ACCESSING THE GLOBAL ENERGY MARKET TO ENHANCE LOCAL ENERGY SECURITY: THE LATIN AMERICAN CASE

Plausibility of Political Energy Integration and Energy Security

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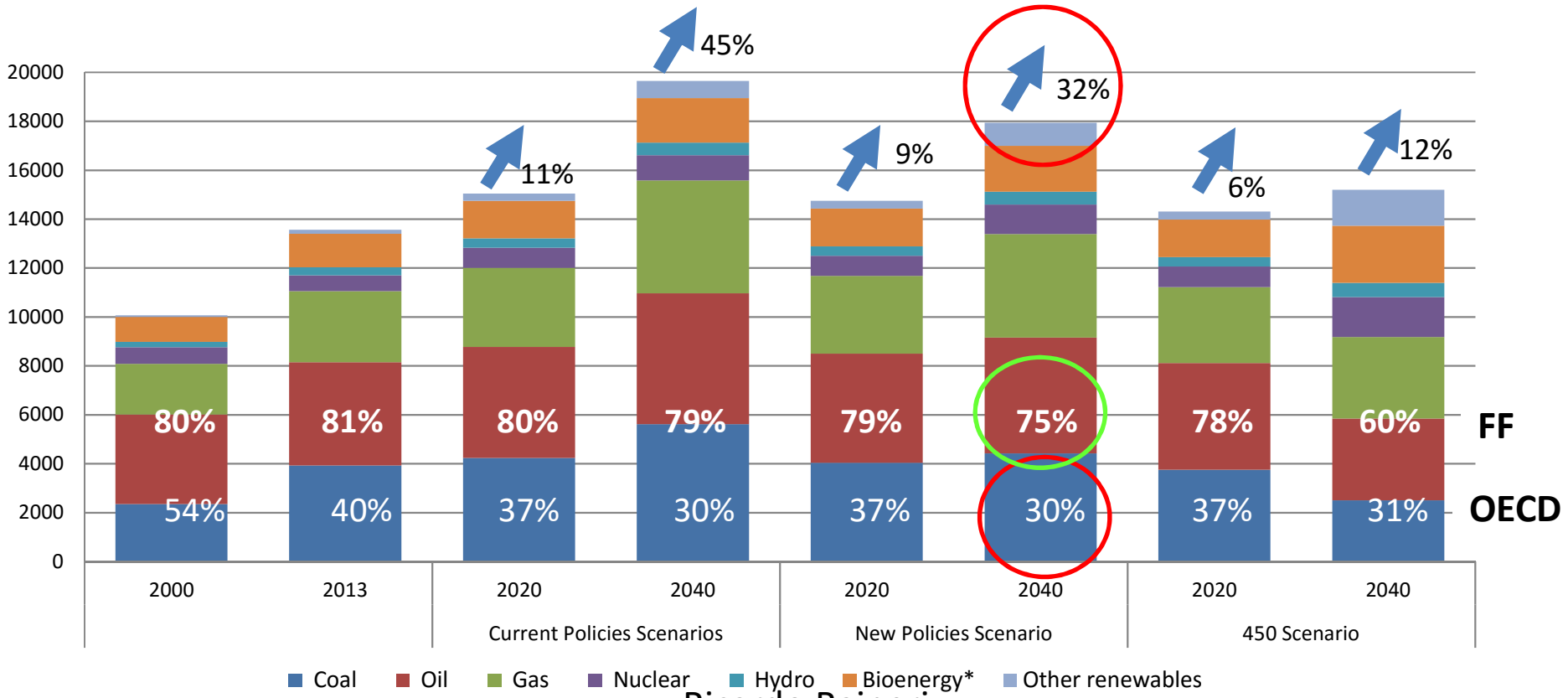
Energy Demand

- According to IEA world energy demand is expected to growth from 13,559 Mtoe in 2013 to 17,934 Mtoe in 2040 in its New Policies Scenario , what represents a 32% increase in energy consumption, where fossil fuels participation in primary energy demand are expected to decrease from 81% in 2013 to 75% in 2040.

World primary energy demand by fuel and scenario, and FF share

Mtoe, Data source WEO 2015



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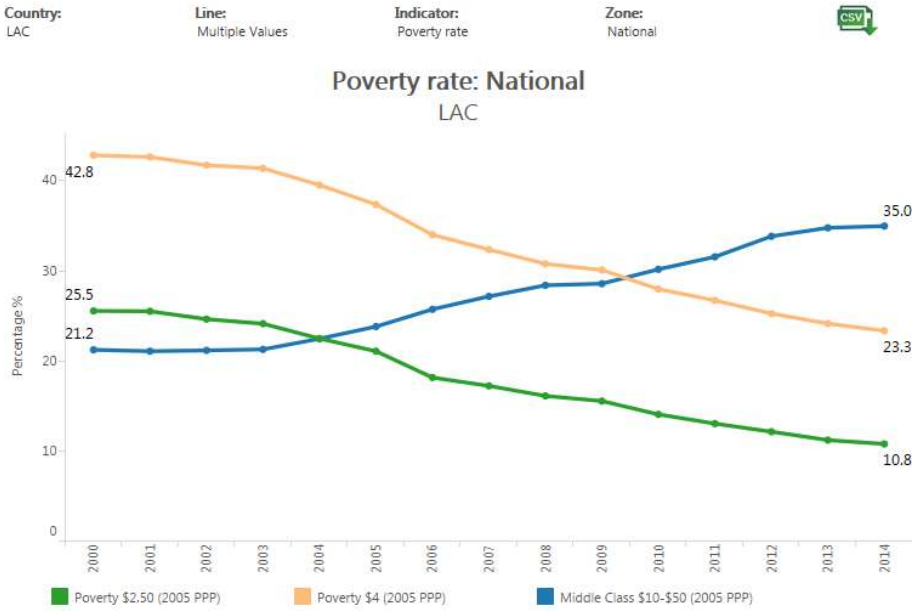
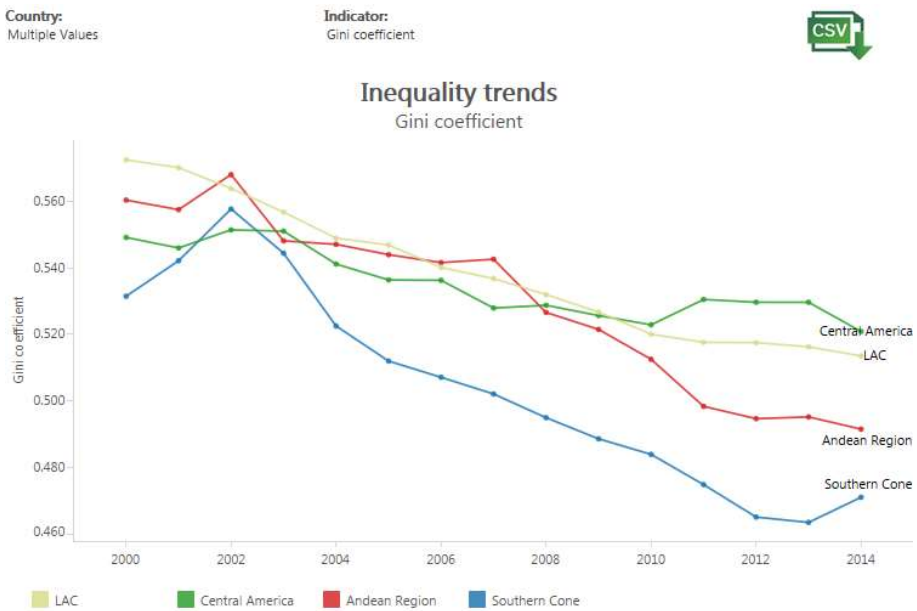
Population and the Economy

- **LAC 623 million, 100 million more expected in 2030, but still more than 22 million (3.5%) without access to electricity** and 80 million (13%) without access to modern cooking facilities.

A huge appetite for energy: we are more and the modern economy is addicted to energy.



Source: LAC Equity Lab tabulations of SEDLAC (CEDLAS and the World Bank).
Note: Since the numbers presented here are based on SEDLAC, a regional data harmonization effort that increases cross-country comparability, they may differ from official statistics reported by governments and national statistical offices. In cases where data are unavailable for a given country in a given year, values have been interpolated using WDI data to calculate regional measures. The number of poor is based on total population from WDI. The LAC aggregate is based on 17 countries in the region for which microdata are available at national level. Urban and rural poverty rates are not available for the LAC aggregate or subregions. *Updated April 2016*



Source: LAC Equity Lab tabulations of SEDLAC (CEDLAS and the World Bank) and World Development Indicators (WDI).
Note: Since the numbers presented here are based on SEDLAC, a regional data harmonization effort that increases cross-country comparability, they may differ from official statistics reported by governments and national statistical offices. The LAC aggregate is based on 17 countries in the region for which microdata are available; they do not include Haiti. In cases where data are unavailable for a given country in a given year, values have been interpolated using WDI data to calculate regional measures. *Updated April 2016*

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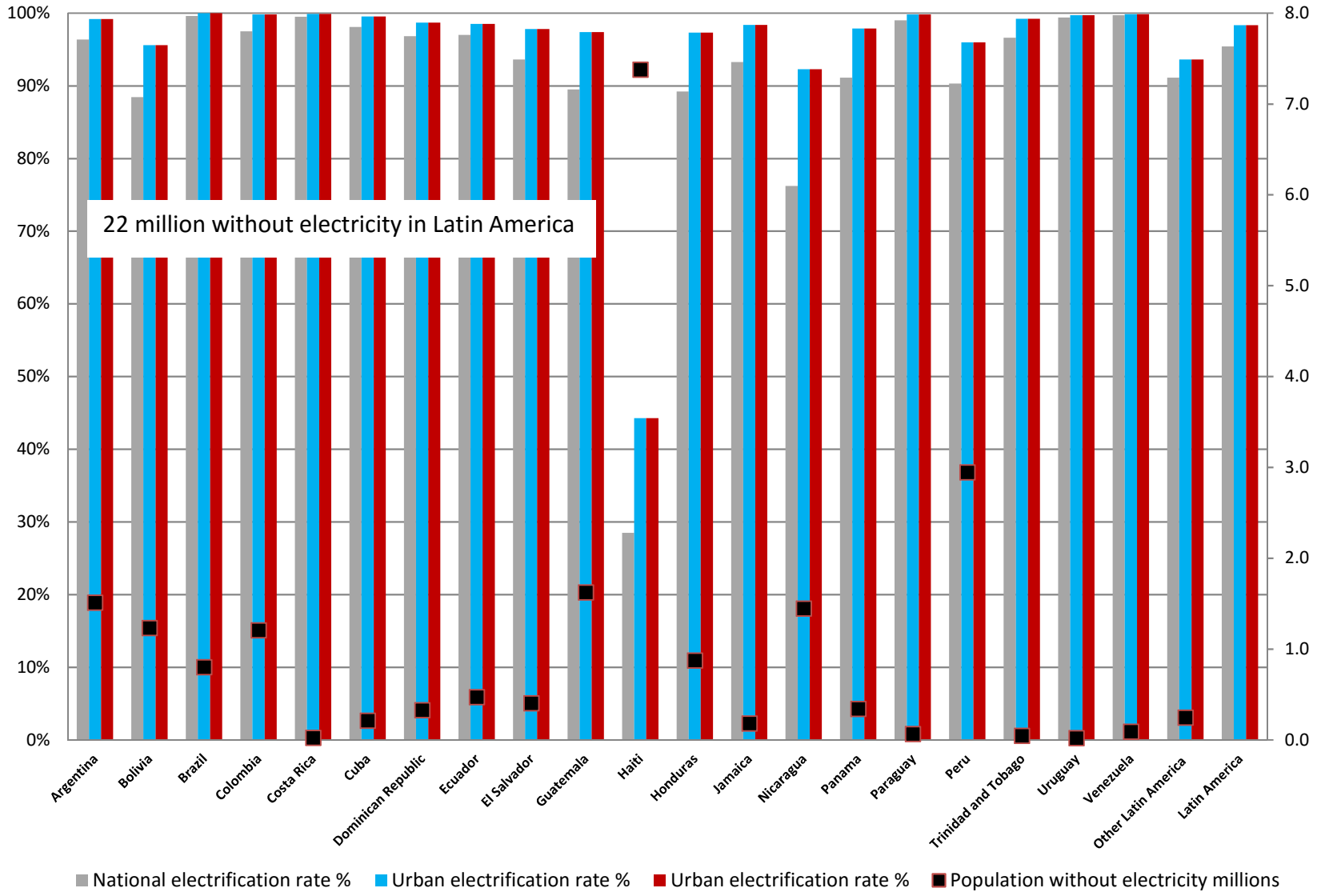
Energy Demand LAC

Electricity access in Latin America - 2013



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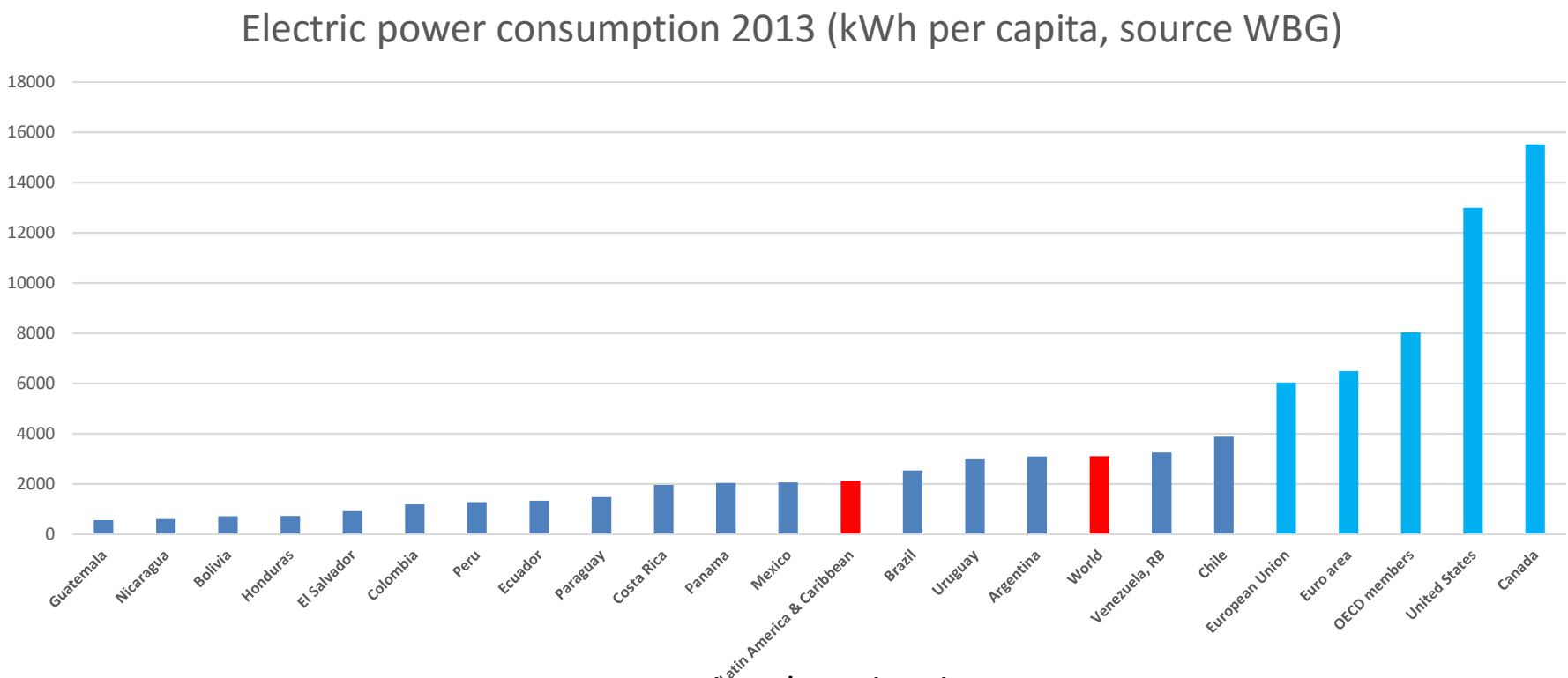
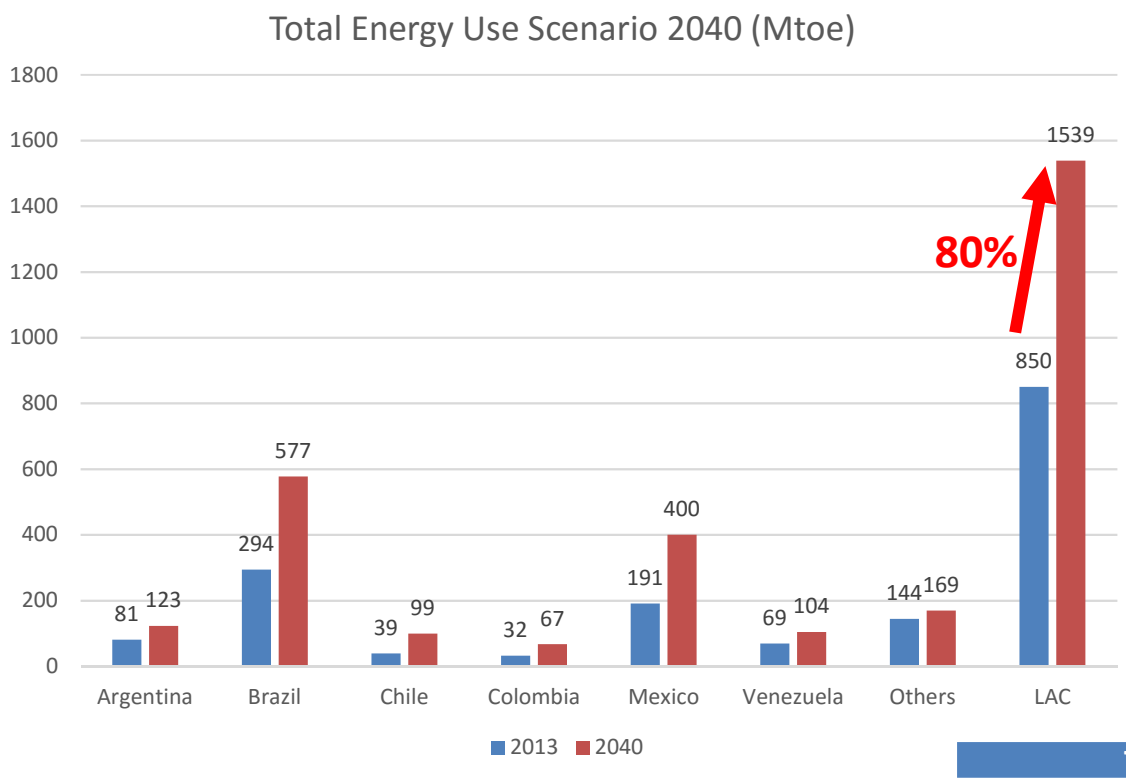
Energy Demand LAC

- Regional levels of per capita electricity consumption average **1/3 of the European Union, ¼ of OECD members, and less than 1/6 of the one in the US.** Thus, while the region keeps improving the standard of living of its population, the number of people living in poverty decreases, and the population that is incorporated to the middle class increases, and the regions increases the size of its economy and productive activities, we will expect that energy demand will increase further.



Primary Energy Demand LAC



LAC primary energy consumption represents only 6.7% of world energy consumption, and it has grown more than 100% in the last 25 years, or at an annual rate of 2.9%.

Total Energy Use Scenario 2040 (Mtoe)				
	2013	2040	Growth	CAGR
Argentina	81	123	51.9%	1.56%
Brazil	294	577	96.3%	2.53%
Chile	39	99	153.8%	3.51%
Colombia	32	67	109.4%	2.77%
Mexico	191	400	109.4%	2.78%
Venezuela	69	104	50.7%	1.53%
Others	144	169	17.4%	0.59%
LAC	850	1539	81.1%	2.22%

Source: Lights On? Energy Needs in Latin America and the Caribbean to 2040. Lenin H. Balza, Ramón Espinasa, Tomas Serebrisky. IDB 2014.

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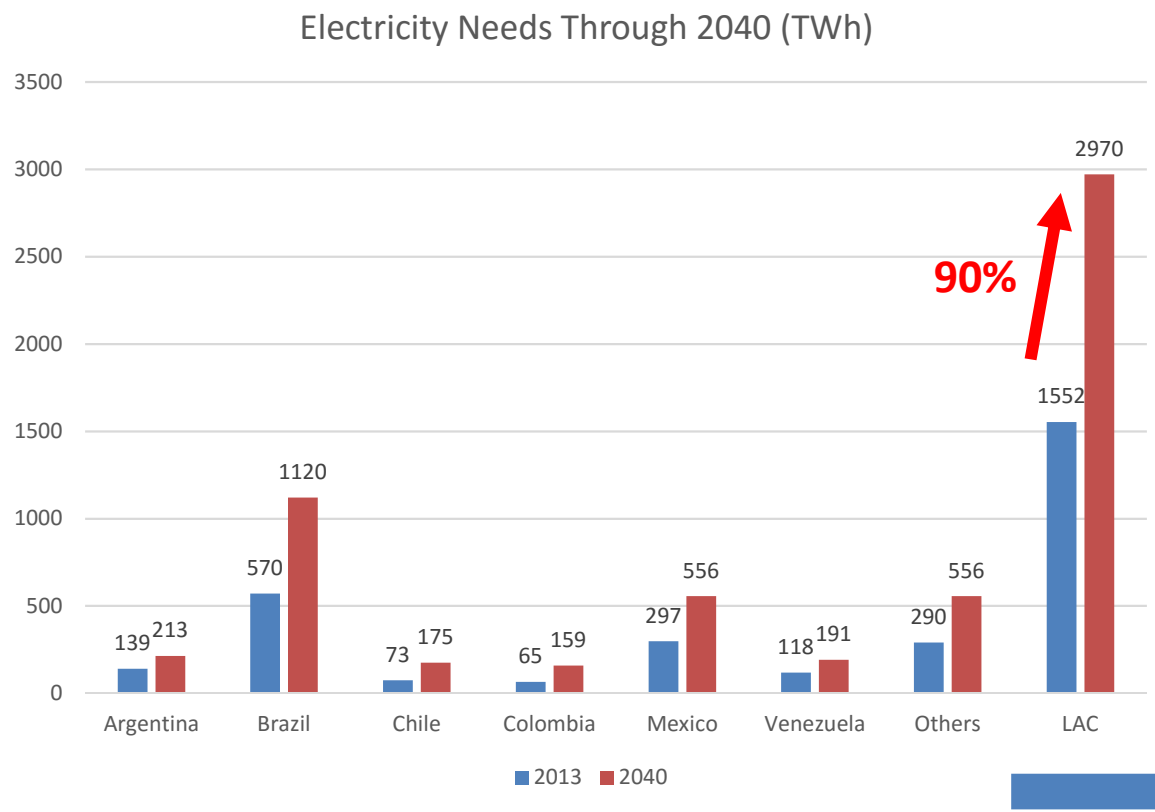
Electricity Demand LAC



Electricity Needs Through 2040 (TWh)				
	2013	2040	Growth	CAGR
Argentina	139	213	53.2%	1.59%
Brazil	570	1120	96.5%	2.53%
Chile	73	175	139.7%	3.29%
Colombia	65	159	144.6%	3.37%
Mexico	297	556	87.2%	2.35%
Venezuela	118	191	61.9%	1.80%
Others	290	556	91.7%	2.44%
LAC	1552	2970	91.4%	2.43%

Source: Lights On? Energy Needs in Latin America and the Caribbean to 2040. Lenin H. Balza, Ramón Espinasa, Tomas Serebrisky. IDB 2014.

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LAC Resources: Fossil Fuels

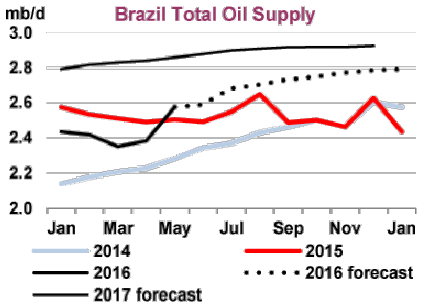
LAC has 22% of the world's proven oil reserves, 4% of natural gas and coal 1.7%

OIL PR Total LAC as % World	21.95%
Venezuela	19,62%
Brazil	0,79%
Mexico	0,62%
Ecuador	0,49%
Argentina	0,14%
Colombia	0,14%
Otros LAC	0,14%
Source: BP 2016	

Natural Gas PR as % World PR	4.3%
Venezuela	3.0%
Mexico	0.2%
Brazil	0.2%
Trinidad and Tobago	0.2%
Peru	0.2%
Argentina	0.2%
Other LAC	0.3%
Source: BP 2016	

EIA estimates that LAC has **18% of technically recoverable Shale Oil**, where 7% is in Argentina, 4% within Colombia and Venezuela in the Maracaibo basin, and 3% in Mexico

Pre Salt Brazil: there are **an estimated 13.3 billion barrels** of commercially recoverable reserves from announced projects in offshore Brazil



Shale gas:
EIA **22% in LAC**, Argentina 9%, Mexico 6% and Brazil 3%

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LAC Resources: Renewables

IADB, Rethinking our Energy Future

- LAC has developed **1/3 of regional hydropower potential (320 GW)**
- Great potential for wind, geothermal, solar and other renewables
- Brazil is the second largest producer of ethanol and biodiesel

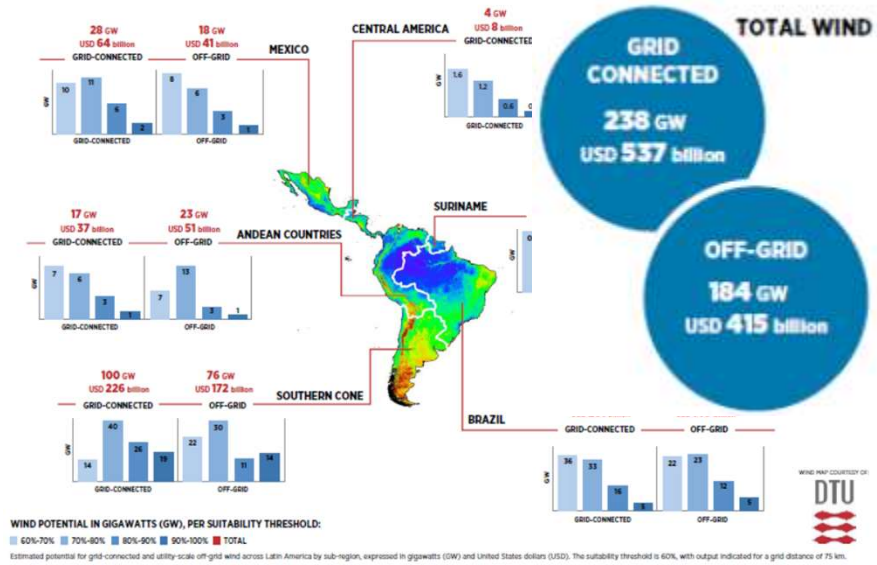

Figure 4: Wind energy - Grid-connected and utility-scale off-grid technical potential estimates for Latin American by region, expressed in GW and USD. The suitability threshold is 60% and the output is indicated for a grid distance of 75 km.

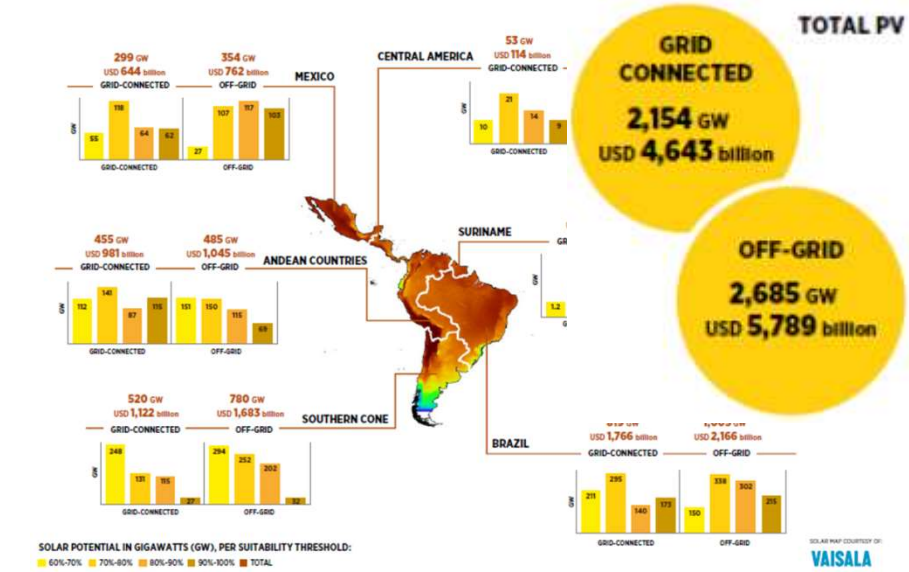

Figure 5: Solar PV - Grid-connected and utility-scale off-grid technical potential estimates for Latin America by region, expressed in GW and USD. The suitability threshold is 60% and the output is indicated for a grid distance of 75 km.

IRENA GLOBAL ATLAS FOR RENEWABLE ENERGY INVESTMENT OPPORTUNITIES IN LATIN AMERICA

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SA Major Power Generation and Electrical Interconnections 2014

Ref.	Country	Name	River	Inst. Cap.	Comment
A	Br -Py	Itaipú	Paraná	14.000 MW	In operation
B	Ar -Uy	Salto Grande	Uruguay	1.890 MW	In operation
C	Ar -Py	Yacyretá	Paraná	3.200 MW	In operation
D	Ar -Br	Garabí	Uruguay	1.500 MW	In Study
E	Ar -Py	Corpus	Paraná	3.400 MW	In Study
Ref.	**Country**	**Name**	**River**	**Inst. Cap.**	**Comment**
F	Pe	Inambari	Inambari	2.300 MW	In Study
G	Bo	Cachuela Esperanza	Madeira	800 MW	In Study

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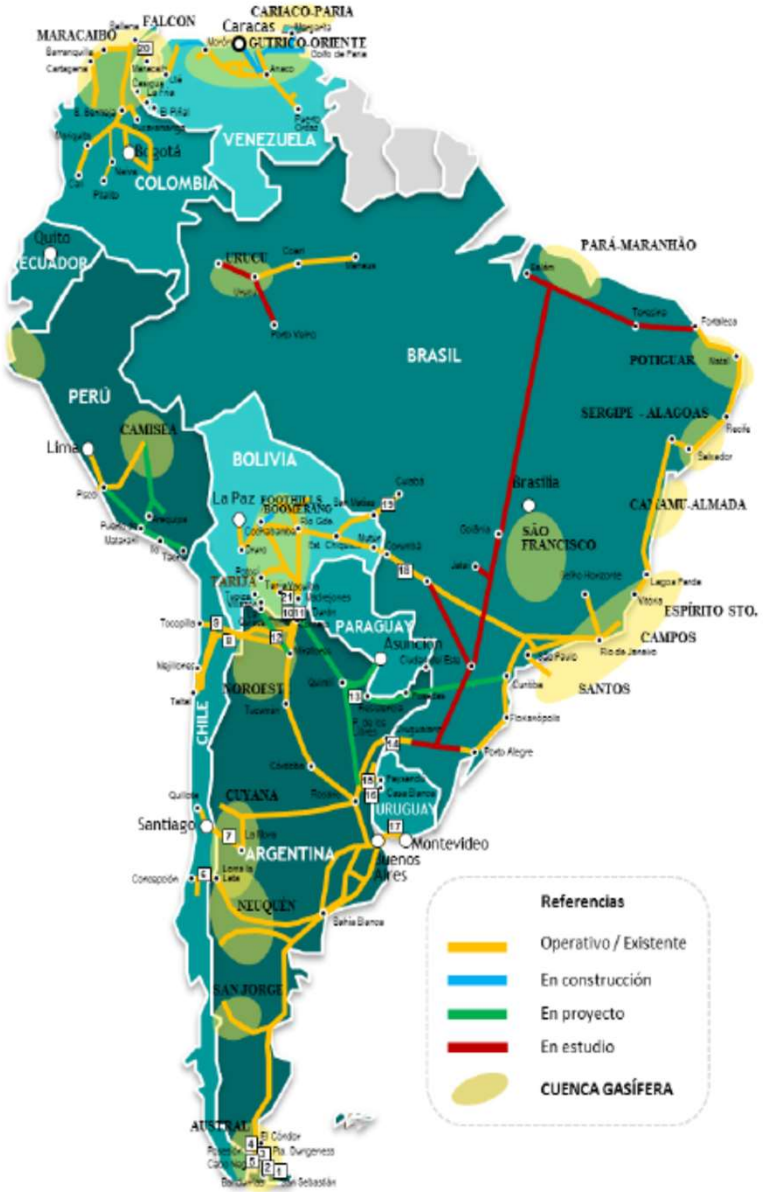
Cier, 2015

Main Gas Pipelines, South America 2014

Gas Trade in 2015 (billion cubic meters)				
World Gas CONSUMPTION	3468.6			
LNG	9.8%			
PIPE	20.3%			
Total gas trade LNG and Pipe	30.1%			
LAC Gas CONSUMPTION	258.0			
	Pipeline imports	LNG imports	Pipeline exports	LNG exports
Mexico	29.9	7.1	0.0	0.0
Trinidad and Tobago	0.0	0.0	0.0	17.0
Other S. & Cent. America	18.5	20.0	18.5	5.0
LAC Total trade	48.3	27.1	18.5	22.0
LAC LNG imports/LAC Gas Consumption				10.5%
LAC PIPE imports/LAC Gas Consumption				18.7%
LAC LNG and PIPE imports/LAC Gas Consumption				29.2%
Source: Own calculations with BP data.				

Oil trade in 2015 (Thousand barrels daily)				
	Crude Imports	Product Imports	Crude Exports	Product Exports
Total World	39707	21516	39707	21516
Mexico	‡	774	1201	171
S. & Cent. America	404	1908	3462	605
LAC	396.2	2647.0	4,655.2	740.5
Oil Production LAC				10,299.7
Oil Production WORLD				91,670.3
Crude Exports LAC/Oil Production LAC				45.2%
Source: Own calculations with BP data.				



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Cier, 2015

Main Advantages

- **LAC has abundant renewable resources and FF**, unevenly distributed, and with great complementarities

LAC has sufficient resources for its energy needs and to contribute to the energy needs of other regions

Expected advantages:

- Integration of the countries and with the rest of the continent
- Generates wealth and monetize energy resources
- Increase system reliability
- Optimizes the use of natural resources
- Cleans the electricity mix and improves environmental sustainability
- Uses the complementarities of the basins and reduce system energy costs
- Reduces the cost of buying oil for power generation

Potential Benefits In Sub Zones

- **Central America**
  - **Economies of scale**
  - Enable more efficient energy infrastructure
  - Reduce energy costs and dependency on oil for power generation
- **Andean community**
  - Energy exchanges
  - Optimization of an integrated power system
  - **Complementarities on power generation for peak demand**
  - **Complementarities on rain seasons with Niño and Niña**
- **South Cone + Brazil**
  - Chance to optimize the use of energy resources
  - **Binational hydro projects**
  - **Electricity and natural gas swaps**
  - **Energy Wheeling**
  - Synergies between natural gas, hydro, wind, solar and biomass.
  - **Energy infrastructure for export**

Plausibility of Political Energy Integration and Energy Security

- Is there a consensus that Energy Integration would enhance energy Security in Latin America?
- Which are main challenges on regulatory convergence/ harmonization?
- Innovative solutions for a Positive Agenda on Energy Integration.

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Energy Security

- **IEA:** defines energy security as the uninterrupted availability of energy sources at an affordable price
- **NATO:** Energy security – there's much more at stake than cheap, reliable sources of energy. It's about independence.

Energy security is about politics, sovereignty, political stability, democracy and development

Risk Categories Faced Investment Projects

Specific risks of the project:

- Construction costs
- Corporate
- Human Resources
- Environmental and social
- Operation
- Technological

Economic risks:

- Market
- Macroeconomic
- Financial

Political risks:

- Country
- War, terrorism and civil unrest
- Expropriation
- Rules and Policy
- Currency inconvertibility and transfer restriction
- Breach of Contract

Source: World Energy Investment Outlook, 2014

MIGA Investment Guarantee Guide, 2015

Risk on Energy Integration

Import Country

- **Choices:** depend on other nation, diversify energy sources with access to regional and/or global markets, or develop native energy resources/sources?
  - Risk of **opportunistic behavior** (principal-agent problem) from
    - **price instability, idiosyncratic risk** different to global markets risk
    - **sudden energy disruptions** with deep economic and political effects
    - changes in **tax regimes, royalties, contractual schemes** in export country which might affect price and supply
    - energy being used as a **political weapon**
    - price/energy used to **punish/rewards**, or as a mean of **extortion/manipulation**
  - Risk of changes in **foreign regulatory framework, environmental/social safeguards** which might affect price and supply
  - Risk of exposure to **political decisions**, ex. energy subsidies, and conditions **of turmoil and social unrest in neighborhood countries**
  - Risk of exposure to the **Rule of Law** and changes in the **business environment** in neighborhood countries
  - Risk of **stranded assets/investments, and huge switching costs**
  - Risk of a **disrupted energy system** with economic, social, environmental and political consequences

Risk on Energy Integration

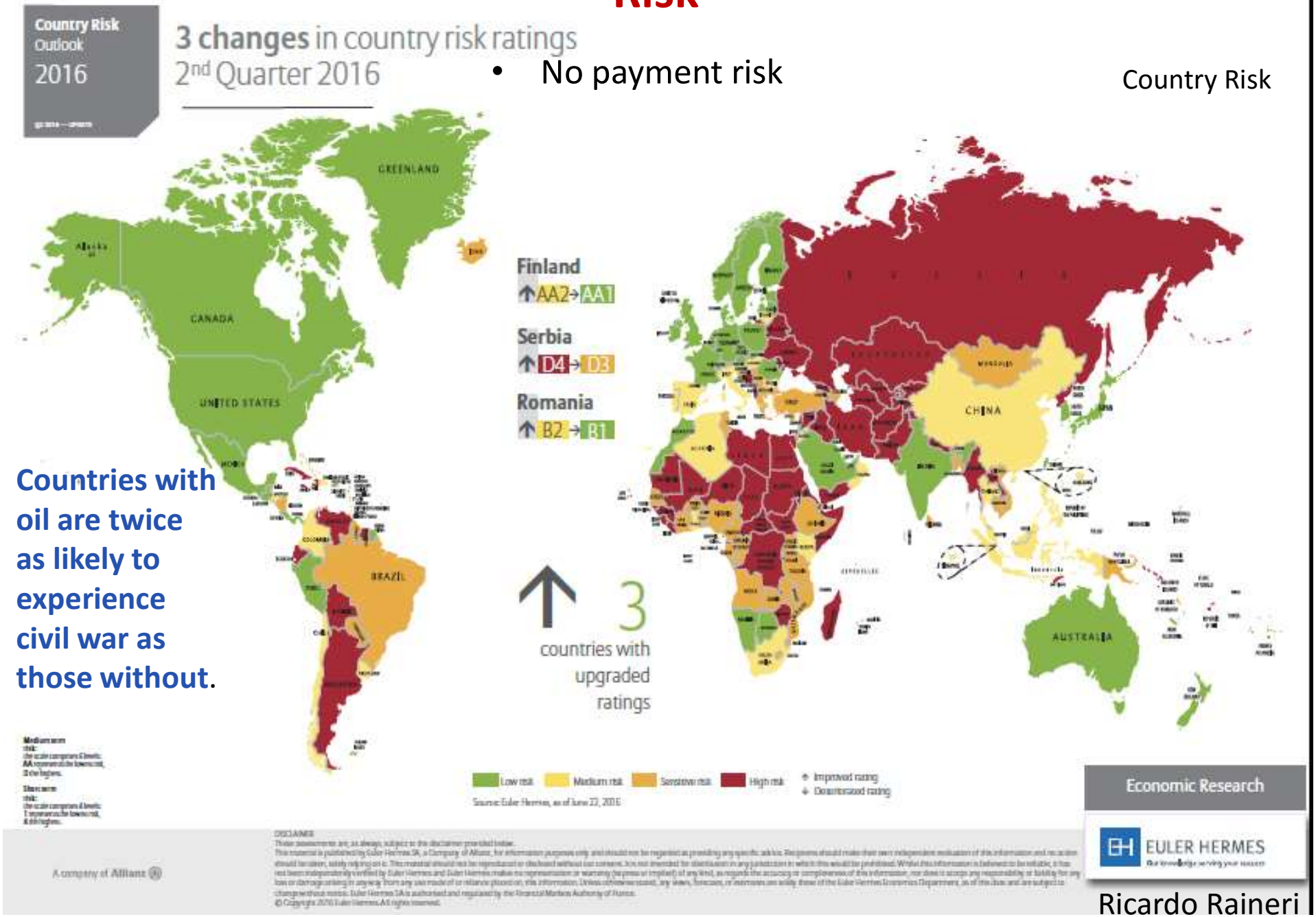
Export Country

- **Choices:** Revenues that depend on other nations, or diversify energy markets to access regional or global markets, or distribute wealth and how?
  - Need to **secure a market** and a **stream of revenues**
  - **Risk on revenues stream**, government revenues, and its impact on social and political stability. The challenge of revenue management and energy subsidies.
  - **Stranded assets**
  - Risk of opportunistic behavior (principal-agent problem)
    - Risk of **price instability** or price extortion/manipulation
    - Risk of **changes in tax regimes, royalties, contractual schemes** in import country which might affect price and demand
  - Changes in **foreign regulatory framework, environmental/social safeguards** which might affect price and demand
  - Demands from **local/national civil society/communities** that expects a share from energy rents.

Risk

- No payment risk

Country Risk



Countries with oil are twice as likely to experience civil war as those without.

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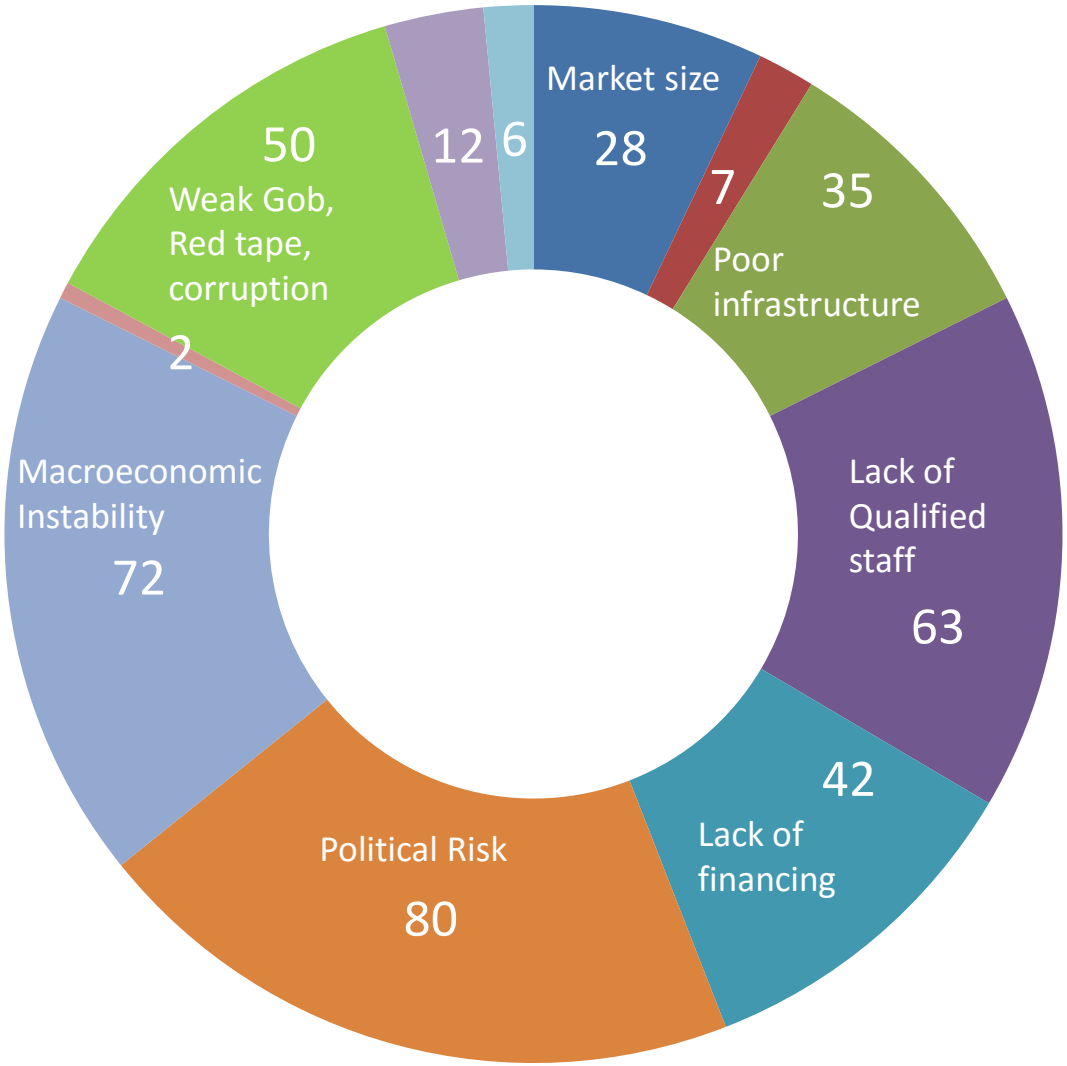
Main Constraints to Invest in Developing Countries

Next three years



- Limited size of the market
- Lack of investment opportunities
- Poor infrastructure
- Lack of qualified staff
- Lack of financing for investments in these countries
- Political risk
- Macroeconomic instability
- Lack of information on the country's business environment
- Weak government institutions/red tape/corruption
- Increased government regulation in the aftermath of the global financial crisis
- Other

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Source: MIGA WIPR report 2013, MIGA-EIU Political Risk Survey

Is there a Consensus that Energy Integration would Enhance Energy Security in Latin America?

- From a **technical and economic point of view**, **yes** there are benefits at the countries` and regional level
- But, from an **energy security/geopolitical** perspective **I can't assure that**.
  - There is a **wide diversity of views**, of **development models**, and on the **role of the private and public sectors** within the region
  - There are diversity of views on the **distribution of rents from energy resource, or twisted competition to capture them**
  - **Recent history of unilateral changes**, on the use of energy as political tool, or as an arm of political coercion and political power, to achieve other objectives of national/political interest, locally, within the region or with energy partners
  - All these happened **besides the great business opportunities that have existed within the region,** to create wealth and improve citizens living conditions. The forgone opportunities!

Which are main Challenges on Regulatory Convergence/ Harmonization?

- That will depend on the desired level of integration
  - But, we don't need regulatory convergence to achieve higher levels of energy integration. What is needed is **a compromise/agreement on the what, the where and the how** (single or independent markets)
- Power sector
  - **Power export contracts**, such as hydroelectricity from Itaipu
    - **Available energy resources** that will not be at risk in the short term and provide a safe environment which mimics an energy independence scenario
  - **Operational safety and exchanges of opportunity**
  - **Operational safety and energy exports**
  - **Swap and wheeling**
- Energy markets
  - Binational energy projects (ring fencing)
  - Coordinated operation, centrally managed/dispatched or market driven (oil and gas versus electricity synchronous or asynchronous interconnections)
  - Single or independent markets

- The main challenge is to **compromise/commit and to deliver on the what, the where and the how**

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Innovate Solutions for a Positive Agenda on Energy Integration.

- Energy Access, Energy for Development
  - Changes in global and regional energy markets, regional politics can impact the nations interests
  - New energy resources map is reshaping FF, Hydro and NCR in LAC
  - Climate change
  - Civil Society
- Identify different levels/steps on energy integration process
- Recognize the risk from energy integration
- Roles of the Government, SOE, **Private Companies** and **MDA**
- **A resilient business model, where independence and security are not at risk**
- **Perseverance and persistency**

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The Way forward

- **There are plenty of multilateral institutions in the region**, with very poor results, which has not been indifferent to the results of regional integration. But, strong MDA are needed to safeguard what is agreed
- **There are different views on energy development, organization, roles of the market and the state**, etc.

Challenges for energy integration

- Need for **well crafted and resilient agreements between States, with guarantees/role MDA,** on the what, the where and the how; and the need to have an appropriate dispute resolution mechanism
- Avoid the **public goods problem on security**, and enable a framework that brings an appropriate level of investments, system sufficiency.
- **Confidence that energy will not be used as a political tool or as an arm of geopolitical power. And this only happens if there is an antidote to the use of energy as a political tool or as an arm of geopolitical power.**

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