

2372-9

**Joint ICTP-IAEA Workshop on Sustainable Energy Development: Pathways
and Strategies after Rio+20**

1 - 5 October 2012

The Energy Paradox in Latin America, a long-term Crossroads

Maria Isabel MARTINEZ SOLARTE
*Universidad Nacional de Colombia
Bogota*



Workshop on SUSTAINABLE ENERGY DEVELOPMENT: Pathways and Strategies after Rio+20

ICTP-IAEA

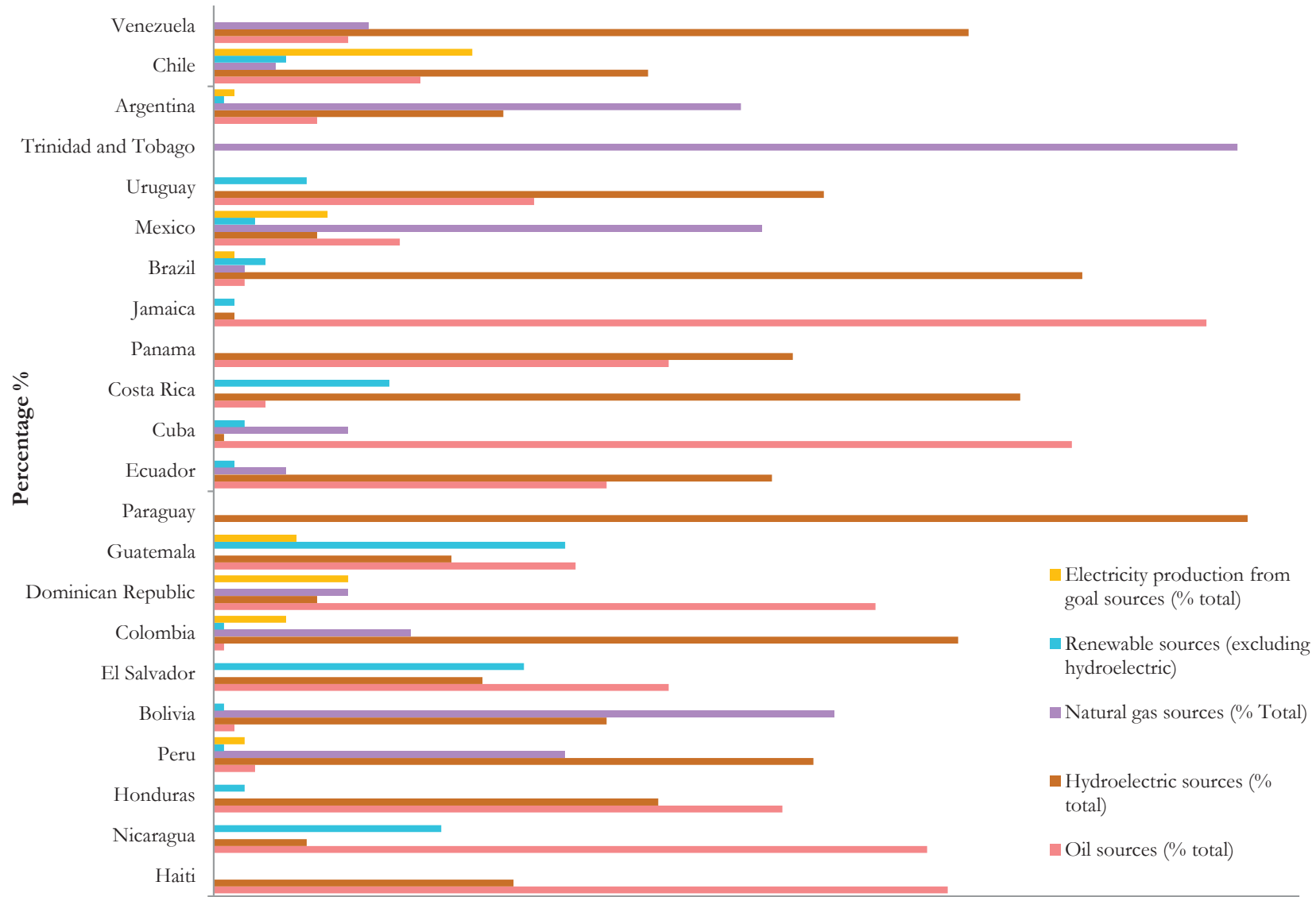
CENTRO INTERNACIONAL DE FÍSICA-ICTP
BOGOTA-COLOMBIA





The Energy Paradox in Latin America, a long-term Crossroads.

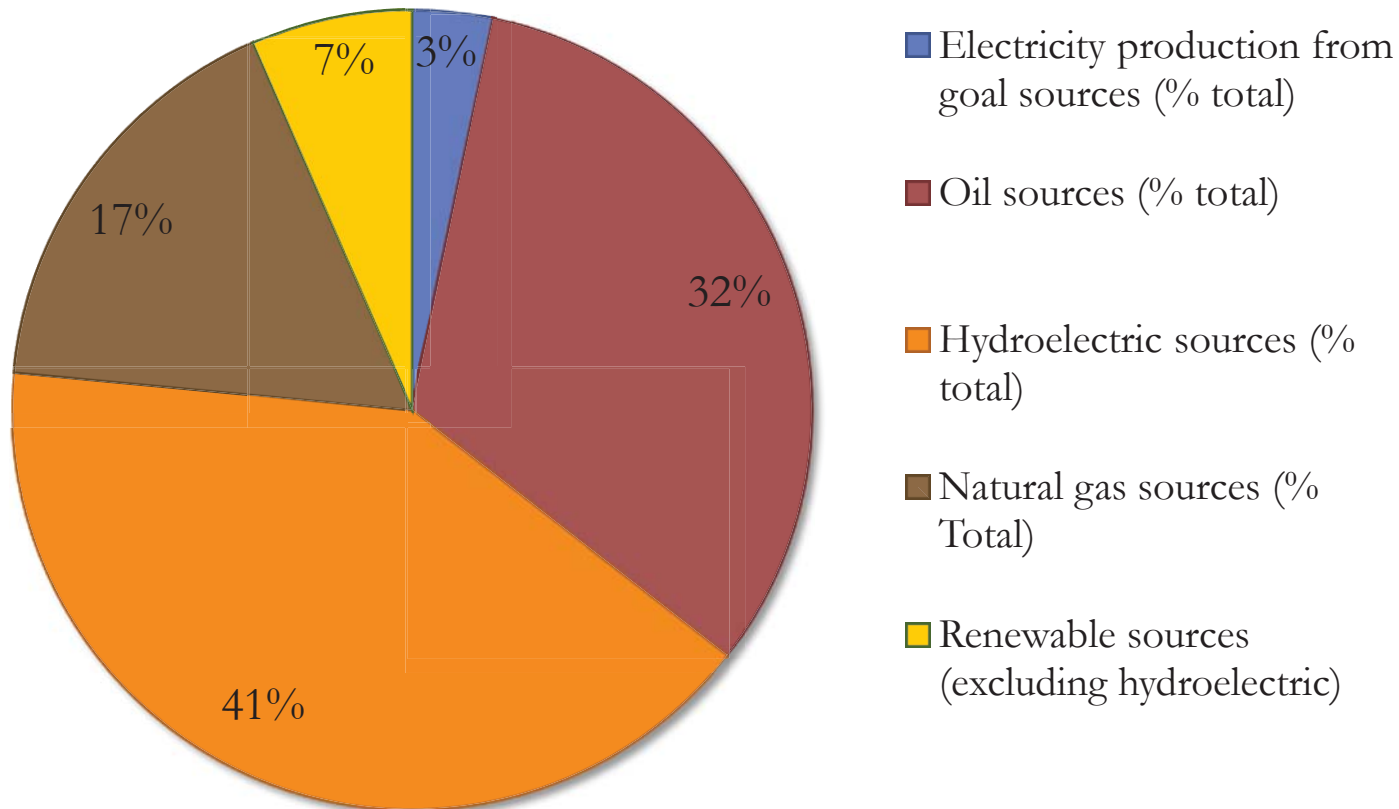
Electricity Production by Resource Latin America (2009)



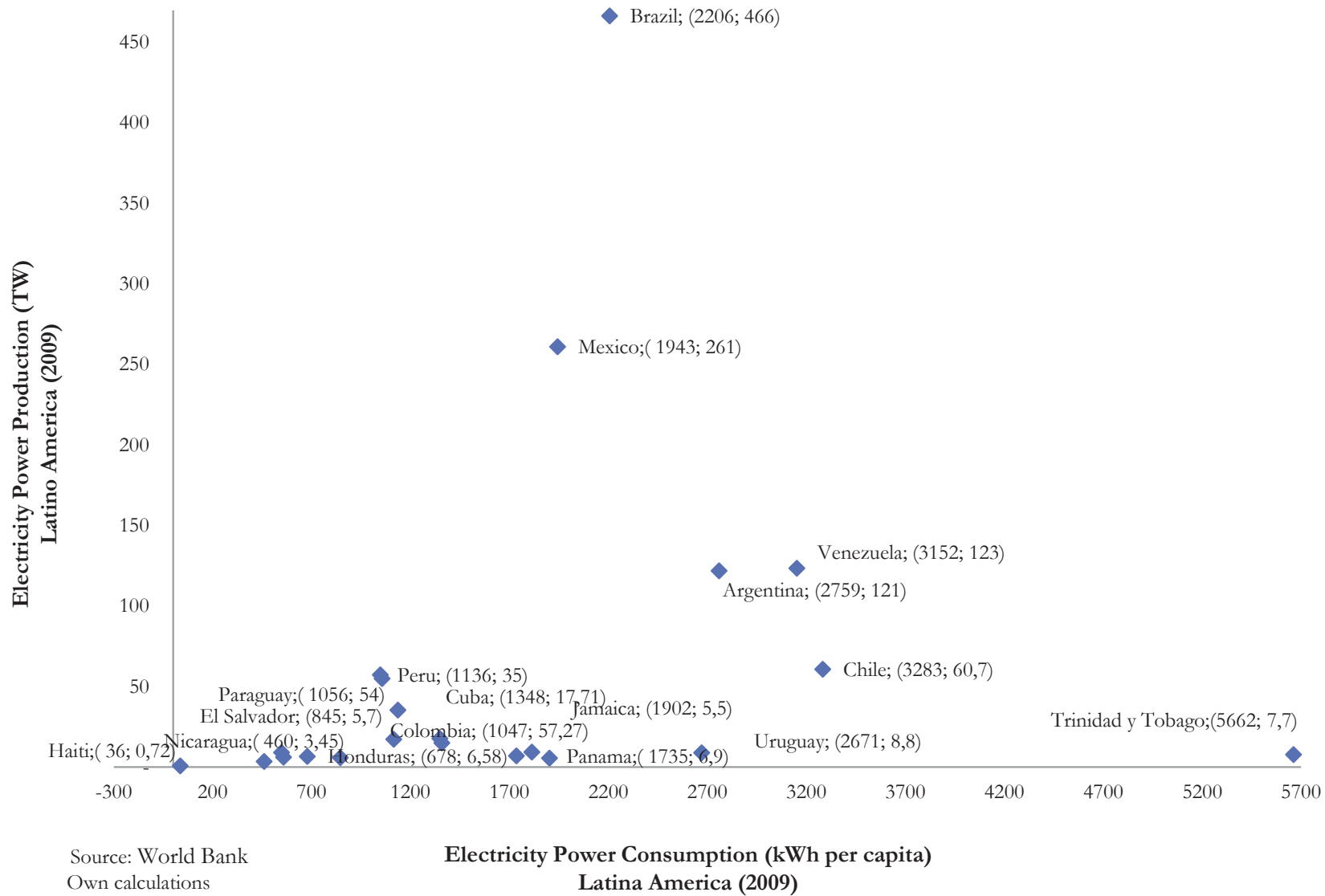
Source: World Bank
Own calculations

Note: Average by resource Hydroelectric (40,688%), Oil (32,9%), Gas (16,95%), Renewable Sources without hydroelectric (6,45%) and coal (3,23%), and (2009) Grenada, Guyana, Barbados and Suriname

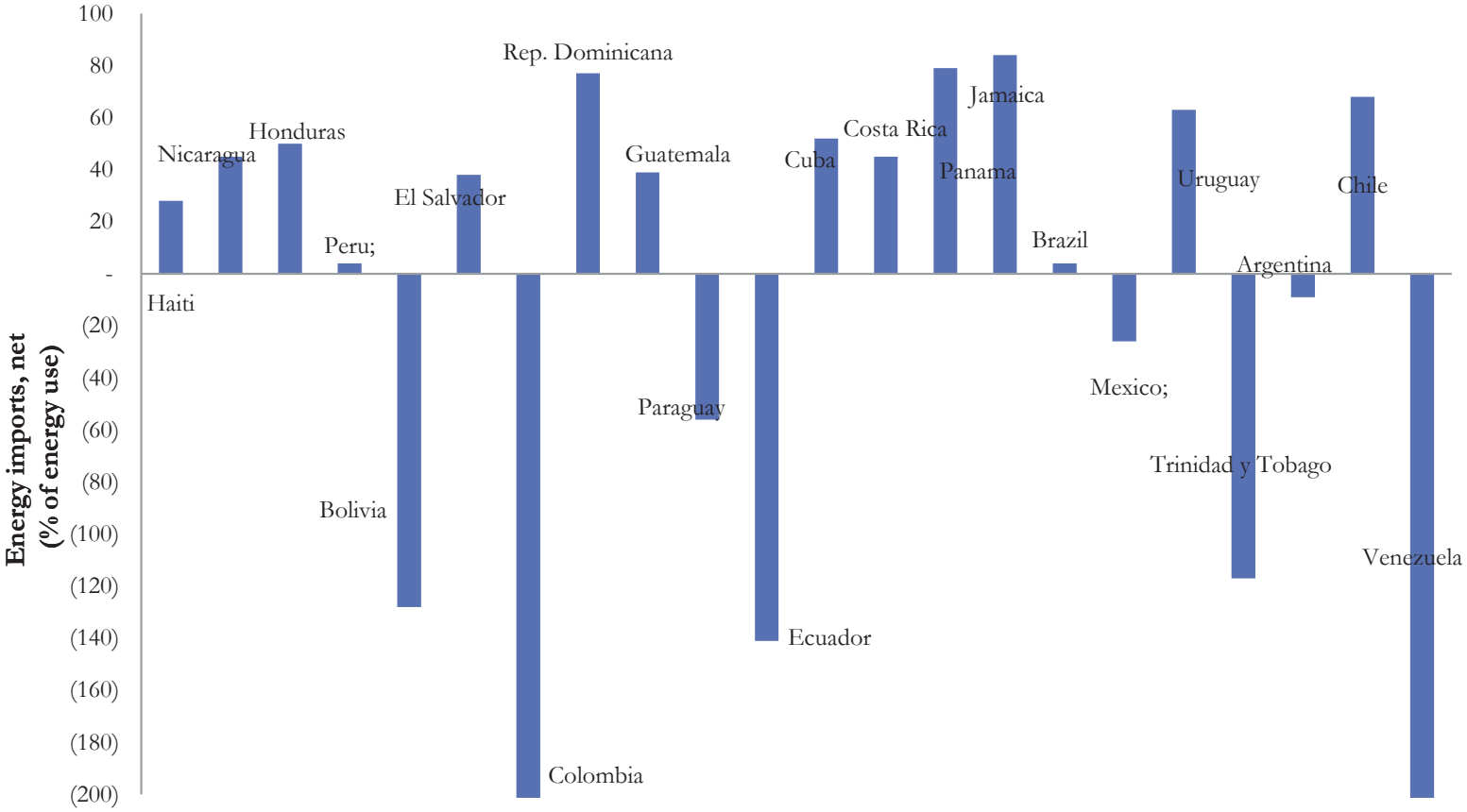
Electricity Production by Resource Latin America (2009)



Electricity Power Production and Consumption Latin America (2009)



Energy Imports Net in Latin America 2009 (% Energy Use)



Source: World Bank
Own calculations



The Energy Paradox focused on the rising costs of energy supplies as a result of 3 externalities

Problem:

According to EIA (2009), the Annual Growth rate of electric generation in OECD non-member countries are higher than member countries during the period 2008 to 2035 at the rate 3.7% and 2.2%, respectively.

The previous context could be explained by structural changes in the economy, problems of energetic efficiency and economic growth, inter alia. In respect of the economic growth, the EIA assessed that the OECD Non-member countries economy will grow at an annual rate of 4.6% while the OECD countries economy at the rate of 2.1% during the period of time between 2008 and 2035. [1].

In other hand, in South and Central America, the EIA estimated that the electric energy generation will rise at 2.4% per year, increasing from 1.0 trillion to 1.9 trillion kilowatts in the time period (2008-2035). However, Cepal (2009) considers that Latin America has serious energetic problems by deficiencies in the Government's planning, so it's questionable the energy security in this region. [1] [2].



The Energy Paradox focused on the rising costs of energy supplies as a result of 3 externalities

Consequently the reason of the failures in the energy planning in Latin America are because

- the short-term view in the planning
- the problems in the definition of future scenarios -the models don't contain the climate change variables and a dynamic process across the time-
- the politics of energy efficiency
- the substitution of conventional energy by non-conventional sources and the regional integration blocs.
- the lack of successful projects in alternative energy sources, continuity in policy implementation by the government agencies, and to the excessive delay in decision making regarding related to energy planning (In Brazil the principle programmes in operation are manage by the energy companies (PROCEL-Electrobas, CONPET-Petrobas).
- the energy regulators don't have any responsibility for promoting the energy efficiency,
- the rational and efficiency use of energy use require institution capable of designing, implementing and operating programs
- Great potential for energy salving (20%-25%).
- Policy signals have been insufficient to induce energy-saving behavior
- Lack of continuity of energy efficiency policy, it's traducing in insufficiency articulation among high-capacity technical teams.
- The countries don't have specific fund for efficiency programs, and it's depends of international cooperation
- The absence of key indicators of success or failure

- e.g. the unique planning indicators to Colombia are in the *Colombian National Development Plan 2010-2014*, and here the Government defined as strategic planning indicators:
 - a) increasing power generation capacity of 13.542 MW to 16.234 MW
 - b) reducing energy intensity in 3% and
 - c) increasing time of electric service in the non-interconnected Zones of 16 to 24 hours,

but these indicators are in the short term and the scope isn't transversal to all components of an energy planning in the medium and long term. [4].

The Energy Paradox focused on the rising costs of energy supplies as a result of 3 externalities

The energy paradox focused on the rising costs of energy supplies as a result of three externalities:

1. Population and climate change externality

Latin America has been the continent with the highest rate of urbanization in the twentieth century. The UN estimates that 9 of 10 people will live in a city at 2050.

In the case of Colombia, the urban population in the period from 1938 to 1992, changed from 29% to 75% of the total population, which translates into purchasing volume growth and therefore on energy consumption increase.

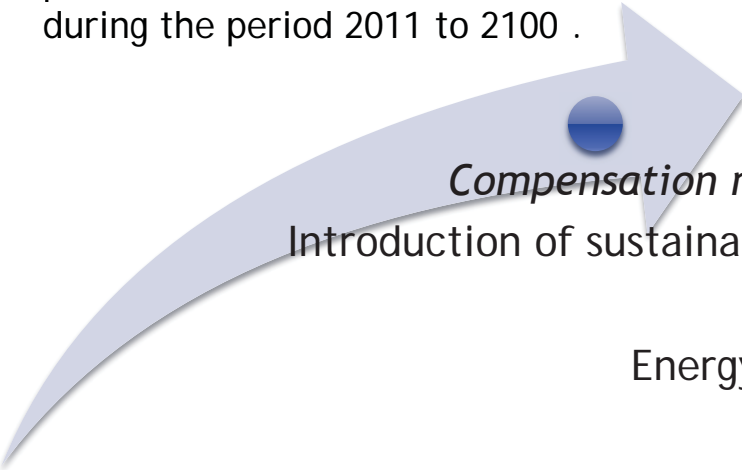
On the other hand, according to the UNFCCC (Second Communication of the United Nations Framework Convention on climate change), the Caribbean and Andean countries will be most affected during the period 2011 to 2100 with a rate of **-30% and -10% due to the impact of Climate Change in the vital areas of hydroelectric generation.**

II. The Risk and uncertainty of supply

The risk and uncertainty of energy supplies as a result of Climate Change and Climate Variability, has become in the last two decades a critical point of analysis, as these greatly affect the water yield.

The difficulty of predicting the amount of rainfall during events of interannual climate variability is largely defined by natural phenomena like El Niño and La Niña with temperature anomalies and precipitation for each month of the annual cycle, creating shortages of water for the energy sector.

The UNFCCC estimated a precipitation **reduction between 20% and 40%** in the Caribbean and Andean region during the El Niño phenomenon. However, this rate will exceed 40% in specific areas during the period 2011 to 2100 .



Compensation mechanism?
Introduction of sustainable energy?
Auction?
Energy rationing?



III. Conflict of alternative power generation

The Latin America energy market presents a growing problem in the conflict of power generation alternatives, for this reason the regulatory entities have established different compensation mechanisms like the energetic auction.

*How is the perception
and appropriation of the
society?*



The Colombian Government is looking for building future scenarios that could answer this situation, through the application and adaption of energy modeling instruments taking into account the conditions of the region.

To define possible countries to make regional integration and energy exchange and to study rising costs of energy supply as a result of the above externalities.

To select and modified the modeling tools of energy expansion plans, according to the conditions of the study region and available data. (Modeling Tools 3E Energy, Environment, Economy).

To model planning scenarios and expansion of renewable energy in Colombia and its relation with the selected countries in the medium and long-term.

To evaluate the regulatory and policy variables, infrastructure financing, regional power exchange, allocation of energy resources, risk management, market failures, conflict of interest in the industry, privatization, economic incentives, financial and operational in the framework of the climate change, climate variability, water vulnerability and the correlation between water stress and environmental effects.

