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# The vision of the green economy in the Latin America and the Caribbean

*XXXVIII Regular Meeting of the Latin American Council  
Caracas, Venezuela  
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Latinoaméricain et Caraïbéen



# The vision of the green economy In Latin America and the Caribbean

## Extra-Regional Relations

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*F O R E W O R D*

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*This document, prepared by the Permanent Secretariat of SELA, offers an analysis of the green economy to its Member States as a contribution to the ongoing international debate on the subject, ahead of the upcoming United Nations Conference on Sustainable Development (Rio+20), to be held in Brazil in 2012.*

*The document is intended to respond to three key questions: What is green economy? How could Latin America and the Caribbean, at the regional and country levels, move towards green economy on the basis of an analysis of its energy matrix? And how could such a move contribute to a better quality growth that allows for reducing income inequities and fighting against poverty?*

*After the introduction, the second section presents various concepts and definitions of green economy and green growth, comparing the views of several international organizations and proposing elements to reach a regional definition that attaches priority to social inclusion.*

*The third section analyzes the energy matrix of Latin America and the Caribbean, providing information about the energy resources available to the region in order to move towards a green economy. In sum, it offers a roadmap of the current situation of energy sources in Latin America and the Caribbean and their use.*

*The fourth chapter deals with the implications of the transition to a green economy for the countries in the region, highlighting some of the policies and actions that should be undertaken in order to achieve such change.*

*The fifth chapter contains some ideas and recommendations to promote debates on this subject among the Member States of SELA. Finally, the Conclusions underscore the urgent need for action to attain sustainable development in the region and make a positive balance of the potential energy resources found in our countries so as to move towards a green economy.*

*The Permanent Secretariat of SELA wishes to thank Ms. Luz María de la Mora for her valuable efforts as the consultant in charge of preparing this study.*



## EXECUTIVE SUMMARY

The concept of green economy is relatively new. It refers to the way in which natural resources are used to produce satisfiers for the population. Even though this concept is still under analysis and it has not been applied to its full potential, this idea reflects significant concerns such as sustainable growth, production, use of natural resources, and environment protection. Ultimately, it involves a new form of production and a new way of relating to our environment.

The financial and economic crisis experienced by the global economy has placed the issue of how the recovery should occur at the centre of the debate. An increasing number of government agencies and civil society stakeholders are considering the green economy as the best alternative to retake the course of growth. In fact, during the G-20 Summit in Cannes on 3 and 4 November 2011, the leaders decided to encourage and promote clean energy in order to optimize the potential of green growth and ensure sustainable development in all countries of the world.

This document intends to respond to three key questions: 1) What is green economy? 2) How could Latin America and the Caribbean (LAC), at the regional and national levels, move ahead towards a green economy on the basis of an analysis of its energy matrix? and 3) How could this contribute to a better quality growth that would allow for reducing income inequalities while bolstering the fight against poverty?

The study begins with an analysis of the various definitions and concepts of green economy and green growth. The first section analyzes the different definitions and contrasts those offered by agencies such as the United Nations Environment Programme (UNEP) and the Organization for Economic Cooperation and Development (OECD). In addition, based on the concepts identified, the Permanent Secretariat of SELA proposes elements to contribute to an appropriate definition for the region, giving priority to social inclusion in view of the urgent need to address the serious gaps in inequality in LAC.

The second section discusses the energy matrix of the region to provide an overview of the energy resources available to move towards a green economy. It identifies some countries with alternative energy sources. Based on a scoring system for the types of energy sources used, which was designed by the Permanent Secretariat of SELA, the study offers a roadmap of the current situation of energy and its uses in Latin America and the Caribbean (LAC). For instance, this analysis found that Paraguay has the highest ranking in terms of sustainability and clean energy.

The third section deals with the implications – at the regional and country levels – of moving towards a green economy, and explores the policies and actions that the countries should follow in order to achieve such change. It examines the region's situation in terms of its investments in renewable energy, because the region must make huge investments if it is to change its energy production matrix and therefore its energy supply. The study underscores how important it is for the State to play an active role in promoting, through a series of policies, the transition towards a green economy so that it turns out to be a socially inclusive process. Such a qualitative leap should bring about a way to reduce poverty, inequality and social exclusion. Hence, this paper offers some guidelines to discuss how the State should develop policies to ensure participation of the majority of the population, so that they can benefit from a new production scheme.

The fourth section provides a series of proposals as regards areas where the Permanent Secretariat of SELA could contribute with analyses on this subject to the region. Particularly, it is of the utmost importance to take due account of the characteristics of the region as a whole and of individual countries, as well as their potential to effectively move towards a green economy based on their own capacities, while embracing the concept of green economy in their policies and programmes. It is also important to identify public policies to allow for creating appropriate incentives for adopting public policy instruments to ensure a real and effective transition towards a green economy.

The proposals made by the Permanent Secretariat of SELA in this document are aimed at supporting the region's countries in promoting debates, and outlining policies and programmes with a strong impact and sustainability through time. The study focuses on the following areas of action:

1. **Outline an inventory of basic elements** to be included in a green economy.
2. Develop a **green energy matrix** at the regional level in order to outline policies to support the transition to a redistributive green economy.
3. **Conduct a study and an inventory of available natural capital<sup>1</sup> in LAC and its relation to the hydrocarbon energy sector and biomass**, in order to identify the region's potential to move towards a green economy.
4. Define **thematic areas** and projects which can add up the advantages of each country and region in order to make proposals for mechanisms to adopt a green economy.
5. **Conduct a study to propose mechanisms to follow up** projects and programmes that support the efficient use of energy and natural resources available at the regional and country levels, and to establish indicators to assess their effectiveness in the transition to a green economy.
6. **Promote actions among LAC countries for coordination** among national institutions responsible for the exchange of information and experiences as regards the implementation of programmes aimed at transforming the current carbon-based economies into green economies that are sustainable in the long term.
7. **Examine the feasibility of sectoral programmes for traditional energy-intensive industries** such as metal smelting (steel, aluminum, among others), chemical and glass industries, or **services** such as transport and tourism, in each country with the participation of ministries and agencies responsible for the **energy sector, communications and tourism**, as well as associations and chambers of the productive sector, thus promoting comprehensive policies that lead to the adoption of green economies.
8. **Identify innovative financial sources** to develop new projects, as well as tax incentives and subsidies to promote the use of technologies that support a green economy.
9. **South-South and Triangular Cooperation** based on an analysis of existing offers and requests of experiences concerning the adoption of a green economy.

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<sup>1</sup> The concept of "natural capital" refers to natural assets in their role of providing natural resource inputs and environmental services for economic production. Natural capital is generally considered to comprise three principal categories: natural resource stocks (water, renewable energy and biodiversity, to mention a few), land (agriculture, silviculture) and ecosystems (forests, jungles, wetlands, marine ecosystems, among others). <http://stats.oecd.org/glossary/detail.asp?ID=1730>

10. **Dissemination** of those programmes and projects focused on the green economy in the region, in order to promote successful experiences, identify challenges and refocus existing programs.

The Permanent Secretariat of SELA can be an ideal partner for the national officials in charge of the various policies and areas involved in the transition towards a green economy. As a forum for discussion and analysis on this subject, SELA can be a facilitator to promote proposals that could lead to concrete recommendations, always considering the development of inclusive policies. To this end, the Permanent Secretariat could carry out the following activities:

- 1) **Seminars** to analyze trends and concepts concerning the green economy in order to clarify proposals and ideas, both to government authorities and productive and academic sectors and civil society.
- 2) **Studies** that provide elements for analysis to countries seeking to move towards fiscal, energy, agricultural, educational, environmental, science and technology policies, among others, and best practices that will actually enable the transition to an inclusive green economy.
- 3) To convene **meetings** of experts to promote a debate on proposals to systematize information through indicators to better assess the impact of the green economy on every country in Latin America and the Caribbean.
- 4) To support activities to **disseminate information** about the programs existing in the region to support the transition towards a green economy, on SELA's Web site.



## I. INTRODUCTION

The financial and economic crisis unleashed in late 2008 after the collapse of Lehman Brothers has led to rethinking the traditional production models. Apparently, the economic recovery cannot occur under the traditional assumptions of a carbon-based economy. The debates and discussions on how to resume growth point to giving greater value to natural resources in order to ensure sustainable global economic growth. There are several conceptualizations of green economy and green growth, which are analyzed in this study.

This document is intended to respond to three basic questions: 1) What is green economy? 2) How could Latin America and the Caribbean, at the regional and country levels, move towards green economy on the basis of an analysis of its energy matrix? And 3) how could such a move contribute to a better quality growth that allows for reducing income inequities and fighting against poverty?

The concept of green economy is relatively new. It refers to the way in which natural resources are used to produce satisfiers for the population. The study begins with an analysis of the various definitions and concepts of green economy and green growth. The first section analyzes the different definitions and contrasts those offered by agencies such as the United Nations Environment Programme (UNEP) and the Organization for Economic Cooperation and Development (OECD). In this section, based on the concepts identified, the Permanent Secretariat of SELA deems it necessary to reach a proper definition of the term, so as to respond to the needs, realities and resources of the region. With this document, the Permanent Secretariat intends to help build conceptual bridges between the analyses conducted by the United Nations system and the OECD. Also, based on the concepts identified, the Secretariat proposes elements to contribute to an appropriate definition for the region, in accordance with the notions contained in already developed definitions, where social inclusion should be a central element as a way to reduce the huge inequalities persisting in the region.

The second section discusses the energy matrix of the region to provide an overview of the energy resources available to the region to move towards a green economy. It identifies some countries with alternative energy sources. Based on a scoring system for the types of energy sources used, which was designed by the Permanent Secretariat of SELA, the study offers a roadmap of the current situation of energy and its uses in Latin America and the Caribbean (LAC). For instance, this analysis found that Paraguay has the highest ranking in terms of sustainability and clean energy.

The third section deals with the implications – at the regional and country levels – of moving towards a green economy, and explores the policies and actions that the countries should follow in order to achieve such change. This study found that must make huge investments if it is to change its energy production matrix and therefore its energy supply. This section underscores how important it is for the State to play an active role in promoting the transition towards a green economy so that it turns out to be a socially inclusive process. It is fundamental to prevent such a qualitative leap from exacerbating poverty, inequality and social exclusion. Hence, this paper offers some guidelines to discuss how the State should develop policies to ensure participation of the majority of the population, so that they can get involved in the process and benefit from it.

The fourth section provides a series of proposals as regards areas where the Permanent Secretariat of SELA could contribute with analyses on this subject to the region. Particularly, it is of the utmost importance to take due account of the characteristics of

the region as a whole and of individual countries, as well as their potential to effectively move towards a green economy based on their own capacities, while embracing the concept of green economy in their policies and programmes. It is also important to identify public policies to allow for creating appropriate incentives for adopting public policy instruments to ensure a real and effective transition towards a green economy.

In sum, with this document, the Permanent Secretariat of SELA offers a series of proposals to support the region in promoting discussions and analyses on how to move towards an inclusive green economy. It is considered to be crucially important for the State to develop policies and programs with a high social impact and economic and environmental sustainability through time, but above all to ensure an effective participation of the majorities in such transition.

## II. TOWARDS A CONCEPTUALIZATION OF THE GREEN ECONOMY

What do we mean by a green economy? Basically, a green economy refers to a low-carbon economy with an efficient use of natural resources, as well as traditional inputs such as labour, capital and fossil energy. A green economy values natural capital and invests in it, offering better conditions to ensure sustainable growth and seeking to conserve and preserve the environment, with the understanding that it is essential to guarantee the sustainability of production for future generations.

Over the past few years, the concept of environmental or ecological economics, which had originally been confined to academic circles, has started to permeate and dominate the political and economic agendas in various international forums. The studies and contributions made by the United Nations Environment Programme (UNEP) and the Organization for Economic Cooperation and Development (OECD) are noteworthy. In this section we analyze the definitions offered by both agencies and compare them, highlighting their main similarities and differences.

The global financial crisis unleashed in late 2008 has led to rethinking financial and environmental issues, among many other topics. In fact, the Group of 20 (G-20)<sup>2</sup> has considered environmental issues and the transition towards a green economy as a way to overcome the current economic crisis.<sup>3</sup> Gordon Brown, former Prime Minister of the United Kingdom, pointed out that the mitigation measures to overcome the effects of the crisis should be a central component of the so-called "New Global Deal", whereas the U.S. pledged to allocate US\$ 59 billion from its economic stimulus package to promote clean energy projects. Similarly, China's President Hu Jintao announced that the country would earmark 38 percent of a US\$ 586 billion package for green issues.<sup>4</sup>

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<sup>2</sup> The G-20 is made up by the Ministers of Finance and the presidents of the Central Banks of 19 countries and the European Union, namely: Germany, Saudi Arabia, Argentina, Australia, Brazil, Canada, China, United States, France, India, Indonesia, Italy, Japan, Mexico, United Kingdom, Republic of Korea, Russia, South Africa, Turkey and the European Union.

<sup>3</sup> In previous joint statements by G-20 leaders and international organizations. The German Federal Chancellor, Angela Merkel, and the directors of the OECD, WTO, ILO, IMF and World Bank gathered in Berlin, Germany, on 6 October 2011, and made a call to restore confidence and improve balanced and sustainable growth as well as employment prospects prior to the G-20 Summit in Cannes in November 2011.

<sup>4</sup> "G-20, green economy to save the planet," in *El Informador*. 2 April 2010. <http://www.informador.com.mx/tecnologia/2009/91440/6/g20-economia-verde-para-salvar-el-planeta.htm>.

Environmental organizations such as Greenpeace have urged the G-20 to develop clean energy as the only option to save both the global economy and the planet.

In their joint communiqué on 4 November in Cannes, France, the G-20 leaders expressed their desire to promote clean energy, green growth and sustainable development through the following specific actions:<sup>5</sup>

- Promote low-carbon development strategies in order to optimize the potential for green growth and ensure sustainable development in G-20 and other countries.
- Encourage effective policies to overcome obstacles to efficiency and spur innovation and deployment of efficient clean energy technologies.
- The G-20 leaders welcomed the initiative “Sustainable Energy for All” proposed by the UN Secretary-General. They supported the development and use of clean energy technologies and energy efficiency (Centre of Excellence in Energy Efficiency, C3E). They also welcomed the assessment of the current situation of the countries regarding the deployment of these technologies, as well as the ongoing efforts to share best practices as a basis for better policy making.
- They committed to the success of the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012. “Rio+20” will provide an opportunity to mobilize the necessary political will to reinsert sustainable development in the core of the international agenda as a long-term solution for growth, protection of job creation, poverty reduction and environmental protection. Inclusive green growth will create a wide range of opportunities in new industries and in areas such as environmental services, renewable energy and new ways of providing basic services to the poor.

Thus, during the period in which Mexico will hold the presidency of the G-20, growth within the context of the green economy will remain one of the top priorities of the agenda. To this end, Mexico will seek to reduce subsidies for fossil fuels and promote green infrastructure and investments.<sup>6</sup>

### Concept definition and vision

As discussed in this section, the various agencies of the United Nations system have identified **green economy** as “investment in sectors such as energy efficiency technologies, renewable energy, public transport, sustainable agriculture, environment-friendly tourism and sustainable management of natural resources, including ecosystems and biodiversity” aimed at generating new areas of production, quality jobs and an increase in income, while serving to mitigate climate change and protect biodiversity (United Nations). Meanwhile, agencies such as the G20,<sup>7</sup> OECD or APEC<sup>8</sup> refer to the

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<sup>5</sup> G-20 communiqué. Cannes, France, 4 November 2011.

[http://www.g20.org/pub\\_communiques.aspx](http://www.g20.org/pub_communiques.aspx).

<sup>6</sup> “México ofrece impulsar economía verde en presidencia del G-20,” in CRIOnline. <http://espanol.cri.cn/782/2011/10/22/1s229468.htm>.

<sup>7</sup> The G-20 Summit held in Cannes, France, on 3 and 4 November, considered the issue of green growth as a priority of its political and economic agenda.

concept of green growth.

For the purposes of this document, an inventory of the definitions of the concepts of **green economy and/or green growth** used by UNEP and OECD, respectively, has been prepared. In addition, an analysis is made of the **positive and normative economic** elements<sup>9</sup> of such definitions, and how they relate to the concept of sustainable development. Finally, the Permanent Secretariat of SELA provides its own views on this subject matter along with some elements that could be included in the definition of green economy from an inclusive approach for Latin America and the Caribbean.

### UNEP: Green economy

In its seminal document **Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication**, UNEP defines **Green Economy** as "*one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.*" In this connection, a green economy can be thought of as one which is low carbon, resource efficient and socially inclusive.

Another definition used at the XVII Meeting of the Forum of Ministers of Environment of Latin America and the Caribbean – held in Panama City, Panama, from 26 to 30 April 2010 – is as follows: "*A Green Economy is a system of economic activities related to the production, distribution and consumption of goods and services that results in improved human well-being over the long term, whilst not exposing future generations to significant environmental risks and ecological scarcities. It is environmentally friendly and ecological, and for many groups, it is also socially just.*"<sup>10</sup>

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<sup>8</sup> The Asia Pacific Economic Cooperation Forum (APEC) has also included the issue of green growth in its agenda. Green growth has had a prominent place on the agenda of the three preparatory meetings of APEC in 2011 (Washington, DC, in March; Big Sky, Montana, in June; and San Francisco, California, in September) as well as in the Meeting of APEC Economic Leaders held in Honolulu, Hawaii, from 10 to 12 November 2011. APEC is committed to promote green growth and help its economies to make a successful transition to clean energy. Among the objectives of APEC is to confront and reduce barriers to trade in environmental goods, including non-tariff measures related to technology products such as vehicles, as well as remanufactured and recycled products.

<sup>9</sup> Positive economics is defined as the branch of economics that aims at describing those economic phenomena that affect individuals from a theoretical and completely objective point of view, without explicit value judgments. In contrast, normative economics refers to "what ought to be" in economic matters, providing opinions and value judgments about economic justice and equity, and seeks solutions to economic problems. In other words, positive economics is "what is", while normative economics is "what ought to be".

Normative economics: Economic approach characterized by the predominance of value judgments ("what ought to be"), closely related to the formulation of economic strategies and policies.

Positive economics: Economic approach focused on the analysis of facts and economic data as they actually are, without explicit value judgments.

See: [http://www.enotes.com/topic/Normative\\_economics](http://www.enotes.com/topic/Normative_economics) and <http://www.bcv.org.ve/c1/abceconomico.asp>.

<sup>10</sup> UNEP, 2010. General information that can be used by the Ministers and Heads of Delegation for the dialogue on Green Economy. XVII Meeting of the Forum of Ministers of Environment of Latin America and the Caribbean. Panama City, Panama, from 26 to 30 April 2010. (UNEP/LAC-IG.XVII/4).

## Green economy public policies

At present, enabling conditions are heavily weighted towards, and encourage, the prevailing brown economy (carbon-based economy), which, inter alia, depends excessively on fossil fuel energy. To make the transition to a green economy, specific enabling conditions will be required, namely: 1) The backdrop of national regulations on production; 2) Energy policies; 3) Domestic subsidies and incentives to move towards a green economy; 4) Legal and institutional infrastructure to promote the adoption of a green economy; and 5) Trade and aid protocols to effectively support such transition.<sup>11</sup>

UNEP notes that economic policy makers at the national level are at the very core of decisions to create the enabling conditions for greater investment in the transition to a green economy. To that end, it makes the following recommendations:

1. Regulations, standards and targets are important to provide direction. However, developing countries must be allowed to move at their own speed, respecting their development objectives, circumstances and constraints. Developed nations have a key role to play in building skills and capacity in developing countries, and in creating international market and legal infrastructure for a green economy.
2. Use economy-based arguments to promote a change in public and private investments, so as to transform key sectors for greening the global economy. UNEP points out that jobs that are created in green sectors can offset job losses in the transition to a green economy.
3. Prove that a green economy can reduce persistent poverty by promoting a number of important sectors: agriculture, forestry, freshwater, fisheries and energy. Sustainable forestry and environmentally friendly agricultural practices help preserve soil fertility and water resources, thus ensuring production sustainability in the long term.
4. Offer guidelines as regards the necessary policies to bring about such transformation:
  - a. Phase out harmful subsidies to the environment or those that support the brown economy, which are a deterrent to achieving a green economy, (e.g. subsidies to gasoline, coal or highly polluting carbon-based energy sources). In select circumstances and over defined periods however, the rational use of subsidies can facilitate the transition to a green economy.
  - b. Deal with market failures due to externalities or lack of information, through market-based incentives, an adequate regulatory framework and green procurement, while encouraging investment in those industries that adopt green practices.

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<sup>11</sup> UNEP, 2011. Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication.

- c. Use taxes and other market-based instruments to encourage the necessary investment and innovation to finance green transition. Although the scale of financing required for a green economy transition is large, it can be mobilized by smart public policy and innovative financing mechanisms.

In reviewing the foregoing definition and general policy motivations, one can conclude that **UNEP's concept of green economy** incorporates very important elements of **positive economics** such as: efficiency, benefits from market signals in some areas, market failures and imperfections, problems prevailing in the current brown economy, the negative impacts of the of the current patterns of production and consumption on the environment and natural capital, the importance of investment as a catalyst and as a mechanism for change and transition towards a green economy, and the economic benefits of adopting a low-carbon economy, to mention a few. All these concepts are detailed in the document from a factual descriptive approach, underscoring the causes and effects of the behaviour of economic agents (UNEP, 2011).

Additionally, UNEP offers some recommendations that are typical of **normative economics**, proposing specific economic policies which, in its opinion, are essential to ensure the transition to **green economy**. In those policies, UNEP makes value judgments in referring to issues such as: social justice, resource allocation mechanisms, measurement and points of views about inequality and poverty, how to eradicate it through the green economy, and the role that governments should play, to mention a few.

UNEP stresses that the concept of "**green economy**" does not replace that of "**sustainable development**", but there is growing recognition that achieving sustainability almost mandatorily requires having an adequate and proper economy. Sustainability remains a crucial long-term objective and greening the economy is necessary in order to achieve it. **The green economy is not intended to replace sustainable development**. It is rather a way to achieve such development at the national, regional and global levels, in line with the implementation of the Agenda 21,<sup>12</sup> and even enhancing it. For decades, the creation of wealth has followed a "brown economy" pattern, which did not address substantial problems such as social exclusion or depletion of resources. This places us still very far from achieving the Millennium Development Goals by the year 2015. The green economy is therefore the best mechanism for achieving the ultimate goal of sustainable development, while taking due account of social inclusion, poverty eradication and long-term sustainability of natural capital.

### Investments for a green economy

UNEP added that in a **green economy**, rising income and job creation must be derived from public and private investments aimed at: i) reducing carbon emissions and

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<sup>12</sup> Agenda 21 is a comprehensive action plan that will be adopted universally, nationally and locally by organizations of the United Nations System, Governments and Major Groups in every area where humans have an influence on the environment. The Agenda 21, the Rio Declaration on Environment and Development and the Declaration of Principles for Sustainable Forest Management were signed by more than 178 countries at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, from 3 to 14 June 1992. The UN Agenda 21 deals with the most serious problems at present, namely: sustainable development, social inequality, health, environmental degradation and human development, to mention a few. Agenda 21 includes 4 sections: 1) Social and economic dimensions, 2) Conservation and management of development resources, 3) Strengthening the role of major groups, and 4) Means of implementation. <http://www.un.org/spanish/esa/sustdev/agenda21/agenda21spchapter1.htm>.

pollution; ii) promoting energy efficiency and the consistent use of resources, and iii) preventing the loss of biodiversity and ecosystem services. Such investments must be catalyzed and supported by targeted public expenditure, political reforms and regulatory changes. The path towards development should maintain, enhance and, whenever necessary, rebuild the natural capital as a fundamental economic asset and as a source of public benefits, particularly for disadvantaged people, whose livelihood and security depend on nature.

Most of the investments needed for the transformation towards a green economy are expected to come from the private sector, which has greater financial resources than the public sector to perform such reconversion. However, in developing countries, much of the necessary funds for large-scale green investment in the initial stages of the transition must come from new and innovative funding mechanisms. In this regard, the Climate Change Green Fund and the emerging financing mechanisms of the REDD+<sup>13</sup> Partnership offer favourable funding prospects to achieve the scale needed for an effective transition towards a green economy. In cases in which national budgetary conditions are limited, multilateral development banks are in an ideal position to provide financial assistance and allow these countries to participate in the path towards green growth.

UNEP also attaches a central role to the State and the public policies for correcting the distortions caused by harmful subsidies and externalized costs.

### **Clean energy**

UNEP also states that replacing fossil fuels with clean energy and low-carbon technologies not only contributes to deal with environmental and climate change problems. As a matter of fact, new technologies that promote an efficient use of energy and resources offer opportunities for growth in new directions, offsetting “brown economy” job losses.

The efficient use of resources – both energy and material resources – turns out to be a crucial commitment to attain better waste management, expansion of public transportation, green building and reduction of waste in the food supply chain.

In short, UNEP found that a green economy values and invests in natural capital. A green economy can generate as much growth and employment as a brown economy, and outperforms the latter in the medium and long run, while yielding significantly more environmental and social benefits. Although in the short term economic growth under a “green” scenario may be less than under business as usual, in the longer term (2020 and beyond), moving towards a green economy would outperform business as usual by both traditional measures and more holistic measures.

Moving towards a green economy will require world leaders, civil society and leading businesses to engage in this transition collaboratively. It will require a sustained effort on the part of policy makers and their constituents to rethink and redefine traditional measures of wealth, prosperity and well-being. Obviously, there are many risks and

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<sup>13</sup> The REDD+ Partnership (Reduction of Emissions from Deforestation and Forest Degradation) is an effort to create financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions through forest land and invest in low-carbon mechanisms for sustainable development. REDD+ goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon storage. <http://www.un-redd.org/AboutREDD/tabid/582/Default.aspx>.

challenges involved in this endeavour.<sup>14</sup> However, the biggest risk of all may be remaining with the status quo.

### OECD: Green growth

The OECD has also included the discussion of **Green Growth** in its agenda. In June 2009, Ministers from 34 countries signed a Green Growth Declaration, declaring that they will: “Strengthen their efforts to pursue green growth strategies as part of their responses to the crisis and beyond, acknowledging that green and growth can go hand-in-hand.”<sup>15</sup> They endorsed a mandate for the OECD to develop a Green Growth Strategy, bringing together economic, environmental, social, technological, and development aspects into a comprehensive framework. The strategy outlined by the OECD responds to that mandate.<sup>16</sup>

Two broad sets of policies are essential elements in any green growth strategy: The first set mutually reinforces economic growth and the conservation of natural capital, including core fiscal and regulatory settings such as well as innovation policies. The second set includes policies providing incentives to use natural resources efficiently and making pollution more expensive.

The document recognizes that it is becoming increasingly costly to substitute physical capital for natural capital, and that the necessary infrastructure to clean natural assets such as water, soil and polluted air can be costly, but the cost of inaction may be even greater. The report says that **greening** growth is necessary in order to prevent further erosion of natural capital, which could lead to increased water scarcity, worsening resource bottlenecks, greater pollution, climate change, and unrecoverable biodiversity loss, all of which could undermine future growth.

In its document **Towards green growth**, the OECD defines green growth as “fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this, it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities.”<sup>17</sup>

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<sup>14</sup> In a number of important sectors, such as agriculture, buildings, forestry and transport, a green economy delivers more jobs throughout the short, medium, and long terms than business as usual. In sectors whose capital is severely depleted, such as fisheries, greening will necessitate the loss of income and jobs in the short and medium term to replenish natural stocks, but this is to prevent the permanent loss of income and jobs in these same sectors. This refers to the sustainability of the resource and, hence, economic activities. In such cases, transitional arrangements are needed to protect workers from negative impacts on their livelihoods.

<sup>15</sup> *Towards green growth: A summary for policy makers*, May 2011.  
<http://www.oecd.org/dataoecd/58/34/44077822.pdf>  
y [http://www.oecd.org/document/10/0,3746,en\\_2649\\_37465\\_44076170\\_1\\_1\\_1\\_37465,00.html](http://www.oecd.org/document/10/0,3746,en_2649_37465_44076170_1_1_1_37465,00.html).

<sup>16</sup> The strategy develops a referential policy framework that is flexible enough to adapt itself to different national circumstances and development stages. In conjunction with initiatives undertaken by other international organizations – including the United Nations Environment Programme (UNEP), the Economic and Social Commission for Asia and the Pacific (ESCAP) and the World Bank – the OECD has planned its work on green growth in order to contribute to accomplishing the objectives of the Rio de Janeiro Summit.

<sup>17</sup> At the OECD Ministerial Council Meeting in June 2009, Ministers acknowledged that green and growth can go hand-in-hand, and asked the OECD to develop a **Green Growth** Strategy. In response to this mandate, the OECD published in May 2011 the document **Towards Green Growth**, which outlines its views and strategy on how to transform the current economy into one with green growth.

The OECD stressed that **green growth** is necessary because the risks for development are increasing as the economic growth generated by the current **status quo economy** continues to erode natural capital. Failure to firmly address this challenge and to control its harmful effects, resulting from unsustainable patterns of production and consumption, will inevitably lead to greater water shortages, greater risk of undermining natural resources, increased pollution, progressive exposure to negative effects and chaotic climate change, as well as an irreversible loss of biodiversity on the planet with unusual consequences to welfare of society and human beings.

The OECD warns that If we want to ensure that the progress made in living standards in these past fifty years does not grind to a halt, we have to find new ways of producing and consuming things, and even redefine what we mean by progress and how we measure it.

According to the OECD, **green growth** can open up new sources of growth through:

- **Productivity.** Incentives for greater efficiency in the use of resources and natural assets, including enhancing productivity, reducing waste and energy consumption.
- **Innovation.** Opportunities for innovation, spurred by policies and framework conditions that allow for new ways of creating value and addressing environmental problems.
- **New markets.** Creation of new markets by stimulating demand for green technologies, goods, and services; creating new job opportunities.
- **Confidence.** Boosting investor confidence through greater predictability and continuity around how governments deal with major environmental issues.
- **Stability.** More balanced macroeconomic conditions, reduced resource price volatility and supporting fiscal consolidation through, for instance, reviewing the composition and efficiency of public spending, and increasing revenues by putting a price on pollution.

The OECD points out that Green growth will also reduce the risks to growth from:

- **Bottlenecks** that arise when resource scarcity or reduced quality makes investment more costly, such as the need for capital-intensive infrastructure when water supplies become scarce or water quality decreases. In this regard, the loss of natural capital can exceed the gains generated by economic activity, undermining the ability to sustain future growth
- **Imbalances** in natural systems that raise the risk of abrupt, highly damaging – and potentially irreversible – effects for the communities.

### Comparing the definitions of green economy and green growth

OECD's green growth incorporates, as well as UNEP's green economy, key concepts of the **positive economics**. Comparing those definitions, one might note that both are comprehensive concepts and share the same theoretical and factual bases. However, green growth emphasizes incentives and the search for new sources of growth through innovation, productivity, new markets, trust and stability, while green economy gives priority to the government's role, the regulatory and legal framework, the promotion of

the private and public investment and its effects on certain sectors<sup>18</sup> that will drive the greening of the economy.

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<sup>18</sup> The 10 sectors considered as generators and drivers of the transformation to a green economy, according to UNEP, are: Agriculture, Buildings, Energy (supply), Fisheries, Forestry, Industry, Tourism, Transport, Waste and Water.

**TABLE I:**  
**Positive and normative economic elements in the definitions  
of green economy and green growth**

Organization	Concept	Positive economics	Normative economics
UNEP	Green economy	Efficiency as a guiding mechanism	Social justice
		Importance of the government's role	Regulatory and guiding role of the government
		Regulatory and legal framework	Measurements of inequality and poverty
		Promotion of clean energy	Mechanism to allocate resources that takes due account of social elements
		Conservation of natural capital, internalization of externalities and investments in key sector for transition towards a green economy	By investing 2% of the global GDP it would be possible to promote the transition towards a low-carbon economy with a more efficient use of resources
OECD	Green growth	Incentives, Innovation, new markets, productivity, confidence	Public policies to support green growth; welfare economy
		Macroeconomic stability, competition and efficiency as guiding mechanisms for markets	Measurements and indicators of green growth for economic policy decision-making
		Conservation of natural capital and internalization of externalities	Greater allocation of resources to achieve economic green growth

*Source: Prepared by the author on the basis of the UNEP and OECD definitions.*

From the point of view of **normative economics**, the OECD expresses value judgments about: resource allocation, measurement and indicators of green growth, public policy issues, welfare economics and the problems of the current economic system. It also provides a summary of policies that should be used (see Table II).

As shown in Table I, the elements of the normative economics for the OECD's definition of green growth fail to consider the issues of social justice, responsibilities among countries and intergenerational justice, contrasting significantly with the definition of green economy proposed by UNEP.

**TABLE II:  
OECD's policy recommendations to achieve green growth**

<b>Policies to address the limitations of green growth</b>	
<b>Limitations of green growth</b>	<b>Policy options</b>
<b>Inadequate infrastructure</b>	<ul style="list-style-type: none"> <li>- Public-private societies</li> <li>- Public sector investments</li> <li>- Tariffs</li> <li>- Transfers</li> </ul>
<b>Low human and social capital and poor institutional quality</b>	<ul style="list-style-type: none"> <li>- Reforms / Elimination of subsidies</li> <li>- Growth and stabilization of government income</li> </ul>
<b>Incomplete property rights, subsidies</b>	<ul style="list-style-type: none"> <li>- Review and reform or elimination</li> </ul>
<b>Regulatory uncertainties</b>	<ul style="list-style-type: none"> <li>- Setting objectives</li> <li>- Creation of independent systems of governance</li> </ul>
<b>Externalities of information and divided incentives</b>	<ul style="list-style-type: none"> <li>- Labelling</li> <li>- Voluntary approaches</li> <li>- Subsidies</li> <li>- Technology and performance standards</li> </ul>
<b>Environmental externalities</b>	<ul style="list-style-type: none"> <li>- Trade permits</li> <li>- Subsidies</li> <li>- Taxes</li> </ul>
<b>Low returns on R&amp;D</b>	<ul style="list-style-type: none"> <li>- Subsidies for R&amp;D and fiscal incentives</li> <li>- Focus on general purpose technologies</li> </ul>
<b>Network effects</b>	<ul style="list-style-type: none"> <li>- Strengthening of industrial competition through networks</li> <li>- Subsidies or loan guarantees for new network projects</li> </ul>
<b>Barriers to competition</b>	<ul style="list-style-type: none"> <li>- Regulation of reform</li> <li>- Reduction of government monopoly</li> </ul>

Source: *Towards green growth: A summary for policy makers, OECD, May 2011.*

The OECD stresses that **sustainable development** provides an important context for **green growth**. OECD's Green Growth Strategy leverages the substantial body of analysis and policy effort that has emerged from the Earth Summit in Rio de Janeiro in 1992. It develops a clear and focused agenda for delivering on a number of Rio's key aspirations.

Green growth has not been conceived by the OECD as a replacement for sustainable development, but rather a subset of it. It is narrower in scope, entailing an operational policy agenda that can help achieve concrete, measurable progress at the interface of the economy and the environment. It provides a strong focus on fostering the necessary conditions for innovation, investment and competition that can give rise to new sources of economic growth, consistent with resilient ecosystems.

Green growth strategies need to pay specific attention to many of the social issues and equity concerns that can arise as a direct result of greening the economy – both at the

national and international level. To achieve this they should be implemented in parallel with initiatives focusing on the broader social pillar of sustainable development.<sup>19</sup>

The OECD has also proposed to include green growth in national examinations and future work on indicators, tools, sector studies and development cooperation.

### **SELA: Redistributive green economy and its relation with energy and the natural capital of Latin America and the Caribbean**

The Permanent Secretariat of SELA recognizes the progress made by UNEP and OECD in the construction of the theoretical and practical scaffolding of **green economy and growth**, and this section is aimed at providing some thoughts to the discussion of the topic. In the context of LAC, high levels of inequality have been reported. The growth experienced by the region in the past decade is still insufficient to reduce the huge gaps in income and participation in the economy of the countries. We know that LAC is not the poorest region, but is the most unequal. Therefore, emphasis should be made not only on growth, but also on how that growth enables better distribution of income to reduce historical lags in social matters.

In the opinion of the Permanent Secretariat, a **green economy** must necessarily be **redistributive and focus on policies that make growth and development inclusive, especially for the most vulnerable groups in rural areas, indigenous groups and women**, who have traditionally faced major barriers to progress in the economic scale. It would have to be based on an economic system that considers – in its holistic balance – a fair interaction of economic actors and factors of production, the respect for and proper functioning of the implied balance of natural capital and environmental ecosystems, the needs of society and the correct harmony among developed, emerging and developing countries to promote inclusive development.

The **redistributive green economy** should comply with the following:

1. Not compromise the ability of future generations to meet their needs;
2. Consider and respect the rights of the least developed countries with special and differential treatment in the transition towards a green economy;
3. Ensure justice and social inclusion through State intervention and the implementation of public policies to assume the costs of transition; and
4. Assign a value to goods and services of the natural capital of each country, so that the contribution being made by developing countries, in particular those in LAC, is recognized.

Sustainable development is and will remain the ideal paradigm and the ultimate goal to be achieved by society and each of the countries. The concept of redistributive green economy is the mechanism or instrument to reach sustainable development.

From the standpoint of positive economics, redistributive green economy takes into account the facts and factual evidence of contemporary economics; it takes note of the developments and progress achieved at the present time, with special emphasis on efficiency and correct intertemporal allocation of factors of production; it considers the role of governments of all countries; it takes into account the relevance of production

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<sup>19</sup> OECD, 2011. Towards Green Growth. Box 0.1 Green growth and sustainable development. P 11.

factors, especially labour and natural capital, based on the production function of the redistributive green economy.

From the perspective of the normative economics, the concept of redistributive green economy expresses value judgments about: social justice, fair distribution of benefits among different countries and intergenerational social justice. It also attaches special importance to distribution of benefits of labour and natural capital. It provides recommendations and policy elements to be considered by all countries from the point of view of Latin American and Caribbean nations. It is vital to attach special importance to the elements of positive economics, without forgetting the normative aspects from a redistributive and inclusive approach.

#### **Other contributions to the concept of green economy**

In October of 2010, a meeting of experts was held at the headquarters of the United Nations Conference on Trade and Development (UNCTAD) to analyze the green economy and the implications for trade and sustainable development. On that occasion, an interesting exchange of information and views took place about the term "green economy" and its implications in the context of sustainable development and eradication of poverty. The role of the green economy was stressed as a new paradigm and the engine of sustainable development, having the potential to provide new impetus to trade and investment in the economies of developing countries.

The experts said, among other things, that the concept of green economy was defined more than twenty years ago as the "economic underpinning of the idea of sustainable development." More recently, in light of the treatment of this topic at international forums, it has been agreed that the term is an item of sustainable development and should be used to launch this process.

In the base document of the meeting of experts, UNCTAD defines green economy as a productive process resulting from the improvement of human well-being and the reduction of inequalities, while limiting the significant scarcity risks at the environmental level for future generations.

In addition, green economy could have several meanings and scopes and be considered:

- an economic sector (land, water, biodiversity, energy, etc.)
- a sector with a connotation of best practices, such as sustainable consumption and production, integrated strategies, social responsibility, etc.
- a set of policies to achieve development goals (prices, taxes, subsidies, public investment or education)
- a transition process that includes the previously identified policies and practices
- the ultimate objective, with practices and policies being universally adopted.

If it is related to trade and investment, concerns arise over the possibility that green economy could be used for protectionist purposes, to force certain economies to undertake structural changes, and/or as an element associated with the imposition of conditionalities.

In any case, the different conceptions of the term "green economy" could demand greater flexibility to incorporate views and approaches of the various regions or countries and to consider several economic, social and environmental levels.

**TABLE III:  
Summary of definitions and conceptual framework**

DEFINITION AND CONTEXTUAL ASPECTS			
ORGANIZATION	UNEP	OECD	SELA
CONCEPT	GREEN ECONOMY	GREEN GROWTH	REDISTRIBUTIVE GREEN ECONOMY
<b>DEFINITION</b>	<p>One that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities, i.e. it is low carbon, resource efficient and socially inclusive (1)</p> <p>It is a system of economic activities related to the production, distribution and consumption of goods and services that results in improved human well-being over the long term, whilst not exposing future generations to significant environmental risks and ecological scarcities: it is environmentally friendly, is ecological, and for many groups, is also socially just. (2)</p>	<p>Green growth means fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this, it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities. (3)</p>	<p>It is the economic system that considers – in its holistic balance – a fair interaction of economic actors and factors of production, the respect and proper functioning of the implied balance of natural capital and environmental ecosystems, the needs of society and the correct harmony among developed, emerging and developing countries.</p> <p>The redistributive green economy should comply with the following: 1) Not compromise future generations' capability to meet their needs; 2) Consider and respect the rights of the least developed countries with special and differential treatment; 3) Ensure social justice; and 4) Assign a value to goods and services of the natural capital of each country.</p>
<b>SUSTAINABLE DEVELOPMENT</b>	<p>The concept of a "green economy" does not replace sustainable development, but there is now a growing recognition that achieving sustainability rests almost entirely on getting the economy right. Sustainability is still a vital long-term goal, but we must work on greening the economy to get us there. The green economy is not a replacement for sustainable development. Rather, it is a way of realizing that development at the national, regional and global levels and in ways that resonate with and amplify the implementation of Agenda 21.</p>	<p>Sustainable development provides an important context for green growth. The OECD Green Growth Strategy leverages the substantial body of analysis and policy effort that has flowed from the 1992 Rio Earth Summit. It develops a clear and focused agenda for delivering on a number of Rio's key aspirations. Green growth has not been conceived as a replacement for sustainable development, but rather should be considered a subset of it. It is narrower in scope, entailing an operational policy agenda that can help achieve concrete, measurable progress at the interface of the economy and the environment.</p>	<p>Sustainable development is and will remain the ideal paradigm and the ultimate goal to be achieved by society and each of the countries. The concept of redistributive green economy is the mechanism to reach sustainable development.</p>
<b>POSITIVE ECONOMICS</b>	<p>It focuses on the facts and cause-effect relationships of the behaviour of economic actors, taking into account the concept of market economy and its benefits, uses the concept of efficiency, internalizes the negative environmental effects of current patterns of production, highlights the State's role as a regulatory agent and private investment as a catalyst for green economy.</p>	<p>It focuses on the facts and cause-effect relationships of the behaviour of economic actors, taking into account the concept of market economy and its benefits, uses the concept of efficiency, internalizes the negative environmental effects of current patterns of production, considers the effect of incentives as an important support mechanism to boost green growth, strongly incorporates the concepts of innovation, investment and competition as new sources of economic growth.</p>	<p>It takes into account the facts and factual evidence of contemporary economics; it takes note of the developments and progress achieved at the present time, with special emphasis on efficiency and correct intertemporal allocation of factors of production; it considers the role of governments of all countries; it takes into account the relevance of the factors of production, especially labour and natural capital, based on the production function of the redistributive green economy.</p>
<b>NORMATIVE ECONOMICS</b>	<p>It expresses elements of value judgments about: social justice, resource allocation, measurement of inequality and poverty, public policies, welfare economics, the problems of "brown economy." for decades, a model of "brown economy" has been followed to create wealth, but it did not overcome substantial problems such as social exclusion or depletion of resources, leaving us still far from achieving the Millennium Development Goals.</p>	<p>It expresses elements of value judgments about: resource allocation, measurement and indicators of green growth, public policy issues, welfare economics, and the problems of the prevailing economic system.</p>	<p>It expresses value judgments about: social justice, fair distribution of benefits among different countries and intergenerational social justice. It also attaches special importance to distribution of benefits of working and natural capital.</p>
<b>COROLLARY</b>	<p>Provides recommendations and public policy elements to all UN members, attaching equal importance to the concepts of positive and normative economies.</p>	<p>It provides recommendations and elements of economic policies of OECD Member States, based on positive economics to a larger extent than on normative economics.</p>	<p>It provides recommendations and policy elements to be considered by all countries from the point of view of Latin American and Caribbean nations. SELA considers it vital to attach special importance to the elements of positive economics, without forgetting the normative aspects from a redistributive and inclusive approach.</p>

Notes:

- (1) UNEP, 2011 Towards a Green Economy. Pathways to Sustainable Development and Poverty Eradication.  
 (2) UNEP, 2010 General Information that can be used by the Ministers and Heads of Delegation for the dialogue on Green Economy.  
 (3) OCDE, May 2011 Towards green growth. A summary for policy makers.



### III. THE ENERGY MATRIX

The origin of energy sources is among the conditions requisite and necessary to move towards a green economy, as it is a basic, fundamental and essential resource in any production function and ought to be taken into account in implementing any policy intended to green a brown economy. In this section, an analysis is conducted of the energy matrix in the region, where certainly carbon prevails, that is, petroleum, natural gas and coal, which are significant CO<sub>2</sub> generators. Furthermore, current renewable energy sources in LAC are reviewed, namely: wind, solar, hydraulic, geothermal energy and biomass, among others, as well as the regional potential to develop them. In this way, we will be able to ascertain in a more precise way the possibilities of moving from a carbon-based economy towards an economy of renewable, clean energy sources.

#### **Energy Matrix of Latin America and the Caribbean<sup>20</sup>**

##### **Outlook of energy production in LAC in 2009**

In 2009, the energy output in LAC amounted to 7,424.4 million barrels of oil equivalent (mboe), a 1.1% drop compared with the previous year (7,507.6 mboe), as a result of the world financial-economic crisis in late 2008, bringing about a fall of the regional GDP to 1.75%<sup>21</sup> and a subsequent reduction of the energy domestic consumption together with a plunge in energy imports and exports in the region by 3.8% and 8.4%, respectively.

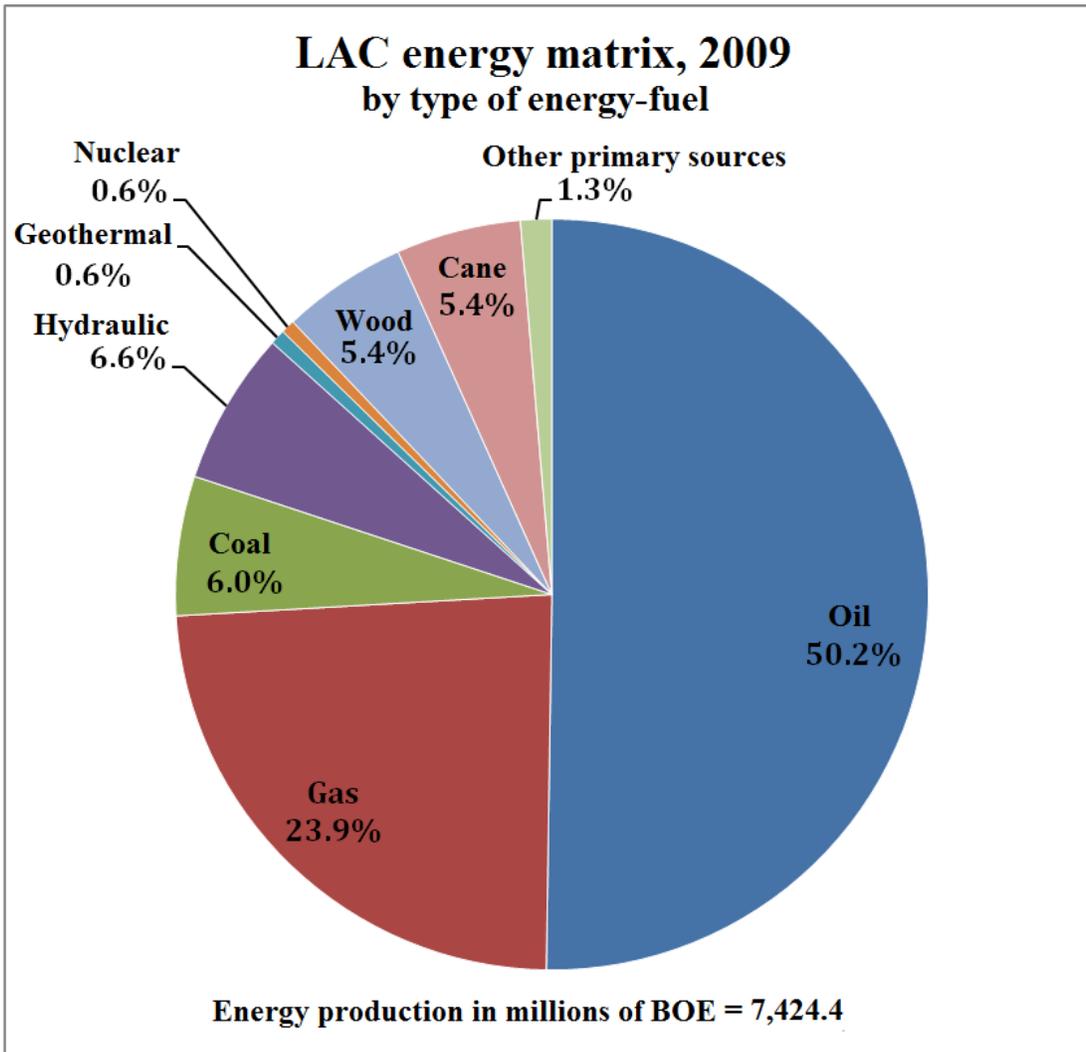
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<sup>20</sup> The statistical data released by the Latin American Energy Organization (OLADE) in its Energy Statistics Reports 2004-2009 have been used in this analysis.

<sup>21</sup> International Monetary Fund.

[http://www.imf.org/external/pubs/ft/weo/2011/02/weodata/weorept.aspx?sy=2000&ey=2016&scsm=1&ssd=1&sort=country&ds=.&br=1&c=205&s=NGDP\\_RPCH&grp=1&a=1&pr1.x=46&pr1.y=9](http://www.imf.org/external/pubs/ft/weo/2011/02/weodata/weorept.aspx?sy=2000&ey=2016&scsm=1&ssd=1&sort=country&ds=.&br=1&c=205&s=NGDP_RPCH&grp=1&a=1&pr1.x=46&pr1.y=9)

CHART 1:  
LAC energy matrix, 2009, by type of energy-fuel



LAC energy matrix per type of fuel in 2009 was distributed as follows: 50.2% petroleum; 23.9% gas; 10.8% biomass (firewood and sugar cane 5.4%, each); 6.6% hydraulic energy; 6.0% coal; 1.3% other primary energy sources including renewable energy sources, such as wind and solar energy, among others, and, finally, with a marginal 0,6% each, nuclear and geothermal energy.

Noteworthy, hydrocarbons and coal (80.1%), widely known as CO<sub>2</sub>-intensive, presently prevail in the LAC energy matrix.

The following table is a summary of the LAC energy matrix in 2009 per type of fuel and country.



TABLE IV:  
Energy matrix, 2009: By type of fuel and in each country

LAC ENERGY PRODUCTION MATRIX, 2009										
LAC country	Oil	Gas	Coal	Hydraulic	Geothermal	Nuclear	Firewood	Cane	Other Prim. <sup>1</sup>	Total Prim Prod. <sup>2</sup>
 Argentina	40.31%	50.62%	0.06%	4.63%	0.00%	0.00%	0.81%	1.27%	2.30%	572,021
 Bermuda	43.92%	18.64%	0.00%	0.00%	0.00%	0.00%	0.00%	37.44%	0.00%	633
 Bolivia	14.68%	75.63%	0.00%	1.39%	0.00%	0.00%	5.36%	2.33%	0.60%	102,187
 Brazil	42.88%	7.19%	0.88%	14.23%	0.00%	1.43%	10.42%	19.02%	3.96%	1,698,301
 Chile	1.30%	13.39%	4.51%	26.48%	0.00%	0.00%	54.20%	0.00%	0.12%	71,832
 Colombia	33.63%	10.01%	47.11%	4.26%	0.00%	0.00%	2.13%	2.20%	0.66%	727,924
 Costa Rica	0.00%	0.00%	0.00%	28.69%	43.05%	0.00%	12.72%	8.33%	7.21%	21,547
 Cuba	55.74%	20.31%	0.00%	0.26%	0.00%	0.00%	4.77%	18.92%	0.00%	36,185
 Ecuador	89.62%	4.89%	0.00%	3.07%	0.00%	0.00%	1.61%	0.81%	0.00%	206,745
 El Salvador	0.00%	0.00%	0.00%	7.21%	58.36%	0.00%	22.60%	11.83%	0.00%	16,178
 Grenada	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	92.16%	7.84%	0.00%	51
 Guatemala	10.61%	0.00%	0.00%	4.89%	5.14%	0.00%	60.76%	18.60%	0.00%	46,565
 Guyana	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	56.40%	43.60%	0.00%	3,142
 Haiti	0.00%	0.00%	0.00%	1.10%	0.00%	0.00%	96.82%	2.58%	0.00%	14,484
 Honduras	0.00%	0.00%	0.00%	13.25%	0.00%	0.00%	72.21%	14.51%	0.02%	16,253
 Jamaica	0.00%	0.00%	0.00%	2.28%	0.00%	0.00%	70.20%	27.52%	0.00%	3,812
 México	56.88%	34.44%	1.99%	0.89%	1.46%	1.06%	2.45%	0.76%	0.07%	1,834,336
 Nicaragua	0.00%	0.00%	0.00%	6.62%	1.91%	0.00%	70.42%	18.21%	2.85%	10,214
 Panamá	0.00%	0.00%	0.00%	40.50%	0.00%	0.00%	49.02%	10.48%	0.00%	5,965
 Paraguay	0.00%	0.00%	0.00%	69.60%	0.00%	0.00%	20.55%	3.41%	6.44%	63,293
 Perú	27.36%	46.80%	0.67%	12.14%	0.00%	0.00%	9.49%	2.70%	0.84%	123,614
 Rep. Dom.	0.00%	0.00%	0.00%	12.89%	0.00%	0.00%	50.27%	22.56%	14.26%	8,128
 Suriname	76.24%	0.00%	0.00%	16.68%	0.00%	0.00%	5.51%	0.00%	1.57%	6,367
 Trin. y Tob.	17.67%	82.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	311,834
 Uruguay	0.00%	0.00%	0.00%	38.16%	0.00%	0.00%	27.25%	0.00%	34.59%	11,741
 Venezuela	76.94%	15.61%	3.06%	4.38%	0.00%	0.00%	0.01%	0.00%	0.00%	1,511,086
 Total LAC	50.24%	23.85%	5.99%	6.59%	0.65%	0.59%	5.37%	5.37%	1.34%	7,424,438

Source: Prepared by the author based on OLADE data.

1) Includes production of ethanol and other primary energies.

2) Thousand barrels of oil equivalent.

An in-depth analysis of the energy matrix of the 26 LAC countries (OLADE Member States) yielded the following results for the following countries together with their top percentages.

**TABLE V:**  
**Maximum percentages by type of fuel in each country**

	Oil	Gas	Coal	Hydraulic	Geothermal	Nuclear	Firewood	Cane	Other Prim <sup>1</sup>	Total Prim. Prod <sup>2</sup>
<b>Max. Internal %</b>	<b>89.62%</b>	<b>82.28%</b>	<b>47.11%</b>	<b>69.60%</b>	<b>58.36%</b>	<b>1.43%</b>	<b>96.32%</b>	<b>43.60%</b>	<b>34.59%</b>	<b>24.71%</b>
<b>LAC country</b>	 Ecuador	 Trin & Tob	 Colombia	 Paraguay	 El Salvador	 Brazil	 Haiti	 Guyana	 Uruguay	 Mexico

Source: Prepared by the author based on OLADE data.

1) Includes production of ethanol and other primary energies.

2) Thousand barrels of oil equivalent.

- The energy production matrix of **Ecuador** shows the highest concentration of oil in LAC at 89.62%;
- In **Trinidad and Tobago**, 82.28% of the total energy output comes from natural gas.
- **Colombia** generates 47.11% of its energy with coal.
- As much as 69.60% of the total energy output in **Paraguay** comes from hydraulic energy, turning it into the main LAC country with such a renewable energy source.
- Geothermal energy focuses 58.36% of the energy matrix in **Salvador**.
- **Brazil** is the LAC country with the largest share of nuclear energy in its energy matrix.

In terms of biomass:

- **Haiti** and **Guyana** are the LAC countries where firewood (96.32%) and sugar cane (43.60%), respectively, prevail in their energy matrix.
- **Uruguay** shows a much diversified energy matrix, with 34.59% accounting for other primary energy sources.

**TABLE VI:**  
**Dominant source in the energy production matrix in each LAC country**

LAC country										
Max. Prod. %	50.62%	43.92%	75.63%	42.88%	54.20%	47.11%	43.05%	55.74%	89.62%	58.36%
Dominant source	Gas	Oil	Gas	Oil	Firewood	Coal	Geothermal	Oil	Oil	Geothermal

Source: Prepared by the author based on OLADE data.

LAC country										
Max. Prod. %	92.16%	60.76%	56.40%	96.32%	72.21%	70.20%	56.88%	70.42%	49.02%	69.60%
Dominant source	Firewood	Firewood	Firewood	Firewood	Firewood	Firewood	Oil	Firewood	Firewood	Hydraulic

Source: Prepared by the author based on OLADE data.

LAC country							
Max. Prod. %	46.80%	50.27%	76.24%	82.28%	38.16%	76.94%	50.24%
Dominant source	Gas	Firewood	Oil	Gas	Hydraulic	Oil	Oil

Source: Prepared by the author based on OLADE data.

The table above depicts the kind of prevailing energy in the energy matrix of each LAC country, to wit:

- In **Argentina, Bolivia, Peru and Trinidad and Tobago**, gas prevails in the energy matrix, accounting for 50.62%, 75.63%, 46.80% and 82.28%; respectively, of their total energy output in 2009.
- In **Barbados, Brazil, Cuba, Ecuador, Mexico, Suriname and Venezuela**, oil is the main fuel. Such preponderance is mirrored in the LAC consolidated energy matrix, with petroleum totalling 50.24% out of the overall amount.
- **Colombia** is the only LAC country with coal being top in the energy matrix.

In some other countries, renewable energy sources are the basis of their energy matrix, namely:

**Geothermal energy:** Costa Rica and El Salvador

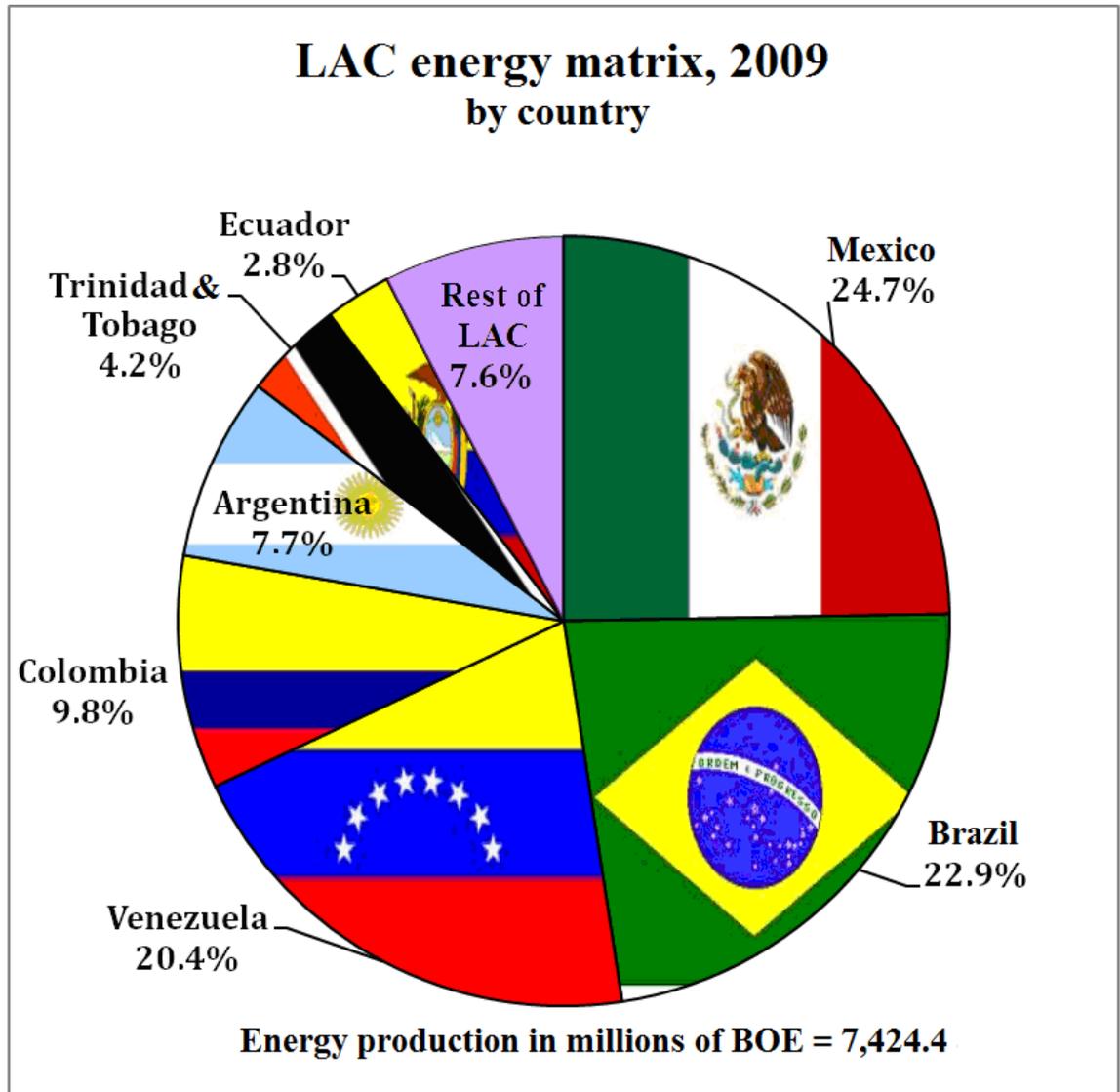
**Hydraulic energy:** Paraguay and Uruguay

**Firewood:** Chile, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Nicaragua, Panama and Dominican Republic.

### LAC energy matrix by country and type of fuel

In 2009, the LAC energy matrix was distributed as follows: Mexico ranks first in fuel production at 24.7%, followed by Brazil, 22.9%; Venezuela, 20.4%; Colombia, 9.8%; Argentina, 7.7%; Trinidad and Tobago, 4.2%, and Ecuador, 2.8%, that is, 92.4% on aggregate of the energy output in LAC. These seven countries have historically accounting for more than 92% of the energy output in LAC (2005-2009). The remaining 7.6% is apportioned among the other 19 countries.

CHART 2:  
LAC energy matrix, 2009, by country



The table below is a summary of the LAC energy matrix in 2009 per country and type of fuel.

TABLE VII:  
Energy matrix, 2009: By country and type of fuel

LAC ENERGY PRODUCTION MATRIX, 2009										
LAC country	Oil	Gas	Coal	Hydraulic	Geothermal	Nuclear	Firewood	Cane	Other Prim. <sup>1</sup>	Total Prim. Prod. <sup>2</sup>
 Argentina	6.18%	16.35%	0.08%	5.41%	0.00%	0.00%	1.16%	1.81%	13.23%	7.70%
 Belize	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.00%	0.01%
 Bolivia	0.40%	4.36%	0.00%	0.29%	0.00%	0.00%	1.37%	0.60%	0.61%	1.38%
 Brazil	19.52%	6.89%	3.36%	49.38%	0.00%	55.50%	44.34%	80.98%	67.68%	22.87%
 Chile	0.03%	0.54%	0.73%	3.89%	0.00%	0.00%	9.76%	0.00%	0.08%	0.97%
 Colombia	6.56%	4.11%	77.05%	6.34%	0.00%	0.00%	3.89%	4.02%	4.84%	9.80%
 Costa Rica	0.00%	0.00%	0.00%	1.26%	19.29%	0.00%	0.69%	0.45%	1.56%	0.29%
 Cuba	0.54%	0.41%	0.00%	0.02%	0.00%	0.00%	0.43%	1.72%	0.00%	0.49%
 Ecuador	4.97%	0.57%	0.00%	1.30%	0.00%	0.00%	0.83%	0.42%	0.00%	2.78%
 El Salvador	0.00%	0.00%	0.00%	0.24%	19.63%	0.00%	0.92%	0.48%	0.00%	0.22%
 Guatemala	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
 Honduras	0.13%	0.00%	0.00%	0.47%	4.98%	0.00%	7.09%	2.17%	0.00%	0.63%
 Guyana	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.44%	0.34%	0.00%	0.04%
 Haiti	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	3.50%	0.09%	0.00%	0.20%
 Honduras	0.00%	0.00%	0.00%	0.44%	0.00%	0.00%	2.94%	0.59%	0.00%	0.22%
 Jamaica	0.00%	0.00%	0.00%	0.02%	0.00%	0.00%	0.67%	0.26%	0.00%	0.05%
 Mexico	27.97%	35.67%	8.20%	3.35%	55.69%	44.50%	11.25%	3.49%	1.21%	24.71%
 Nicaragua	0.00%	0.00%	0.00%	0.14%	0.41%	0.00%	1.80%	0.47%	0.29%	0.14%
 Panamá	0.00%	0.00%	0.00%	0.49%	0.00%	0.00%	0.73%	0.16%	0.00%	0.08%
 Paraguay	0.00%	0.00%	0.00%	9.00%	0.00%	0.00%	3.26%	0.54%	4.08%	0.85%
 Perú	0.91%	3.27%	0.19%	3.07%	0.00%	0.00%	2.94%	0.84%	1.04%	1.66%
 Rep. Dom.	0.00%	0.00%	0.00%	0.21%	0.00%	0.00%	1.02%	0.46%	1.16%	0.11%
 Suriname	0.13%	0.00%	0.00%	0.22%	0.00%	0.00%	0.09%	0.00%	0.10%	0.09%
 Trin. y Tob.	1.48%	14.49%	0.00%	0.00%	0.00%	0.00%	0.00%	0.04%	0.00%	4.20%
 Uruguay	0.00%	0.00%	0.00%	0.92%	0.00%	0.00%	0.80%	0.00%	4.08%	0.16%
 Venezuela	31.17%	13.32%	10.39%	13.52%	0.00%	0.00%	0.05%	0.00%	0.00%	20.35%
 Total LAC	3,729,983	1,771,035	445,053	489,408	48,094	43,629	398,973	398,776	99,488	7,424,438

Source: Prepared by the author based on OLADE data.

1) Includes production of ethanol and other primary energies.

2) Thousand barrels of oil equivalent.

**TABLE VIII:**  
**Maximum percentages by country per total type of fuel in LAC**

	Oil	Gas	Coal	Hydraulic	Geothermal	Nuclear	Firewood	Cane	Other Prim. <sup>1</sup>	Total Prim. Prod. <sup>2</sup>
Maximum %	31.17%	35.67%	77.05%	49.38%	55.69%	55.50%	44.34%	80.98%	67.68%	24.71%
LAC country	 Venezuela	 Mexico	 Colombia	 Brazil	 Mexico	 Brazil	 Brazil	 Brazil	 Brazil	 Mexico

Source: Prepared by the author based on OLADE data.

1) Includes production of ethanol and other primary energies.

2) Thousand barrels of oil equivalent.

The LAC energy matrix per country and type of energy or fuel is controlled by the seven aforementioned countries, except for some individual cases. To sum up, Brazil takes over five out of the nine analysed energy sources (hydraulic energy, nuclear energy, firewood, sugar cane and other primary energy sources). Mexico takes the lead in two types of energy (gas and geothermal energy). In the aggregate, Venezuela and Colombia are top in the ranking of oil and coal, respectively.

## Hydrocarbons

### a) Petroleum

**Venezuela** is the leader in petroleum in LAC, accounting for 31.17% of the total amount, in addition to having 85.30% of oil proven reserves in LAC and 15.40% in the world. Next, **Mexico** and **Brazil** go with 27.97% and 19.52%; respectively. The seven countries encompass 97.86% of the overall production in LAC.

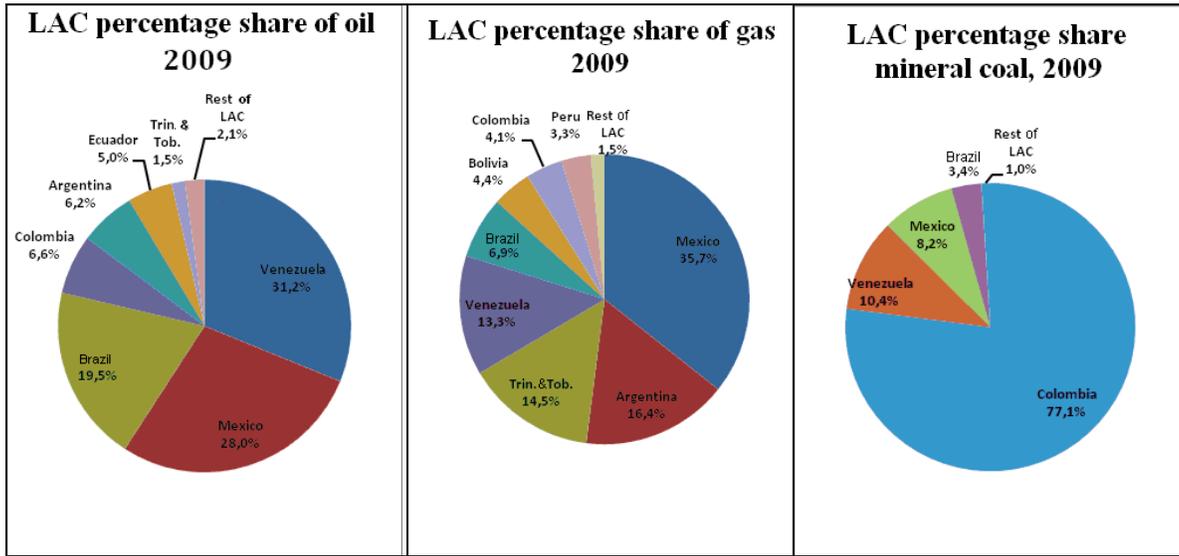
### b) Gas

**Mexico** is the main gas producer in LAC, accounting for 35.67% out of the total amount. **Argentina, Trinidad and Tobago** and **Venezuela** come next at 16.35%, 14.49% and 13.32%, respectively. The seven countries encompass 91.41% out of the overall production in LAC.

## Coal

**Colombia** comprehends 77.05% out of the total coal output in LAC, placing it as the major coal producer in LAC. Other minor producers include **Venezuela** and **Mexico**, 10.39% and 8.20%, respectively. The seven countries encompass 99.09% out of the overall production in LAC.

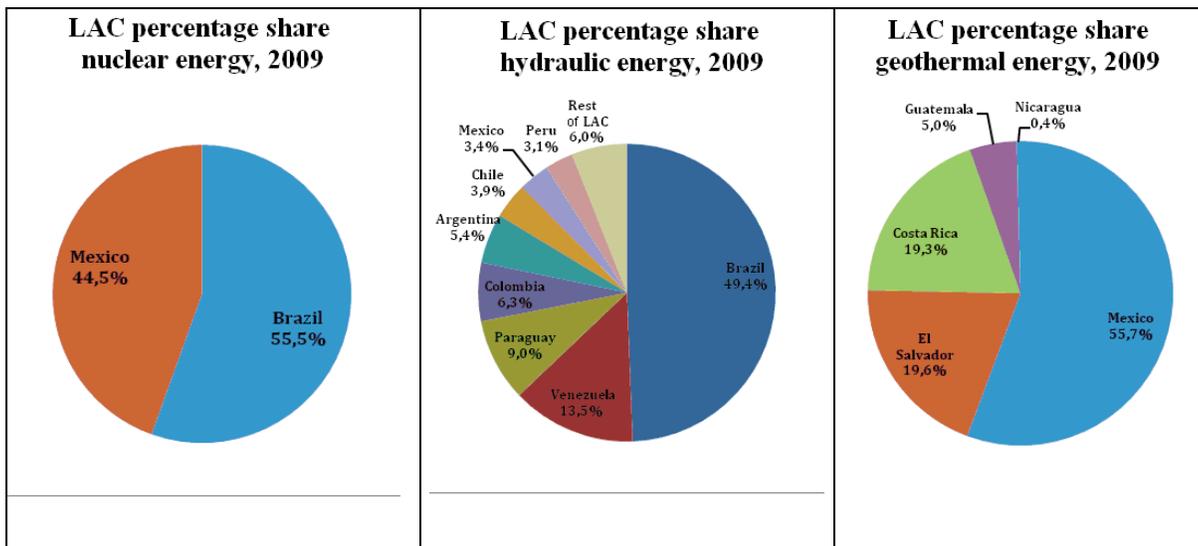
**CHART 3:**  
Percentage share by country for each type of fuel, 2009: Oil, gas and coal



**Nuclear energy**

**Brazil and Mexico** comprise 100% out of the total output in LAC, broken down as follows: 55.50% and 44.50%, respectively.

**CHART 4:**  
Percentage share by country for each type of fuel, 2009: Nuclear, hydraulic and geothermal energy



## Renewable energy sources

### a) Hydraulic energy

**Brazil** is the LAC leader in hydraulic energy, accounting for 49.38% out of the total output. Next, **Venezuela** and **Paraguay** go with 13.52% and 9.00%, respectively. The seven countries encompass 79.30% of the overall production in LAC.

### b) Geothermal energy

**Mexico** is the largest producer of geothermal energy in LAC, accounting for 55.69% of the total output and the only one of the seven largest energy producing LAC countries engaged in such renewable energy source. **Salvador (19.63%)**, **Costa Rica (19.29%)**, **Guatemala (4.98%)** and **Nicaragua (0.41%)** complete the overall production of geothermal energy in LAC.

### c) Biomass (firewood and sugar cane)

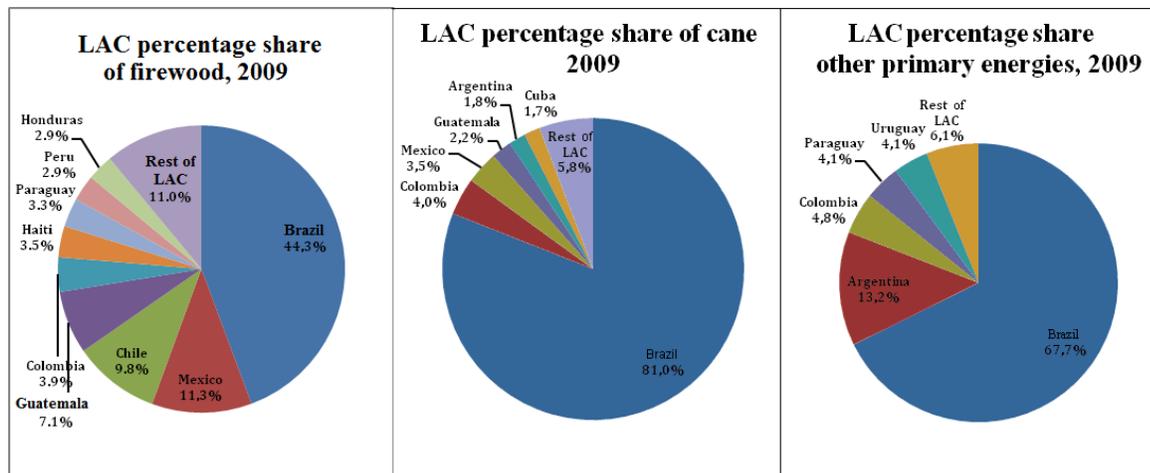
#### i. Firewood

**Brazil** is the leader in firewood output in LAC, accounting for 44.50% out of the overall production. **Mexico**, **Chile** and **Guatemala** follow with 11.25%, 9.76% and 7.09%, respectively. The seven countries encompass 61.52% of the overall production in LAC.

#### ii. Sugar cane

**Brazil** takes the lead in sugar cane production in LAC -80.98% on aggregate. Other, minor, producers include **Colombia**, **Mexico** and **Guatemala**, accounting for 4.02%, 3.49% and 2.17%, respectively. The seven countries encompass 90.77% of the overall production in LAC.

**CHART 5:**  
**Percentage share by country for each type of fuel, 2009: Firewood, cane and other primary energy sources**



#### d) Other renewable primary energy sources<sup>22</sup>

**Brazil** accounts for 67.68% of the LAC total output. Other, minor, producers include **Argentina, Colombia, Paraguay** and **Uruguay**, accounting for 13.23%, 4.84%, 4.09% and 4.08%, respectively. The seven countries encompass 86.96% of the overall production in LAC.

#### The primary energy supply of Latin America and the Caribbean

For the purposes of the following analysis, energy will be defined as per the original source. This will provide a characterization of the sustainable use of energy and quality of the energy source as green energy (clean or dirty energy).

**Renewable energy** means, as a whole, hydraulic energy, geothermal energy, biomass (firewood and sugar cane) and other primary renewable energy sources.

**Non-Renewable energy** means all hydrocarbons (oil and gas), coal and nuclear energy.

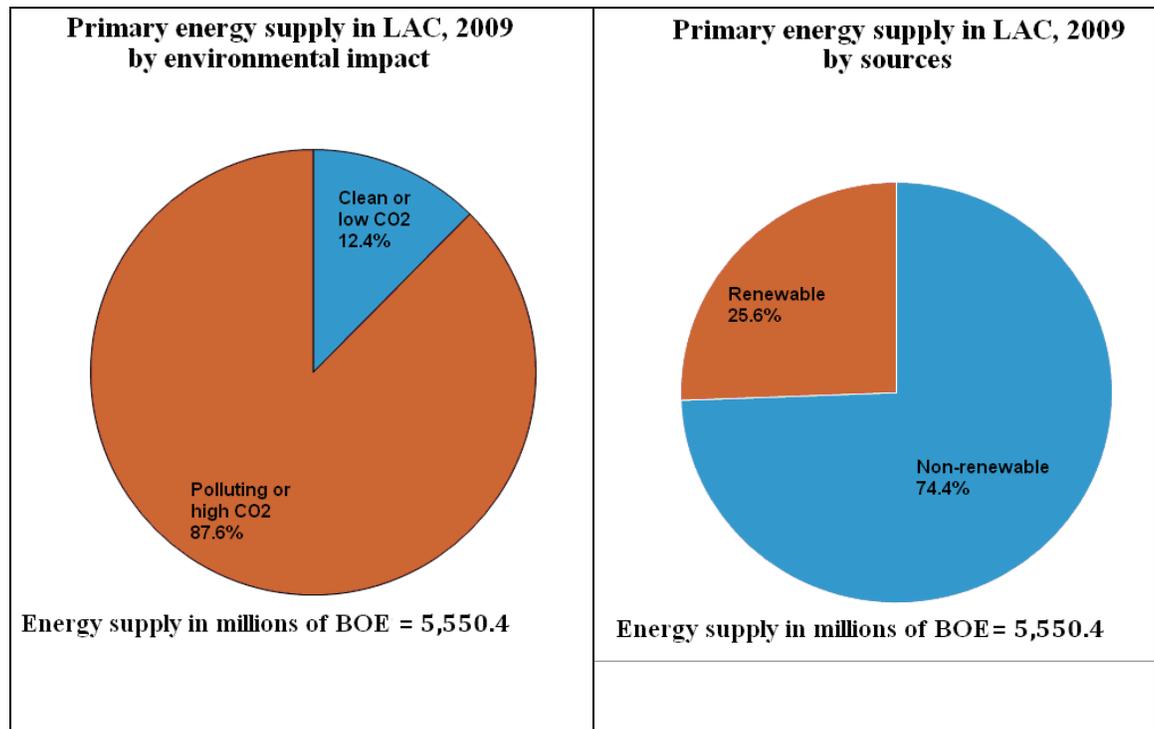
Furthermore, the environmental impact of both types of energy with regard to their CO<sub>2</sub> emissions is to be explored. It is worth ascertaining whether the LAC energy supply provides **clean or low CO<sub>2</sub>-emissions energy**<sup>23</sup> or **polluting or high CO<sub>2</sub>-emissions energy**.<sup>24</sup>

<sup>22</sup> This concept includes: *1) Fuel from animals*: the remains of agricultural and cattle breeding activities and urban waste. It is directly used as fuel in dry form or turned into biogas through decay processes. *2) Fuels from plants*: resources from agribusiness and forest remains for energy purposes, including all agricultural waste (except for sugar cane mash). *3) Other primary renewable energy sources*: wind energy, solar energy and any other primary renewable energy source unlisted in the previous definitions, yet relevant for a country's energy structure.

<sup>23</sup> The sum of hydraulic energy, geothermal energy, nuclear energy and other primary renewable energy sources (solar and wind energy, and some others with low CO<sub>2</sub> emissions). It has been acknowledged that the status of nuclear energy as "clean energy" is an issue for discussion. Actually, despite being among the lowest generators of greenhouse gas emissions, it produces nuclear waste, the disposal of which has not been settled once and for all. For the purposes of this study, nuclear energy will be regarded as "clean in terms of CO<sub>2</sub>."

<sup>24</sup> The sum of hydrocarbons (oil and gas), coal and biomass.

**CHART 6:**  
**Energy supply in LAC: By environmental impact and sources**



The charts above show that the LAC energy supply is still barely sustainable from the environmental and economic standpoint. Less than 26% of the sources come from renewable energy sources and the environmental impact of the used energy is barely “green” or environmentally friendly. Less than 13% of the energy is clean or with low CO<sub>2</sub> emissions. However, there is good news: LAC has renewable energy sources available. Nevertheless, its potential is yet to be utilized. Programs for a green economy are of the essence to reconvert the LAC energy matrix and drive it towards a green economy.

The table below lists the LAC primary energy supply in 2009 per country; it notes the type of energy resource and the environmental impact. In the aggregate, for LAC the use of non-renewable and highly polluting energy sources due to CO<sub>2</sub> emissions amounts to 74.4% of the primary energy supply, whereas renewable energy accounts for as little as 25.6%.

**TABLE IX:**  
**Primary energy supply by country: Sources and environmental impact,**  
**and analysis of energy policies for a redistributive green economy**

LAC PRIMARY ENERGY SUPPLY, 2009									
LAC country	Sources		Environmental impact		Energy Supply 1	LAC country	Energies		
	Non-Renewable	Renewable	Clean or low CO <sub>2</sub>	High CO <sub>2</sub>			Dominant source	Environment impact CO <sub>2</sub>	Dependence on Non-Renewable
Argentina	90.87%	9.13%	9.78%	90.22%	563,877	Argentina	Non-Renewable	Very high	Very high
Barbados	33.71%	66.29%	0.00%	100.00%	350	Barbados	Renewable	Very high	Moderate low
Bolivia	77.04%	22.96%	4.71%	95.29%	43,090	Bolivia	Non-Renewable	Very high	High
Brazil	53.05%	46.95%	19.34%	80.66%	1,722,659	Brazil	Energy balance	High	Moderate
Chile	96.32%	33.68%	11.09%	88.91%	172,299	Chile	Non-Renewable	Very high	Moderate high
Colombia	77.18%	22.82%	13.47%	86.53%	266,104	Colombia	Non-Renewable	Very high	High
Costa Rica	13.78%	86.23%	64.14%	35.86%	20,534	Costa Rica	Renewable	Moderate low	Very low
Cuba	88.93%	11.07%	0.12%	99.88%	78,319	Cuba	Non-Renewable	Very high	Very high
Ecuador	85.81%	14.19%	7.94%	92.06%	79,928	Ecuador	Non-Renewable	Very high	Very high
El Salvador	26.66%	73.34%	48.09%	51.91%	22,058	El Salvador	Renewable	Moderate	Low
Grenada	0.00%	100.00%	0.00%	100.00%	51	Grenada	Renewable	Very high	Very low
Guatemala	4.79%	95.21%	10.69%	89.31%	42,720	Guatemala	Renewable	Very high	Very low
Guyana	0.00%	100.00%	0.00%	100.00%	3,142	Guyana	Renewable	Very high	Very low
Haiti	0.00%	100.00%	1.10%	98.90%	14,484	Haiti	Renewable	Very high	Very low
Honduras	3.09%	96.91%	12.87%	87.13%	16,771	Honduras	Renewable	Very high	Very low
Jamaica	70.15%	29.85%	0.68%	99.32%	12,771	Jamaica	Non-Renewable	Very high	High
Mexico	91.71%	8.29%	5.13%	94.87%	1,243,471	Mexico	Non-Renewable	Very high	Very high
Nicaragua	37.46%	62.54%	5.63%	94.37%	15,906	Nicaragua	Renewable	Very high	Moderate low
Panama	0.00%	100.00%	40.50%	59.50%	5,965	Panama	Renewable	Moderate high	Very low
Paraguay	0.00%	100.00%	74.60%	25.40%	59,243	Paraguay	Renewable	Low	Very low
Peru	78.32%	21.68%	11.18%	88.82%	143,508	Peru	Non-Renewable	Very high	High
Rep. Dom.	69.86%	30.14%	8.18%	91.81%	26,970	Rep. Dom.	Non-Renewable	Very high	Moderate high
Suriname	78.81%	21.19%	20.50%	79.50%	8,608	Suriname	Non-Renewable	High	High
Trin. Tob.	99.89%	0.11%	0.00%	100.00%	133,097	Trin. Tob.	Non-Renewable	Very high	Very high
Uruguay	56.88%	43.12%	31.09%	68.91%	26,166	Uruguay	Energy balance	Moderate high	Moderate high
Venezuela	91.75%	8.25%	8.22%	91.78%	805,267	Venezuela	Non-Renewable	Very high	Very high
Total LAC	74.43%	25.57%	12.39%	87.61%	5,559,423	Total LAC	Non-Renewable	Very high	High

Source: Prepared by the author based on OLADE data. 1)Thousand barrels of oil equivalent. Source: Prepared by the author based on OLADE data.

The table below ranks the first 10 LAC countries based on the percentage of the primary energy supply coming from renewable energy and clean or low CO<sub>2</sub> emissions energy.

**TABLE X:**  
**Top 10 countries by renewable energy and low CO<sub>2</sub> energy sources**

LAC country	Renewable energy	LAC country	Clean or low CO <sub>2</sub> energy
 Grenada	100.00%	 Paraguay	74.60%
 Guyana	100.00%	 Costa Rica	64.14%
 Haiti	100.00%	 El Salvador	48.09%
 Panama	100.00%	 Panama	40.50%
 Paraguay	100.00%	 Uruguay	31.09%
 Honduras	96.91%	 Suriname	20.50%
 Guatemala	95.21%	 Brazil	19.34%
 Costa Rica	86.23%	 Colombia	13.47%
 El Salvador	73.34%	 Honduras	12.87%
 Barbados	66.29%	 Peru	11.18%

Source: Prepared by the author based on OLADE data.

Note that in five LAC countries the primary energy supply is totally renewable, to wit: **Grenada, Guyana, Haiti, Panama** and **Paraguay**. As regards green energy, **Paraguay, Costa Rica, Salvador, Panama** and **Uruguay** supply over 30% of green and renewable energy sources.

Countries listed in both tables nowadays have an outstanding sustainability and environmental impact, namely: **Paraguay, Costa Rica, Salvador, Panama** and **Honduras**.

The table below shows the current status of each LAC country, based on a score of three variables: a) prevailing energy source; b) reliance on non-renewable sources, and c) environmental impact with regard to CO<sub>2</sub> emissions.

**TABLE XI:**  
**Criteria and ranking of each LAC country by energy performance and sustainability**

Energy dependence and environmental impact				Dominant energy source			LAC country	Ranking	LAC country	Ranking
100.0%	85.0%	Very high	0	Non-Renewable	More than 60%	0	 Paraguay	13	 Rep. Dom.	2
85.0%	70.0%	High	1	Energy Balance	40% to 60%	1	 Costa Rica	12	 Suriname	2
70.0%	55.0%	Moderate high	2	Renewable	0% to 40%	2	 El Salvador	10	 Bolivia	1
55.0%	40.0%	Moderate	3				 Panama	10	 Colombia	1
40.0%	30.0%	Moderate low	4				 Grenada	8	 Jamaica	1
30.0%	15.0%	Low	5				 Guatemala	8	 Peru	1
15.0%	0.0%	Very low	6				 Guyana	8	 Total LAC	1
							 Haiti	8	 Argentina	0
							 Honduras	8	 Cuba	0
							 Barbados	6	 Ecuador	0
							 Nicaragua	6	 Mexico	0
							 Brasil	5	 Trin. y Tob.	0
							 Uruguay	5	 Venezuela	0
							 Chile	2		

Source: Prepared by the author based on OLADE data.

Based on this score, **Paraguay** ranks first with 13 points: its reliance on non-renewable energy sources is **very low** (six points); its energy supply is mostly **renewable** (two points); its environmental impact contains **low** CO<sub>2</sub> emissions and its energy sources are clean (five points, for 13 points on aggregate; it is closely followed by Costa Rica, 12; Salvador and Panama, 10, and Grenada, Guatemala, Guyana, Haiti and Honduras, 8 points.

It is worth mentioning that regardless of being a big country, Brazil got five in this score. This highlights the country endeavours to diversify its energy supply and move toward a green economy by using clean energy.

In view of the foregoing, countries with the highest profile in terms of renewable energy sources are expected to be the first ones to implement policies oriented toward a green economy. In addition, they are supposed to be in a privileged position to share their experiences with other countries in the region about the policies and steps that enabled them to achieve such status. By the same token, the rest of LAC countries should make urgent changes in their energy-related policies to reconvert and green their economies and energy sources.

### **2010 Outlook of renewable energy sources in LAC**

LAC has still a long way to go in production and generation of renewable energy sources. Nevertheless, it is worth mentioning that nowadays several LAC countries stand out in the world in some types of renewable energy sources:

- As regards existent capabilities in 2010, **Brazil** occupied the second and fourth positions in the world in biomass and total capacity of renewable energy sources, including hydraulic energy.
- **Mexico** ranked fourth for its installed capacity in geothermal energy.
- With regard to the addition of renewable energy sources in 2010, **Brazil** excels in three items: it occupies position number 5 in new capabilities and position number 2 in production of ethanol and biodiesel. In this latter item, **Argentina** ranked third.

ECLAC found that in 2010, electricity output in six Central American countries – **Costa Rica, Salvador, Guatemala, Honduras, Nicaragua and Panama** – came from 65% of renewable energy sources (hydraulic energy, geothermal energy, sugar cane and wind), a record for the sub-region. In 2010, electricity output in these countries totalled 40,668.2 GWh; sales amounted to 34,579.6 GWh, a surge of almost 4% versus 2009. The increasing use of renewable energy sources is due to the growing hydroelectric output. In 2010, it was, for the first time, over the threshold of 20 terawatts-hour (20,974 GWh). In 2010, US\$ 1.1 billion was invested in new generating powerhouses, a hike near 500 MW in installed capacity.<sup>25</sup>

### **Eolian energy**

LAC installed capacity in wind energy advanced 54% in 2010. **Brazil** and **Mexico** took the lead by adding 0.3 GW (Gigawatt) each. Notwithstanding, the LAC share in the world remains tiny. Anyway, wind energy projects in **Argentina, Brazil, Chile, Costa Rica, Mexico, Nicaragua** and **Uruguay** are encouraging signals.

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<sup>25</sup> ECLAC. Mexico Regional Head Office. The Central America Report: Statistics of the electric sub-sector 2010. Mexico. November 2011. [http://216.122.62.22/view/index.asp?ms=258&pageMs=26402&item\\_id=94617](http://216.122.62.22/view/index.asp?ms=258&pageMs=26402&item_id=94617)

### Biomass

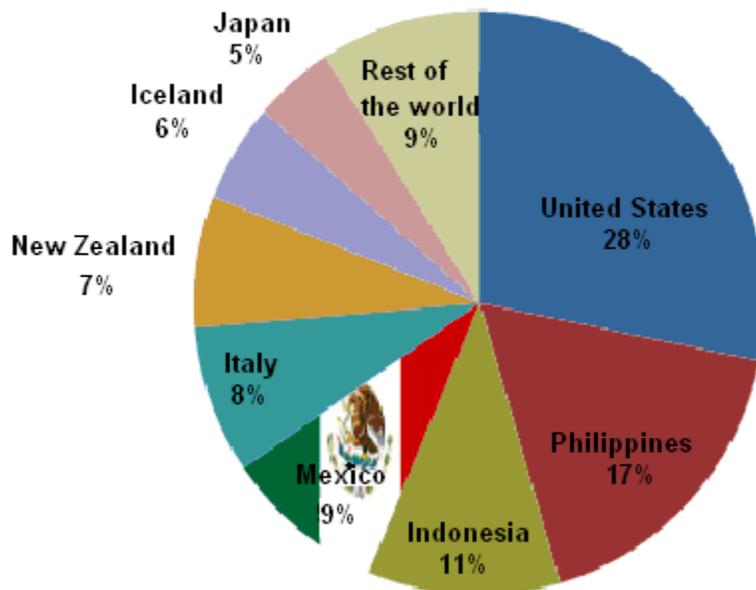
**Brazil** occupies the second or third position, depending on the addition of the European Union, in biomass generation. Brazil's capabilities have been on the rise, up to 7.8 GW ending 2010, for a total electric power generation of 28 TWh (Terawatt-hours). Most generation comes from co-generation plants of sugar mills. In the harvest season of 2010, sugar cane mash produced 18.5 TWh, including 8.8 TWh of overage that was exported to the electrical grid. Biomass has significantly grown in several LAC countries, such as **Costa Rica, Mexico** and **Uruguay**.

### Geothermal energy

In early 2011, geothermal plants operated in at least 24 countries. However, most of the global capacity is located in eight countries, including **Mexico**, in the first place with a 1 GW capacity.

CHART 7:  
World geothermal energy generation capacity

## Geothermal energy generation capacity



### World capacity of 11 GW in 2010

In 2010, **Mexico** gained geothermal capacity; **Salvador** and **Guatemala** enlarged their capacity by 35% and 58%, respectively. Ending 2010, there were some ongoing projects in **Chile** (0.2 GW) and **Costa Rica** (0.4 GW).

### Hydraulic energy

At present, such renewable energy source is used in over 150 countries. Brazil is among the world leaders, ranking second for its capabilities (only after China) and third in generation, after China and Canada. In 2010, Brazil added 5 GW to the operations, up to a current capacity of 80.7 GW and 8.9 GW in construction. Wide-ranging projects completed in 2010 in the world include Brazilian plant Foz do Chapeco of 0.9 GW. Around 80% of the electricity generated in Brazil comes from hydraulic energy. **Brazil** has 53 ongoing small-scale hydraulic projects (0.7 GW), and 149 additional plants have been authorized (2.1 GW).

LAC is among the best performing regions in the world for the development of new hydraulic projects. **Brazil** takes the lead with two sizeable projects in Amazon, including a 3.2 GW dam to be completed at the end of 2011.

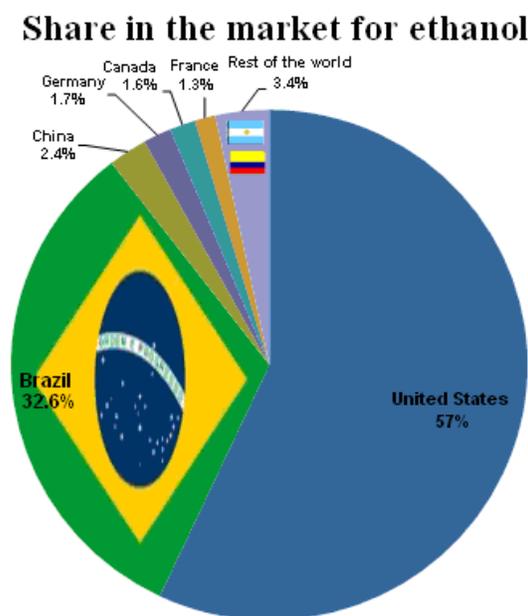
### Solar heating and cooling

In the market of solar heating, **Brazil** figures among the 12 countries with the largest installed capacity. LAC has a great potential for growth in such technologies. At present, there are small, yet significantly expanding, markets in countries such as **Chile** and **Uruguay**.

### Ethanol

In 2010, ethanol world output totalled 86 billion litres, a 17% hike compared with 2009. **Brazil** was the second world producer after the United States, with a 32.6% share. While Brazil used to be the main world exporter of ethanol, it has been losing lately its share in the global market due to the advance of corn-made ethanol subsidized by the United States and poor climate conditions which have increased sugar cane prices.

**CHART 8:**  
Percentage share in the world market for ethanol



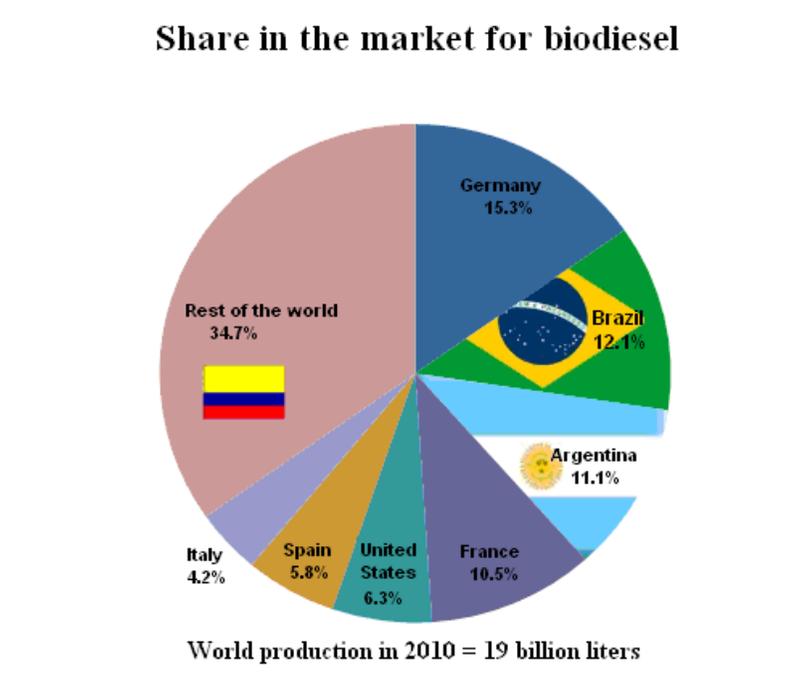
World production in 2010 = 86 billion liters

It should be noted that **Colombia** and **Argentina** are also among the largest 15 world producers of ethanol.

**Biodiesel**

**Brazil, Argentina** and **Colombia** occupy positions numbers 2, 3 and 13 in the world production of biodiesel; that is, 12.1%, 11.1% and 1.6% of the total world output, respectively.

**CHART 9:**  
Percentage share in the world market for biodiesel



The highest annual percentage increases since 2009 were recorded in **Brazil** (46%, up to 2.3 billion litres in 2010) and **Argentina** (57%, up to 2.1 billion litres, three fourths of which were exported).

**IV. POLICIES APPLIED TO PROMOTE AND ENCOURAGE THE GENERATION OF RENEWABLE ENERGY IN LATIN AMERICA AND THE CARIBBEAN**

As stated in the first section of this paper, moving from a coal-based economy toward a green economy will not be overnight. Such a process requires substantial investments; a change in production and consumption patterns and also the State direct involvement, where public policies play a key role. In this section, a focus will be placed on suggested public policies to further the passage to a green economy. In addition, an outlook will be given of the necessary investments in the region to materialize a green economy.

This paper identifies three policies that have been used in furtherance of renewable energy sources around the world and that LAC countries could adopt for their ultimate conversion into a green economy.

Firstly, the **regulatory policy** is based on instruments such as guaranteed prices or allocation of market shares through quotas or government mandates. Reference is made to feed-in tariffs; utility quota obligations; net metering and mandates or renewable energy debentures.

Secondly, the **tax policy** uses incentives and subsidies. It is aimed at curtailing costs and improving competitiveness relative to renewable energy technologies through capital grants, subsidies and bonuses, tax incentives and payments for generation of renewable energy.

Thirdly, **government direct funding** provides funds for the development of renewable energy sources. It is of the essence for their steady growing. Public funding where governments grant the necessary capital to the sector of renewable energy includes public investment by means of loans with subsidized rates, subventions, or public tender which favour the use of renewable energy sources.

In LAC, like in the rest of the world, the number of countries which have implemented policies to foster and encourage generation and production of renewable energy sources has gradually increased, and public policy instruments used for such purpose are more and more varied as time goes by and as more elements for analysis and cutting-edge technology are available.

In early 2011, according to the report *Renewable 2011* released by REN21, **17 LAC countries** used some policy to support generation of renewable energy sources. As many as 61 related policies have been implemented. Major policies include tax incentives (30), regulatory policy (17) and public funding (14). Furthermore, there is no record of such policies in Barbados, Cuba, Grenada, Guyana, Haiti, Jamaica, Paraguay, Suriname and Venezuela.

**TABLE XII:**  
Policies to support renewable energy generation in LAC

Policies to support renewable energy generation in LAC													
Country	Regulatory policies						Fiscal incentives				Public financing		Total policies per country
	Feed-in tariff	Electric utility quota obligation RPS	Net metering	Biofuels obligations/ mandates	Heat obligations/ mandates	Tradable renewable energy certiff.	Capital subsidy, grant or rebate	Investment or production tax credit	Cuts in sales, energy, CO2, VAT, other taxes	Energy production payment	Public investment, loans or grants	Public competitive biddings	
Argentina	★						★	★	★	★	★	★	7
Bolivia													1
Brasil				★					★		★	★	4
Chile		★					★		★		★		4
Colombia				★			★						2
Costa Rica	★			★									2
Ecuador	★												1
El Salvador								★	★	★	★	★	5
Guatemala			★					★	★			★	4
Honduras	★							★	★			★	4
Mexico			★					★			★	★	4
Nicaragua	★							★	★				3
Panama	★									★		★	3
Peru	★			★				★	★	★		★	6
Rep. Dominic.	★						★	★	★				4
Trin. y Tob.							★	★	★				3
Uruguay		★		★					★			★	4
<b>Total policies in LAC</b>	<b>8</b>	<b>2</b>	<b>2</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>9</b>	<b>12</b>	<b>4</b>	<b>5</b>	<b>9</b>	<b>61</b>

Source: REN21, 2011, Renewable 2011 Global Status Report.

Based on the report *Renewable 2011*, specific policies mostly used by the aforementioned 17 countries are as follows:

1. **Taxes:** curtailed taxes on purchases, energy, VAT or other imposts. It is used by 12 LAC countries.
2. **Tax credits:** on investment or production and competitive public tender, implemented by nine countries each.
3. **Feed-in tariffs:** for the electricity grid, implemented in eight countries.

In terms of policies implemented per country, **Argentina** takes the lead with 7 out of the 12 analysed instruments, followed by **Peru**, 6, and **Salvador**, 5. Overall, the mean in **LAC** is of four instruments per country.

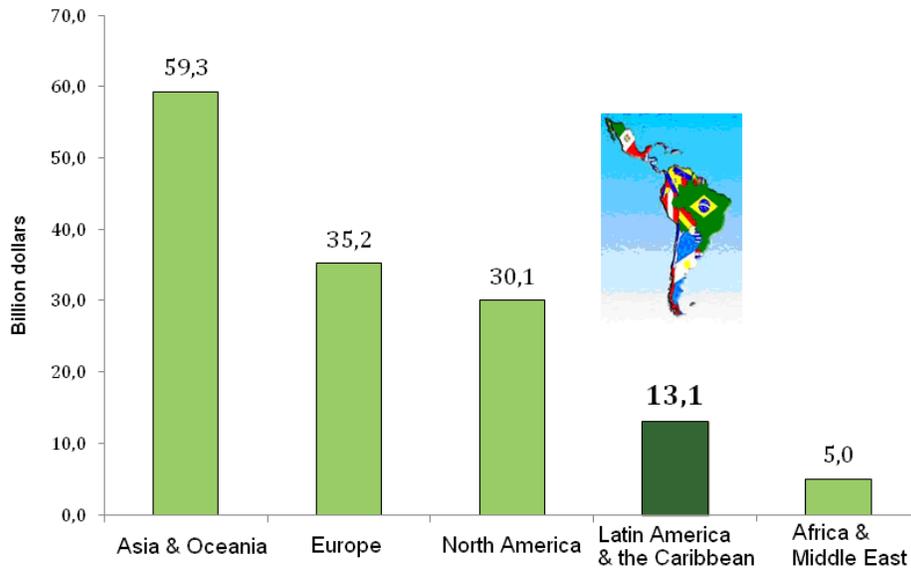
As appears from the table above, several regulatory instruments are still barely explored in LAC, namely: mandates and obligations for the use of renewable energy sources in heating and debentures. To date, no LAC country has implemented them. Additionally, renewable portfolio standards or renewable quotas -that is, a regulation under which a minimum percentage of sale or installed capacity should be supplied by renewable energy sources- and net metering are barely enforced in LAC; two countries only (**Chile** and **Uruguay**) apply the former instrument and other two countries (**Mexico** and **Guatemala**) apply the latter.

#### **Flows of investments in renewable energy sources**

As a region, LAC ought to invest in development of renewable energy sources. As stated by both the UNDP and the OECD, such investment will be the best way of ensuring steady growth and employment, as it will raise the possibility of preserving natural resources for the sake of future generations. Following an analysis is made of the status of the LAC region concerning its investments in renewable energy sources.

In 2010, LAC investments in renewable energy sources amounted to US\$ 13.1 billion, that is, around 9.2% of global investments. This placed LAC, in terms of blocs, on the fourth position, still far away from North America, Europe and Asia/Oceania.

**CHART 10:**  
**Investment in renewable energy in 2010**  
**Investment in renewable energy in 2010**

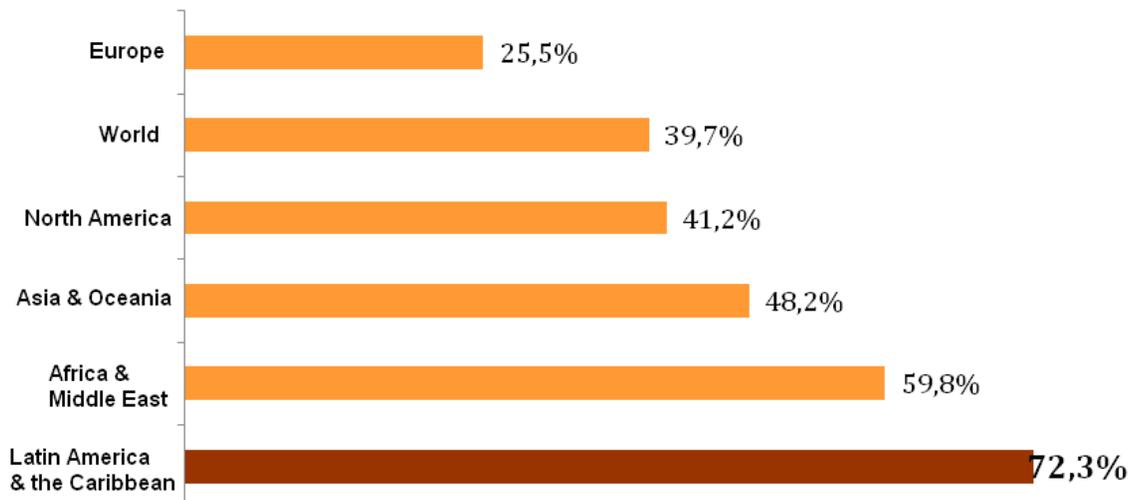


Source: UNEP, Global Trends in Renewable Energy Investment 2011

Nonetheless, the annual growth rate of investments in renewable energy sources for LAC in 2004-2010 averaged 72.3%, the highest in the world, even higher than that of Asia/Oceania, yet not significantly.

**CHART 11:**  
**Dynamics of investment in renewable energy**

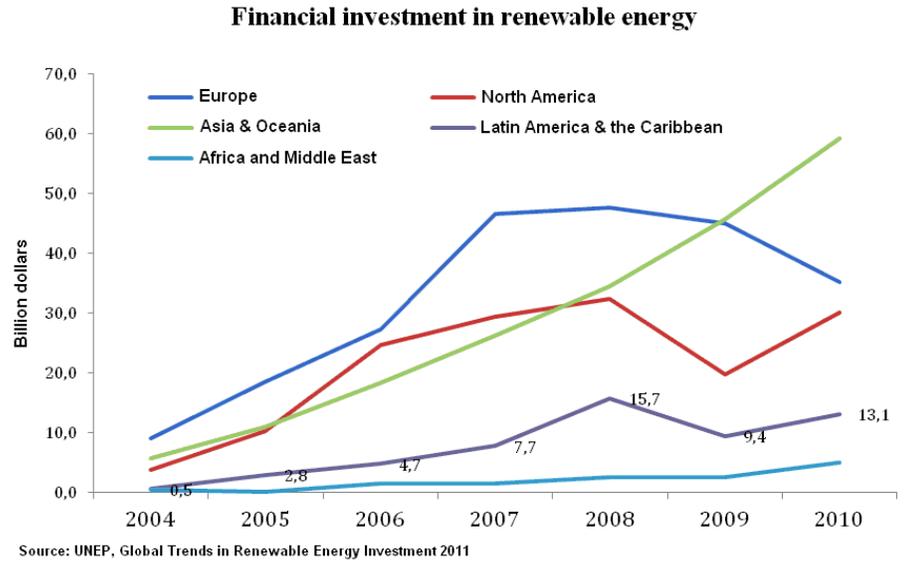
**Average growth rate of investment in renewable energy (2004-2010)**



Source: UNEP, Global Trends in Renewable Energy Investment 2011

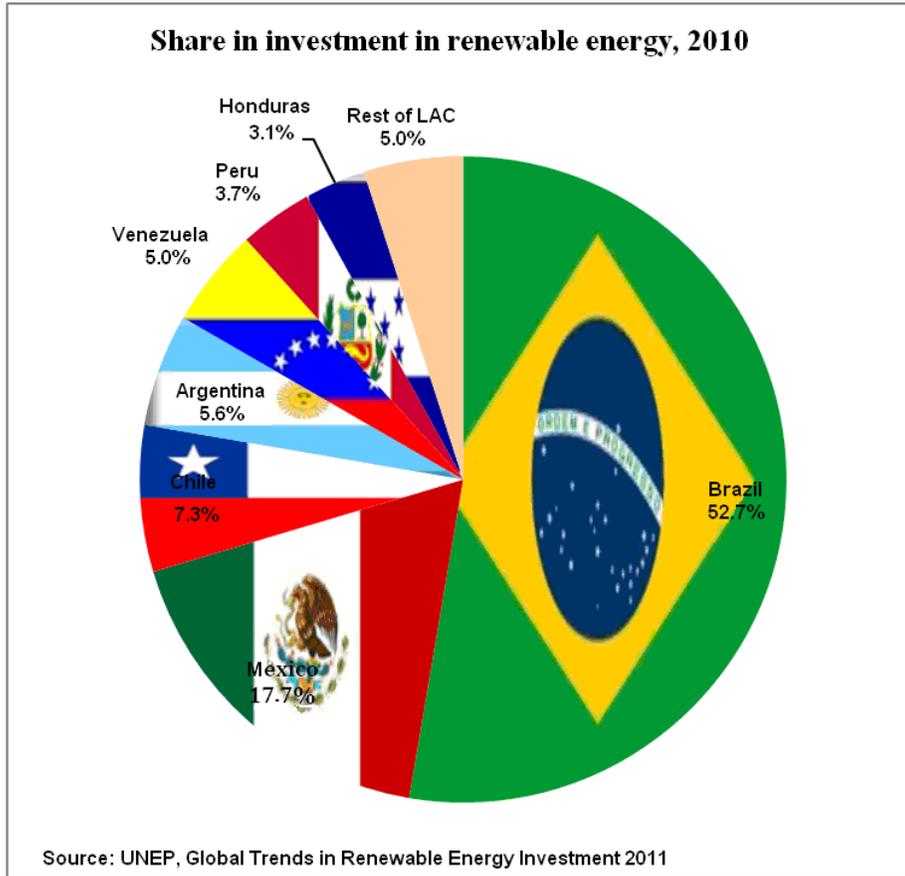
As noted in the following chart, financial investments in renewable energy sources in LAC advanced 39.4% compared to 2009. Nevertheless, they are 16.6% below the level prior to the global financial crisis of 2008 (15.7 mmd).

**CHART 12:**  
**Financial investment in renewable energy by region**



A review per individual country will show that **Brazil** is in the fifth place with investments in renewable energy sources in 2010, only after China, Germany, United States and Italy. **Brazil's** share in the world market of investments in renewable energy sources stands at 2.6%.

**CHART 13:**  
**Percentage share of investment in renewable energy in LAC, 2010**



Within the region, country shares are as follows Brazil, 52.7%; Mexico 17.7%; Chile 7.3%; Argentina 5.6% and Venezuela 5.0 out of the total investment in renewable energy sources in 2010.

**Mexico** hit the largest increase in Latin America (348%). Such growth was the result of a successful funding of sizeable wind projects and a geothermal project following a government announcement related to the expansion of the goals of renewable energy sources from 3.3% to 7.6% in 2012. **Argentina** enlarged investments by 568%, to US\$ 740 million; **Peru**'s investments doubled to US\$ 480 million, and **Chile** showed a surge from 21% to US\$ 960 million.

**Brazil**'s spectacular performance in investments in renewable energy sources stems from a focused funding policy by its development bank (BNDES). Because of such funding policy, in 2010, the BNDES was the second development bank in the world to finance renewable energy projects (US\$ 3.1 billion), only after the European Investment Bank (US\$ 5.4 billion). BNDES activities doubled the level recorded in 2007. Nevertheless, it smashed its historical record in 2008, when investments in ethanol climaxed.

Investments in renewable energy sources have given the regional private industry substantial economic benefits. For instance, Brazilian companies are emerging as major manufacturers of solar water heaters, following the policies to embolden such sector. In 2010, the Brazilian production of solar troughs reached almost one million square meters,

that is, a 20% leap compared to previous years. Now, the industry comprises 200 manufacturing plants and around 1000 installers.

**Brazil** occupies the third position in the world market of solar heaters. In 2010, one million square meters of solar troughs were laid, versus 1.2 million m<sup>2</sup> in Germany and 50 million m<sup>2</sup> in China. **Brazil** has a considerable experience since 1974, mainly in social applications and public premises. The main driver of such technologies is the state-run electric power utility, which generally donates equipment for poor families. This company should allocate 0.5% of its earnings (or invoicing) to energy efficient social applications. For such efficiency, there are two main programs: instalment of solar heaters and replacement of refrigerators. Further, the federal government, in the context of the program "Minha Casa, Minha Vida," donates top-quality heaters. Non-poor families have the choice of getting funding for 15 years.<sup>26</sup> The Brazilian social program is set to install 300,000-400,000 solar water heaters in low-income houses. The goal of the Brazilian Government is 15 million m<sup>2</sup> of solar troughs by 2015, out of a current total amount of 6 million m<sup>2</sup> in 2010.

In **Brazil**, biodiesel production heightened 50% in 2010, mainly in reply to a mandate on the domestic biodiesel mixture of 5% issued in January 2010. Ending 2010, 68 biodiesel plants were operating in Brazil. Major companies in the country include Granol, Brasil Ecodiesel, Caramuru, Petrobras and ADM Brasil.

One of the fastest-growing biodiesel industries is located in **Argentina**, where 23 providers have met the domestic demand by expanding the mixture from B5 to B7.<sup>27</sup> The sector expansion was bolstered by the peso depreciation and a strong soya harvest. Major companies in Argentina include YPF, Shell, Eso and Petrobras.

In **Brazil**, a coalition led by developer Curcas has launched the biggest bio-jet fuel plant in the world along with BP, Airbus, TAM Linhas Aéreas and Brasil Ecodiesel. Major manufacturers, namely Amyris, ClearFuels, Sapphire Energy, Solazyme and Combustibles Solena, have focused their attention on bio-jet fuels.

Job generation is a value-added benefit of investments in renewable energy sources. In 2010, more than 3.5 million people worked in renewable energy industries. In **Brazil**, such benefits are glaring in the bio-fuel industry with almost 730,000 jobs in sugar cane plantations and ethanol production. That is, near 50% of employees in the world working in this sector. In the wind sector, **Brazil** employs 14,000 people. Therefore, the renewable energy industry is a very important employer for the countries that boost it and make it grow, and a recently developing process as well.

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<sup>26</sup> <http://www.diarioelpueblo.com.uy/generales/la-instalacion-de-calentadores-solares-rebaja-el-70-de-la-demanda-de-energia-anual-del-hogar-o-la-industria.html>.

<sup>27</sup> B5 means 5% of biodiesel and 95% of ordinary gasoline; therefore, B7 means a mixture of 7%-93%.

## V. PROPOSALS AND RECOMMENDATIONS TO SUPPORT THE TRANSITION TOWARDS A GREEN ECONOMY IN LATIN AMERICA AND THE CARIBBEAN

Latin America and the Caribbean should embark upon a green economy. It seems that there is no better choice for sustainable growth. There is widespread consensus about the fact that a coal-based economy is reaching the limit and its effects on the people's quality of life have exacerbated the levels of poverty and inequity in LAC.

The region counts on inputs in the energy sector to achieve this goal. To that end, the State direct involvement is required through a number of public policies intended to galvanize and enliven the transition. Nevertheless, transition towards a green economy is not enough; there is the need to make it all-inclusive. LAC cannot go ahead without bridging the inequity gap. Passage from a brown economy to a green economy will mean adjustments that could cause unemployment as a result of turning the activities of the carbon-intensive production into an economy based on a technology favouring renewable energy sources. The transition is likely to be onerous for the underprivileged. Therefore, the State should make policies to ensure job adjustments and training so that the labour force is able to work in a green economy. Importantly, also, care should be taken of some sectors that could lose their road serviceability (fossil fuel-intensive sectors) following the adoption of new technologies and cleaner energy sources.

The following is a set of proposals made by the Permanent Secretariat of SELA for the region to have more food for thought. Particularly, bearing in mind the characteristic features of the whole region and individual countries, as well as their potential, is most relevant and urgent in order to make headway with a green economy as effectively as possible based on their own potential and the inclusion in their programs and policies of the concept of green economy.

The proposals made by the Permanent Secretariat of SELA in this paper to support the region aim at promoting discussion and the making of long-term policies and programs with a high impact. The following action areas have been pondered:

1. **Inventory of the basic constituent elements of a green economy.** Contrast definitions and concepts of green economy and green growth with their regulatory and positive definitions and provide elements able to support a redistributive green economy in the region.
2. Outline of a **green energy matrix** in the region in order to make policies in furtherance of transition toward a redistributive green economy. Undoubtedly, this will be the basic component as an input so that each country in the region can turn into a green economy. Counting on such a matrix will also help identify public policy efforts to be made, in both regulations and required investments. Likewise, countries with the best green energy matrix could develop their sectors to take part in the transition of other countries, giving them business and employment opportunities.

3. **Preparation of a report on the natural capital in LAC and its ties to the carbon energy sector**, in order to pinpoint the regional potential towards a green economy.
4. Definition of **thematic areas** and projects where the comparative advantages of individual countries and the whole region can be summed up to make proposals on the adoption of schemes for a green economy.
5. **Preparation of a report including proposals on mechanisms to follow up** projects and programs which back the efficient use of energy, as well as the set-up of indicators to measure their effectiveness in the transition towards a green economy.
6. **Promotion of actions among LAC countries for the purposes of coordination** among incumbent national institutions to enable exchange of information and experience on the implementation of programs intended to make the economies in the region sustainable in the long-term.
7. Proposal to develop **sectoral programs for industries, such as steel and transportation**, in each country involving ministries and agencies responsible for the **energy sector** and associations and chambers of the production sector, with a view to furthering comprehensive policies leading to the adoption of green economies.
8. **Survey of new funding sources** in order to undertake new projects, give tax incentives and bring subsidies that spur the use of technologies in support of a green economy.
9. Development of **South-South and Triangular cooperation** programmes following a review of the existent supply and demand of experiences to adopt a green economy and based on the available potential of renewable energy sources in several countries in the region.
10. **Dissemination** of information about programmes and projects focused on a green economy in the region, in order to galvanize successful experiences, find challenges and redirect ongoing programmes.

SELA could be an ideal partner for the national parties responsible for the policies and areas related to the transition towards a green economy. SELA, as a forum for discussion and analysis of this subject matter, could be a catalytic agent to energize experts' analyses. In this way, specific recommendations could be retrieved, always taking into account all-inclusive policies. For such purpose, SELA could take the following steps:

- 1) Holding seminars to explore trends and conceptualization of a green economy in order to clarify proposals and ideas, to both government authorities and production sectors, academia and civil society.
- 2) Conducting studies which provide elements for analysis to any countries seeking changes in tax, energy, agricultural, educational, science and technology, and environmental policies, among others, and the adoption of better practices towards an inclusive green economy.

- 3) Calling experts to discuss and make proposals on data standardization by means of indicators which help make a better assessment of the impact of a green economy on each Latin American and Caribbean country.
- 4) Posting on SELA's Web site existent programmes in the region to support the transition towards a green economy.

## VI. CONCLUSIONS

In this paper, a review has been made of the concepts of green economy and green growth. The UNEP has found that a green economy values and invests in the natural capital to produce the same level of growth and employment as a brown economy, with better performance in the medium and long terms and significantly improved environmental and social benefits. In turn, the OECD focuses on the concept of green growth as a new form of production for sustainable economic growth, while maintaining the standards of living achieved. By comparing these definitions, it could be inferred that both of them are comprehensive concepts and share the same theoretical and factual foundations. Nevertheless, green growth puts emphasis on incentives and new growth sources by means of innovation, productivity, new markets, confidence and stability, whereas green economy prioritizes the government role, the regulatory and legal framework, the push of both private and public investment and its effects on some sectors.

Furthermore, an analysis is made of the concept of redistributive green economy as a mechanism or instrument to attain sustainable development. The Permanent Secretariat of SELA just seeks to provide the LAC experience after decades of analysis on the causes of growth and its redistributive effects. Whereas LAC is the most unequal region in the world, SELA thinks that going towards a green economy is not enough. This process should take place in such a way that the inequity gap can be bridged. In this regard, the green economy should focus on economic imbalances concerning the access and opportunities for LAC countries.

In order to address such imbalances and lags in LAC, SELA is keenly aware that moving towards a green economy is not an easy task. Therefore, the involvement of the public and private sectors is requisite and necessary to make substantial investments. It is very likely that such investments, in addition to the sources of technical and economic cooperation, will have to be procured overseas. Furthermore, a set of public policies are needed to embolden the transition but also to dampen any adjustments arising therefrom. The passage from a coal-based economy to a green economy will not be overnight. This process requires substantial investments, as it means the change of production and consumption patterns. The process also requires the State direct involvement, where public policies play a key role, particularly tax, regulatory and financing policies. The State should make policies and programmes able to prevent any severe mismatches in the labour market on the way to new means of production. In this connection, the State is set to provide mechanisms for training of the labour force and reconversion of production in the countryside, fishery, industry and several service sectors.

Without shadow of a doubt, LAC counts on an energy matrix able to become a matrix of renewable, clean energy sources, yet investments are dearly needed. Certainly, nowadays a carbon-based energy prevails; that is, oil, natural gas and coal which are considerable CO<sub>2</sub> generators. As a matter of fact, in five LAC countries the primary energy supply is entirely renewable, namely: **Grenada, Guyana, Haiti, Panama** and **Paraguay**. As regards green energy, **Paraguay, Costa Rica, Salvador, Panama** and **Uruguay** boast a supply higher than 30% of green, renewable energy sources. The challenge lies on replacing the carbon-based energy matrix with an energy matrix composed of renewable energy sources. Apparently, some countries have made it.

The region counts on the potential to turn its carbon-based energy matrix into a green energy matrix if it is to become a green economy with state-of-the-art technologies and novel means of production. The carbon-based economy is reaching its limit and its effects

on the people's quality of life have exacerbated the levels of poverty and inequity in LAC. Therefore, the present *status quo* seems no more feasible.

With this paper, SELA has intended to feed the debate and provide countries with an input in making their public policies. Proposals will be tuned up in the same proportion as they are implemented. The process has started, but a bigger push from the State, with already set policies and goals, is necessary. Latin America and the Caribbean cannot afford to be lagged behind this movement, let alone putting aside large sectors of the population. Accordingly, pondering on a green economy with a true social face is most urgent and of the essence.