



Good governance for energy transition

Costs and prices for renewable energy

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Agenda



1. Context
2. Energy investments and renewable energy costs
3. Policies and governance for renewable energy



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Latam main countries

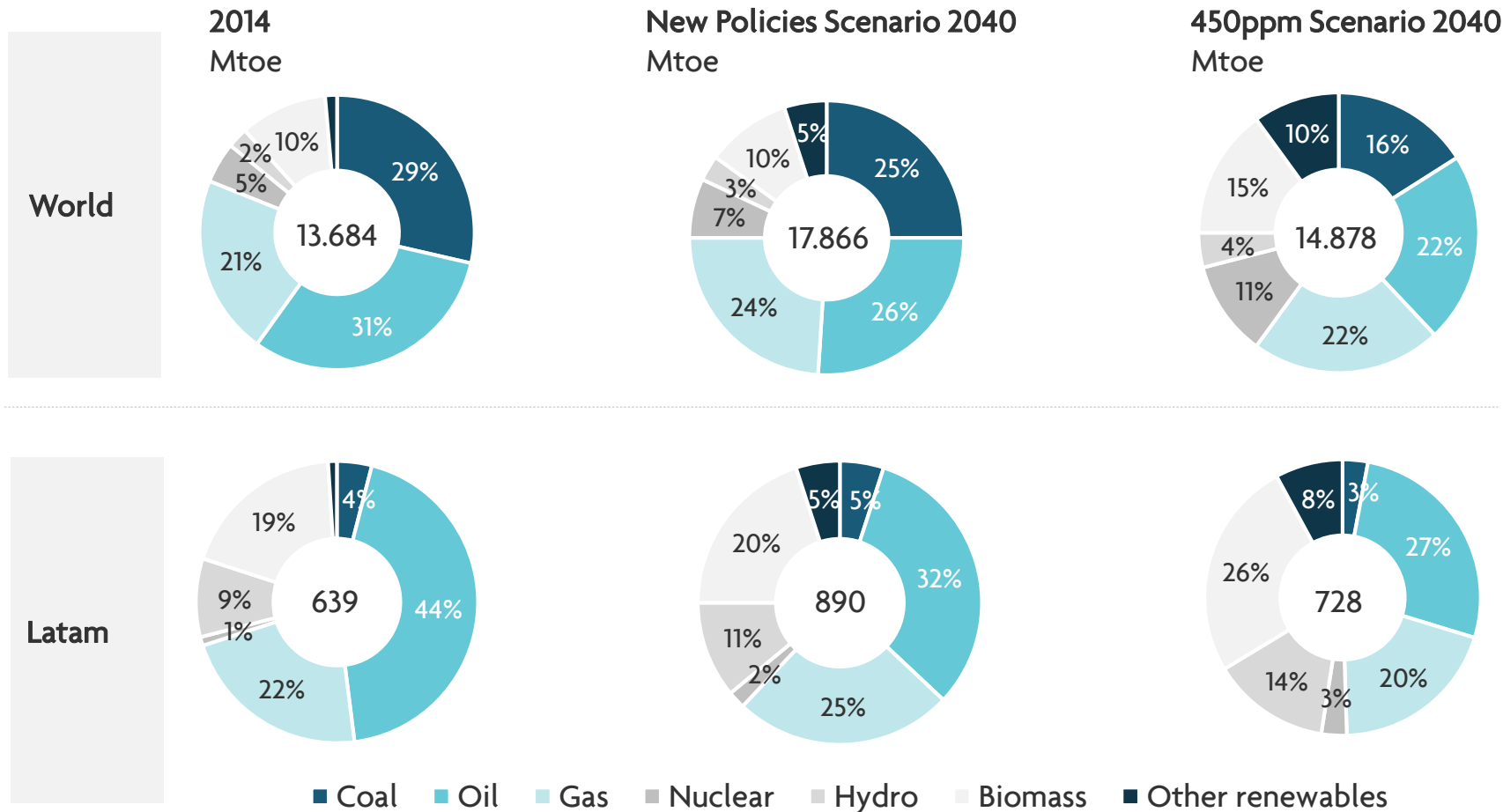
Brazil and Mexico as the most relevant actors in the region



| | Latam | Argentina | Brazil | Chile | Colombia | Mexico | Peru | Venezuela |
|------------------------------|-------|-----------|--------|-------|----------|--------|------|-----------|
| Population (mi) | 630 | 43 | 207 | 18 | 48 | 120 | 31 | 31 |
| GDP (US\$ bn) | 5.201 | 546 | 1.796 | 247 | 282 | 1.046 | 192 | 371 |
| Primary energy demand (Mtoe) | 639 | 67 | 258 | 34 | 31 | 151 | 24 | 58 |
| Renewable energy share (%) | 29 | 12 | 40 | 37 | 64 | 9 | 24 | 12 |

Energy landscape

Transition towards a more diversified energy matrix

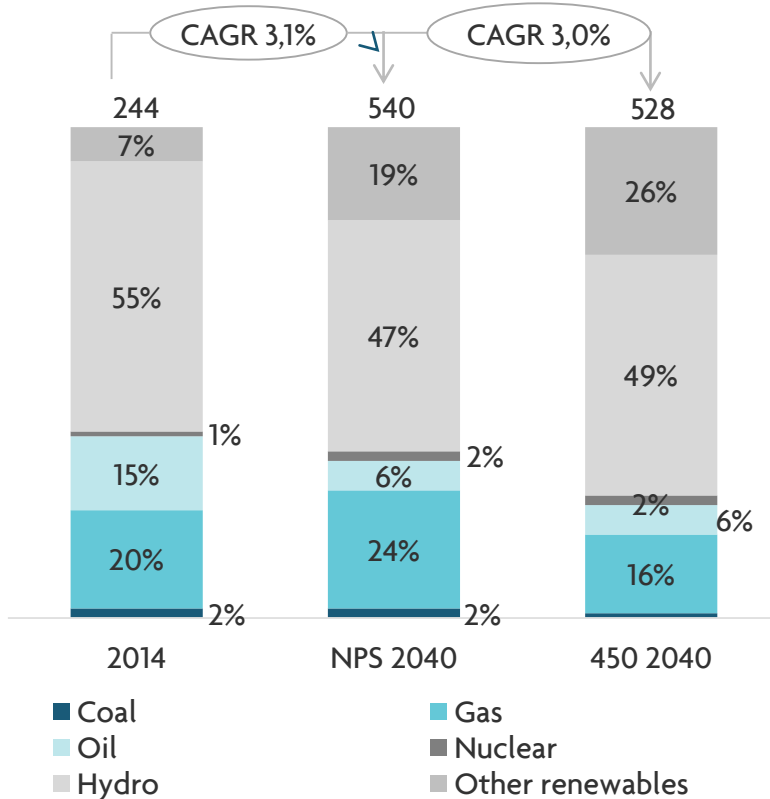


Energy landscape

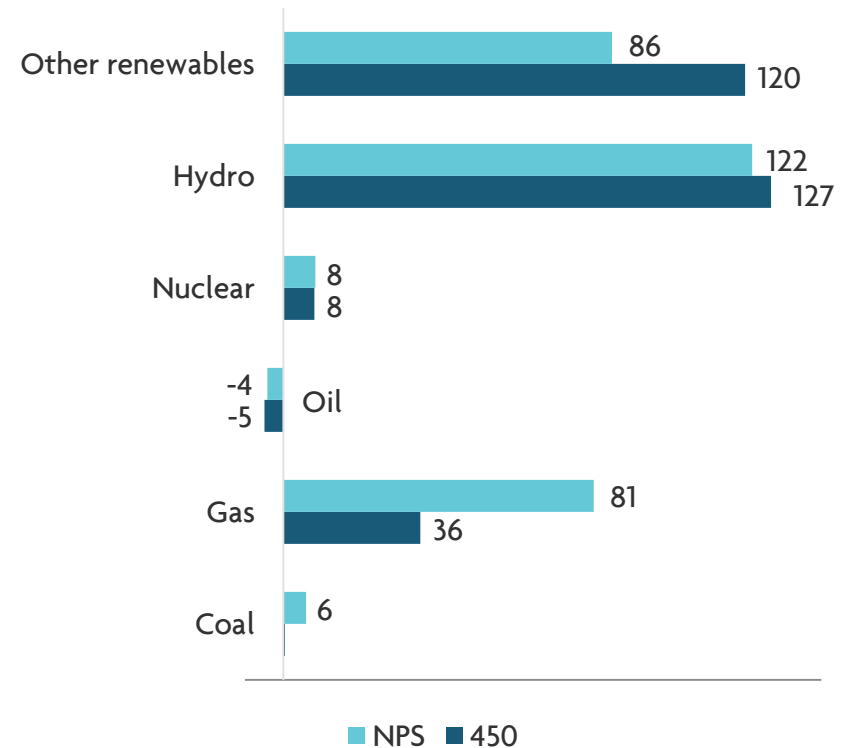
Increased renewable share in the electricity matrix



Electric capacity in Latam
GW



Variation in electric capacity in Latam 2014 - 2040
GW

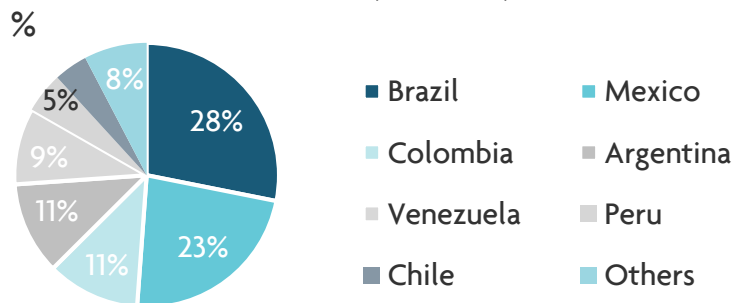


Energy landscape

Regional GHG emissions and climate commitments

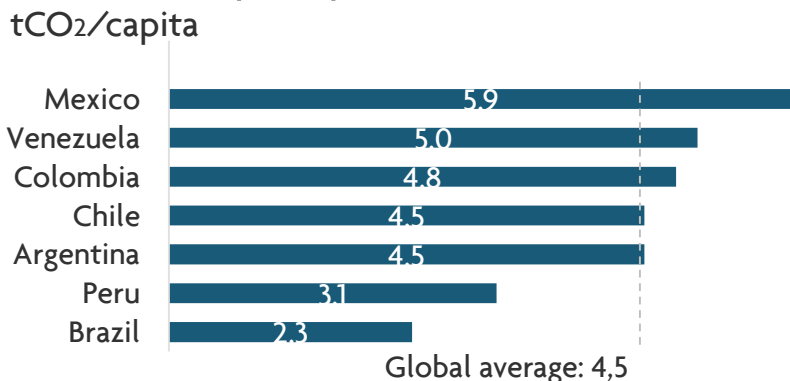


Latam emissions share by country, 2016



6% of global emissions (32.381 MtCO₂)

CO₂ emissions per capita, 2016



Climate commitments (COP 21)

| | Emission decrease | Goal | Type |
|-----------|-------------------|-----------------|----------|
| Argentina | 15% | 2030 | BAU* |
| Brazil | 37% | 2025 (vs. 2005) | Absolute |
| Chile | 30% | 2030 (vs. 2007) | Relative |
| Colombia | 20% | 2030 | BAU |
| Mexico | 25% | 2030 | BAU |
| Peru | 30% | 2030 | BAU |
| Venezuela | 20% | 2030 | BAU |

* Business as usual scenario

Sources: BP – “BP Statistical Review”, 2016; IEA – “World Energy Outlook”, 2016; UNFCCC – “INDCs as communicated by Parties”, 2016



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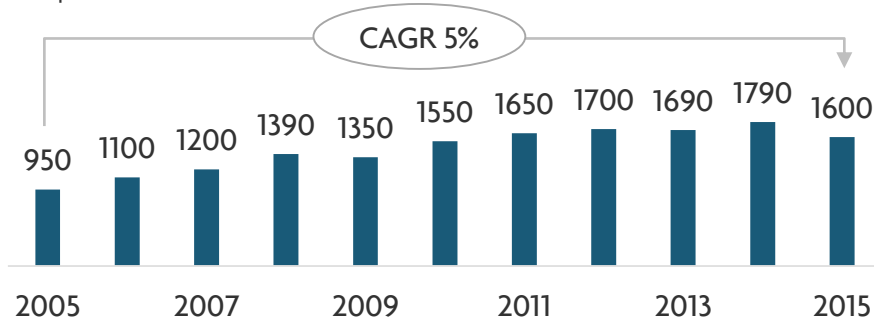
3. Policies and governance for renewable energy

Energy investments

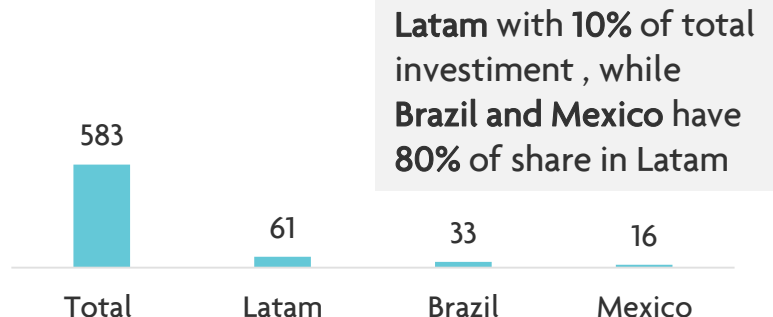
Timid participation of Latam countries, mainly in renewables



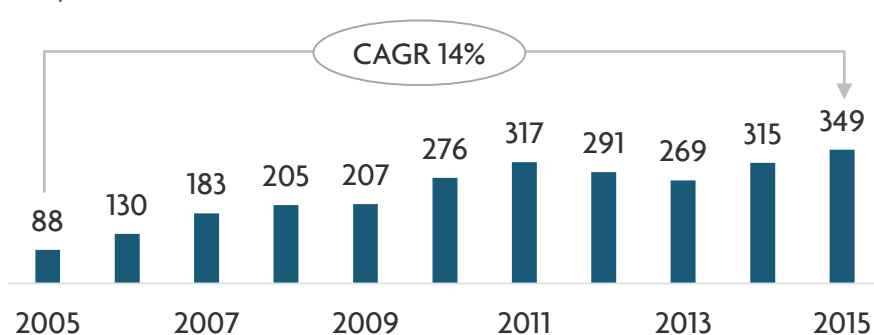
Global investment in energy
US\$ bn



Total investments in upstream O&G, 2015
US\$ bn



Global investment in clean energy
US\$ bn



Investment in clean energy*, 2015
US\$ bn

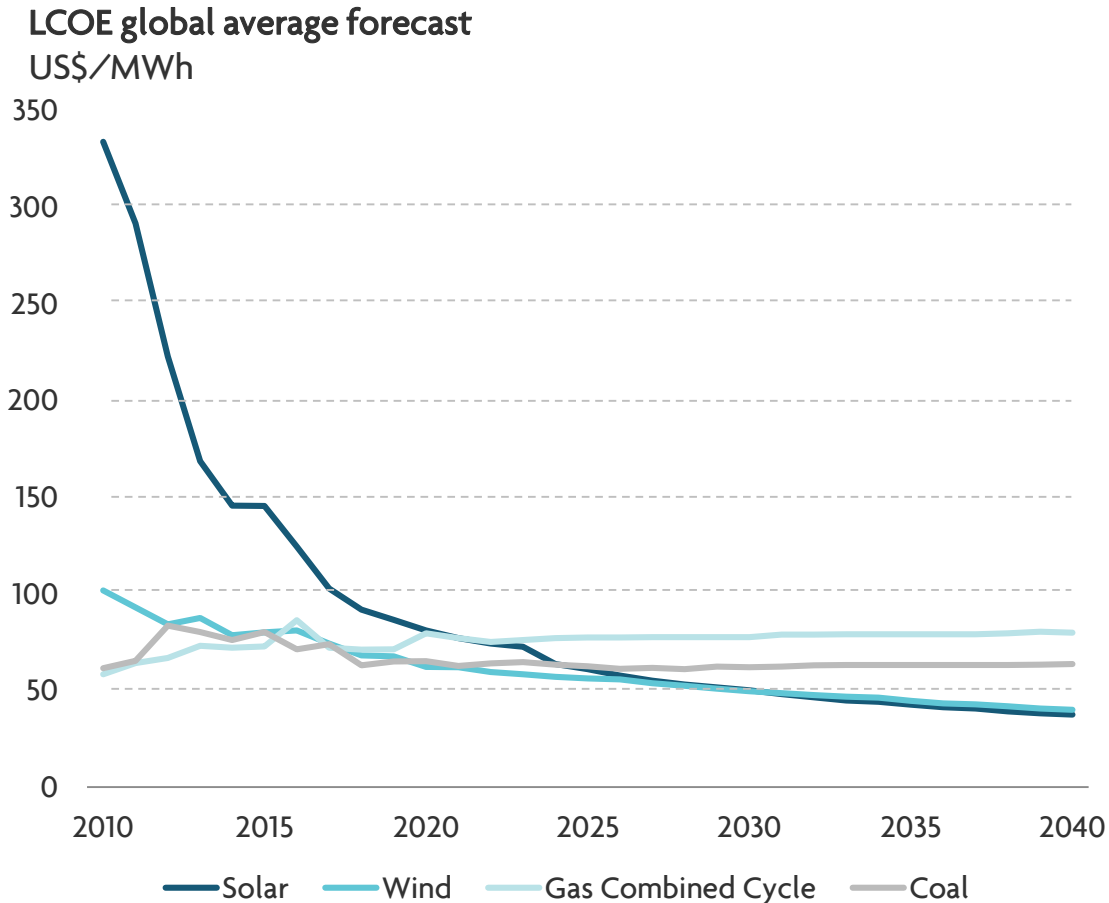


* Includes biomass, hydrop, wind, solar, and others;

Sources: Bloomberg New Energy Finance – “Global Trends in Renewable Energy Investment”, 2017; REN21 – “Renewables global status report”, 2016; The Dialogue – “Why and How Latin America Should Think about the Future”, 2016; IRENA – “Renewable Energy Market Analysis”, 2016; IEA – “World Energy Investment”, 2016

Global energy costs

Sharp decline in recent years, expected to last



- **Solar power cost declined 69% from 2010 to 2017, and is expected to decrease additional 64% until 2040, reaching US\$ 40/MWh**
- **Wind power cost declined 27% since 2010 and a further 46% decrease is expected**

Cost decline factors

- Technological improvements
- Economies of scale
- Higher efficiency
- Increased operational factors

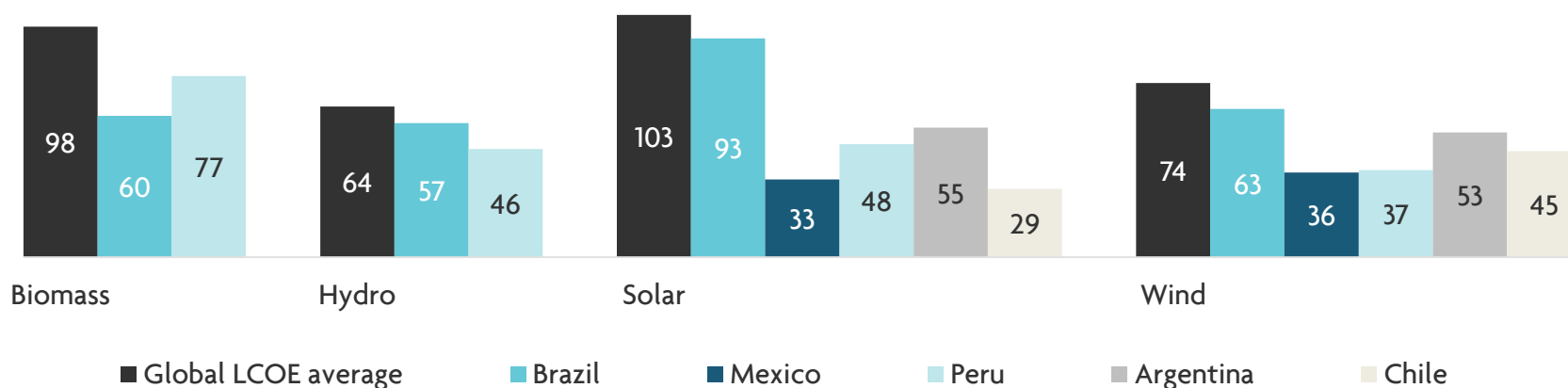
Latam renewable energy costs

Auctions leading to prices below global LCOE average



Renewable energy auctions prices in Latam, 2016*

US\$/MWh



- Lower auction prices compared to global LCOE related to regional fiscal incentives and bidding strategies
- Solar and wind auctions in Mexico had the largest electrical capacity in the region, with 1,853 MW for the last solar auction and 1,038 MW for the most recent wind auction

*Includes 2015 Brazilian solar and wind power auctions

Source: IRENA – “Renewable Energy Market Analysis”, 2016; BNEF – “New Energy Outlook”, 2017; IRENA – “Renewable Energy Auctions”, 2017; IEA – “World Energy Outlook”, 2016; FGV Energia – “Recursos Energéticos Distribuídos”, 2016; Aneel website – “Resultado de leilões”, 2017

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Renewable energy policies

Potential framework to foster a sustainable energy transition



Fiscal

- Governments need to evaluate how fiscal incentives may benefit renewable energy without creating disruptions to the economy

Financial

- The sector has an important role in scaling up the investments, structuring the most efficient allocation of risks and return between private and public investors

Regulatory

- Transparency and stability are essential to enable the future development of market based financing schemes

Governance

- Predictable, stable and transparent policies with strong compliance are key issues to create a positive business environment towards a greater penetration of renewable energy

Sources: Catavento analysis based on IRENA – “Renewable Energy Market Analysis”, 2016; FGV Energia – “A comparative analysis of energy transition in Latin America and Europe”, 2016; Columbia SIPA – “Financing Solar and Wind Power - Insight from the O&G Sector”, 2017; Energy Transitions Commission – “Better Energy, Greater Prosperity”, 2017

Fiscal mechanisms

From tax reliefs and import duty exemptions to carbon pricing?



Latam renewable energy fiscal incentives could balance fossil fuel subsidies (US\$ 50 bn in 2013)

Mexico

- Carbon tax*
- National exemptions of local taxes
- Transmission discount

Peru

- Solar power law
- VAT exemptions

Chile

- Carbon tax*
- Fuel tax exemptions
- Solar power law



Brazil

- Fuel tax exemptions
- Import and export benefits
- National exemptions of local taxes
- Transmission discount

Argentina

- Fuel tax exemptions
- Income tax exemptions
- Import and export benefits
- National exemptions of local taxes
- VAT exemptions

Carbon tax x emission trading scheme

- At the same price per ton, ETS could have a greater environmental impact, but it is a more complex mechanism than carbon tax

*Mexico = 3 US\$/tCO₂e and Chile = 5 US\$/tCO₂e *

Sources: IRENA – “Renewable Energy Market Analysis”, 2016; World Bank – “State and Trends of Carbon Pricing”, 2016; IMF – “Energy Subsidies in Latin America”, 2015; WRI – “Carbon Tax vs. Cap-and-Trade: What’s a Better Policy to Cut Emissions?; IMF – “Energy Subsidies in Latin America and the Caribbean”, 2015

Financial mechanisms

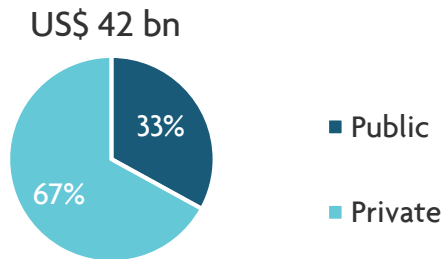
Latam challenges and opportunities



The financial sector role is to develop the most efficient allocation of risks and return between private and public investors, based on a transparent and stable governance

Latam renewable energy investment, 2013 -2015

%



- Private banks demonstrated interest in mature markets (Brazil, Mexico, and Chile)
- Long term macroeconomic stability is key to increase private sector participation
- China as a key player: US\$ 4,8 bn invested in Brazilian renewable energy sector (68% of total clean energy investments)

Green bonds

- This asset class doubled globally from 2015 to 2016 reaching US\$ 95 bn (38% for renewable energy)
- BNDES issued US\$ 1 bn in green bonds for wind and solar energy projects (2017)
- **Pros:** investors can balance risk and financial returns with social and environmental benefits x **cons:** lack of standardization lead to complex labeling process

Climate funds

- IFC invested US\$ 210 mi in Latam for renewable energy and energy efficiency projects (2016)
- IDB plans to invest 30% of its operational approvals in climate related projects by 2020

Regulatory mechanisms

Auctions and blending mandates playing a key role in the region



| | Argentina | Brazil | Chile | Colombia | Mexico | Peru | Venezuela | Latam |
|----------------------------|-----------|--------|-------|----------|--------|------|-----------|-------|
| Auction | ✓ | ✓ | ✓ | | ✓ | ✓ | | 12 |
| Feed in Tariff | | | | | | ✓ | | 3 |
| Ethanol blending mandate | ✓ | ✓ | | ✓ | ✓ | ✓ | | 7 |
| Biodiesel blending mandate | ✓ | ✓ | | ✓ | | ✓ | | 6 |

Regulatory mechanisms

Auctions facing price reduction x project quality challenges



Auctions can reduce renewable energy projects prices and increase market competition, but long term planning, predictable schedule, stable and robust design are also necessary

Auction challenges

- **Underbidding** poses a significant risk for low quality and delays. It may also result in very low or negative profits for the project developer
- **Intentional underbidding:** project developer wants to negotiate additional remuneration after winning the auction or evade obligations
- **Qualification requirements:** strong requirements constitute potential barriers for small or new players, while weak requirements raises the risk of delays and low quality engineering

Well designed auctions

- Financial requirements, guarantees, and construction milestones commitments may **reduce underbidding risks**
- Strict compliance rules, transparency, and penalties for non-compliance are **key issues for well designed auctions**
- Participant qualification must be clear with legal, technical, and financial requirements that guarantee **project quality and market competition**

Conclusion

Final remarks



A transition to an increasingly renewable energy system in Latam is economically feasible, although it requires to scale up investments, understand the real price for renewable energy, and implement sustainable policies for energy transition

Investments

- Raise investors' confidence is key to increase renewable energy in a sustainable way
- Auctions have proved popular in fostering increased renewable capacity in a well planned, cost efficient and transparent manner, but project developers must be aware of the winner's curse risk (negative profits)

Prices

- Auction mechanism is an effective way to discover the real price for renewable energy
- The forecast of rapid decline in renewable energy cost is an opportunity for project developers, but bidding strategy must be adjusted to the other key aspects of this market

Policies

- The renewable energy sector needs predictable, stable, and transparent policies with strong compliance, under a combination of well designed fiscal, financial, and regulatory mechanisms
- Fiscal incentives for renewable energy should not be the principal pillar to attract private investments



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