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FACILITATION OF TRANSPORT AND TRADE IN LATIN AMERICA AND THE CARIBBEAN

The economic infrastructure gap and investment in Latin America

Introduction

Economic infrastructure is a fundamental capital input for the creation of wealth and a necessary element at all stages of economies' development. Its impact may be transformative, boosting productivity and competitiveness in international markets and thus driving growth and economic and social development. InvMestments in infrastructure projects help improve the coverage and quality of public services (for example, in health, education and leisure), reduce the costs associated with mobility and logistics and open up access to different markets (goods and services, labour and financial markets). As a result, these investments create a positive environment for increased general well-being.

The networks of services that rely on energy, transport, telecommunications and drinking water and sanitation infrastructure together form the core element underpinning the economic structure of territories and markets. These networks are also concrete mechanisms for linking national economies to the rest of the world, enabling the transport of goods and passengers, and making transactions possible within a particular economic and geographical space, and outside it (Rozas and Sánchez, 2004).

To what extent does economic infrastructure contribute to the creation of wealth, and to economic growth and development? How much investment is needed, and in which sectors? Is the current pattern of investment in infrastructure conducive to sustainable development? To answer these and other questions, and to design and recommend public policies, analysts, planners and policymakers require coherent and consistent data. For example, they need data to measure the impact of infrastructure on the economy and on well-being, and to estimate sectoral financing requirements and thereby implement strategic infrastructure development plans.

For infrastructure to have the desired impact, policymakers must have a clear idea of the amount of investment on infrastructure in their country or region. What is more, the positive effects of infrastructure (where provided with adequate

This *FAL Bulletin* aims to present and encourage the use of the economic infrastructure investment database for Latin America and the Caribbean (EII-LAC-DB), built by the Infrastructure Services Unit of the Economic Commission for Latin America and the Caribbean (ECLAC).

The information contained in this edition of *FAL Bulletin* refers to the period 1980-2012, in keeping with measurements undertaken by the World Bank, ECLAC and under the cooperation agreement between ECLAC and the Development Bank of Latin America (CAF).

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Natural Resources and Infrastructure Division, UNECLAC

quantity and quality) on growth and on individuals' living standards, are maximized when accompanied by the proper regulatory, organizational and institutional arrangements.

A major obstacle to effective policymaking in Latin America and the Caribbean has been the lack of data on how much is invested in infrastructure, how much is invested by the public and private sectors, respectively, and how this expenditure is shared between the different tiers of government. Similarly, the absence of clear definitions and common measurement practices in different countries makes it difficult to obtain good-quality data and, therefore, a valid analysis of the figures (including international comparisons).

Papers published in the early 2000s by the World Bank economists Marianne Fay, Mary Morrison, César Calderón and Luis Servén paved the way in the study ofinfrastructure investment trends in Latin America.

In this connection, the paper by César Calderón and Luis Serven, Infrastructure in Latin America (World Bank policy research working paper No. 5317) (2010) has been of great use. It provided the first database on infrastructure investment in Latin America, covering six countries in the region from 1980 to 2006, and is currently the series whose data reaches the furthest back in time.

This line of research was taken up in the middle of the decade by the Infrastructure Services Unit (ISU) of the Natural Resources and Infrastructure Division of ECLAC, first as an initiative to build a database on economic infrastructure investment in some countries, then in the context of a theoretical examination of development problems (Patricio Rozas and Ricardo Sánchez, 2004), and later in an analysis of obstacles to development posed by infrastructure deficits in the largest countries of the region (Patricio Rozas, 2008; Patricio Rozas, 2009; Patricio Rozas, José Luis Bonifaz and Gustavo Guerra-García, 2010; Daniel Perrotti and Ricardo Sánchez, 2011). Also on this subject, Rozas, Bonifaz and Guerra-García examined the main aspects related to the funding of investment in infrastructure (institutions, instruments and mechanisms), with reference to an economically and financially sustainable sectoral policy. Meanwhile, Perrotti and Sánchez calculated the infrastructure gap that Latin American and the Caribbean countries must close if they are to sustain their growth and respond to emerging needs in the period to 2020.

As far as the task of further developing a database on economic infrastructure investment is concerned, since 2012 ECLAC has received support from the Development Bank of Latin America (CAF) in collecting and systematizing investment information with the commonly agreed goal and programme of work to develop a database on public and private investment made in the countries of the region since 2009. The first stage of the initiative included ten countries (Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico, Peru, the Plurinational State of Bolivia and Uruguay) and was supported by Jorge Lupano and Mauro Gutiérrez; a further five countries (Costa Rica, El Salvador, Nicaragua, Panama and Paraguay were subsequently included, thanks to the participation of researchers from the University of Chile (Jorge Rivera, Gonzalo Aguilar, Roberto Jalón, Miguel Vargas, George Vega and Alejandra Sepúlveda). The Inter-American Development Bank (IDB) joined the initiative in 2014.

This *FAL Bulletin* aims to present and encourage the use of the economic infrastructure investment database for Latin America and the Caribbean (EII-LAC-DB), developed by the Infrastructure Services Unit of ECLAC. Users have access to information broken down by country, infrastructure sector and private or public source.

This document has a further six sections, besides the introduction. Section 2 describes the experience of quantifying economic infrastructure investment and briefly outlines some of the procedures used to this end. Section 3 presents the approaches used. The fourth section describes some outcomes of this activity and briefly summarizes the findings of the Perrotti and Sánchez study, while Section 5 makes some important observations regarding the quality of data. The sixth and final section presents conclusions and general recommendations. The annex acknowledges those who worked on building the database since 2013.

The compilation, recording and processing of information on economic infrastructure investments is a gradual process, and one that will require continuous updating and improvement in the short, medium and long term. Thus far, only the initial steps have been taken. Procedures still need to be improved and it is hoped that gradually greater precision will be reached in cross-sector and sector-specific data and coverage will be expanded to all the countries of Latin America and the Caribbean.

I. Challenges involved in estimating economic infrastructure investments

Building an infrastructure investment database entails plenty of conceptual and methodological challenges, some of which are mentioned below. **The first of these challenges** is to define the concepts of investment and infrastructure.

From a macroeconomic standpoint, in the System of National Accounts, gross investment[1] is termed "gross capital formation" (GCF), which is one of the components of gross domestic product (GDP). The concept of "investment" is seen as a flow: gross capital formation (GCF) in turn

[1] It is called "gross" because it is not adjusted for the depreciation of capital.

consists of gross fixed capital formation (GFCF), changes in inventories (DI) and acquisitions less disposals of valuables (V).[2] By omitting the valuables (V),[3] this relationship may be expressed as follows:

$$GFC = GFCF + \Delta I$$

Changes in inventories refer to construction or other work in progress as part of projects taking more than one year to be completed.

Major improvements, extensions and expansions of machinery and structures that enhance the performance of existing infrastructure, increase its capacity or prolong its expected working life, are recorded under gross fixed capital formation and may therefore be regarded as investment in infrastructure. Conversely, regular repair and maintenance work carried out by firms to keep their fixed assets and infrastructure in good operational condition, is considered intermediate consumption.

Economic literature makes little mention of the inherent features of infrastructure, which has been presented as a subset of capital in most cases. From a more pragmatic point of view, perhaps the most concise definition is provided by Rozas, Bonifaz and Guerra-García (2012), who proposes that infrastructure be understood as "... the set of engineering structures and facilities —of long economic life— that forms the basis for providing the services needed for productive, geopolitical, social and personal purposes".

The literature also usually makes the distinction between "infrastructure" and "economic infrastructure". For example, IDB (2000) in *Un nuevo impulso para la integración de la infraestructura regional en América del Sur,* states that "the growing private-sector involvement in the provision of infrastructure, technological innovation and an inclusive approach to sustainable development lead to a broader vision of the infrastructure sphere". In this document, infrastructure is classified by function, as follows:

- economic infrastructure (transport, energy and telecommunications);
- social infrastructure (dams, irrigation channels, drinking water and sewerage systems, education and health);
- environmental infrastructure;
- information and knowledge-related infrastructure.

A **second challenge** is to define the sectors that should be included in the compilation of information. In the database constructed by ISU, four economic infrastructure sectors were selected for each country (excluding health, education and housing infrastructure). These are:

- Energy: electricity generation, transmission and distribution; and the transportation and distribution of natural gas. This category does not include economic infrastructure investments by Stated-owned enterprises in oil and gas production, or investments in refining or petrochemicals.
- Drinking water and sewerage; the provision of mains drinking water and sanitation services.
- Telecommunications: fixed, mobile and satellite telephony, Internet and multimedia services.
- Transport: roads, public transport systems and railways (infrastructure and rolling stock), ports and airports.

A **third challenge** arises from the need to reconcile the criteria for recording expenditure and investment by the various national sources. This requires a detailed review of governments' financial reporting and budgetary classification systems, in order to ensure that the compiled data achieve a minimum level of homogeneity.

Recording private investment in infrastructure, which has risen in recent decades, presents a **fourth challenge,** mainly because of the limited availability of information.

A **fifth challenge** is that of recording investment in infrastructure by subnational (State, provincial, and municipal) governments using their own resources. This investment is significant in various countries and is driven by the progress that many of them have made in decentralizing their administrative structures. Many cases involve programmes that are part-funded by national governments, meaning that data compilation should at least include capital transfers by central governments.

II. Data compilation procedures

The four infrastructure sectors (transport, energy, telecommunications and drinking water and sewerage) have been classified in turn as public and private investment, depending on the entity responsible for the investment. Public investment is broken down by central and subnational levels of government.

Websites were consulted and personal interviews conducted in respect of the following sources of information:

1. Public sector investments

Public financial statistics are recorded using one of four accounting bases: accrual, due-for-payment, commitment and cash. As recommended by the International Monetary Fund (IMF) in the *Government Finance Statistics Manual 2001*, the accrual basis was adopted for this project. Under

[2] See various sections of System of National Accounts 2008, for example, paragraph 10.31, page 198.
[3] Valuables are not a relevant item for the descriptive and analytical purposes related to infrastructure.

this method, "flows are recorded at the time economic value is created, transformed, exchanged, transferred or extinguished. In other words, the effects of economic events are recorded in the period in which they occur, irrespective of whether cash was received or paid, or was due to be received or paid" (International Monetary Fund, 2001).

This method of recording data reconciles the time at which public-sector transactions are recorded with the guidelines on methodological recommendations adopted in other synthetic statistical instruments, such as national accounts, the balance of payments, monetary and financial statistics, etc. The accrual basis consequently provides the best estimation of the macroeconomic impact of government fiscal policy.

The national budgets processed by finance ministries provide the main source of information, although data is also taken from reporting on budget execution by the ministries responsible for public works, energy, transport, telecommunications, water and sanitation, and other sectors.

To date, the database has focused exclusively on public-sector activities carried out by central and subnational governments, and therefore does not include investments made by autonomous bodies or State-owned enterprises. This exclusion may be significant in relation to some countries and sectors.

2. Private sector investments

As stated above, the information on private sector investment is limited. The main source used is the Private Participation in Infrastructure (PPI) Project Database, published by the World Bank.

For certain years and countries, data have been drawn from the financial statements of dominant enterprises in sectors of interest.

III. Findings: the economic infrastructure gap and main trends

The aim of this section is to highlight some of the findings of the EII-LAC-DB and to show the type of analysis that it may be used for, without going into great detail. The figures presented below have been grouped by sector for all of the countries on which data has been compiled, without illustrating specific cases. However, it should not be forgotten that aggregate behaviours may conceal heterogeneous outcomes in specific countries, regions or sectors.

The database cannot be reproduced in this *FAL Bulletin* owing to space restrictions; however, full annual series are available at the website of the Infrastructure Services Unit of ECLAC: http://www.cepal.org/transporte/.

A parameter of investment needs is essential for finding out whether a specific country is investing enough. This was the subject addressed by Perrotti and Sánchez in their research on calculating the infrastructure gap in Latin America and the Caribbean, in which they analysed investment trends in the four major sectors that constitute economic infrastructure (energy, transport, telecommunications and water and sanitation) and, ultimately, estimated and quantified investment needs using alternative measurements.

It is worth noting that the infrastructure gap is defined in relation to factors that are internal to the country or region analysed. This means identifying differences between supply and demand trends, as a result of economic activity.

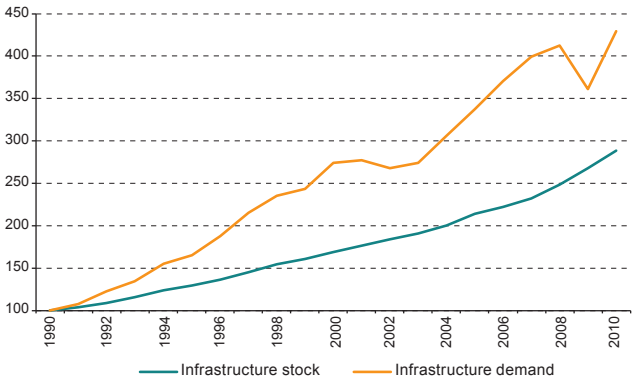
By calculating this gap, the authors determined the level of annual investment required to respond to the emerging needs of enterprises and final consumers in the region between 2006 and 2020. After updating their calculation for the period 2012-2020, the authors obtained the annual value of 6.2% of GDP (US$ 320 billion in 2012). This calculation rests on the assumption that the pattern of investment will remain unchanged from the study period, in other words, that investment decisions are repeated in relation to alternative transport and energy technologies, among others. The value would probably therefore change if, as ECLAC proposes, infrastructure investment decisions were to adopt a more sustainable and inclusive pattern.

One of the methodologies used by the authors to measure the gap analyses the evolution of the infrastructure stock in relation to the demand trend. Figure 1 shows both variables: the evolution of the infrastructure supply in the selected countries is represented by an infrastructure capital stock index, which was compared with a volume of trade index as a proxy for demand. Taking 1990 as the base year, it was concluded that the growing disparity between the variables (greater than 200% in 2005) reflected a widening of the relative gap.

Figure 2 includes various aspects of the history of investment in infrastructure in Latin America since 1980, and gives an idea of the potential of the EII-LAC-DB and the type of analysis that it may be used for.

When the external debt crisis struck in the 1980s, most of the region's governments stopped using external credit to fund investment in infrastructure, and instead used their own resources. After a considerable fiscal effort over a number of years, this became unsustainable, leading to a steep drop in public investment levels. Despite the obstacles, investment in infrastructure on average accounted for 3.5% of GDP during the 1980s.

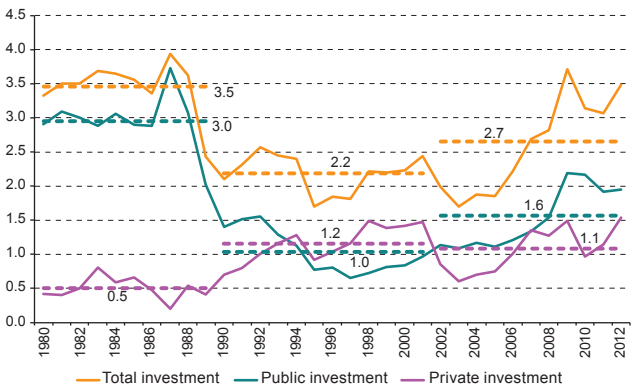
Figure 1
INFRASTRUCTURE GAP: INDEX OF SELECTED COUNTRIES [a]
(Base year 1990=100)



Source: Updated by the authors, on the basis of Perrotti and Sánchez, 2011, in turn based on Carciofi and Gaya (2007).

[a] Infrastructure stock index constructed according to the weightings of each country in the aggregate GDP.

Figure 2
LATIN AMERICA: INVESTMENT IN INFRASTRUCTURE, BY SECTOR, 1980-2012
(Percentages of GDP)



Source: Infrastructure Services Unit of the Natural Resources and Infrastructure Division of ECLAC, with data from Calderón and Servén (2010), Rozas (2008) and the unit itself.
Note: data from the unit are preliminary.

In the 1990s, investment by the public sector fell as a share of total investment, since many countries were bound by fiscal constraints and debt servicing requirements. Public investment thus took on a more passive role than had hitherto been the norm. Plans were set in motion under the Washington Consensus, which was presented as the best viable alternative for overcoming the economic stagnation of the 1980s, and which aimed to give the markets a bigger influence over the economy, at the expense of the role of State.

While private investment responded with faster growth, this was unable to counterbalance the drop-off in public investment, which meant that total investment in infrastructure plummeted. A wave of privatizations in the region's countries in the late 1980s gave substantial impetus to the inclusion of private capital in the infrastructure sector. Public works concessions offered a second mechanism whereby private actors were able to participate in the financing, construction and management of infrastructure services, especially from the mid-1990s onwards (Rozas, 2010; Rozas Balbontín, Bonifaz and Guerra-García, 2012).

Since 2002, the region has experienced a commodity price supercycle and an improvement in the terms of trade, leading to ten years of sustained economic growth (with the exception of 2009). Investment in infrastructure staged a partial recovery during this period. Substantial windfall revenues as a result of the price boom permitted an increase in national savings and a significant improvement in governments' fiscal positions. This proved essential in reducing the region's external vulnerability and enabled a countercyclical response, in the form of vigorous public investment programmes, when the global financial crisis broke in 2008-2009. 2009 also saw investment in infrastructure return to the average levels of the 1980s.

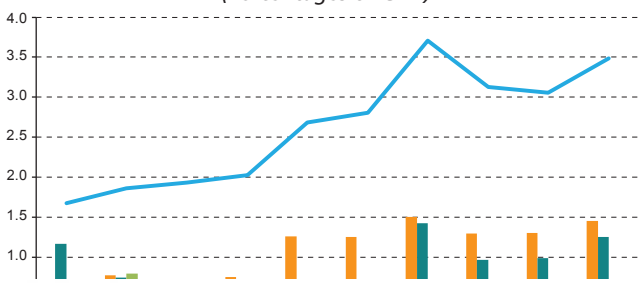
Investment in infrastructure over the past decade has averaged 2.7% of GDP, which according to the Perrotti and Sánchez study, indicates that the region is not investing sufficiently. These authors propose that the region should invest 6.2% of GDP annually between 2012 and 2020 in order to meet the needs of domestic firms and consumers. An appropriate response to these requirements will be a key factor in the region's linkages with the world economy in the twenty-first century, and in the quality of life of its inhabitants.

Total investment in the four infrastructure sectors covered by the EII-LAC-DB shows an overall uptrend over the period 2003-2012. With few exceptions, most investment since 2005 has been in the transport sector, followed by investment in energy, telecommunications, and water and sanitation. The sharp increase in investment in 2009 occurred mainly in the energy and transport sectors. In 2012, the latest year for which records are available, investment again increased, led by the energy sector (mainly in Uruguay, Peru, Brazil, Guatemala and Chile) and the transport sector (in Brazil, Panama and Costa Rica). Investment in water and sanitation, as a percentage of GDP, also edged up especially in Costa Rica, Brazil and Panama (see figure 3).

In practice, infrastructure sectors are interrelated, with trends in one sector affecting the others. As a result, isolated sector analysis only gives an incomplete picture. With technological advances, it has been empirically proven that the four infrastructure sectors interact even more closely with each other, creating all kinds of synergies, with a degree of complementarity and also substitution. Road toll collection systems are one example of a complementary activity between telecommunications and transport sectors; another is where transport provides

better accessibility to distant locations, where it is probable that new settlements will be established, increasing the demand for water, electricity and telecommunications services; environmental concerns may be the result of changes to the transport mix, reducing the propose of fossil-fuel powered vehicles and replacing them with electric cars and bicycles.

Figure 3
LATIN AMERICA: INVESTMENT IN INFRASTRUCTURE BY SECTOR, 2003-2012
(Percentages of GDP)



1. Public sector investments

As noted above, the main source of information on central government public investment is public sector budgets. Given the gradual trend towards decentralization in the countries of the region, it is becoming more difficult to draw together information on all subnational projects under way in each country. Subnational governments are often simultaneously funded by more than one level of government, meaning that in some cases information on investments must be drawn from different government units in order to arrive at a total amount. It is therefore possible that the data for subnational investment is underestimated.

On the other hand, the accounting records of many ministries are conducted on a cash basis, whereas others use an accrual basis, in line with the Government Finance Statistics Handbook 2001. Where the source of information consists in the budget implementation of sectoral ministries (transport, public works, energy, telecommunications or water and sanitation), the problems are similar to the previous instance (cash basis and not accrual basis), although they may be aggravated by the difficulty of consolidating information from various sources, which may contain differing definitions and classifications.

It is likewise possible that some data are not necessarily comparable, since each country uses its own definitions and classifications of investment in infrastructure. In some cases, information on projects is not distinguished from current and capital expenditure, and includes categories such as project management, installation expenditure, fees paid, trade and transport expenditures, taxes, VAT, profits, administration and supervision, and feasibility studies. These items should be addressed systematically according to the international statistical recommendations, and included in summary statistical systems.

In some cases, uncertainty prevails regarding institutional