# Renewables, Energy Complementarity and Global Sustainable Goals:

## *challenges for Latin America & the Caribbean*


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# Presentation overview

1 - The Global Goals on Renewables

2 – Global Tracking Framework's outlook on Renewables

3 – Situation and perspectives of Renewables in LAC

4 – The ECLAC/MIT Study: "*Fostering an Efficient Integration of Renewables in South America*"

# The 2030 Agenda for Sustainable Development

- At the UN Sustainable Development Summit (Sept. 2015), world leaders adopted the 2030 Agenda for Sustainable Development, which includes 17 Sustainable Development Goals (SDGs) to be achieve by 2030 in order to:
  - *end poverty,*
  - *fight inequality and injustice*
  - *tackle climate change*

- The SDGs combine social and economic development with ecological sustainability. They also address issues such as peace and security, the rule of law and good governance, all of which are essential to sustainable development

- The SDGs are universally applicable. This means that all the countries in the world, according to their capacity, should contribute to achieving the goals.

# S.D. Goal #7: Ensure access to affordable, reliable, sustainable and modern energy for all

- By 2030, ensure universal access to affordable, reliable and modern energy services
- By 2030, increase substantially the share of renewable energy in the global energy mix
- By 2030, double the global rate of improvement in energy efficiency
- By 2030, enhance international cooperation to facilitate access to clean energy research and technology, …… and promote investment in energy infrastructure & clean energy technology
- By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries

# The *SE4ALL* Initiative

The Sustainable Energy for All (SE4ALL) initiative is a multi-stakeholder partnership between governments, the private sector, and civil society.

Launched by the UN Secretary-General in 2011, it has three interlinked objectives to be achieved by 2030:

- Ensure universal access to modern energy services.
- Double the global rate of improvement in energy efficiency
- Double the share of renewable energy in the global energy mix.

# The *SE4ALL* Latin America & Caribbean Hub

- The SE4All/Americas Hub is hosted by the Inter-American Development Bank (IADB) and its mission is to facilitate the implementation of the SE4All initiative in Latin America and the Caribbean (LAC) region

- In Feb. 2015, the Hub launched a partnership between IADB , the UNDP and ECLAC, to implement strategic objectives on behalf of SE4All and help coordinate activities and information in the LAC Region.

- Main targets:
  - *creation of knowledge products,*
  - *help with planning for universal access to energy,*
  - *coordination with national and international partners*
  - *monitoring the status & advances towards SE4All goals*

→ Need for a goal-tracking system !

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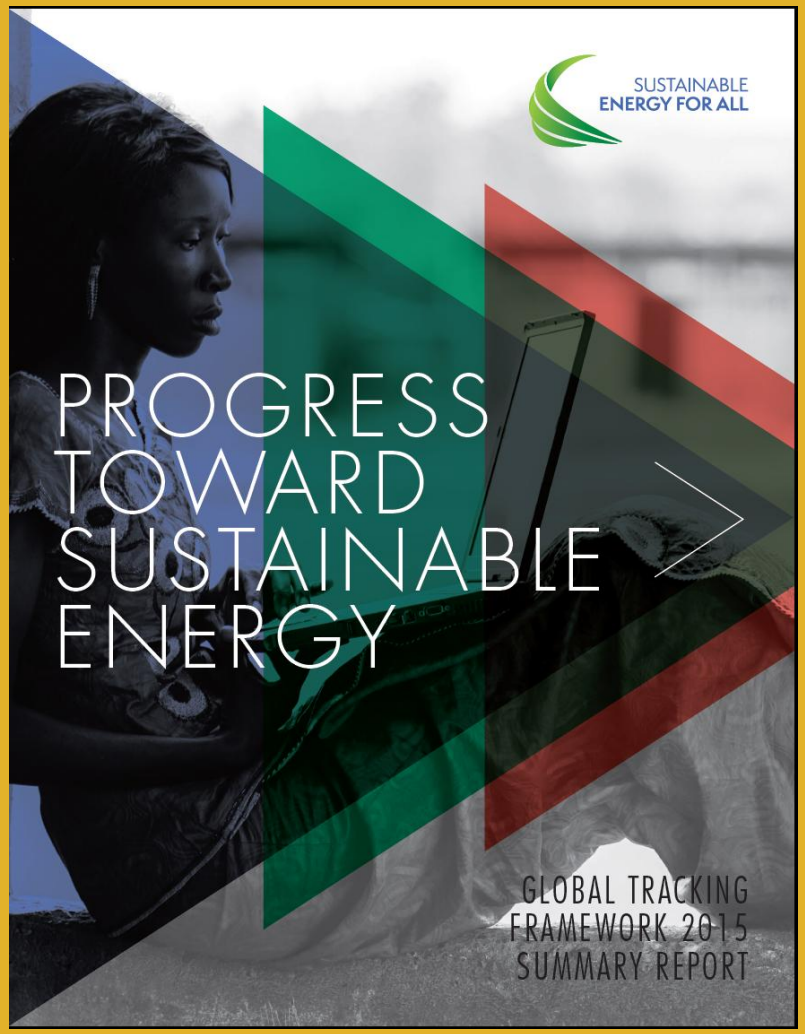
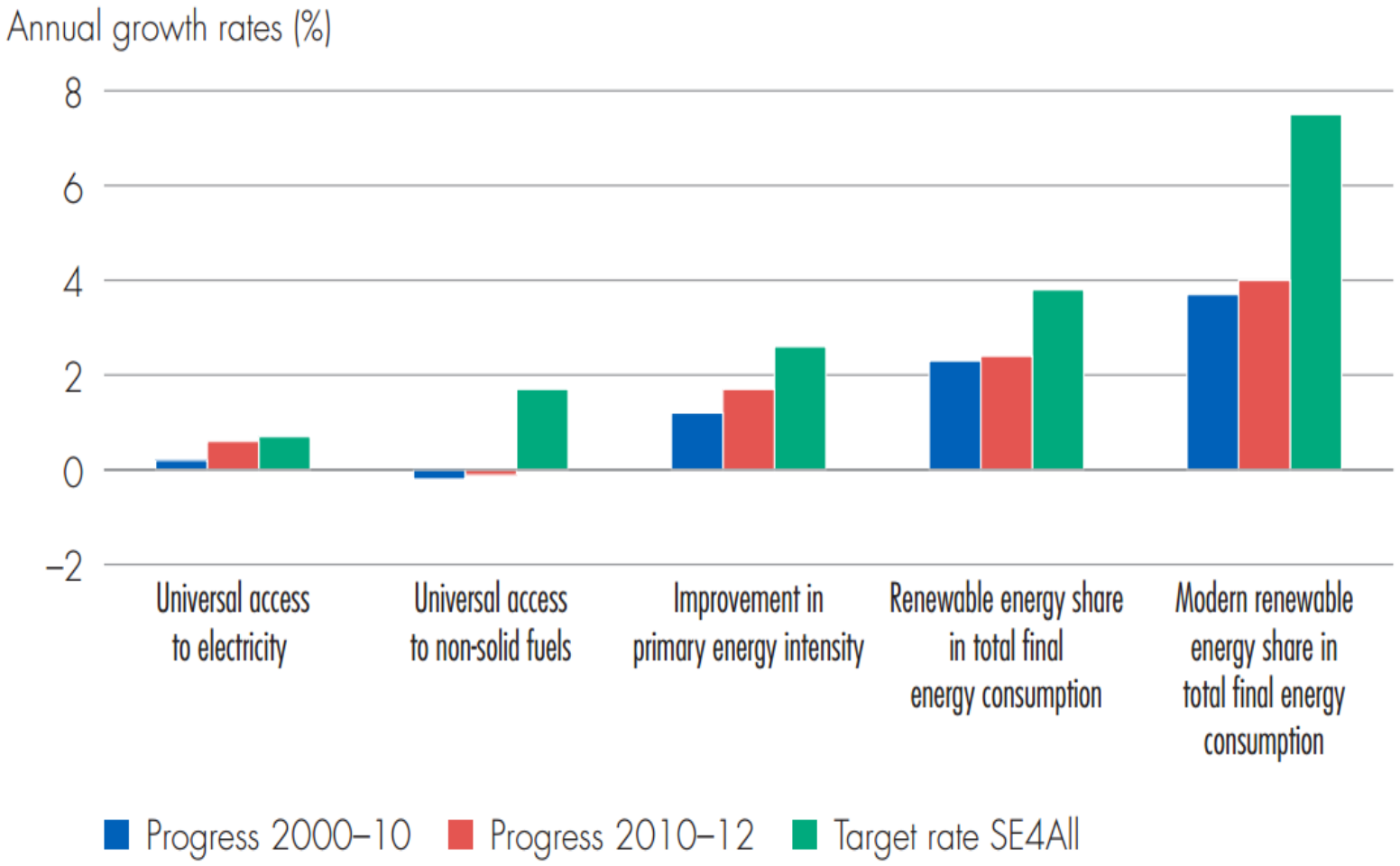
# Sustainable Energy for All – SE4ALL

## *Global Tracking Framework 2015*



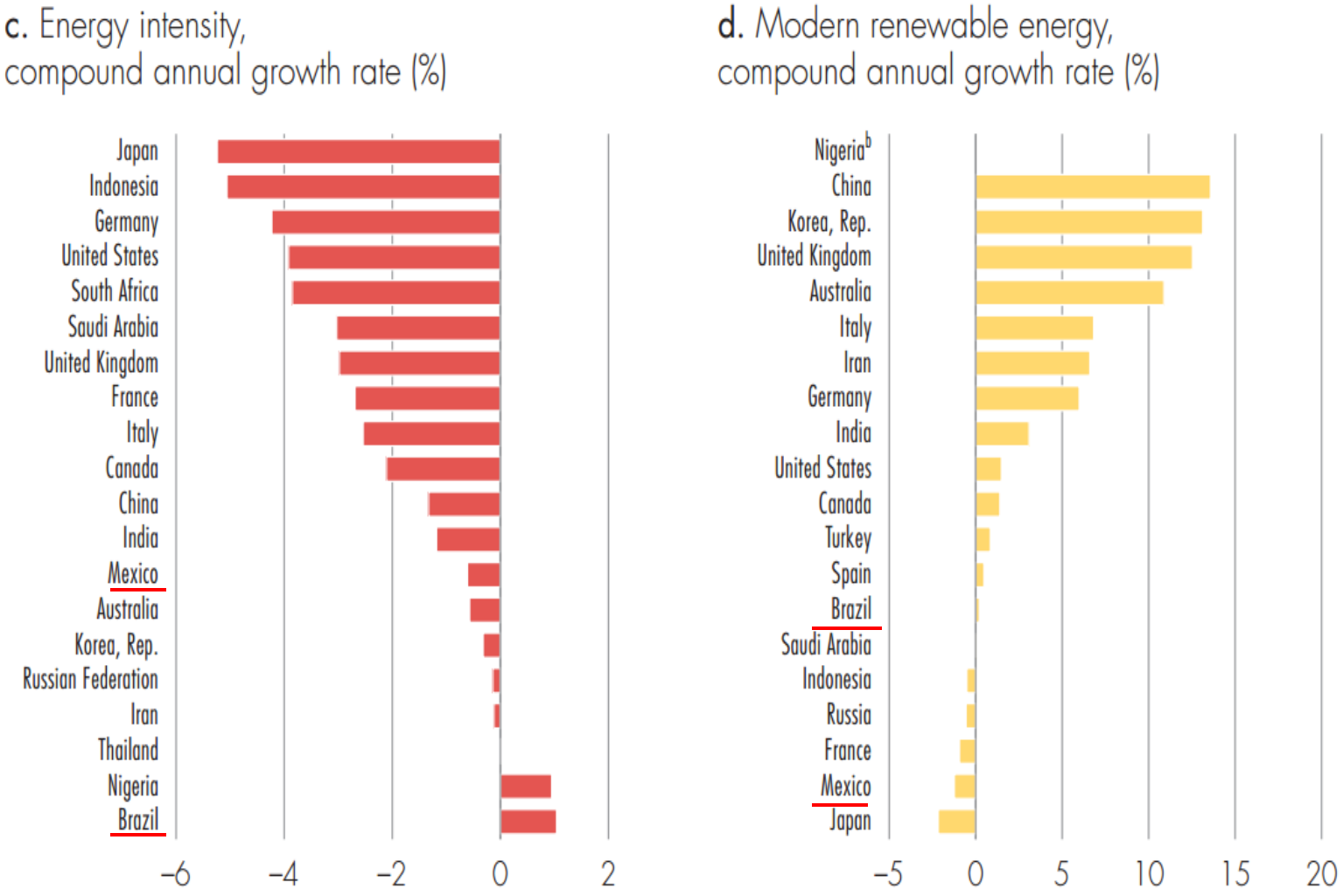

source: Global Tracking Framework 2015, WB

# RATE OF PROGRESS TO ATTAIN *SE4ALL* TARGETS



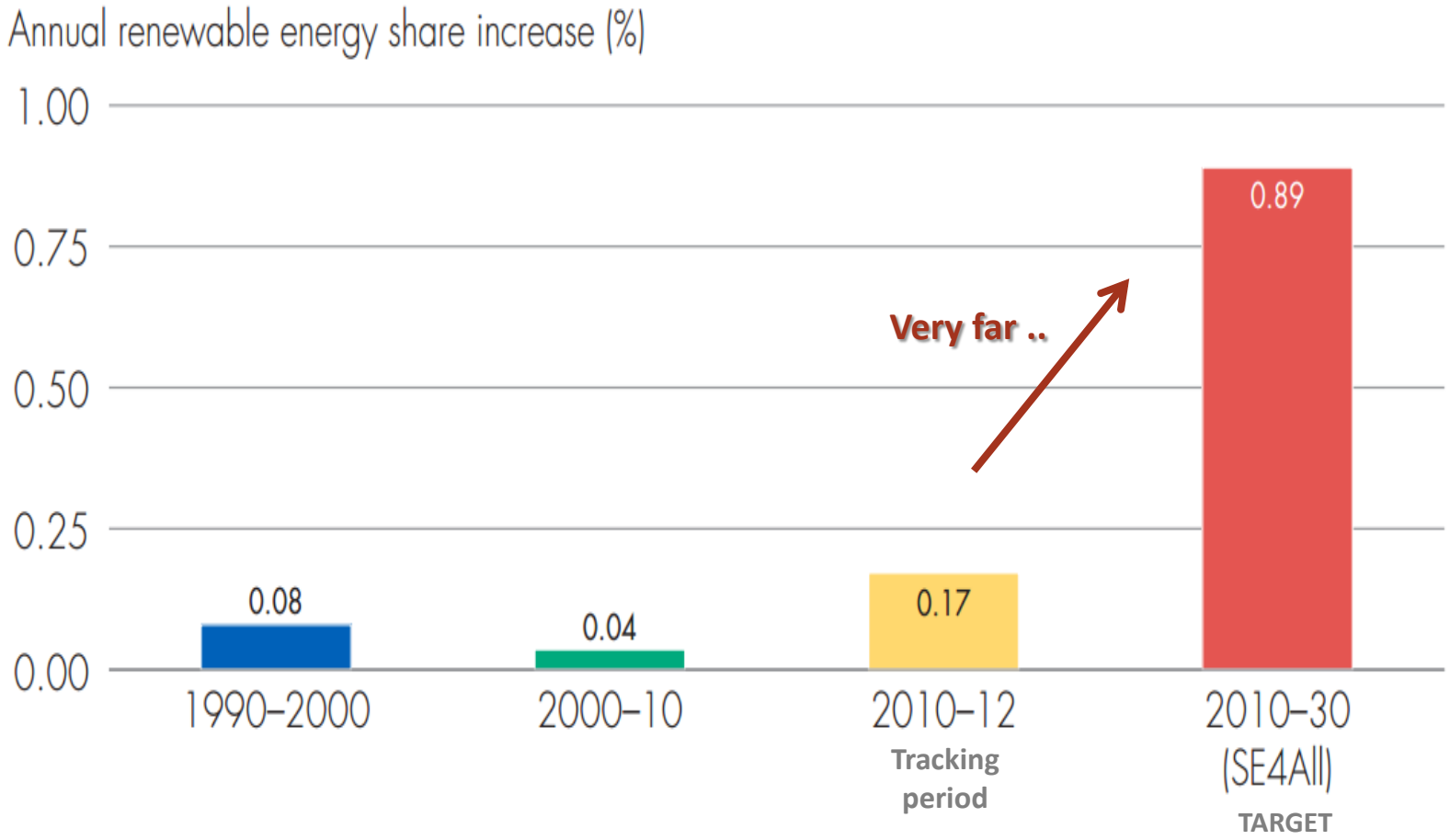

source: Global Tracking Framework 2015, WB

# 2010→2012: PROGRESS TOWARDS SE4ALL TARGETS



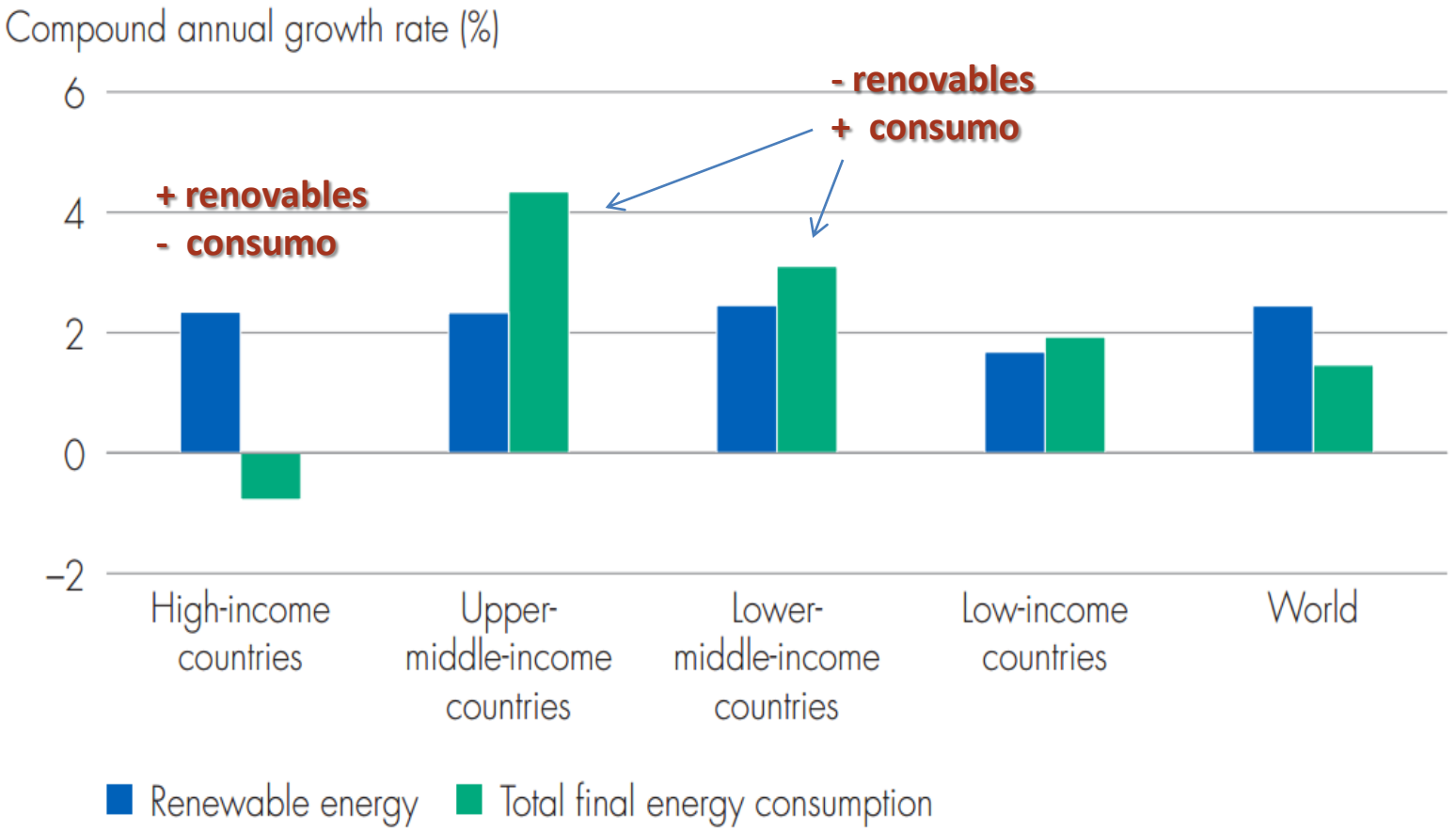

source: Global Tracking Framework 2015, WB

# Average annual increase of renewable energy share



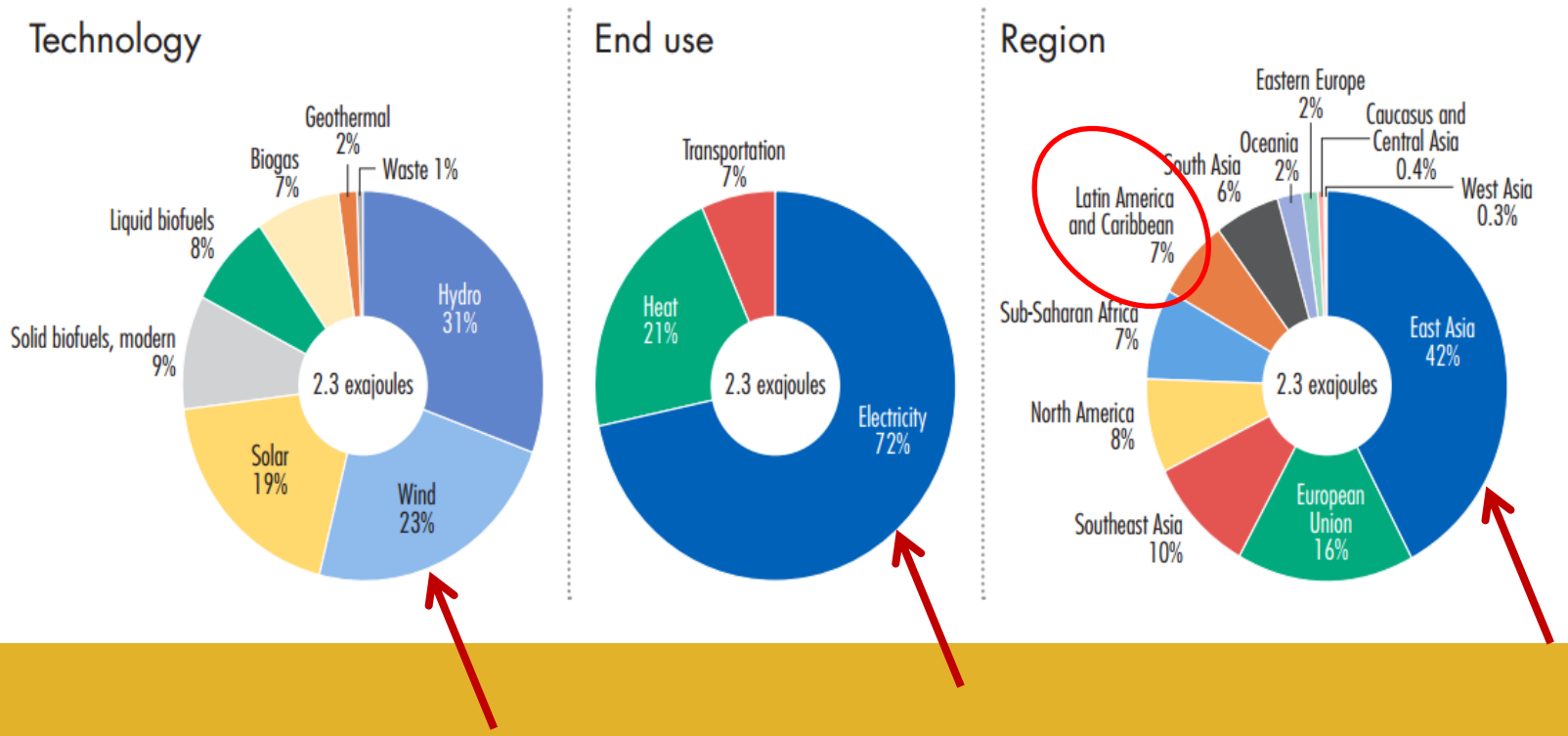

source: Global Tracking Framework 2015, WB

# 2010→2012: Annual growth rate of renewable energy consumption VS total final energy consumption




source: Global Tracking Framework 2015, WB

# 2010→2012: net increment of modern renewables in total final energy consumption




source: Global Tracking Framework 2015, WB

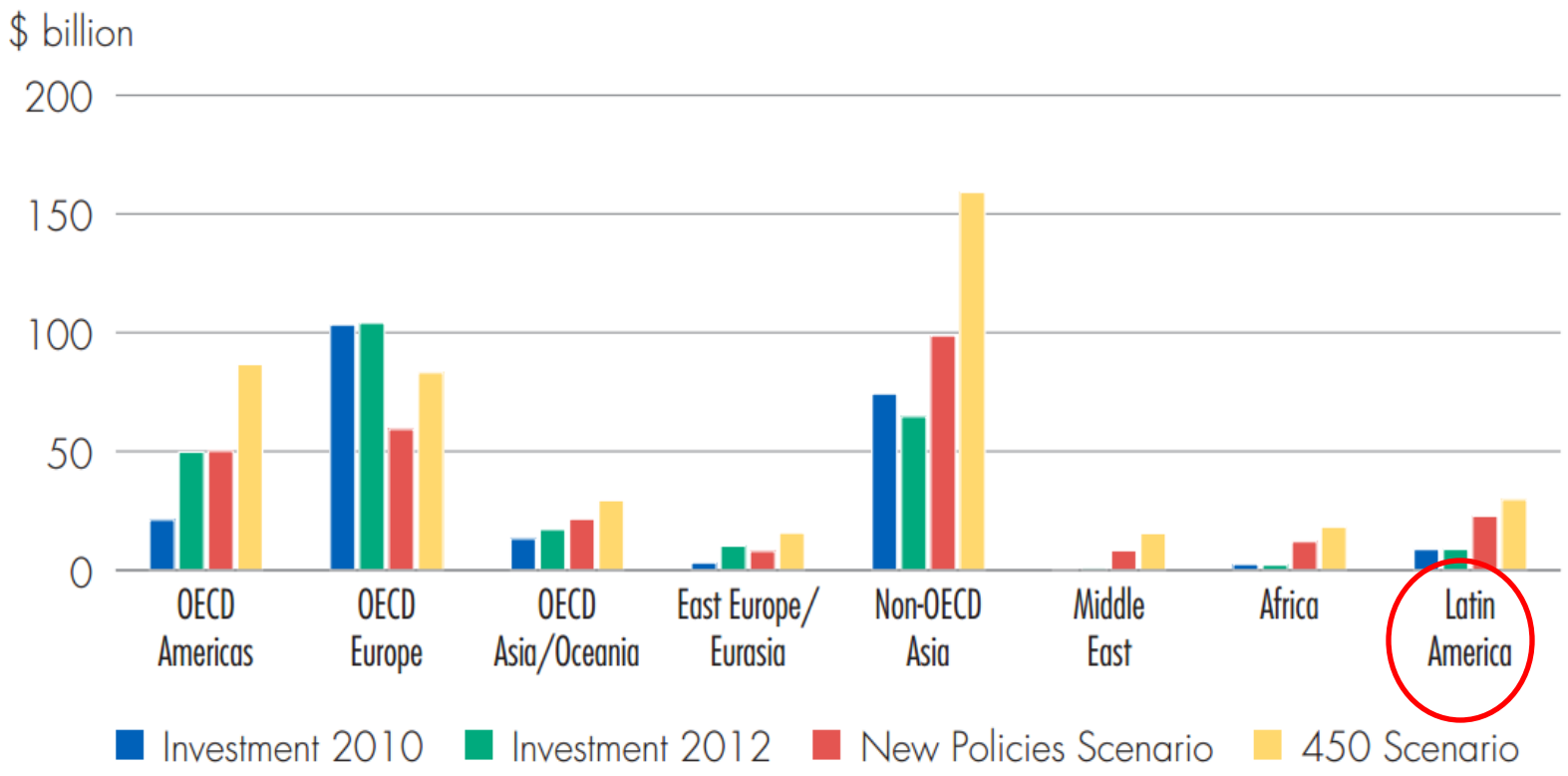
# Annual Global Investment

## actual & required (US$ billions)

| Annual investment | Universal access to modern energy services | Universal access to modern energy services | Doubling the global rate of improvement in energy efficiency | Doubling the share of renewable energy in the global mix[a] | |
|---|---|---|---|---|---|
| Source | Electrification | Cooking | Energy efficiency | Renewable energy | Total |
| Actual for 2012[b] | 9 | 0.1 | 130 | 258 | 397 |
| Required to 2030[c] | 45 | 4.4 | 560 | 442–650 | 1,051–1259 |
| Gap | 36 | 4.3 | 430 | 184–392 | 654–862 |

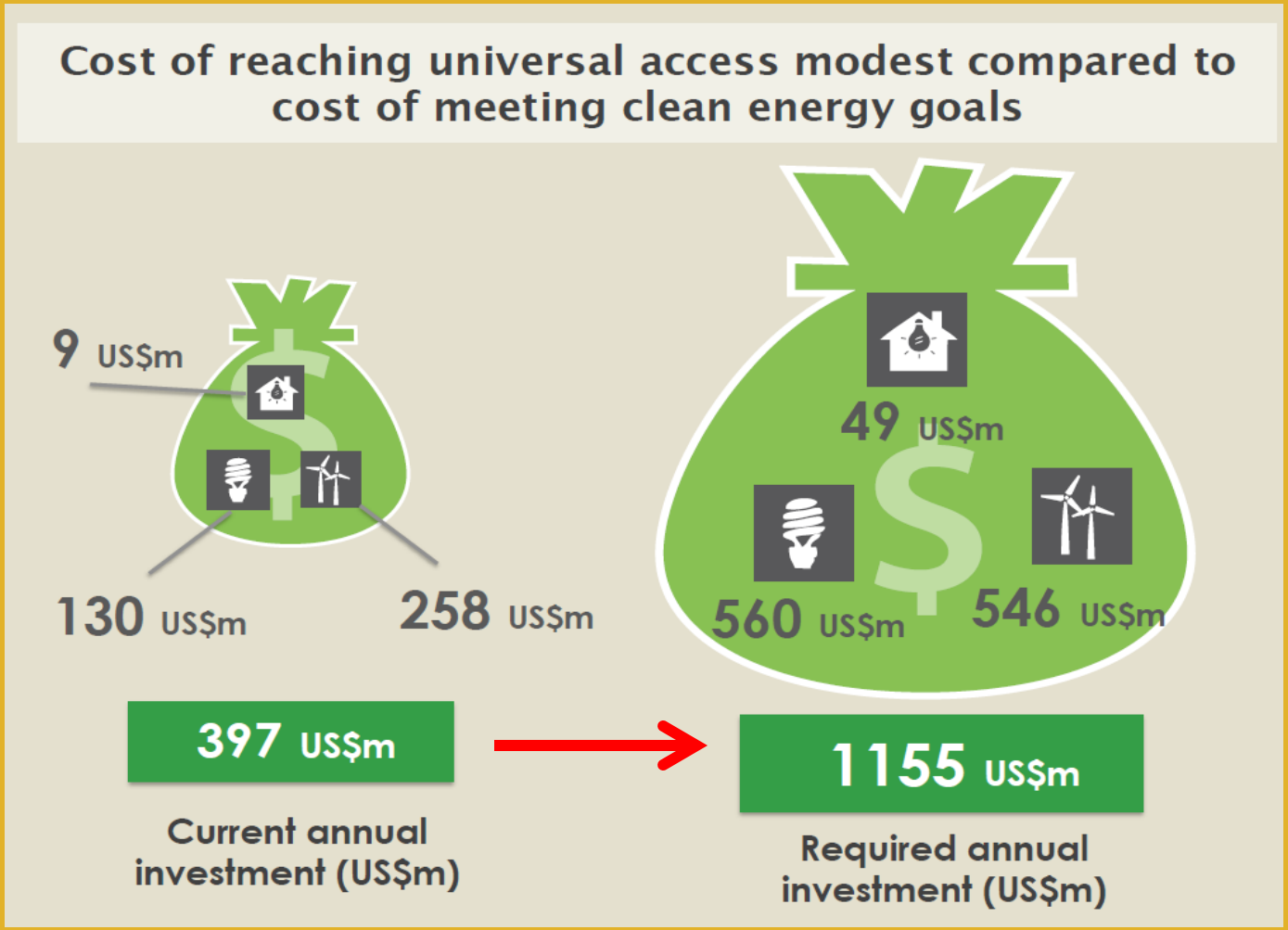
source: Global Tracking Framework 2015, WB

# Annual Renewable Energy Investments, actual and required in the IEA's 450 Scenario




source: IEA & Global Tracking Framework 2015, WB

# Financing for sustainable energy needs to triple, to over US$ 1 Trillion *annual* !!!!




source: Global Tracking Framework 2015, WB

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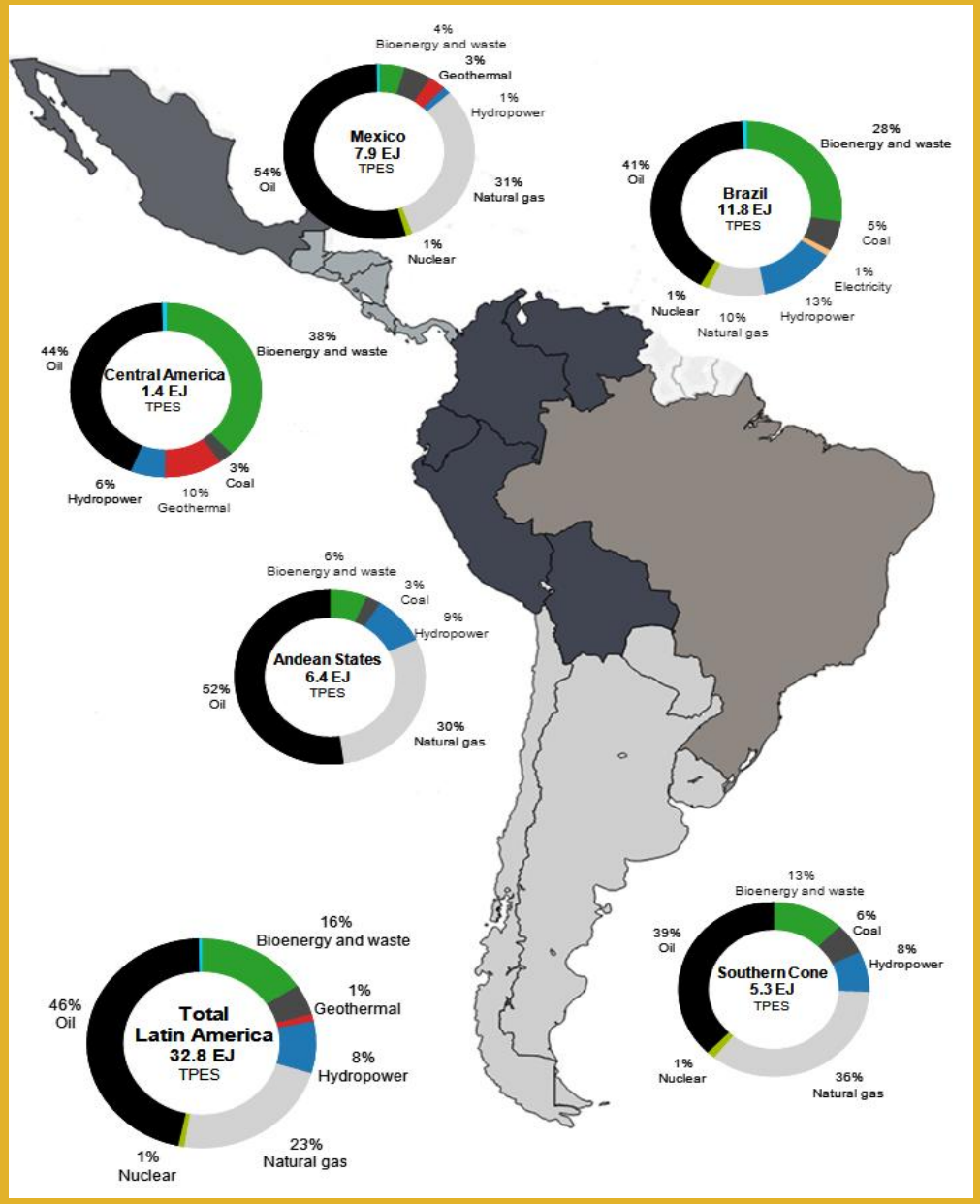
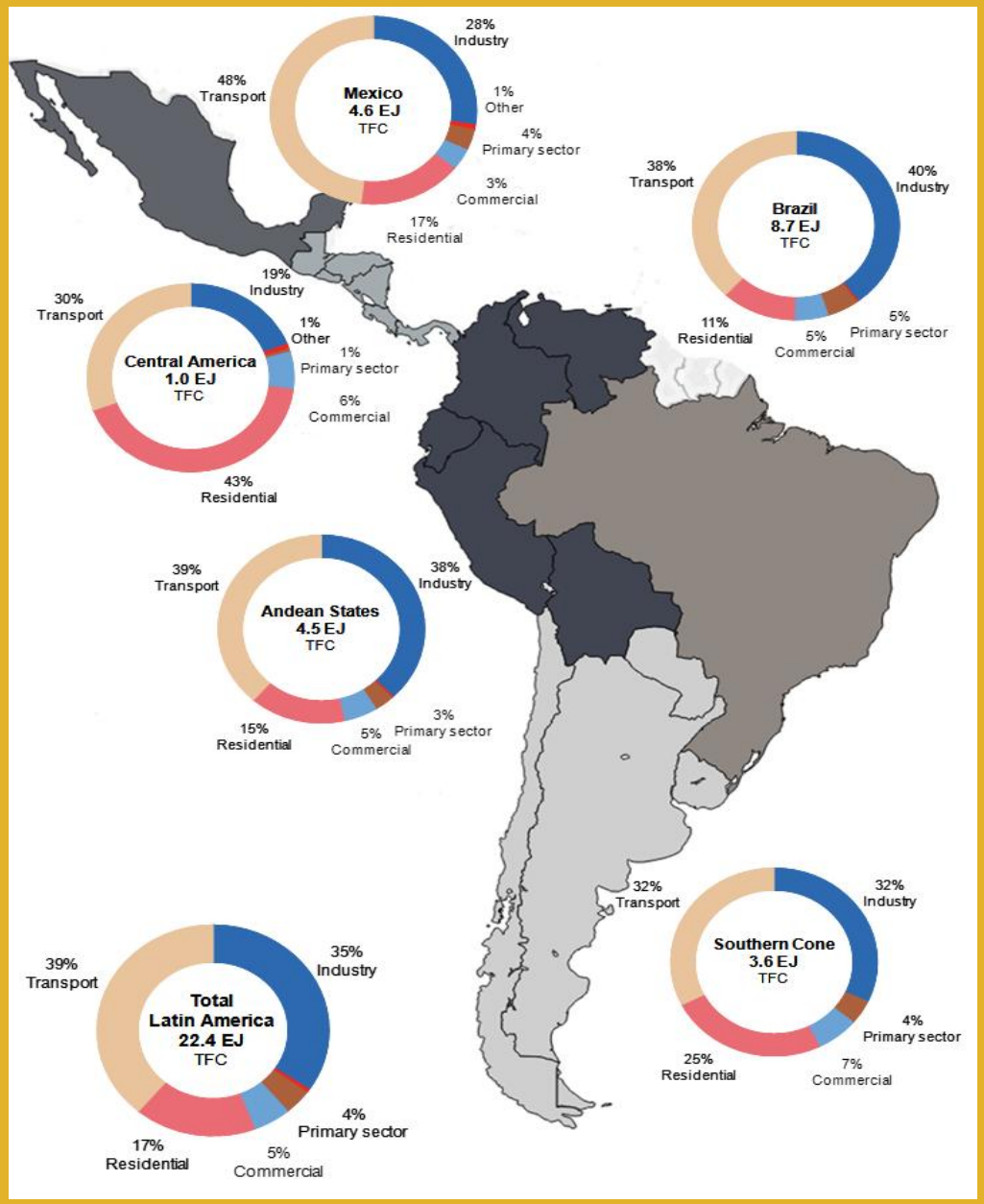
# Total Primary Energy Supply - 2012




**OIL IS STILL THE KING…**

source: Latin America Renewable Energy Market Analysis, IRENA,2015

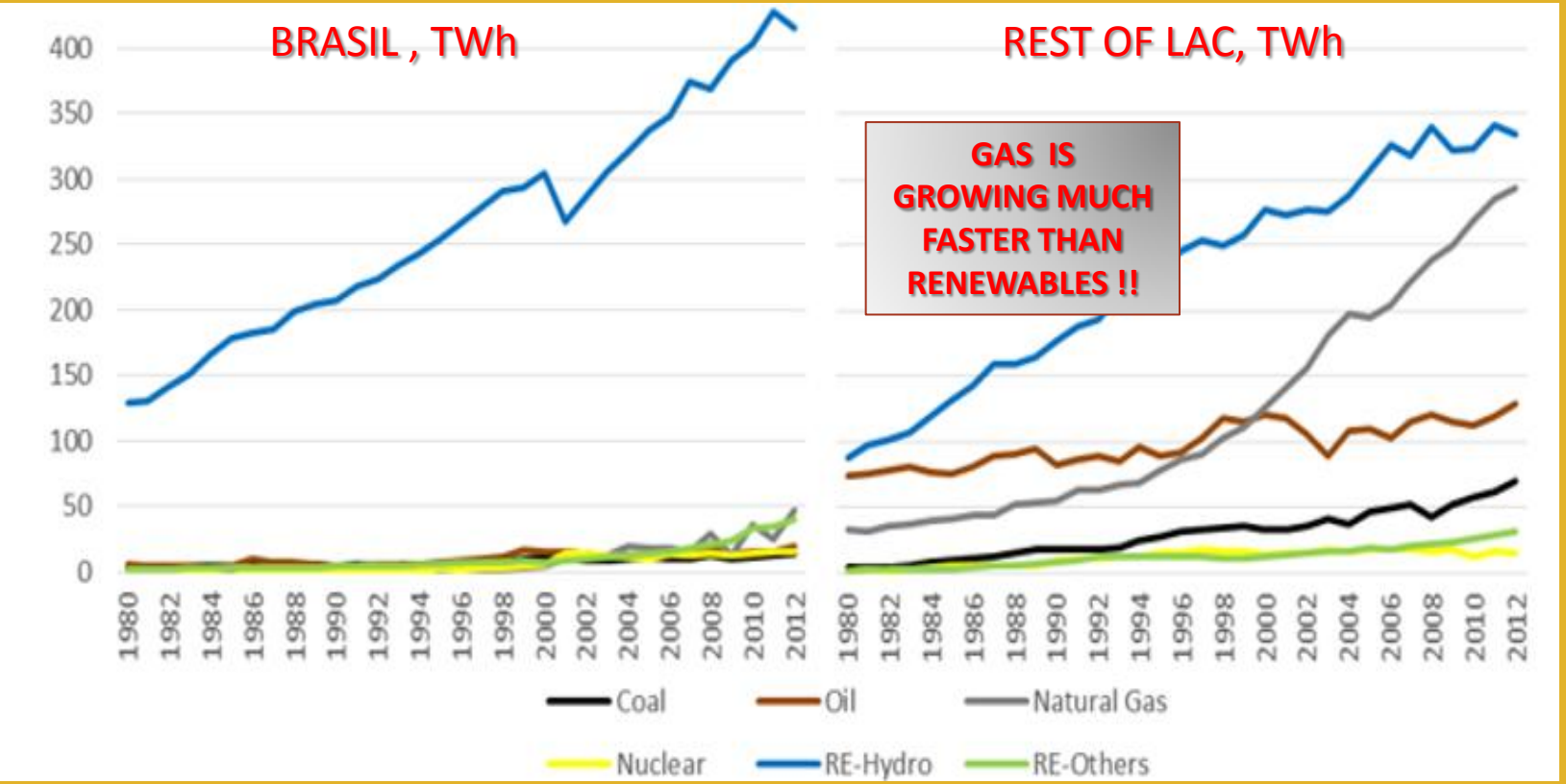
# Final Energy Consumption - 2012




**TRANSPORT + INDUSTRY = 75% OF CONSUMPTION**

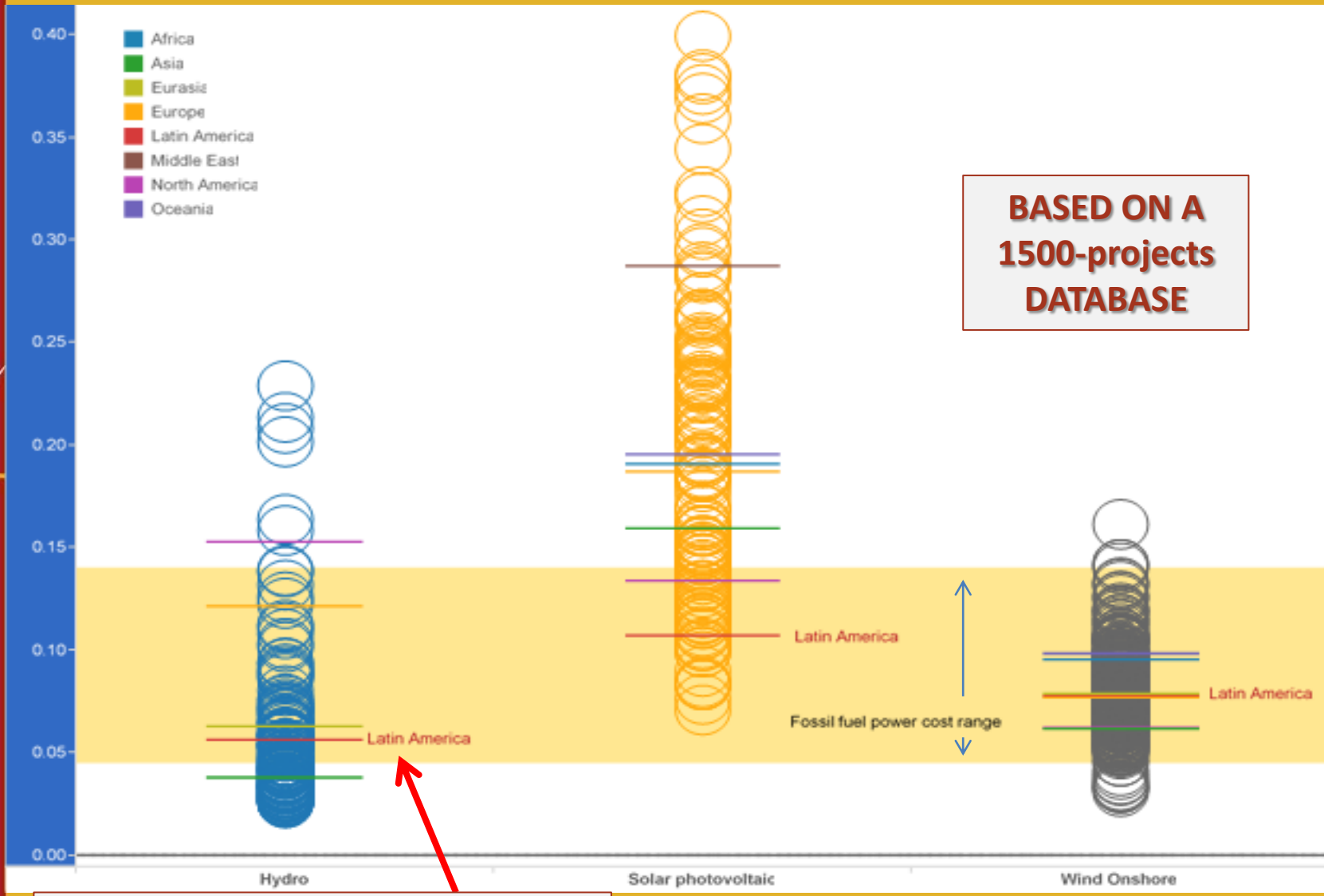
source: Latin America Renewable Energy Market Analysis, IRENA,2015

# **Electricity Generation** (by sources)




source: Latin America Renewable Energy Market Analysis, IRENA,2015

# LCOEs by Regions, 2014 (USD/kWh)

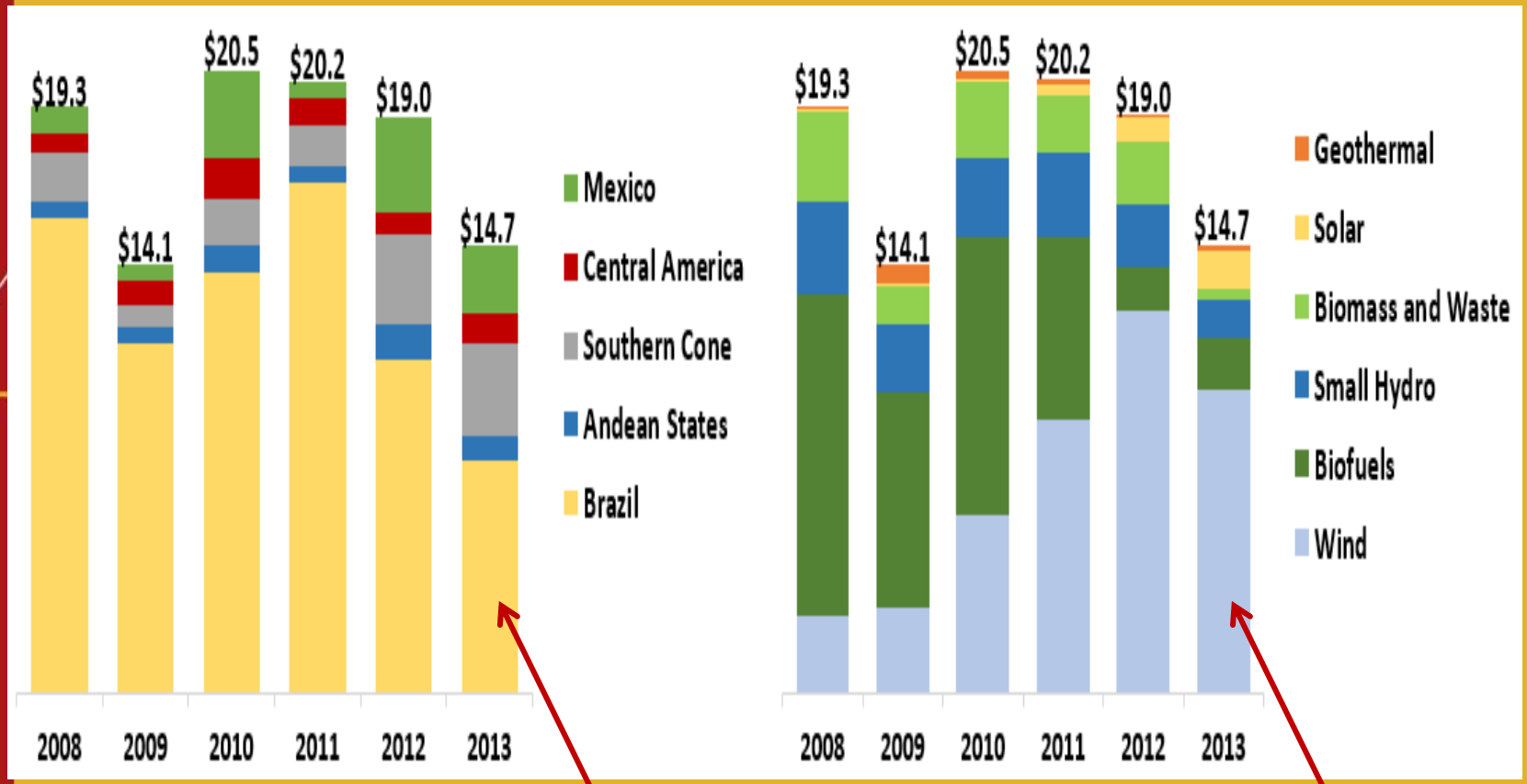



**BASED ON A 1500-projects DATABASE**

**Hydro is still the cheapest way to produce electricity….**

source: Latin America Renewable Energy Market Analysis, IRENA,2015

# Investments in Renewables




**50% investments in Brazil..**

**60% wind..**

source: Latin America Renewable Energy Market Analysis, IRENA,2015

# Barriers to Renewables Investment in LATAM

## Macroeconomic barriers

- **Inflation**
- Volatile of **currency exchange**
- Volatile economic **growth** & energy demand growth rates
- Less stable **fiscal situation**

## Barriers related to the structure and the organization of the energy sector

- Inadequate **RE pricing**
- Subsidies and **price control for fossil fuels**
- **Entry barriers** for private investors:
  - Remuneration uncertainty
  - Long, complex and costly administrative processes
  - Insufficient infrastructure capacity
- Lack of **qualified workforce**
- Lack of technological **standards and norms**

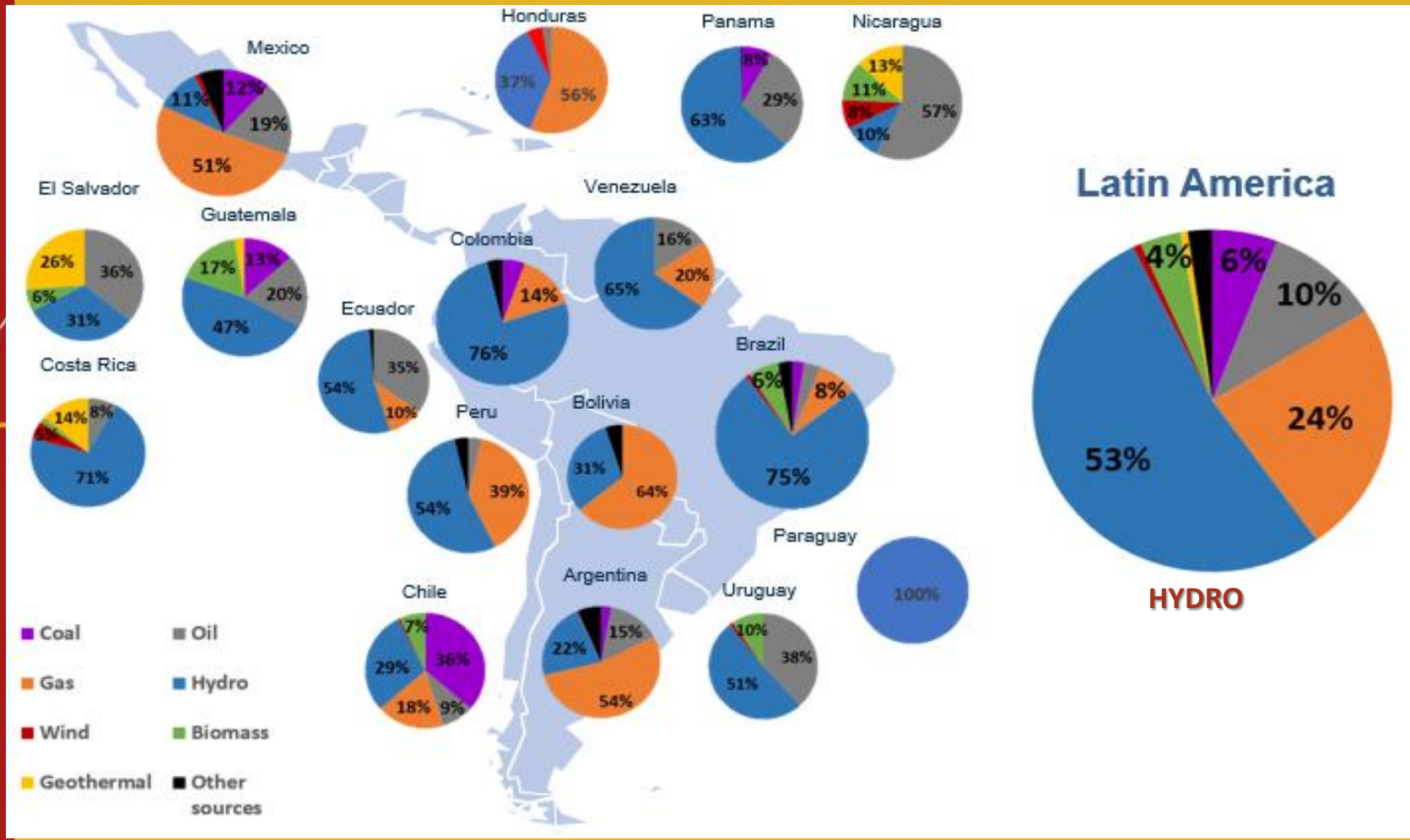
## Barriers related to finance sector

- High remuneration risks → high **cost of private capital**
- Scarcity of **hedging** instruments
- Insufficient **diversification of capital** sources
- Uncertainties about **long-term deal flow**
- Limited renewable energy **finance expertise**

source: Latin America Renewable Energy Market Analysis, IRENA,2015

# THE KEY-ROLE OF *ENERGY COMPLEMENTARITY* IN THE SUSTAINABLE DEVELOPMENT OF LAC

# Electricity Generation Mix in LAC - *2012*




source: Latin America Renewable Energy Market Analysis, IRENA,2015

# HYDRO vs N.H.R.E.T

HYDRO

**Complementarity:**
***a win/win solution***

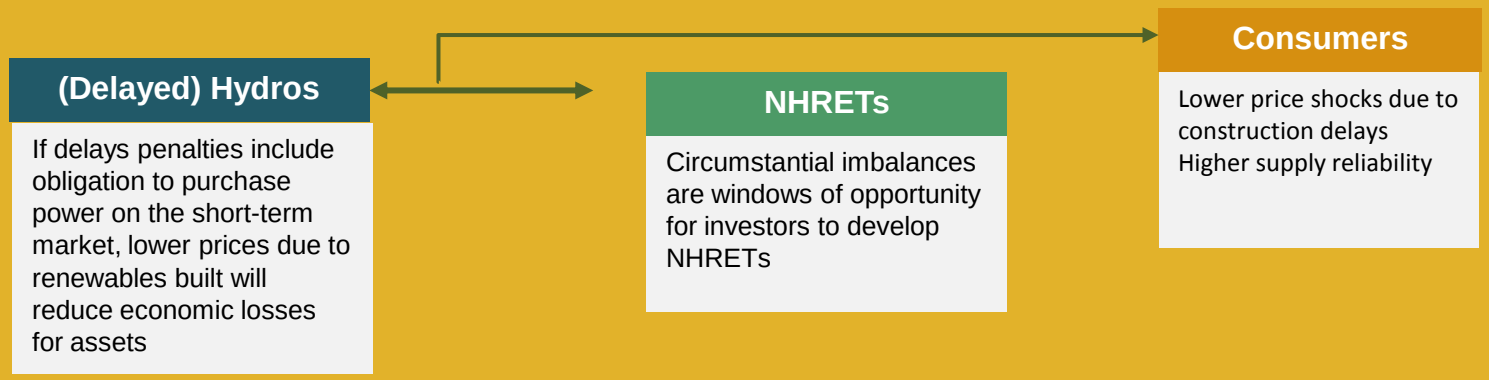
Non-Hydro REnewable Tech

- Enhance economic performance of the power system
- Enhance reliability of supply

source: Latin America Renewable Energy Market Analysis, IRENA,2015

# EXPANSION: *modularity*

- **Implementation of generation infrastructure**
  - Modular NHRETs with short construction times can be built quickly to partially counteract circumstantial imbalances in supply/demand, especially if delays in implementation of hydro plants occur




Implementation delays of hydropower projects in Latin America

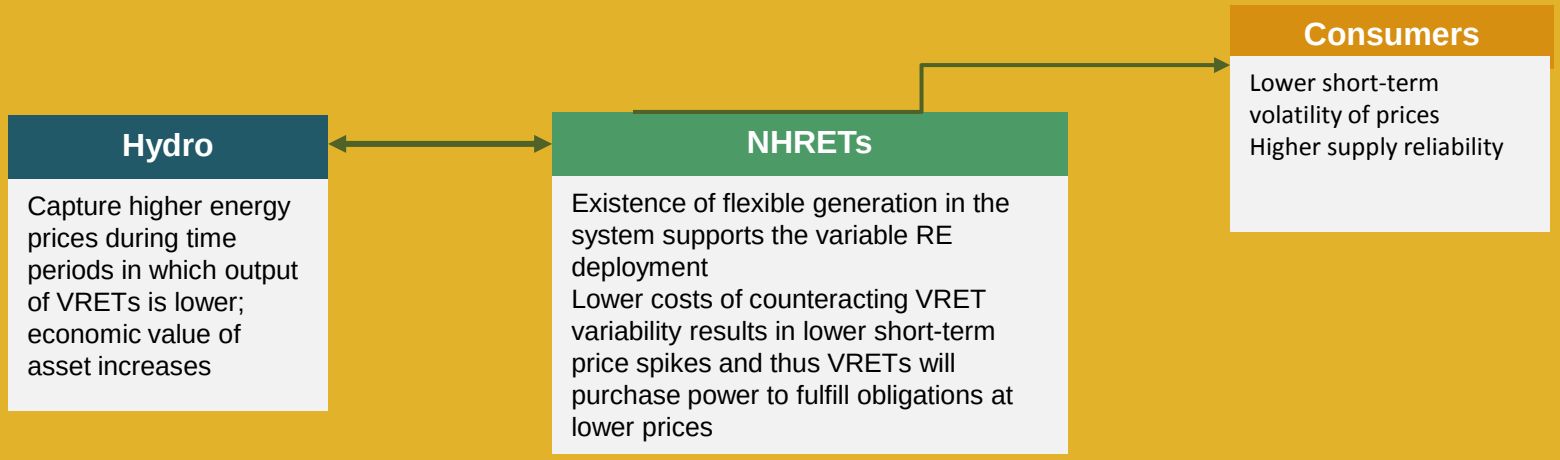
- Large delays in hydro implementation allow implementation of small NHRETs

| Project | Countries | Date | Capacity [MW] | Delay [months] |
|---|---|---|---|---|
| Bayano | Panama | 1970 | 190 | 18 |
| Sixth Power Project | Honduras | 1973 | 40 | 42 |
| Playas | Colombia | 1981 | 200 | 30 |
| Itaipu | Brazil, Paraguay | 1991 | 12,600 | 116 |
| Yacyreta | Argentina, Paraguay | 1994 | 3,100 | 108 |
| Baixo Iguaçu | Brazil | 2016 | 350 | 39 |

source: Latin America Renewable Energy Market Analysis, IRENA,2015

# OPERATION: *flexibility*

- **Hydropower's flexibility counteracts short-term variability of NHRETs**
  - Hydropower plants with reservoirs are flexible assets and the costs of using such existing plants to counteract the short-term variations in the VRETs' production is lower than that of other flexible generation technology



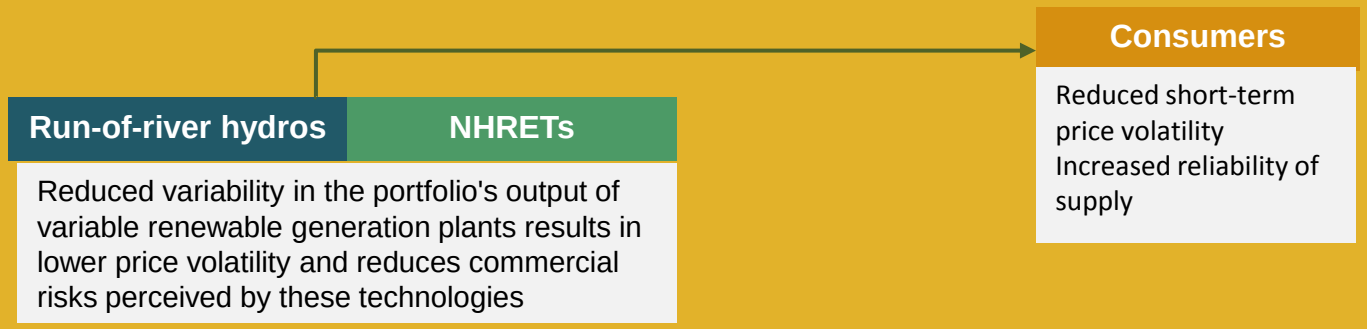

**Hydro plants as cost effective providers of flexibility in Brazil**

- The hydro plants in Brazil, with flexible generation at low costs, have been historically the sole provider of a large range of ancillary services, called secondary frequency control

source: Latin America Renewable Energy Market Analysis, IRENA,2015

# OPERATION : *diversification*

- **Portfolio diversification of non-dispatchable renewable energy plants**
  - The production of a diversified renewable energy portfolio of non-dispatchable renewable energy plants, including run-of-river hydro plants, is less volatile in the short-term than that of each individual plants




**100% Renewable portfolio target in Costa Rica**

- Costa Rica aims at supplying 100% of its electricity need with renewable energy
- The diversified renewable portfolio (hydro, wind, geothermal and solar projects) managed in supplying for 75 consecutive days in the beginning of 2015, without any fossil fuels dispatch

source: Latin America Renewable Energy Market Analysis, IRENA,2015

# OPERATION: *complementarity*

- **Seasonal climatic complementarity**
  - Generation of hydro plants is lower during drier seasons, but the generation of some NHRETs is not reduced or even increases during these periods
  - What **benefits** does this mechanism bring?

**Hydros**

NHRETs reduce seasonal price oscillations, hydros will purchase power during dry seasons to fulfill obligations at lower prices (if the contractual liabilities of hydros don't vary with seasonal patterns)

**NHRETs**

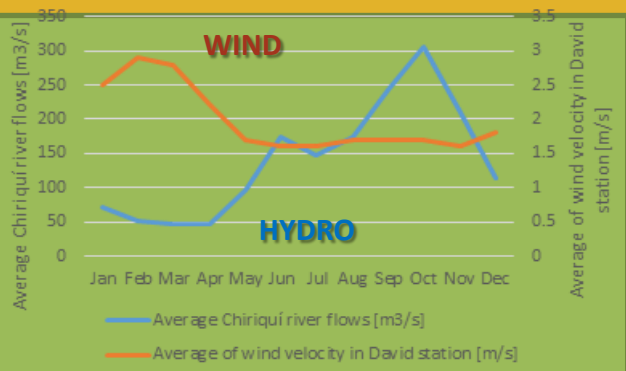
Capture higher energy prices during dry seasons, economic value of asset increases

**Consumers**

Reduced seasonal oscillation of electricity prices Higher supply reliability

## Seasonal complementarities in Panama

- Observed complementarity between wind velocities and water flows of the same district, in the Pacific Coast of Panama




source: Latin America Renewable Energy Market Analysis, IRENA,2015

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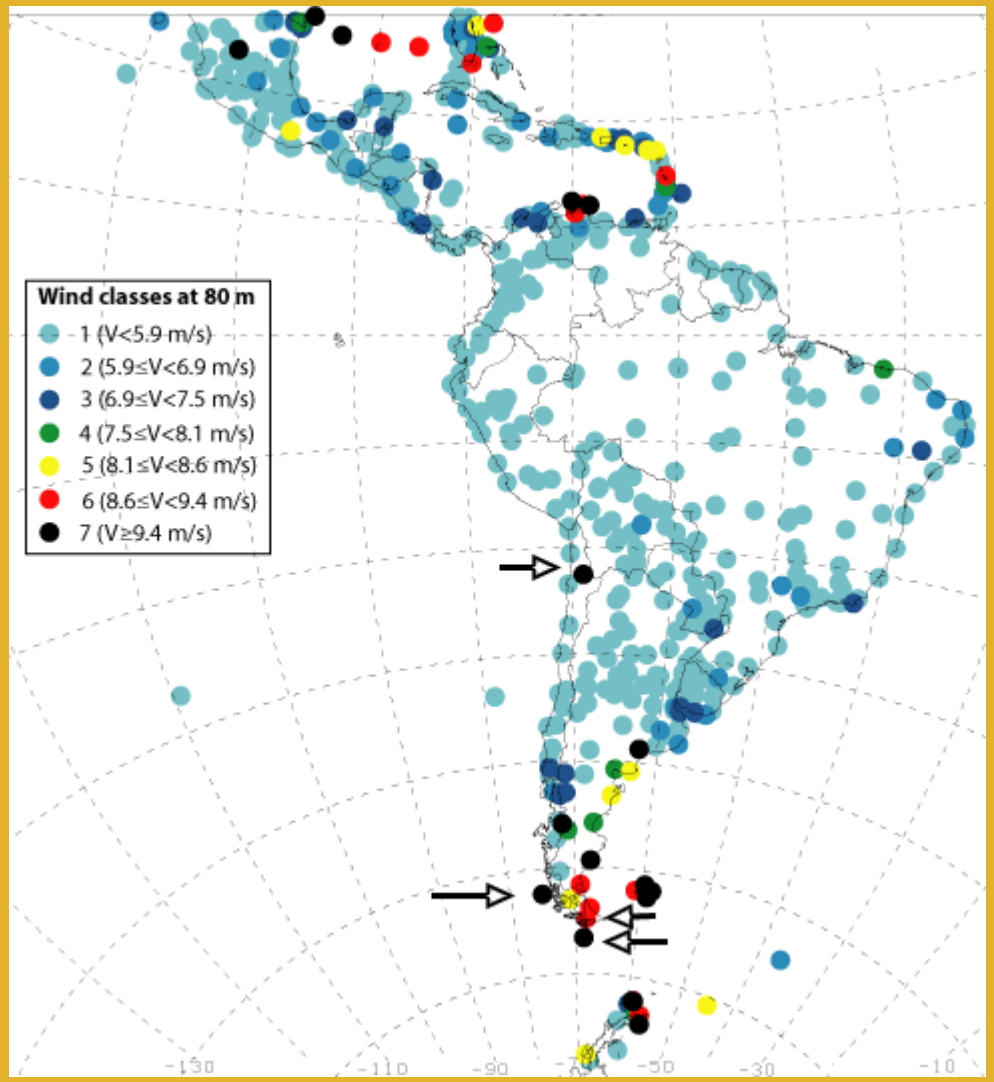
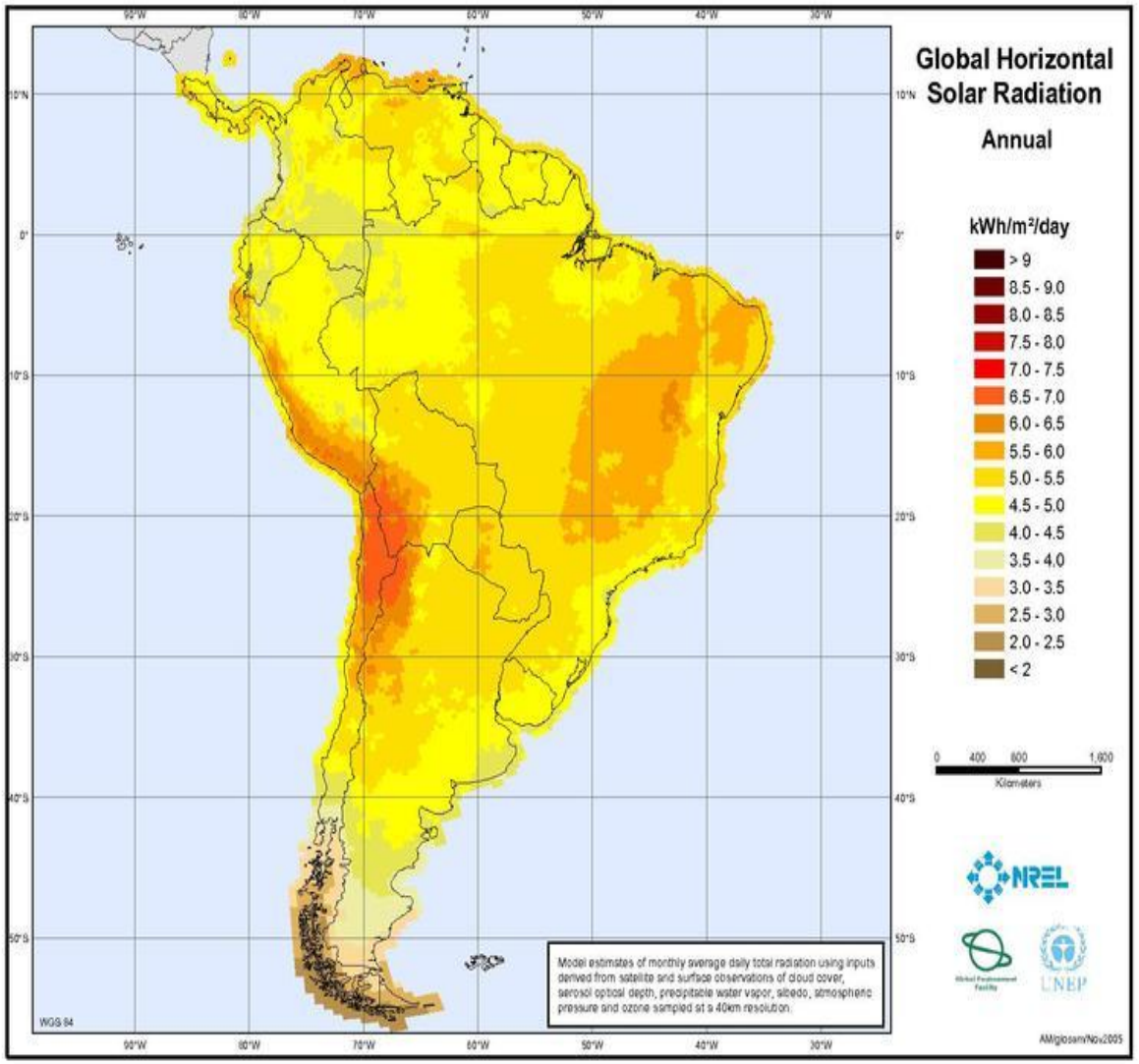
# The ECLAC/MIT study: *the "assets"*




**The wind resource**

# The ECLAC/MIT study: *the "assets"*




**The sun resource**

# The ECLAC/MIT study: *the "assets"*


**The geo resource**

# The ECLAC/MIT study: *the background*

- The new non-conventional renewable sources enable diversifying the current mix of South American countries which is strongly based on hydroelectric generation and, therefore, vulnerable to climatic phenomena like El Niño/La Niña.

- In addition, the increasing lack of clarity in the policies for granting permits for the construction of new hydro, combined with the increasing influence exerted by opposing groups to prevent the construction of reservoirs, has led to delays in the construction of these plants, which has negatively affected supply reliability.

- RES are smaller projects which are geographically scattered, subject to fewer barriers for obtaining environmental permits, which enable the diversification of the energy mix.

# The ECLAC/MIT study: *the background*

- From an economic perspective - especially in the current context where financing capacity at global level has significantly declined - the smaller scale of the RES is a clear advantage.

- This is true, considering the large capital investment involved in large hydroelectric projects under construction in the region – e.g. Belo Monte plant (11,233 MW) in Brazil; Pescadero Ituango plant (2,400 MW) in Colombia; and potential projects like Aysén in Chile (2,000MW)

- For many countries in the region the output regime of RES can complement the hydroelectric output regime, which enables the creation of invaluable synergies for the system.

# The ECLAC/MIT study: *the workplan*

- The key objective of this modelling effort is to assess the future impact of a significant deployment of RES in the operation and expansion planning of the power systems in the Region

- Given the spatially dependent nature of these resources, the analysis will include an assessment of the transmission and storage capacity requirements that would accompany these renewables.

- The project will use power system modeling tools to examine what combination of additional power generation - including distributed, utility scale energy resources and transmission assets - will be required in the region to meet future electricity demand.

# The ECLAC/MIT study: *the workplan*

- Currently, the scale of regional interconnection along the South American region is limited.

- Efforts are afoot to open up greater links in the region including the creation of a regional power market.

- A comparative analysis of contemporary regulation in the region's different countries will be carried out in order to assess their differences and provide guidance on how regional and national regulation can be optimized.

- The study will analyze how complementarity/integration developments – e.g. SINEA initiative - might aid in helping the region meet its growing electricity needs, in order to systemically leverages the region's energy resources, particularly RES that have not yet been developed

# *Thanks for you attention*

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