of its project portfolio. Other multilateral organizations, particularly the IDB, have decided to allocate massive resources to the development of infrastructure. While these are important resources, they should be combined with those coming from other sources. Regarding physical integration, in the past decade CAF has approved operations for USD 7.3 billion for the execution of 57 projects that involve a total investment in excess USD 23 billion. Annex 2 ([see p. 122](#)) shows a map and a list of these projects.
- v. The climate finance vehicles. Under the financing scheme aimed at reducing the emissions of GHG, developed countries provide resources to developing countries for infrastructure projects to reduce emissions. The market mechanisms, represented by carbon bonds, have been successful in financing energy projects but not transportation projects. Starting in 2012, new financing modalities are expected to be implemented, for which developed countries have committed massive resources (in the COP 15 held in Copenhagen), and developing countries should be prepared to use them.
- vi. Natural resource companies and transportation and logistics operators, which will be interested in investing in existing facilities or in the creation of new ones, under concession regimes or for private use. It will be necessary to coordinate these investments and decide on the regulatory frameworks so as to avoid external diseconomies

- vii. Sovereign funds or state owned companies, especially interested in developing natural resources and logistics chains. In this instance, it will also be necessary to make compatible national interests with those of these new actors.

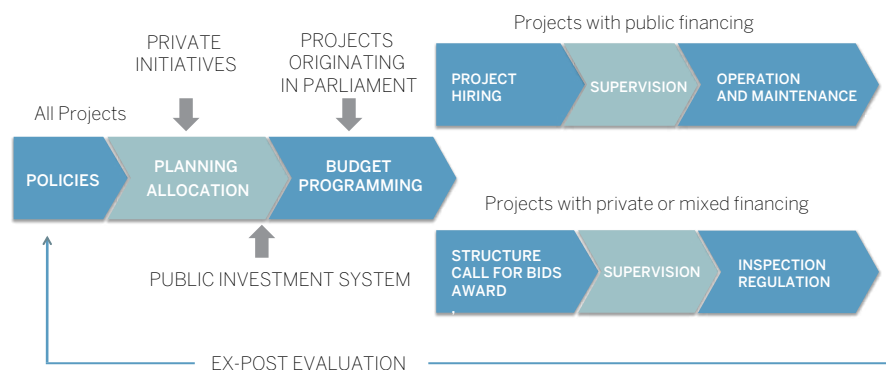
Institutions for infrastructure development

Ensure capacities through the project cycle

Institutions include both the rules of the game —formal and informal— as well as the organizations (the entities and their procedures) of a particular sector of activity. Numerous analyses have concluded that good institutions promote efficiency in achieving the objectives of public policy. In the case of the supply of infrastructure and its services, institutions play a key role. In fact, the development of infrastructure may be seen as a process, a sequence of tasks in which public institutions are responsible for carrying out the multiple functions necessary to achieve the objectives.

The diagram presented in Graph 3.3 represents the typical institutional cycle for promoting the development of infrastructure. It enables a review for each of the components of the process and thus locate the main institutional shortcomings faced by the infrastructure development in Latin America, starting from the sectorial analysis presented in the previous chapter.

Graph 3.3. Conceptual outline of infrastructure's institutional cycle



Source: author's compilation.

From the perspective of the institutional cycle, the starting point is the formulation of policies, a stage at which the guidelines to follow in each subsector are established. The nature of the infrastructure requires that these policies are reflected not only in regulations but also in physical plans that give rise to investment projects. Private initiatives must be added to the plans, programs, and projects established by the public entities: projects originated

in the private sector and proposed to governments, generally under an ad hoc regulatory framework. The portfolio of selected projects may be financed in different ways by combining public resources from different jurisdictions with private resources. The financing mechanism adopted is generally linked to the contractual modalities and the subsequent management of the services. After going through the organizations in charge of analysis and project registry, the projects are integrated in to the budgeting process and are validated in Congress, where some projects are excluded and others are added on.

From this point on, projects follow different processes, depending on whether they are conventional public Works, concessions, or some other form of public-private partnerships (PPPs). The projects with public financing go through different stages: the design of the project, contracting, supervision of the works, and responsibility for its maintenance during the operational stage. In the case of projects with private participation (total or partial) a complicated process of design, structuring, call for bids, and awards must be carried out, followed by the supervision of works and, finally, control or regulation of services according to the management model adopted. The ex post analysis of projects is the tool of choice to “close” the cycle: obtain lessons from the process, monitor its results, and provide feedback for policy definitions, plans, and projects.

Key areas of action to expand and improve the use of infrastructure

The diagram presented in Graph 3.3 allows identifying the institutional requirements faced by sectors in developing their infrastructure. In summary, four groups have been established: policies and plans (that cover all projects whatever their financing mechanism), the capacity to formulate, evaluate, execute, and maintain projects (particularly those financed with public resources), structuring of projects and coordination between actors (in particular those carried out with private participation or that require the interaction of various jurisdictions, and the capacities to promote the best use of infrastructure. The most critical aspects of each of these groups are identified in the following paragraphs.

i) Good policies and plans, the basis for adequate provision of infrastructure.

The main areas in which deficiencies have been found (which, in general terms usually worsen with decentralization) are the following:

- The alignment of infrastructure policies and plans with the government’s general objectives, by establishing state policies and strategic plans for the development of large projects.

- The availability of basic data necessary to prepare plans, particularly for some modes of transportation and in water and sanitation.
- The availability of geographic information systems, which are basic instruments for planning and managing infrastructure. Examples in the region such as GeoSur (implemented by CAF) or the territorial information system developed in Chile shows that it is an extremely useful tool.
- The coordination of policies between different areas of governments and between jurisdictions, particularly between the areas responsible for the supply of infrastructure and those responsible for environmental and urban development policies.
- The selection of projects that do not comply with criteria that ensures their technical, economic, or environmental viability.
- The scarcity of duly trained and motivated human resources in the public sector.

ii) Capacity to formulate, evaluate, and execute projects

- The rush to initiate projects that are not sufficiently prepared, and the weakness of the technical teams that prepare them, usually generates problems in the execution stage and is the source of cost overruns.
- Project management is generally sequential, with different entities in charge of each stage, which are not always coordinated. The experiences of the Ministry of Public Works in Chile in the integrated management of projects, is showing the way toward a more efficient management model.
- The lack of human and material resources to supervise and inspect works.
- The scant attention generally granted to maintenance, by concentrating all efforts on new Works. This shortcoming is worse in public projects; the PPP designs may facilitate management with a view of the project cycle that ensures appropriate maintenance

iii) Structuring of projects and coordination between actors

- The mistakes in planning, designing, and evaluating PPP projects are one of the most common causes of complications during the subsequent implementation. These mistakes produce, for example, unexpected

engineering problems, construction cost overruns, underestimation of risks, renegotiations, and even project cancellations.

- The adequate financial structuring and balance in the distribution of risks are key to the performance of PPP projects. The complexity and long duration of these projects multiply risks, increase costs, and keep investors away. Guarantees are one of the most important instruments to minimize and distribute risks in a PPP project, and may take the form of cross guarantees between the parties to a contract, or may be granted by third parties such as insurance entities or international organizations.
- Budgetary responsibility is another crucial issue. The risk of generating financial charges to the State for future obligations and contingent liabilities of PPPs, requires accounting responsibility and transparency, which implies that they must be adequately valued and reported, independently of the specific accounting criteria in use.

iv) Improving the use of infrastructure

Infrastructure policies do not concentrate exclusively on increasing supply, but also seek to —increasingly— act on demand to reduce investment needs and operation and maintenance costs. For this purpose, there are a number of instruments such as:

- Internalize the externalities in the prices of the services.
- Establish differential rates or tax incentives.
- Impose quotas or restrictions.
- Increase awareness among users and consumers, and in society at large.

The importance of knowledge management and continuous improvement

The practice of ex post analysis of the impacts of projects is not well established in the region. A detailed CAF report (2009) highlights this shortcoming as one of the main problems faced by infrastructure. The document emphasizes the importance of this type of analysis to feed the decision making process.

Monitoring, as a means of control and evaluation is also not sufficiently established in Latin America and should be the object of priority attention in the area of infrastructure. The indicators to be used should not be limited to reflecting progress in infrastructure endowment (output), but should also

reflect, in the best possible way, the impact they generate on the quality of life of the population (outcome).

A social, environmental, and participatory framework, a condition for infrastructure projects

Integrate environmental factors and social actors in policies and projects

The analysis of the sectors shows that project execution frequently runs into environmental and social difficulties. Advances toward the interior of the continent and environmentally sensitive areas, the growing relevance of high impact urban projects, and the increasing participation of the community, are trends that provide greater relevance to this dimension of infrastructure policies and projects.

Many infrastructure agencies in Latin America perceive environmental elements and social actors as an obstacle, an impediment for the implementation of projects that are expected to contribute to the achievement of their sectorial objectives. Infrastructure projects may generate negative impacts on ecosystems and neighboring communities during their construction and operation. Sometimes projects require land purchases and may cause involuntary displacement and the loss of means of subsistence of the affected population. There are abundant examples of this sort in the region, such as the laying of gas pipelines, the construction of roads, the construction of dams, or high tension lines. The prospects of expanding infrastructure and advancing toward environmentally sensitive geographic areas suggest that tensions will increase. It should be noted that the negative impacts are not only of a local character: global environmental issues have an increasingly greater weight in the infrastructure agenda, particularly those related to climate change.

In the areas responsible for the supply of infrastructure services it will be necessary to carry out a profound restatement of the way their development is conceived, seeking to establish a criteria of sustainability in the project cycles from their beginning. Rather than considering the environmental and social issues as an obstacle, the policies should balance the different objectives, including those of sustainability. The concept of sustainability has expanded significantly in the past decade toward a triple balance: economic and financial, environmental and social.

Strategic environmental evaluations and the instruments of environmental territorial planning are increasingly used to support sustainability by strengthening technology selection and location of infrastructure investments. These are evaluated on the basis of the capacity of the natural

resources, the vulnerability of social groups and ecosystems that influence investment policies and projects of all sectors of infrastructure. CAF has adopted an environmental policy for projects of national scope and for those related to regional integration.

Box 3.3. CAF's environmental policy

CAF understands that the main contribution of managing sustainable development points to the recognition of the need for conservation and the sustainable use of the region's nature and the environment, as the basis for improving the quality of life of societies, overcoming poverty, achieving economic development, and improving the welfare of individuals in the long term. In the framework of regional integration, CAF includes the environmental perspective and focuses it on:

- The responsible management of ecosystems and shared natural resources of regional and international importance, as well as the harmonization of environmental policies in the region.
- Capitalizing on opportunities and managing risks and the impacts generated by physical integration.
- The conservation of the natural endowment and the permanence of functional relationships among ecosystems that guarantee life.
- The promotion of a greater regional environmental awareness that leads to the strategic appreciation of the region's natural capital.

At the same time, CAF recognizes that the environmental component is critical in the productive transformation of the region. Aware of the importance of the region's insertion in the global economy, CAF promotes and supports the international environmental agreements that its shareholder countries have subscribed. CAF also promotes and supports the generation and augmentation of the productive value of natural capital, as well as the development of emerging environmental markets, and the improvement of environmental management by entrepreneurs and the productive sectors so that together, these groups promote a sustainable insertion.

Citizen participation in the planning and implementation of infrastructure projects is a distinctive trend in society that ensures the integration of the development model to which it aspires. Infrastructure agencies must make an effort to communicate with the interested parties, and to collaborate with critical and supportive social actors equally. The lack of adequate communication increases the risk that projects will be blocked. Communication with the community must be an integral part of the project cycle.

Balance a responsible role regarding climate change with development objectives

Climate change has special relevance for infrastructure sectors. Some of them, such as energy generation or transportation, have significant weight in greenhouse gas (GHG) emissions, and the trends indicate that with progress toward development, emissions will increase. Transportation, for example, is responsible for about 14% of the GHG emissions and more than 30% of all emissions in Latin America.

As members of the international community, Latin American countries participate in the fora that seek to find answers to global warming, particularly the United Nations Framework Convention on Climate Change. The agenda established in these fora includes both mitigations actions, which may have a significant impact in the structure of some of the infrastructure sectors, (for example, in urban transportation or electricity generation) as well as those referred to adaptation. The latter have the most relevance for countries in the region: changes in rainfall patterns that are attributed to climate change come on top of the various natural disasters that periodically cause heavy damage to Latin American infrastructure, such as hurricanes, earthquakes, volcanic eruptions, and floods. Nonetheless, an adaptation agenda that identifies the actions to be implemented so as to minimize the impact of these changes is clearly less advanced than the mitigation agenda.

Countries in the region face the challenge of responsibly joining the global effort to reduce greenhouse gas emissions, but without neglecting the social and economic development needs of their peoples.

Good environmental management is key in the competitive differentiation of Latin America

Environmental management is a relevant factor in the competitiveness in the region's economies, in addition to contributing to global responsibility. For Latin America, environmental management is one of the keys of competitive differentiation by generating a supply of products aimed at consumers that discriminate according to the environmental and social aspects of the value chain of the goods they purchase. The developed countries, which will have to implement important changes in their productive structure to reduce GHG emissions, most probably will impose import restrictions according to the carbon footprint (green trade restrictions). There are a number of private initiatives leading to the publication of the footprint in the products offered to consumers (carbon labeling) so that they may use their purchasing power and avoid products that have a larger GHG footprint (Lay, 2008). Infrastructure services weigh heavily on the total carbon footprint

of goods; logistics and transportation on average account for between 5% and 15% of carbon emissions (WEF 2010), but these percentages may be higher in some products.

In conclusion, the environmental and social management of infrastructure services will also become a factor in competitiveness, thus adding an important incentive for it to be included in policies and projects.



4

Chapter 4



Toward a strategic infrastructure agenda in Latin American

Priority issues in the short term

Link infrastructure plans with the development plan

In order for Latin America to reach a more relevant position in the global economy and provide for a substantial improvement in the quality of life of its citizens, it should maintain a high rate of sustained growth. This growth should be quality, efficient, inclusive, and environmentally sustainable, and respect cultural diversity. Infrastructure should be part of this development model, together with other key public policies, such as the orderly management of public finance, innovation, inclusion and regional integration.

The globalization of the production of goods and services offers great opportunities for the developing countries, as long as they have the infrastructure that is necessary to compete. The rapid urbanization process has stimulated growth, but it has also come with growing spatial disparities and changes in the location and the nature of the demand for infrastructure services.

Facing climate change is fundamental for development and for the reduction of poverty and has important implications for the planning, management and provision of infrastructure services.

The performance analysis of the infrastructure sectors and their challenges, together with the recognition of the key conditioning factors for their expansion and improvement, makes it possible to identify a set of themes that make up the strategic infrastructure agenda that is proposed for the region. Furthermore, the analysis has also made it possible to recognize some themes that appear as short-term priorities, which require special attention by the governments due to relative deficit situations or due to their direct impact on the social inclusion and quality of life of the population.

These themes are identified below, and afterwards, a medium- and long-term strategic agenda, oriented toward systematically addressing the improvement of the necessary infrastructure is proposed to be able to make the transition toward the proposed integral development model in the desirable scenarios.

Themes requiring priority attention

- Investment efforts in infrastructure should be primarily directed to the most critical sectors: drinking water and sanitation services, roads and their conservation, urban transport, the expansion of broadband services and the main regional infrastructure links.
 - » Expanding the coverage and the quality of the provision of drinking water and sanitation should constitute the first priority: they have a direct impact on health, inclusion and the quality of life of people, and demand moderate financial resources when compared to other sectors.
 - » Stimulating urban public transport, to which priority should be given versus the use of private vehicles, to preserve productivity and the quality of life in large Latin American cities. Subsidies to public transport could be necessary and justifiable to reduce the negative externalities of individual transport (congestion, emissions, and accidents) as well as for reasons of equity, in order to ensure mobility of the underprivileged sectors of the population.
 - » Traffic safety policies in cities and roads. Traffic related accidents are the first cause of death of Latin American youth and adults in their productive years.
 - » Conservation of roads is as important as the construction of new works. For this reason, the region must overcome the low priority that, in general terms has been given to the traffic conservation programs that ensure maintenance no matter what the traffic management model may be.
 - » Broadband expansion has a strong multiplying effect, since it influences the quality of life and the economy's productivity, promoting integration in the productive processes and in the States' administrative processes.
 - » Infrastructure development for regional integration, a critical factor so that economic development will be less dependent on the changing conditions of the international environment. This constitutes a key element to strengthen the political, social and economic dimensions

of the multiple regional and international integration and insertion processes that are under way in Latin America.

- The development of new housing, particularly social housing, should be accompanied by an integrated urban development and mobility plan, in a way to avoid the need for simultaneous displacements that are typical in dormitory towns. For this reason, residential land use should be combined with job locations, services, supply centers and public spaces, as well as the availability of public transport. The informal occupation of urban land and the precariousness of housing and land use make the provision of quality infrastructure services difficult. Urban development and infrastructure provision strategies should be joined together.
- The adoption of an energy efficiency policy, focused on actions that tend to bring the most expenditure efficiency, reduction of losses and regional integration, together with the development of renewable sources of generation, constitute the immediate challenges of the energy agenda in Latin America.
- The development of river and maritime (cabotage) transport, can contribute to improve the region's transport matrix, making use of the extensive inland waterways, particularly in South America. This requires an active support of the States to guarantee the navigability of the waterways, the security of the operations and the compliance with the environmental regulations.
- Infrastructure investments must be planned and executed on territorial axes, displaying basic service "packages", in order to take advantage of synergies, particularly in rural areas. The old practice of isolated sectoral planning should be abandoned.
- There should be greater rationality in the use of infrastructure, by generating policies that control the demand, as in the use of water, in the consumption of electrical energy, or in urban displacements. The governments have at their disposal different policy instruments to achieve this, such as the prices for the services or circulation restrictions.
- Adapting to climate change and giving special attention to the management of natural disasters, because of their social impacts, they deserve urgent attention.

Creating and developing capacities

- In order to meet the challenge of improving infrastructure in the region, it is crucial to reinforce in the short term the capacity of the Latin American

countries in the preparation of infrastructure projects. The creation of a Latin American pre-investment program with the participation of the development banks of the countries, their planning and economy and finance ministries, with the support of CAF and other multilateral organizations, will generate new ways to guarantee quality projects.

- It is necessary to urgently review the infrastructure planning and construction standards in order to adapt them to the challenges of climate change. CAF proposes to create a network of professionals and institutions from the whole continent to exchange the best practices and generate new proposals.
- The continent has good experience in planning, coordination and execution of infrastructure integration projects. This effort should continue through regional work groups that identify and design the best integration axes for the next decade.

The six main action axes for implementing the strategic agenda

In order to advance in the implementation of a medium- and long-term agenda, the plan is to organize it around six fundamental action axes, whose main activities are described below. This agenda constitutes a proposal to help the countries of the region to verify that they are considering the multiple factors that make it possible for infrastructure development to be done in a systemic manner.

1. Significantly increase investment in infrastructure.
2. Incorporate the policies and projects into a sustainable development paradigm and in a territorial perspective.
3. Strengthen institutions, especially in planning, in coordinating sectoral policies and articulation among the different levels of government.
4. Articulate the different financing sources in order to maximize benefits.
5. Promote the development of world-class companies in the wide range of businesses associated with infrastructure.
6. Promote development and the exchange of knowledge as well as the best practices among governments, regions and cities.

1. Significantly increase investment in infrastructure

- In order to make its expectations viable, Latin America should continue to increase its investment in infrastructure: investments on the order of an annual 5% of the GDP will be necessary to cover the existing gap and support the continued growth that is expected to access development (without considering maintenance).
- This goal means an annual amount on the order of from 200 to 250 billion USD, which represents a strong increase with respect to the average amount investment during the last decade (estimated at 2% of the GDP), and 50% above the current levels (estimated at 3%).
- The growth of the infrastructure stock will generate a greater need for resources for maintenance, which at the same time, will require stable financing modalities.

2. Frame policies and projects in a sustainable development paradigm and in a territorial vision

- Investments should be made within the framework of a vision that integrates the productive, social and environmental aspects and a territorial perspective, not only sectoral. This focus should be applied at the national, supra-national (for large integration projects) and sub-national level.
- It will be necessary to adopt an infrastructure definition that is broader than the current one, when emphasizing the expansion of telecommunication services, integral management of water and high social impact infrastructure.
- The infrastructure policies and projects must consider climate change, in order to contribute in its mitigation as well as adapting to its effects, and improve the preparation to face natural disasters.
- The new paradigm should not be limited to increasing the provision of infrastructure, but also contemplate managing the demand and promoting the responsible use of the related services.

3. Strengthen institution in their different dimensions

- The infrastructure planning process should be clearly established in the national environment, within a framework that ensures compliance with

public strategies and makes private initiatives possible. It should include the supporting information systems; ensure the necessary data for planning and developing indicators for monitoring.

- It is necessary for the States to promote the coordination of infrastructure policies with other policies, to overcome the “silos culture” that has been predominant in governmental organization, and thus facilitate coordination among jurisdictions, taking into account that sub-nationals will have a growing responsibility in the provision of infrastructure.
- In order to increase activities in the sector it will be necessary to strengthen capacities for the development of projects, their assessment and execution, in the different levels of government.
- It will be of the utmost convenience to advance in the regional coordination of integration projects, continuing with the efforts made in programs such as IIRSA or the Mesoamerica Project.
- Infrastructure expansion will require increasing the capacities to regulate and control the services rendered by the private sector and ensure transparency for the sectors managed by the State.
- Infrastructure sectors must assume an active participation in the national policies definition processes regarding climate change since they will have a strong influence on their plans and projects.

4. Optimize the use of multiple financing sources and modalities

- The region will have a great need for infrastructure investment funds.
- With the appearance of new financing sources such as: specialized institutions, natural resource agents, sovereign wealth funds, funds associated with climate change, pension funds, etc. the countries must develop capacities to manage and orient these multiple resources, in order to ensure effective management by optimizing their use in the different cases of projects or institutional situations.
- There is already an interesting experience in the region in the participation of the private sector in infrastructure provision and operations: progress should be made in the design of regulatory frameworks and mechanisms that make it possible for private stakeholders to adequately participate in the activity.
- The countries of the region will have an increasing availability of domestic savings over the next two decades: progress should be made in the

development of the local and regional financial markets to make their orientation viable toward projects such as infrastructure.

5. Promote the development of companies in businesses associated with infrastructure

- Giving a strong boost to investment generates the opportunity to promote the development of world-class businesses in a wide range of businesses associated with infrastructure.
- The industries of construction, equipment and services, logistic and services associated with the construction and operation of the different infrastructure sectors, are currently dominated by advanced countries. Plans such as those of the European Union place special emphasis on defending their leadership in these sectors.
- Some recently developed countries (such as Korea and Spain) and emerging countries such as China, India, Brazil and Turkey, are building promising positions in these sectors.
- With its growing investment in infrastructure, Latin America offers an interesting market for businesses of the sector. It should take advantage of this opportunity to consolidate viable and competitive Latin American businesses in sectors such as equipment production, logistic and transport services operations, engineering and construction or TIC services.
- The States will be able to promote incentives for the development of firms who participate in the value chain of the provision of infrastructure services in a reasonably competitive environment in order to promote the development of truly viable and not profit driven businesses.

6. Promote exchange among governments, regions and cities

- Permanently follow up on the best practices in comparable advanced and emerging countries, especially oriented toward studying how these countries develop their infrastructure to improve their competitiveness and their social and regional inclusion.
- Promote study mechanisms, the exchange of the best practices and institutional development, which contemplate the different aspects of planning, operations and regulation of infrastructure by stimulating actions such as creating task forces, human resources education, the Exchange

of the best practices, and harmonizing information systems. Bilateral and multilateral forums of the region, such as IIRSA and COSIPLAN (within UNASUR) and the Mesoamerica Project, constitute valuable initiatives in that direction.

An interesting example of a systemic focus for integral development of infrastructure is the one that Spain has followed over the last 20 years (see Box 4.1); its orientation, adjusted to the country's conditions, coincides with the one established by the six action axes proposed above.

Box 4.1. The successful Spanish experience in the development of infrastructure under public-private collaboration schemes

One of the fundamental bases of Spain's economic and social development over the last 20 years has been the infrastructure sector. The country has invested important resources through innovative financing and management schemes that have resulted in a remarkable evolution. From being one of the less developed countries in Europe, it has gone to be in the first places in the world in construction and efficient management of transport systems, ports, airports, railroads, urban transport, energy, telecommunications and broadband.

Spain has become an essential reference for themes dealing with infrastructure management and finance, primarily based on a public-private collaboration scheme. Its model has been exported to various countries of Latin America, the United States, Canada and the rest of Europe. Out of 11 businesses dealing with the world's largest transport project concessions, six are Spanish (Public Works Financing, Ranking Oct. 2006). Fifteen years ago, the financing of public works through budget appropriations was the model that was applied in the majority of projects. In those days the country had an important deficit in infrastructure compared with the most advanced European countries and, at the same time, felt great pressure to comply with the convergence criteria established by the European Union as an essential condition to incorporate Spain to the Monetary Union. The countries had to adopt a strict budget discipline and, at the same time, create a model that makes the expansion and improvement of the country's infrastructure possible in order to achieve economic growth and social benefits.

Under this pressure, Spain adopted a model based on public-private collaboration for which it initiated an ambitious process of policy and institutional change that created new business agencies charged with the execution of projects based on private enterprise. The legal framework was adapted for private participation in public works. Public sector institutions in charge of the administration, management and execution of the works and of the development of studies and designs for the preparation of projects that would be attractive to the concession system, were strengthened. New institutions were prepared to plan and negotiate with the European Union, the use of Structural and Cohesion Funds and

multilateral financing of the European Investment Bank, in the development of the new infrastructure with the new management model.

For this purpose, the Spanish government developed, in addition to the reform and initial plan that implemented the model, a transport Infrastructure Plan for the period 2000-2007 with a 2010 horizon that included investments estimated in 114 billion Euros, financed 50% with public administration contributions, 30% with European Funds and 20% with private financing.

These ambitious plans have given Spain one of Europe's most modern transport networks and have met the goal of economic and social development for which it was conceived, with the support of key stakeholders of society: public agencies, private businesses, and the financial sector and faculty members.

A visit to any of its regions makes it possible to see the presence of a modern railroad, the development of a strategic network of high speed trains in order to dramatically reduce the travel time between the main regions of the country, the impact in the productivity and quality of life of the urban integrated transport systems in the large cities, managed by ingenious consortiums where national, regional and municipal authorities participate, as well as the private stakeholders who directly operate the transport services. Counting on a thermal and nuclear energy base, Spain launched an aggressive program of renewable energies, especially eolic, which shows its presence in the whole territory. Likewise, data transmission services through broadband installed in the whole country, but especially in the most remote regions, have made it possible for communities located in the most remote zones, to connect to the network and have access to a great variety and high quality of content, bringing these communities close to the information society. If there is a country that has been able to develop its infrastructure following the six action axes that we propose in this work, that country is Spain.

The text adapted from the Report of the Economy and Development 2009 on Infrastructure, CAF. The themes addressed in this box are broadly documented in: Vassallo, J. and Rafael Izquierdo Bartolomé (2010). *Infraestructura Pública y Participación Privada: Conceptos y experiencias en América y España*. CAF. Available at: www.caf.com/publicaciones

A Call to action

In an environment that favors accelerated growth, Latin America can aspire to decidedly advance on the road to an integral, sustained and quality development model, during the years to come. The next decade can be decisive in this sense, and one of the great challenges to consolidate the advance is to substantially improve the funding and performance of the infrastructure and related services. Infrastructure is one of the necessary conditions to advance toward a more inclusive

and equitable society; it is also the support to competitiveness of the economy and of the development of the internal market and constitutes the fundamental vehicle of regional integration.

The key factors to meet this challenge depend on public policies that the countries may adopt: to assign public resources and make an excellent use of the multiple options for financing, to generate the institutional capacities that makes it possible to manage an agenda that is increasingly more complex, and to insert the infrastructure policies and projects in a paradigm of sustainable development with the integration of environmental aspects and social stakeholders. It is the time to make decisions to implement an aggressive infrastructure development agenda.

CAF, which over a span of over 40 years has offered strong support to the development of infrastructure in Latin America, and constitutes its main multilateral source of funding, is willing to closely collaborate with the governments and the private sector of the countries of the region in order to face these challenges, by offering financing support as well as promoting the management of knowledge and the dissemination of the best practices.





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Attachments

Attachment 1. Infrastructure indicators in Latin America

Country	Transportation		
	Quality of port infrastructure (2009) ¹	Maritime transportation connectivity index (2010) ²	Paved road network v total network ³ (%)
Argentina	3.8	27.6	30.0
Bolivia	2.9	-	7.0
Brazil	2.9	31.7	n/d
Chile	5.5	22.1	20.2
Colombia	3.5	26.1	n/d
Costa Rica	2.7	12.8	25.3
Cuba	n/d	6.6	49.0
Dominican Rep.	4.3	22.2	49.4
Ecuador	3.7	18.7	14.8
El Salvador	4.1	9.6	26.0
Guatemala	4.5	13.3	34.5
Honduras	5.3	9.1	20.4
Mexico	3.7	36.3	35.3
Nicaragua	2.9	8.7	12.0
Panama	6.0	41.1	38.1
Paraguay	3.4	0.0	50.8
Peru	3.3	21.8	n/d
Uruguay	5.2	24.5	10.0
Venezuela	2.4	18.6	33.6

n/d = n/a

¹: World Economic Forum (WEF), Global Competitiveness Report 2010-11

²: United Nations Conference on Trade and Development (UNCTAD)

³: International Road Federation (IRF)

⁴: International Union of Railways (UIC, in French)

Transportation

Deaths/100,000 inhabitants (2008) ³	Energy consumption (road transportation/ total economy) (2008) ³ (%)	RAILROAD Length of the lines (in km) (2009) ⁴	RAILROAD tons-km (millions) (2009) ⁴
10.3	18.1	25,023.0	12,025.0
11.3	25.3	2,866.0	1,060.0
18.6	23.0	29,817.0	267,700.0
10.6	18.4	5,352.0	4,032.0
12.6	25.1	1,672.0	11,884.0
7.9	29.5	-	-
12.5	2.7	5,075.6	1,351.0
14.5	17.6	-	-
13.9	37.6	-	-
21.8	16.5	-	-
4.7	22.7	-	-
13.7	21.3	-	-
5.1	27.8	26,704.0	71,136.0
9.2	12.8	-	-
n/d	17.3	-	-
13.8	25.9	-	-
12.3	29.1	2,020.0	900.5
4.4	20.7	-	284.0
22.6	24.1	-	-

continues

*continuation***Transportation**

Country	Transported passengers Air travel (2010)⁵	Cargo (millions of tons/km) Air freight (2010)⁵	Vehicles/1,000 inhabitants (2007)³
Argentina	5,694,547	111.7	314
Bolivia	1,537,032	6.9	68
Brazil	67,945,578	1,782.3	198
Chile	8,097,314	1,179.0	172
Colombia	12,115,330	2,419.9	58
Costa Rica	932,581	9.1	163
Cuba	780,484	26.8	38
Dominican Rep.	n/d	n/d	123
Ecuador	2,896,528	3.2	63
El Salvador	1,996,982	15.3	84
Guatemala	n/d	n/d	117
Honduras	n/d	n/d	97
Mexico	15,728,171	714.1	264
Nicaragua	n/d	n/d	57
Panama	6,348,000	38.5	120
Paraguay	428,493	0.0	82
Peru	5,843,195	256.9	55
Uruguay	563,632	3.8	194
Venezuela	5,121,009	1.9	147

⁵: International Civil Aviation Organization (ICAO)

⁶: German Technical Cooperation (GTZ, in German)

⁷: International Energy Agency (IEA)

⁸: Latin American Energy Organization (OLADE, in Spanish)

⁹: World Bank, Databank

Transportation**Electrical Energy**

Price of Super fuel (USD cents/liter) (2008)⁶	CO₂ emissions (millions of tons) – Total transportation sector (2008)⁷	Total electric coverage (%) (2008)⁸	electricity consumption (kWh per capital) (2008)⁹
78	42.7	95.0	2,788.5
68	4.6	69.0	560.8
126	149.5	97.9	2,232.1
95	25.6	99.0	3,319.3
104	23.1	94.0	973.7
124	4.3	99.0	1,865.8
167	0.9	95.5	1,327.5
104	5.7	95.7	1,376.8
51	12.7	90.4	1,137.5
78	2.4	95.5	953.2
86	5.4	83.5	542.9
80	2.9	76.4	707.6
74	151.4	96.6	2,019.7
87	1.5	63.4	456.7
67	3.1	83.0	1,646.2
117	3.4	96.7	1,001.9
142	13.2	78.1	1,032.4
118	2.6	98.0	2,393.5
2	45.2	97.0	3,074.5

Continue

Country	Electrical Energy		Telecommunications
	Electricity lost in distribution (trillion Kilowatt/hour) (2008) ¹⁰	Total installed capacity (millions of Kilowatts) (2008) ¹⁰	Exports of ICT goods (% of total exported goods) (2009) ⁹
Argentina	16.18	30.97	0.4
Bolivia	0.80	1.45	0.0
Brazil	77.08	103.96	1.8
Chile	5.08	13.15	0.2
Colombia	10.80	13.40	0.3
Costa Rica	0.97	2.37	18.7
Cuba	2.79	5.40	n/d
Dominican Rep.	1.71	5.52	3.6
Ecuador	3.77	4.19	0.2
El Salvador	0.11	1.53	2.9
Guatemala	1.22	2.29	0.7
Honduras	1.35	1.59	0.2
Mexico	43.01	57.23	22.9
Nicaragua	0.80	0.95	0.4
Panama	0.91	1.65	n/d
Paraguay	2.91	8.14	0.2
Peru	2.66	7.16	0.1
Uruguay	1.72	2.24	0.1
Venezuela	32.95	23.12	0.1

¹⁰: United States Energy Information Administration (U.S. EIA)

¹¹: World Bank, World Development Indicators

¹²: International Telecommunication Union (ITU)

Telecommunications

Imports of ICT goods (% of total imported goods) (2009) ⁹	ICT spending (% of GDP) (2008) ¹¹	ICT per capita spending (current dollars) (2008) ¹¹	Broadband Internet subscriptions/100 residents (2010) ¹²
11.2	4.83	397.60	9.56
4.6	4.86	83.61	0.97
11.4	5.28	433.25	7.23
6.8	5.11	515.22	10.45
9.9	4.70	254.39	5.66
17.9	6.17	404.86	6.19
n/d	n/d	n/d	0.03
5.4	n/d	n/d	3.64
7.5	5.26	213.46	1.36
5.5	n/d	n/d	2.83
6.3	n/d	n/d	1.80
6.6	8.60	156.78	1.00
20.9	4.55	465.71	9.98
4.4	n/d	n/d	0.82
7.3	5.47	371.43	7.84
21.6	n/d	n/d	0.61
8.3	3.43	153.55	3.14
7.0	4.30	415.24	11.37
9.3	3.53	396.81	5.37

Continue

Telecommunications

Country	Internet users/100 inhabitants (2010) ¹²	Fixed telephony lines/100 inhabitants (2010) ¹²	Mobile telephony/100 inhabitants (2009) ¹²
Argentina	36.00	24.74	141.79
Bolivia	20.00	8.54	72.30
Brazil	40.65	21.62	104.10
Chile	45.00	20.20	116.00
Colombia	36.50	14.71	93.76
Costa Rica	36.50	31.80	65.14
Cuba	15.12	10.34	8.91
Dominican Rep.	39.53	10.17	89.58
Ecuador	24.00	14.42	102.18
El Salvador	15.00	16.16	124.34
Guatemala	10.50	10.41	125.57
Honduras	11.09	8.81	125.06
Mexico	31.00	17.54	80.55
Nicaragua	10.00	4.46	65.14
Panama	42.75	15.73	184.72
Paraguay	23.60	6.27	91.64
Peru	34.30	10.87	100.13
Uruguay	43.35	28.56	131.71
Venezuela	35.63	24.44	96.20

¹²: International Telecommunication Union (ITU)

¹³: Central Intelligence Agency (CIA), The World Factbook

¹⁴: World Health Organization (WHO)

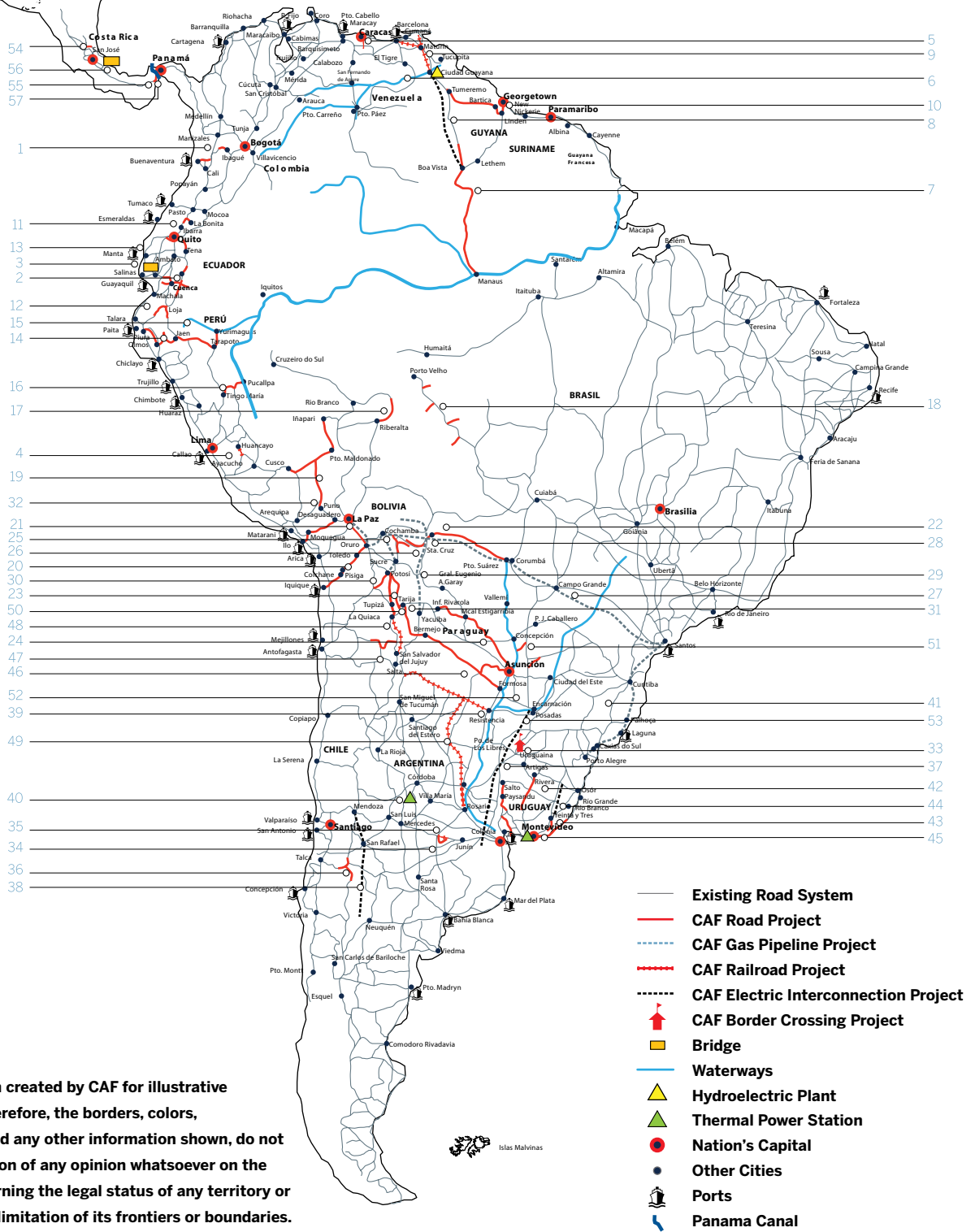
¹⁵: World Health Organization (WHO) and United Nations Children's Fund (UNICEF)

Source: author's compilation.

Gas transportation**Water and sanitation**

Gas pipes (km)¹³	Improved sanitation installations (% of the population with access) (2008)¹⁴	Improved water sources (% of the population with access) (2008)¹⁴
29,401	90	97
5,330	25	86
13,514	80	97
3,064	96	96
4,801	74	92
-	95	97
41	91	94
-	83	86
5	92	94
-	87	87
-	81	94
-	71	86
16,594	85	94
-	52	85
-	69	93
-	70	86
1,526	68	82
226	100	100
5,347	94	93

Attachment 2. Physical integration projects financed by CAF



This map has been created by CAF for illustrative purposes only. Therefore, the borders, colors, denominations, and any other information shown, do not imply the expression of any opinion whatsoever on the part of CAF concerning the legal status of any territory or concerning the delimitation of its frontiers or boundaries.

Physical Integration Projects Financed by CAF	CAF's Contribution (Million USDs)	Total Investment (Million USDs)
Andean Axis		
1. Colombia: Bogota-Buenaventura Road Corridor	447,0	1,116,6
2. Ecuador: Amazon Connection with Colombia and Peru (Eastern Amazonia Trunk Highway)	93,8	152,7
3. Ecuador: Segmental Bridge Project over the Babahoyo River	123,0	133,9
4. Peru: Rehabilitation of the Huancayo-Huancavelica Railroad	14,9	18,8
5. Venezuela: Railroad Connection between Caracas and the National Network	360,0	1,932,0
6. Venezuela: Support for Commercial Navigation in the Orinoco-Apure River Axis	10,0	14,3
Guyana Shield Axis		
7. Brazil: Venezuela-Brazil Road Interconnection	86,0	168,0
8. Brazil: Venezuela-Brazil Electric Grid Interconnection	86,0	210,9
9. Venezuela: Studies for a Railroad Connecting Guayana City-Maturin-Sucre State	2,6	2,6
10. Venezuela: Studies for a Highway Connecting Guayana City (Venezuela)-Georgetown (Guyana)	0,8	0,8
Amazonian Axis		
11. Ecuador: Central Trans-Andean Connection	33,7	54,5
12. Ecuador: South Trans-Andean Corridor	70,0	110,2
13. Ecuador: International Cargo Transfer Terminal in Port of Manta, Ecuador	35,0	525,0
14. Peru: Northern Amazon Road Corridor	110,0	328,0
15. Peru: Pre-Investment in the Border Region with Ecuador	5,3	8,7
16. Peru: Central Amazon Corridor (Tingo Maria-Aguaytia-Pucallpa section)	3,5	13,6

Peru-Brazil-Bolivia Axis

17. Bolivia: Guayaramerin-Riberalta Highway	42,0	45,5
18. Brazil: Highway Integration Program in Rondonia State	56,4	134,2
19. Peru: Southern Inter-Oceanic Road Corridor (sections 2, 3 and 4) and Guarantees for Private Structuring	1.004,5	2.091,0

Central Inter-Oceanic Axis

20. Bolivia: Bolivia-Chile Integration Road Corridor	138,9	246,0
21. Bolivia: La Paz-Oruro Two-Lane Highway	250,0	265,1
22. Bolivia: Road Corridor Integrating Santa Cruz-Puerto Suarez (sections 3, 4, and 5)	280,0	585,5
23. Bolivia: Road Corridor Integrating Bolivia-Argentina	314,0	642,0
24. Bolivia: Road Corridor Integrating Bolivia-Paraguay	135,0	285,6
25. Bolivia: The "Y" Integration Road Program	97,3	141,3
26. Bolivia: La Guardia-Comarapa Highway Rehabilitation	21,0	34,7
27. Bolivia/Brazil: Bolivia-Brazil Gas Pipeline	215,0	2.055,0
28. Bolivia: Support Program for the PAST IV Transport Sector	22,4	32,3
29. Bolivia: Transredes Gas Pipeline	88,0	262,8
30. Bolivia: Complementary Road Works	70,0	73,0
31. Bolivia: Sectoral Transport Program	150,0	221,2
32. Peru: Bolivia-Peru Integration Road Corridor	48,9	176,6

Mercosur-Chile Axis

33. Argentina/Brazil Paso de los Libres Uruguaiiana Border Center	10,0	10,0
34. Argentina: Buenos Aires-Santiago Corridor (Laguna La Picasa Alternative roadway)	10,0	10,0
35. Argentina: Buenos Aires-Santiago Corridor (Laguna La Picasa Alternative Railroad Route)	35,0	50,0
36. Argentina: Buenos Aires-Santiago Corridor (Access to Paso Pehuenche, RN 40 and RN 145)	106,7	188,1
37. Argentina: Electric Grid Interconnection Rincon Santa Maria-Rodriguez	400,0	635,0
38. Argentina: Comahue-Cuyo Electric Grid Interconnection	200,0	414,0
39. Argentina: Road Works Program Integrating Argentina and Paraguay	110,0	182,0
40. Argentina: Useful Life Extension of Embalse Nuclear Plant	240,0	1.026,7
41. Brazil: Integration Road Program- Phase One. State of Santa Catarina	32,6	65,5
42. Uruguay: Mega-Concession of the Main Road Connections to Argentina and Brazil	25,0	136,5
43. Uruguay: Road Infrastructure Programs	240,0	757,1
44. Uruguay: Program to Strengthen the National Electricity System	150,0	621,0
45. Uruguay: Punta del Tigre Thermal Power Station Project	28,0	165,4

Capricorn Axis

46. Argentina: Paving of RN81	90,2	126,2
47. Argentina: Access to the Jama Pass (Argentina-Chile)	54,0	54,0
48. Argentina: Studies for the Rehabilitation of the Jujuy-La Quiaca Railroad	1,0	1,0
49. Argentina: Recovery and Improvement of the General Belgrano Railroad	326,0	408,0
50. Bolivia: Tarija-Bermejo Road Program	74,8	200,0
51. Paraguay: Rehabilitation and Paving of the Integration Corridors RN10 and RN11 and Complementary Works	19,5	41,9

Paraguay-Parana Waterway Axis

52. Studies to Improve Navigation, Institutional Management and the Financial Scheme for the Operation of the Waterway (Argentina, Bolivia, Brazil, Paraguay, and Uruguay)	0,9	1,1
53. Argentina: Railroad Works Program for the Integration of Argentina and Paraguay	100,0	166,0

Mesoamerica

54. Costa Rica: Investment Program in the Atlantic Corridor	60,0	80,2
55. Panama: Highway Rehabilitation and Improvement Program	80,0	125,6
56. Panama: Binational Bridge Over the Sixaola River	5,5	13,4
57. Panama: Panama Canal Authority, Expansion Program	300,0	5.250,0

Others	210,0	812,0
Total	7.324,2	23.623,1



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