

# FIER: A Decade promoting integration



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# The Evolution of Energy Integration in Latin America and the Caribbean, 2004-2014

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## Institutional Frameworks and Energy Integration

The historical evolution of integration processes in Latin America has been described from diverse perspectives. Over time, it has given way to the establishment of multilateral organizations that have contributed to building and consolidating common institutional frameworks. Integration agreements reached in the past two decades have strengthened sub-regional capabilities, policy-centered integration models, and others with a more business approach (Ruchansky, 2013).

The new millennium has brought a change of perspective, and some academics even say that it reoriented the integration paradigm through efforts to strengthen the role of the State in making commercial, policy and economic decisions. The beginning of the 21st Century saw the emergence of institutions such as the South American Community of Nations (CSN) and the Bolivarian Alternative for the Americas (ALBA) in 2004, the latter having members throughout South America, Central America and the Caribbean. In 2007, the South American Community of Nations became the Union of South American Nations (UNASUR). In addition, the

project of the Community of Latin American and Caribbean States (CELAC) became a reality in 2011.

According to Delich & Peixoto (2010), the region has two integration models, which have been reconfigured according to the direction and scope of its business needs. The first is the Pacific model, which brings together Mexico, Chile, Peru and Colombia, the countries that signed FTAs with the USA and have an interest in strengthening trade relations with Asia. The other is the Atlantic model, organized around Brazil and Argentina (Delich & Peixoto, 2010). Although integration agendas and processes have been permeated by externalities, it is noteworthy that the countries have a will to integrate, which poses the need to work together (Gonzalez, 2010).

Institutional frameworks play a significant part when deciding on integration models. Since discussions began regarding the need for integration among the nations of Latin America, it has been a challenge for countries to accept its supra-national nature. Nevertheless, supra-nationality is an essential pillar of true integration, which requires rising above local and national level to build an integrated community with a broader outlook and shared rules that are preferential and mutually enforceable in a timely fashion (KAS 2010).

Having implemented a model of open regionalism and experienced the impacts of economic crises, the countries and blocks of the region have followed their own dynamics and built agreements based on the competitive advantages offered by trade partnerships. The internal heterogeneity and lack of specialization among the countries of the region drove some of them to enter into trade liberalization treaties, which in practice have limited the possibilities of achieving economic and trade integration within the LAC region.

Energy integration has shown to be a necessary, achievable goal in the pursuit of economic growth for the region (Fuser Santos, 2014), and is vital to economic development and complementarity. The concept of energy integration transcends the liberal notion of economic and commercial unification of energy resources between countries. It takes into account the development and coordination of capabilities among states and organizations for the sustainable, efficient development and use of energy resources.

Complementarity is not merely a matter of sharing resources. It is also a process of integrating production capabilities, which tends to enhance the competitiveness that countries need in order to foster their development. Institutional frameworks for integration have followed this view and sought to boost and strengthen the industrialization of energy-related value chains and to foster relationships among state-owned energy companies through partnerships whose features depend on each country, particularly its policies and regulations (CAF, 2013a).

The energy integration paradigm has different connotations in the different sub-regions. The three integration scenarios (Central American, Andean and Southern) show differences in terms of establishing common frameworks. Following various reforms to the integration structures of LAC, the past decade has seen new trends. The presidential summit that provided the framework for the 2002 Guayaquil Consensus on “Integration, Security and Infrastructure for Development” strengthened the process of regional infrastructure integration in South America. The Central American strategy also focuses on boosting the Central American Electrical Interconnection System (SIEPAC). In the Andean region, the foremost interconnection agreements between countries are those of Colombia–Venezuela, Colombia–Ecuador and Ecuador–Peru.

The 2005 Caracas meeting of South American energy ministers showed that some states are interested in renewing and coordinating the negotiating power of energy agreements through strategies designed to enhance their complementarities and the benefits of trade. However, it was not until 2007 and the first energy summit, that the presidents of UNASUR addressed the importance of complementarity and integration in the Southern region.



Despite this expression of will, no concrete political results were forthcoming. In fact, aside from developing the Energy Security Treaty, it was only after 2009, when the impacts of the international economic crises had become evident, that energy issues were addressed for the countries of UNASUR. At subsequent summits, energy discussions centered on the need to encourage investments, especially in renewable energy and energy integration, to make exchanges more efficient through various distribution networks and cross-border trade.

Two significant initiatives have sought to strengthen integration in the past ten years, namely Petrocaribe in 2005 and the Energy Security Treaty (TSE 2007). Other projects, such as the Mesoamerican Energy Integration Project (PIEM), the Central American Electrical Interconnection System (SIEPAC) and the Central American Regional Electricity Market (MER) have enhanced the capacities for exchange among countries from Mexico to Panama and enabled them to interconnect with Colombia.

Despite this progress, institutional barriers are still apparent. The points of reference on which regional integration is based follow two perspectives. The first is functional and centers on institutional frameworks such as community law, among which the CAN stands out with its own regulation-based structures. The second is neo-functional and arose from practical relations among countries seeking an intergovernmental organization to coordinate their wills and needs for integration associated with economic and political restructuring efforts such as UNASUR, ALBA, and others.

The institutional perspective requires understanding that social and organizational approaches include sets of customs that often take the form of legal obligations. In that sense, according to Gehring, integration requires coordinating decision-making and regulations as a result of a process that leads to institutional change (Santos, 2014). Institutional frameworks can be seen as part of integration processes under normative treaties that apply to joint agreements, which include regulations that are autonomous from their party countries. Also involved are non-formal developments that express intentions but are not within the governmental institutional frameworks of the states comprising them.

Cisneros (2009) highlights the importance of institutions to integration efforts, because they guarantee the legal security of energy exchanges (Cisneros, 2009). Accordingly, the integration effort has included numerous attempts to reach multilateral agreements, which historically have been largely unsuccessful, while bilateral integration efforts have prevailed for the most part. However, there have also been discrepancies at the bilateral level, in terms of energy supplies from both hydroelectric plants and natural gas (Ruiz, 2010).

## **Institutional Developments from a Sub-Regional Integration Standpoint**

Over the past ten years, there have been several developments related to the institutional and regulatory aspects of energy agreements. However, it has been difficult to harmonize integration schemes due to domestic regulatory reforms, differences among power supply regimes, loss of trust in agreements due to non-compliance, international price variations, uncertainty of resource availability, lack of funding for infrastructure development, and socio-environmental conflicts.

According to Moreno (2015), regional integration can be expedited and deepened by promoting the energy and infrastructure sectors on a regional scale, despite the instability and uncertain future of the international environment, as long as proper use of the regional energy capacity and its vast natural resources is ensured (Moreno, 2015). Accordingly, an integration strategy must leverage the advantages of local economies through their energy production, based on diversification and the ability to harness the cost-efficiencies of scale.

For example, the experience of some MERCOSUR countries shows that contracts have contingencies related



to supply and demand shocks. Internal energy market imbalances highlight the need to improve the design of contracts governing private sector participation and to enhance public policy coordination (Navajas, 2008). Furthermore, bilateral interconnection agreements are associated with sovereignty over electricity surplus between Paraguay and Brazil, as well as Argentina (the Itaipu and Yacyreta hydroelectric plants).

Within the framework of the Andean Community (CAN), decision 536 of 2002 was passed to regulate electrical interconnections and intra-community trade in electricity. However, conflicts arose between Colombia and Ecuador due to co-management revenue sharing, which in recent years has been allocated to Colombia. As of August 2004, as a result of an inquiry of the Regulatory Bodies, proposed by Ecuador, exports to Ecuador were included as part of the demand served by the Colombian market (CAF, 2009). Recently, temporary suspension of Decision 536 was proposed in order to modify it and study other aspects that had not been adequately regulated, such as emergency supply, since Andean legislation establishes the principle of non-discrimination of markets (Ruiz, 2010).

In the case of the countries of the Central American Electrical Integration System (SICA), integration has centered on the SIEPAC project, which seeks to establish electricity interconnections in a regional power market. This initiative, developed as part of the Mesoamerica Project, formerly Plan Puebla Panama, has made significant progress towards integration. However, despite the progress made in terms of infrastructure, the process has been quite complex institutionally. First of all, SIEPAC operation has had frequent delays due to increased costs, manufacturer defaults and redesigns, which have prevented countries such as Panama and Colombia from interconnecting. Secondly, although the countries of the sub-region have adapted to the institutional framework, which has enabled the MER to introduce power-market mechanisms conducive to competition and cost efficiency, nevertheless other matters like long-term contracts are incompatible with domestic demand.

Central America has a large demand for hydrocarbons, especially natural gas. The 2005 Cancun meeting reaffirmed the commitment to supply its countries through the PIEM using an interconnection strategy. It proposed building a refinery in Central America, at a site to be defined by private investors, and boosting Central American natural gas consumption by building a gas pipeline stretching nearly three thousand kilometers from Mexico to Colombia, including the construction of a regasification plant to create a natural gas distribution system for the region. However, these projects are currently on hold because an offer to supply hydrocarbons from Mexico has not been realized (Ruiz, 2010).

The particular case of the Caribbean islands is different from the rest of the region. Bear in mind that, being a cluster of islands, geographic interconnection represents a challenge to optimal energy integration development. However, cooperation initiatives developed by Venezuela through Petrocaribe have made it possible to improve substantially the energy performance of the islands.

## The LAC Energy Status

Latin America and the Caribbean have a heterogeneous distribution of energy resources, whose development depends on the generation capacity of these economies and their ability to produce added value. In principle, this is what makes complementarity possible in the integration process, as it generates comparative advantages for resource exchange. Despite the advantages of resource diversity, production capacity is limited and the economic foundations of most countries support only incipient industry that cannot fully compete and integrate.

Latin America and the Caribbean account for 4% of primary energy production worldwide. The internal energy mix features primary supplies of 44.3% oil, 22% natural gas, 18% biofuel, and 9.9% hydropower, which is one of the

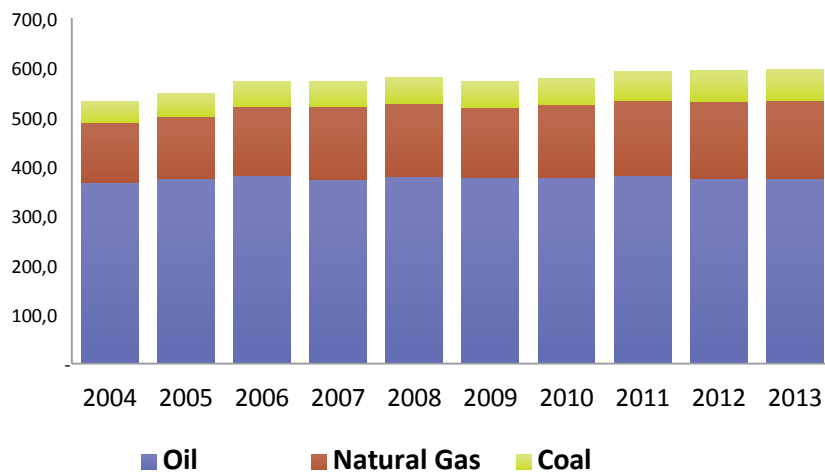


most important sources for electricity transformation and supply. The region's oil reserves account for approximately 20% of global production, with proven reserves of 329.6 mmbbl, more than 90% of which pertain to Venezuela. This gives the region a reserve margin of over one hundred years compared to global reserves, which have an average availability of about 53 years, and those of the Middle East, with a reserve margin of 78 years.

Global natural gas reserves are concentrated in the Middle East, which has a reserve margin of over one hundred years. In LAC, the reserve margin is 43.5 years, with a 4% share of global reserves, which is 185.7 million cubic feet, with a reserve margin of 55 years. Venezuela has the largest natural gas reserves in the region, with a margin of over a hundred years. The largest concentrations of coal reserves are in Europe and Eurasia, with an estimated proven reserve margin of 254 years for different types of coal, followed by the countries of North America, with reserves for 250 years. The LAC region has a proven coal reserve margin of 149 years, and the countries with the largest reserves are Brazil and Colombia.

Primary resource production (gas, oil and coal) in 2013 was 631 million tons, and the average yearly growth rate over the past ten years has been 2.1%. Oil production in the region is 9.1% of the global total, and Venezuela and Brazil are the two largest producers in the region. Natural gas is 5.2% of global production, with Argentina and Trinidad & Tobago being the region's largest producers. Coal is 1.6%, and Colombia has the largest production capacity

● **Figure 1. Oil, Gas and Coal Production Latin America and the Caribbean**

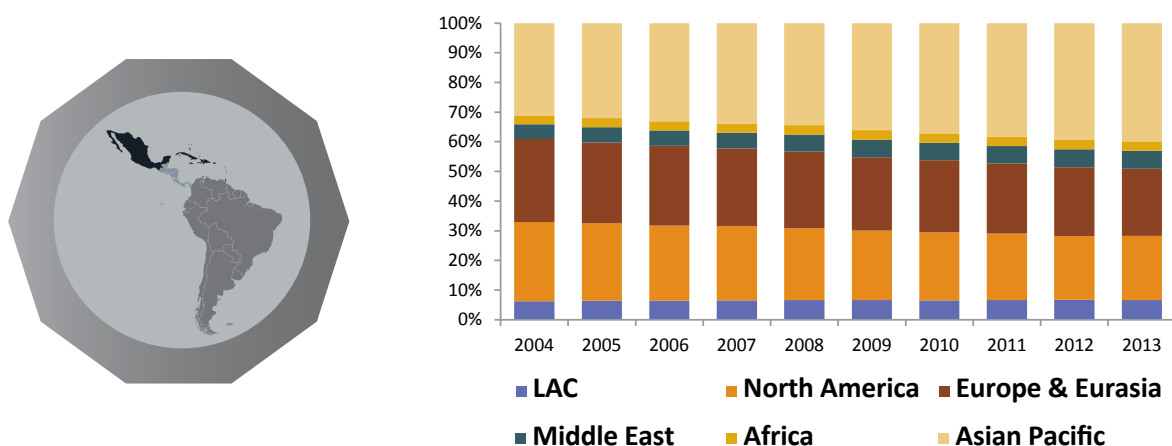


Source: BP Statistical Review of World Energy Natural Gas and Coal in MTOE

On the other hand, Latin America's total installed power capacity is almost 190 GW, excluding Mexico and Venezuela. Of this amount, 120 GW (63%) are hydropower plants, 13 GW (7%) are from non-emitting sources (wind, biomass and small hydropower, geothermal and nuclear power plants), and 57 GW (30%) are from thermoelectric plants burning fossil fuels (natural gas, coal and oil (CIER-CAF, 2012)). Installed power generation capacity has almost doubled over the past two decades, from 157,000 MW in 1990 to 307,131 MW in 2010 (García & Garcés, 2012).

Hydroelectric generation has become more important to energy transformation and exchange among the countries. Accordingly, the capacities of this resource to supply power to the region have been harnessed, and nearly 87% of the population has access to electricity. Another high-percentage resource for power generation is gas, which together with coal accounts for about 20% of the fuel used for generation. The largest electricity producer in the region is Brazil, and the largest exporter is Paraguay.

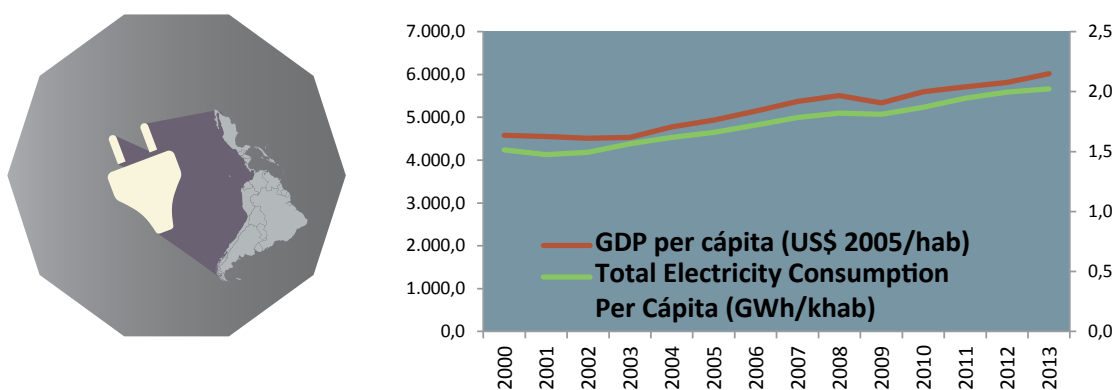
● **Figur2 Primary energy consumption by region (MTOE)**



Fuentes: BP Statistical Review of World Energy.

Total energy consumption worldwide has been growing at a rate of about 2% per year, due to growing energy needs in developing countries, especially China and other Asian countries, which consume 36% of global energy supplies. As a region, LAC consumes about 6% of all primary energy, which in the past ten years has maintained the same levels with no major change. The countries of Europe and Eurasia represent 25% of all energy consumed, although total consumption levels declined from 28% in 2004 to 23% in 2013. North America's consumption trend has also maintained the same levels at approximately 21% of global consumption.

● **Figure 3 GDP and electric power consumption per capita for Latin America and the Caribbean Sea**



Fuente: SIEE OLADE.



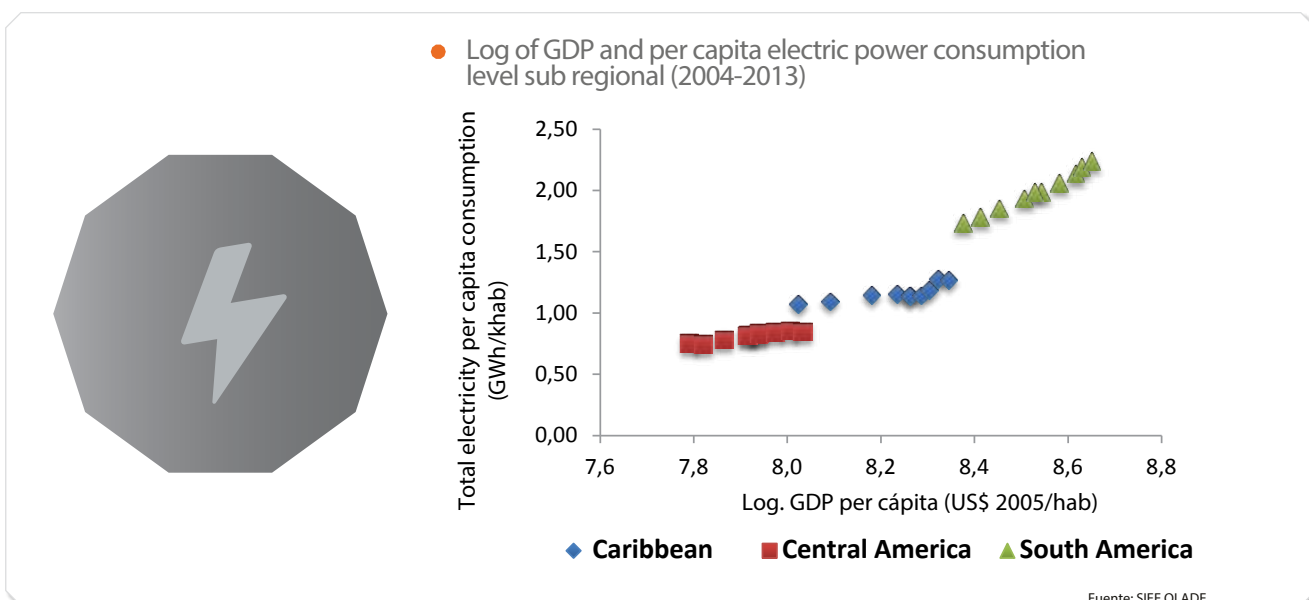
## Energy Resources and Production Integration in LAC

Historically, the capacity of the LAC region to adjust to variations in external impacts on the economy is associated with its institutional features, efficient management of economic policies, and growth measures. Citing Altomonte (2008), since the trade liberalization of the early nineties, the region's growing international involvement has led in turn to increased specialization in the energy industries, in which the region has concentrated its comparative advantages. This structural trend, caused by globalization-induced trade liberalization and economic specialization, has sharply increased the industrial sector's overall energy content and subsequent energy intensity since 1990 in several countries of the region (Altomonte, 2008).

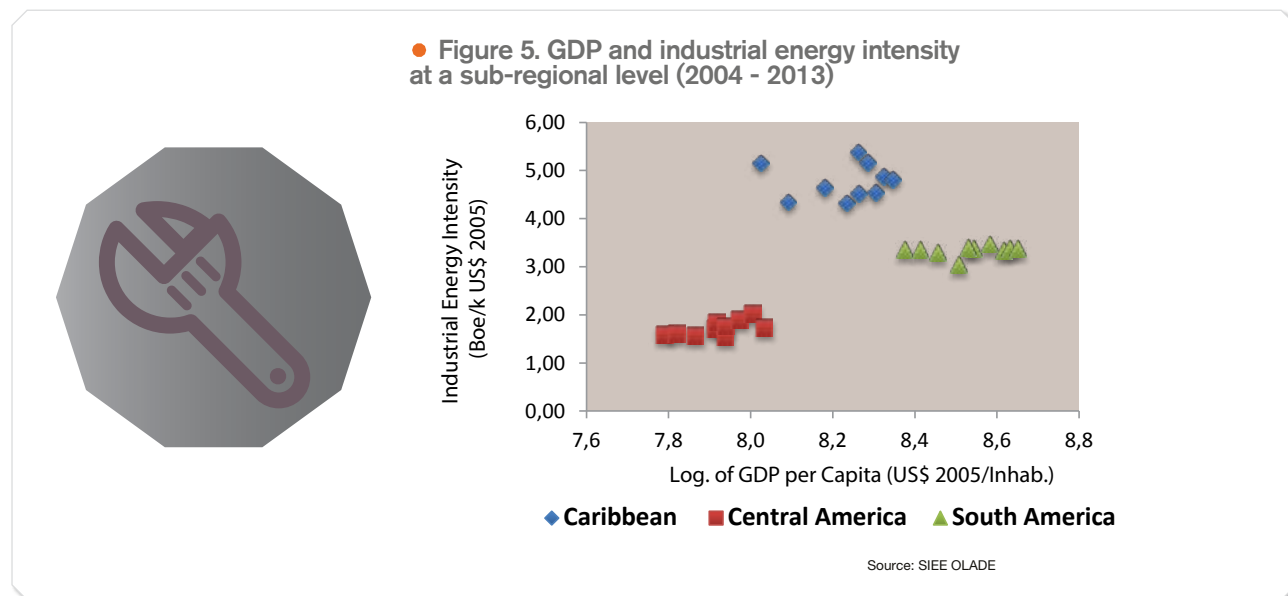
Accordingly, one could ask how productive the economies of LAC are in terms of energy resources. Energy productivity is associated with efficiency and technical progress based on growth in production. Liang & Mei (2005) define productivity as the energy consumption/production ratio. Productivity differs from energy efficiency in that the former relates to the energy units consumed to produce a good or service, while efficiency has to do with using fewer units to produce more goods or services. In terms of production, energy efficiency means lowering production costs, while productivity is only a measure of capacity.

There is a direct relationship between energy consumption and GDP, both of which have grown in the region over the past ten years. The evolution of energy trends, which relate energy intensity to per capita production, depends on social and productive characteristics and the degree of development achieved. In high-income economies, it is expected that as per capita income grows, structural and technical changes will enable efficient resource use. However, the flattening of the energy efficiency curve is due not only to recent dynamics associated with the issues described above, but also to economic policies and industrial planning, which have failed to encourage higher investment to improve conditions.

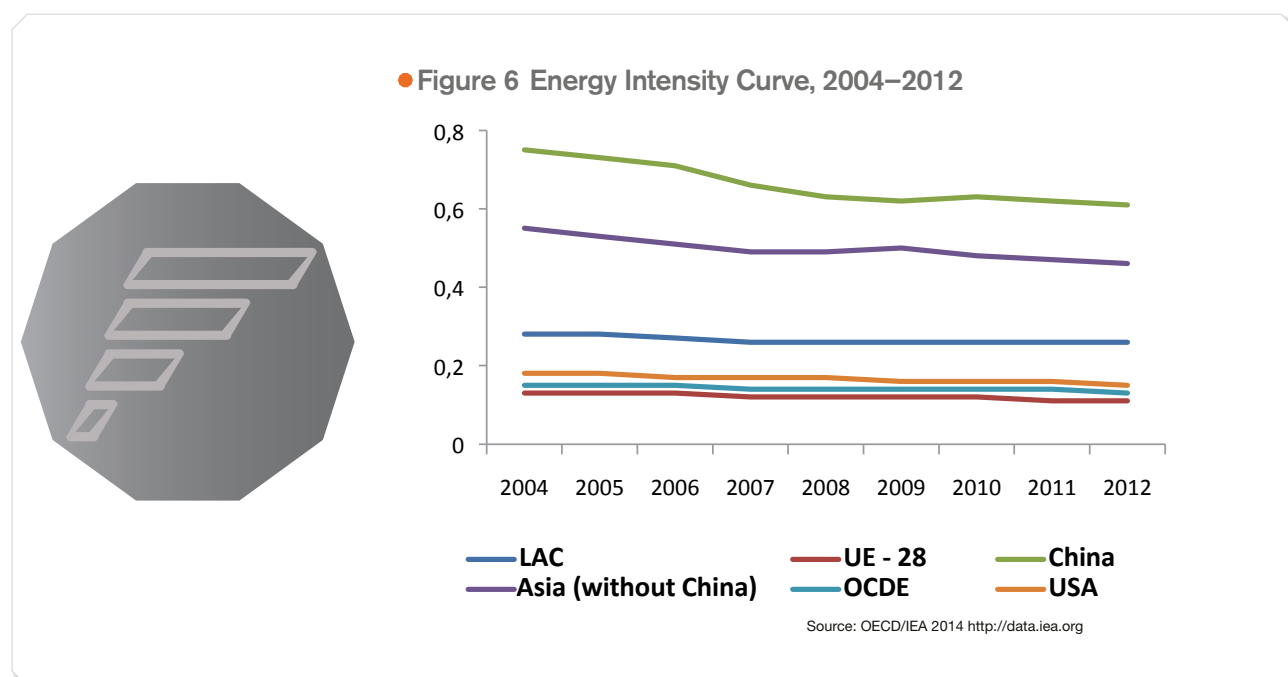
On a sub-regional level, per capita energy consumption is directly proportional to income. It is higher in the countries of South America and much lower in Central America despite having an integrated energy economy, and is consistent with the region's growth performance (Figure 4). One way to understand the economic impacts of resource production and consumption is to analyze energy intensity, which is an efficiency indicator in that it calculates the resource consumption/GDP ratio. Energy intensity relates to how much energy is required to generate one unit of GDP, how much is consumed to move one vehicle, the amount consumed per household or per inhabitant, and the amount per type of service or industry (Baza, 2006).



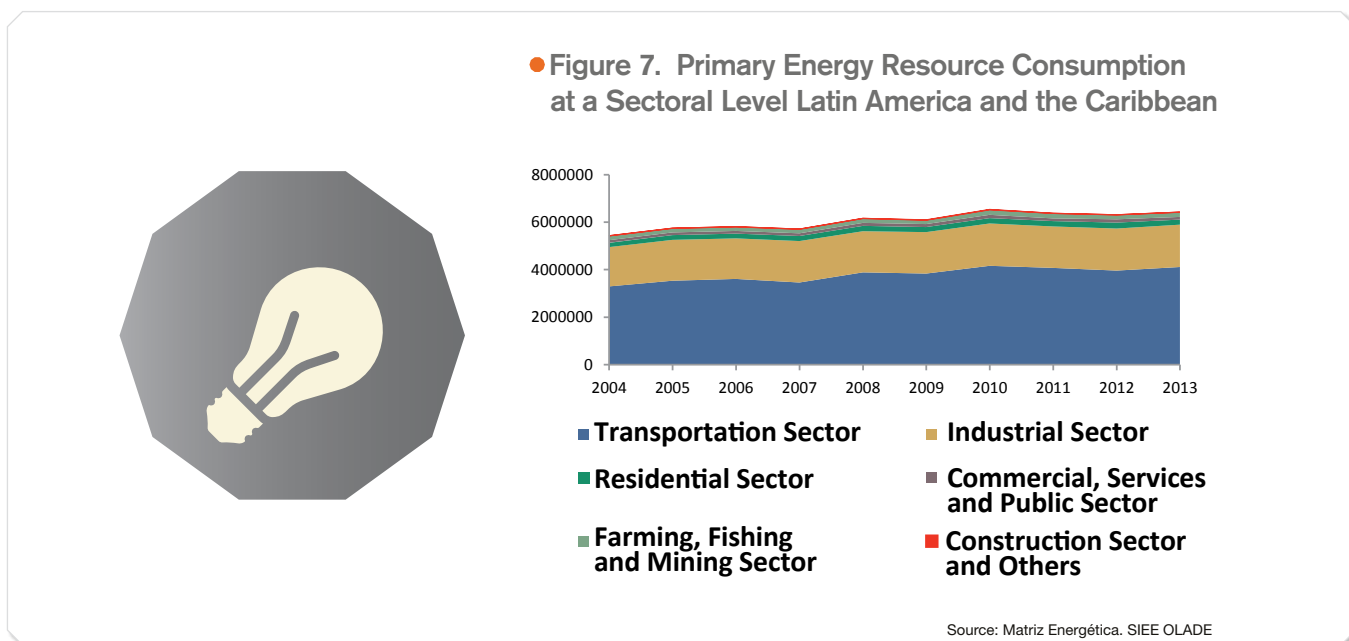
Although power consumption is higher in South American countries, the industrial energy intensity/GDP per capita ratio is higher in the Caribbean sub-region and much lower in the countries of South and Central America (Figure 5). This shows that the industrial sector generates little added value and that sectoral production is poorly integrated. It is due to an economic structure that is concentrated in primary sectors, low economic vitality caused by commodity prices and dependence on exports, lack of investment to increase energy efficiency and, finally, per capita electricity and transport consumption patterns that form as developing countries converge towards higher income levels (Altomonte, 2008).



The energy intensity of LAC is below that of Asia and above that of Europe and the OECD countries. The LAC region currently consumes 1% less than in 2004 to produce one unit of output (Figure 6) due to technological factors that make production more efficient, because economies with more industrial development have higher energy efficiency.



Energy mix structures show that the region's broadest supply variations have been in primary resource exports, primarily oil at around 40%. Although the trade balance for primary resources shows no deficits, import variation has been greater than imports. The industrial sector is the largest primary resource consumer, primarily associated with extraction activities in South American countries. Central America shows higher import levels for primary energy resources. The residential sector comes in second, consuming 17% of all primary production and approximately 5% of total hydrocarbon supplies such as gas and coal (Figure 7).

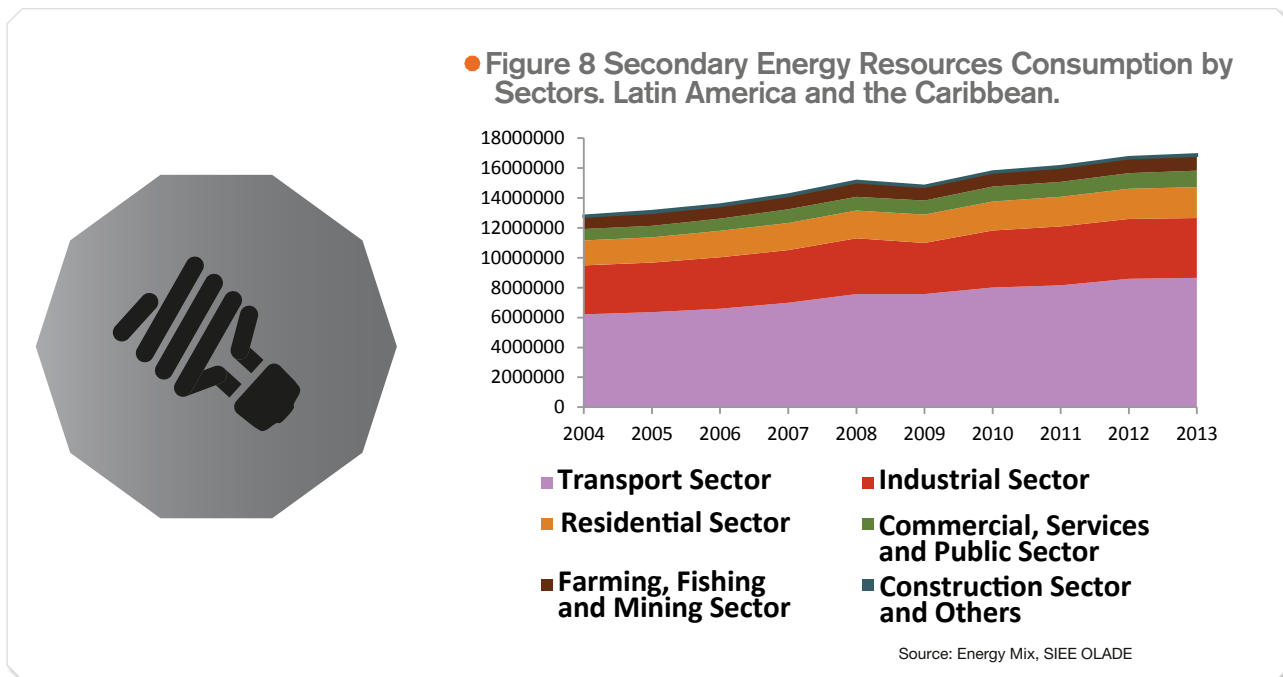


Energy resources from transformed or secondary sources show wider import variations, while production levels remain stable. The largest secondary source is electricity generation, followed by diesel and gasoline. Each source has its own dynamics, especially at the sub-regional level. While electricity production is high in the countries of South America, approximately 4% of all production goes to net exports in the countries of MERCOSUR and the Andean Community, and most fuels are imported due to the region's dearth of refining capacities. The recent economic crises significantly impacted overall production and supply performance for both primary and secondary sources. In 2009, import variations were significant, but commodity prices favored recovery and helped increase productivity.

The sectors with the highest consumption of secondary energy sources were transport, industrial and residential, in that order. Electricity intensity was higher in the LAC industrial sector, while fuel use grew for productive transformation (Figure 8). One industrial performance hypothesis, taking into account the rising commodity prices, fuel prices and costs associated with industrial production, would be to assume that regional production integration declined as the primary sectors grew. This is reflected in patterns of energy-related trade and intra-sectoral complementarity among the countries of the region, which enabled specialization in terms of exploitation and primary resources, and resource transformation from external sectors.

## Considerations

In the energy context, integrating production depends on the ability of domestic sectors to interconnect and achieve economies of scale to enhance resource utilization. Cooperation by these sectors with other economies provides a minimally efficient capacity to achieve competitive advantages in terms of resource use and production. In other words,



the region should not only establish resource-sharing complementarities, but also build institutional frameworks to enable greater production interconnections, in order to promote its competitiveness and integration capacity.

The above sections reviewed the relations between energy integration and economic performance among the LAC countries. While future aspects in the region are unclear, there remain many challenges to energy integration and sustainability. Regional resource use has followed an upward curve to ensure higher levels of income, but heavy dependence for commodities, low diversification of production, and lack of internally generated financial capabilities do not favor substantial improvements in production integration and energy sustainability. Production integration is a process that goes hand in hand with enhancing the conditions for competitiveness, and interconnecting production factors. LAC has the physical capital needed to improve these conditions in terms of energy, but needs to review the added value that the sector can generate, starting with human factors, and the possibilities for mobilizing capital on a regional scale.

Guaranteeing energy sovereignty and security requires strengthening regional integration, from the policy level to the economic level. Since 2004, conditions have been stable for integration, but institutional challenges remain due to the persistence of mutual conflicts that hamper full implementation of bilateral and multilateral agreements for development and physical integration. ●

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