

Latin America and Caribbean Petroleum

Reserves, Production and Investment Trends - Challenges and Transformation

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AGENDA

- Petroleum in the Economies
- Energy Matrices
- Emissions
- Petroleum Production Trends and Reserves
- LAC's Petroleum Maps
- Stellar Oil Play Highlights
- Breakeven Prices and Investments
- Challenges for Upstream and Downstream
- Transformation in Response to Energy Transition
- Future Trends in LAC?



Indicators for major regional economies (2021 data)

	Population	GDP PPP	GDP PPP / Capita	HDI	Final Energy Consumption / Capita	Oil Production	Oil Consumption	Production / Consumption	Refining Capacity
	(M)	(M\$)	(kUSD/c)		(tep/c)	(Kb/d)	(kb/d)		(kb/d)
Argentina	45.8	985,205	21.5	0.84	1.22	627	598	1.05	643
Brazil	214.1	3,127,524	14.6	0.75	1.11	2,987	2,252	1.33	2,424
Chile	19.7	496,085	25.2	0.86	1.44	2	365	0.01	238
Colombia	51.3	753,870	14.7	0.75	0.65	738	349	2.11	363
Ecuador	17.9	189,880	10.6	0.74	0.74	473	247	1.91	175
Mexico	130.3	2,415,675	18.5	0.76	0.85	1,928	1,350	1.43	1,640
Peru	33.4	421,937	12.6	0.76	0.61	77	266	0.29	215
Uruguay	3.5	78,121	22.0	0.81	1.39	0	42	0.00	50
Venezuela	33.0	286,539	8.7	0.69	1.15	664	289	2.30	1,303

Top 3

Sources: OLADE, BP Statistical Review 2022

1/3 of Population in Poverty and 13% in Extreme Poverty

Poverty and income distribution

Population living in poverty^a and extreme poverty and Gini coefficient^{[A]b}

(Percentages and values between 0 and 1) 2020

[A] ECLAC, Household SURVEYS Databank (BADEHOG).

^a Includes those living in extreme poverty.

^b Data correspond to the year 2020, except in Guatemala, Nicaragua and Venezuela (Bolivarian Republic of), where they correspond to 2014, and in Honduras and Panama where they correspond to 2019.

^c Urban areas.

^d Weighted average based on estimated or projected figures for the specific year in 18 countries.

^e Simple average based on the latest year available. Includes 18 countries.

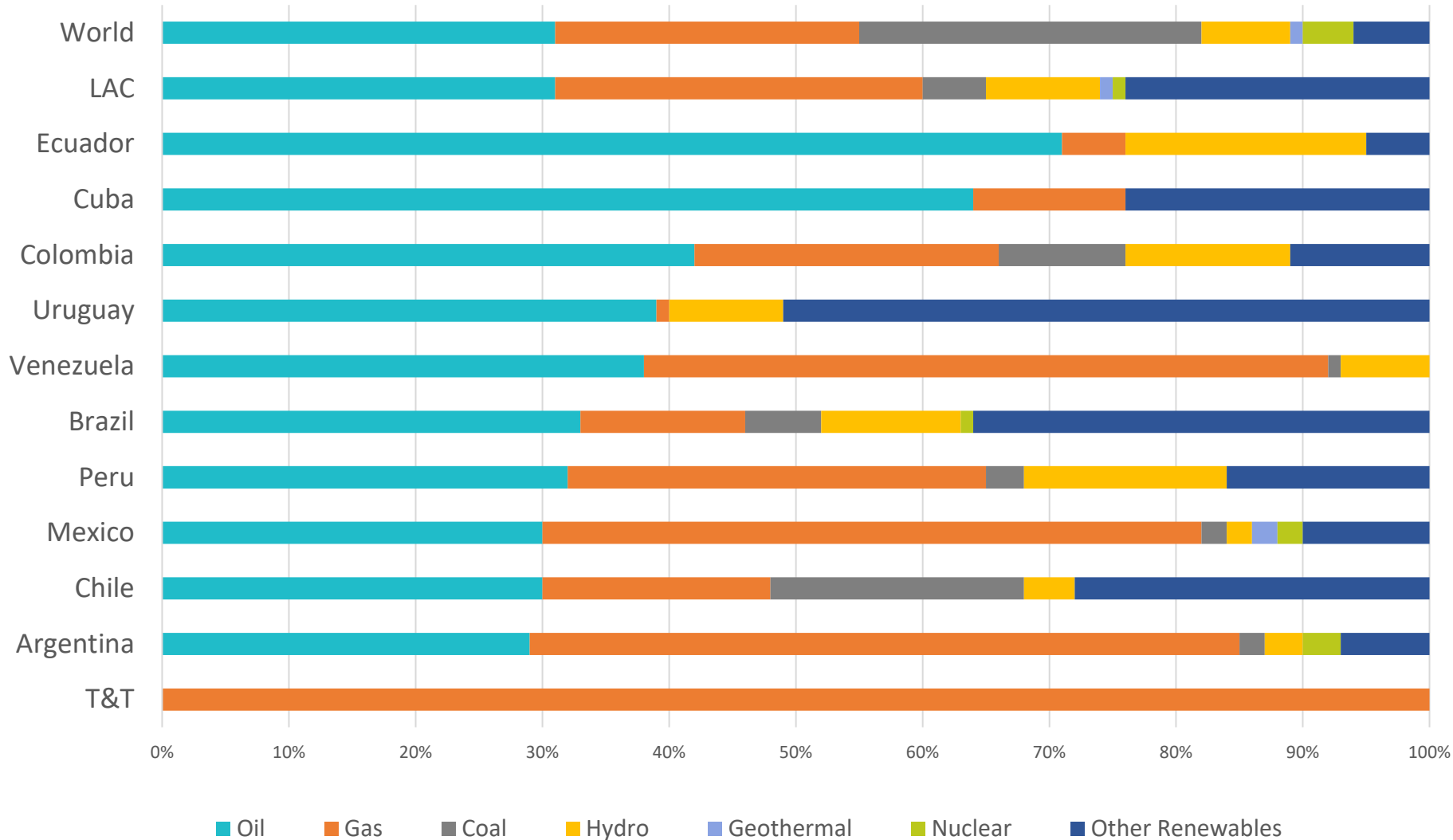
Note: The boundaries and names shown on this map not imply official endorsement or acceptance by the United Nations.



Source: CEPALSTAT (ECLAC)

LAC has a relatively cleaner Primary Energy Matrix, but Oil plays a fundamental economic role

LAC Primary Energy Matrices (2021)



LAC:

31% Petroleum

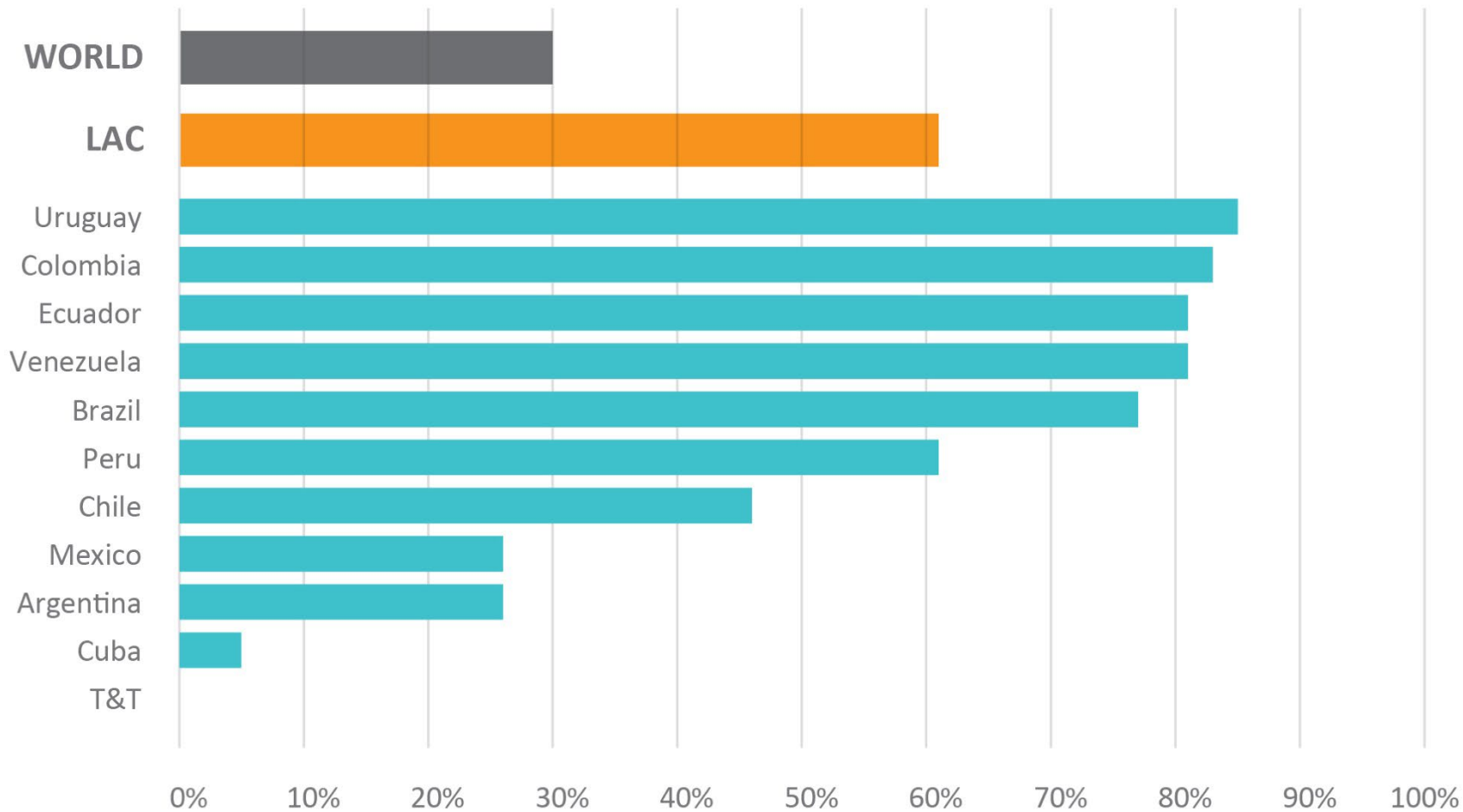
60% Hydrocarbons

Only 5% Coal
(27% Globally)

35% Nuclear + Renewables
(vs. 18% Globally)

LAC already ahead in the Energy Transition

Renewable Power Generation



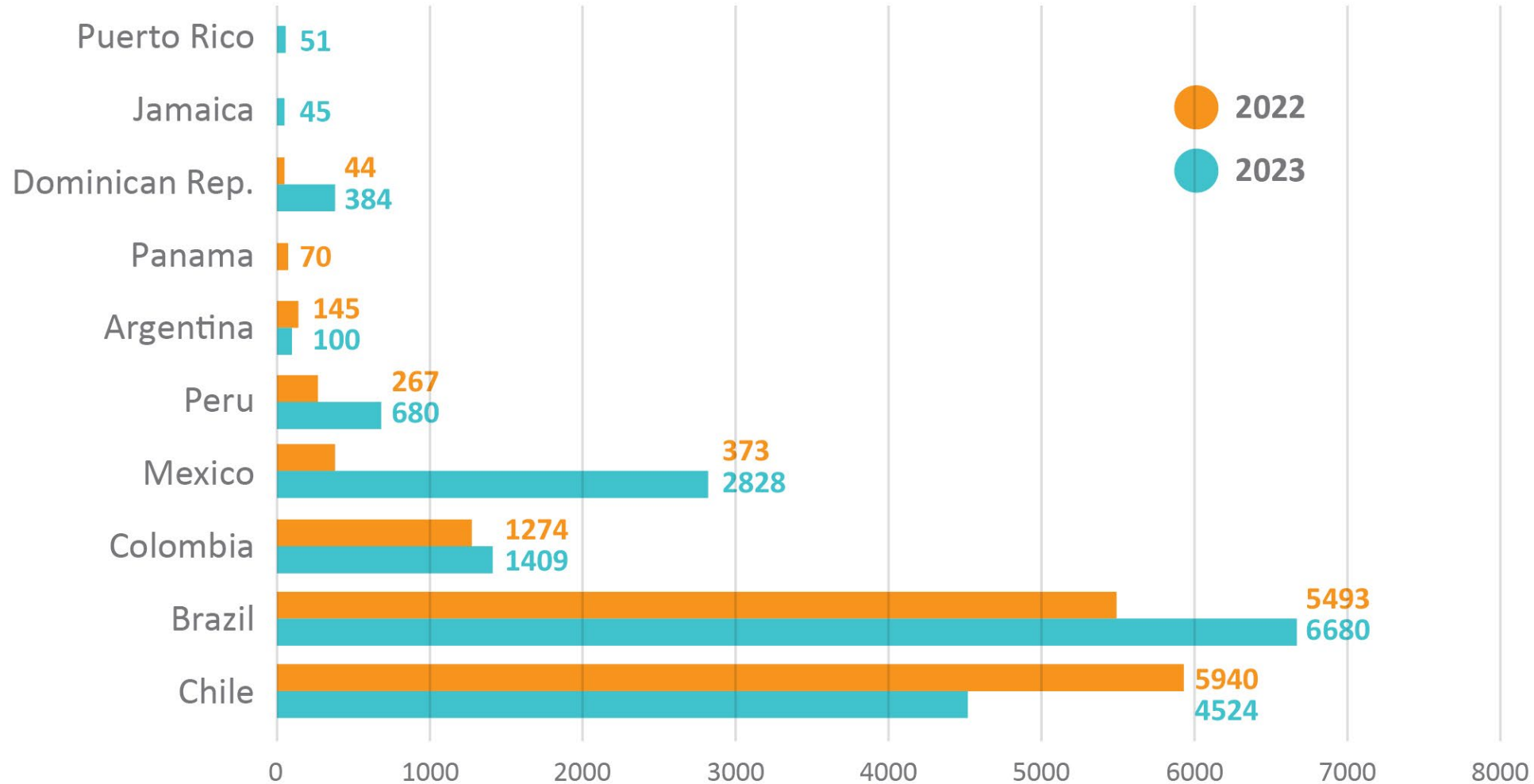
97% electricity access rate

61% Renewable Power Generation
(mostly Hydro)
vs. Global 30%

Source: OLADE

Brazil and Chile regional leaders in Solar

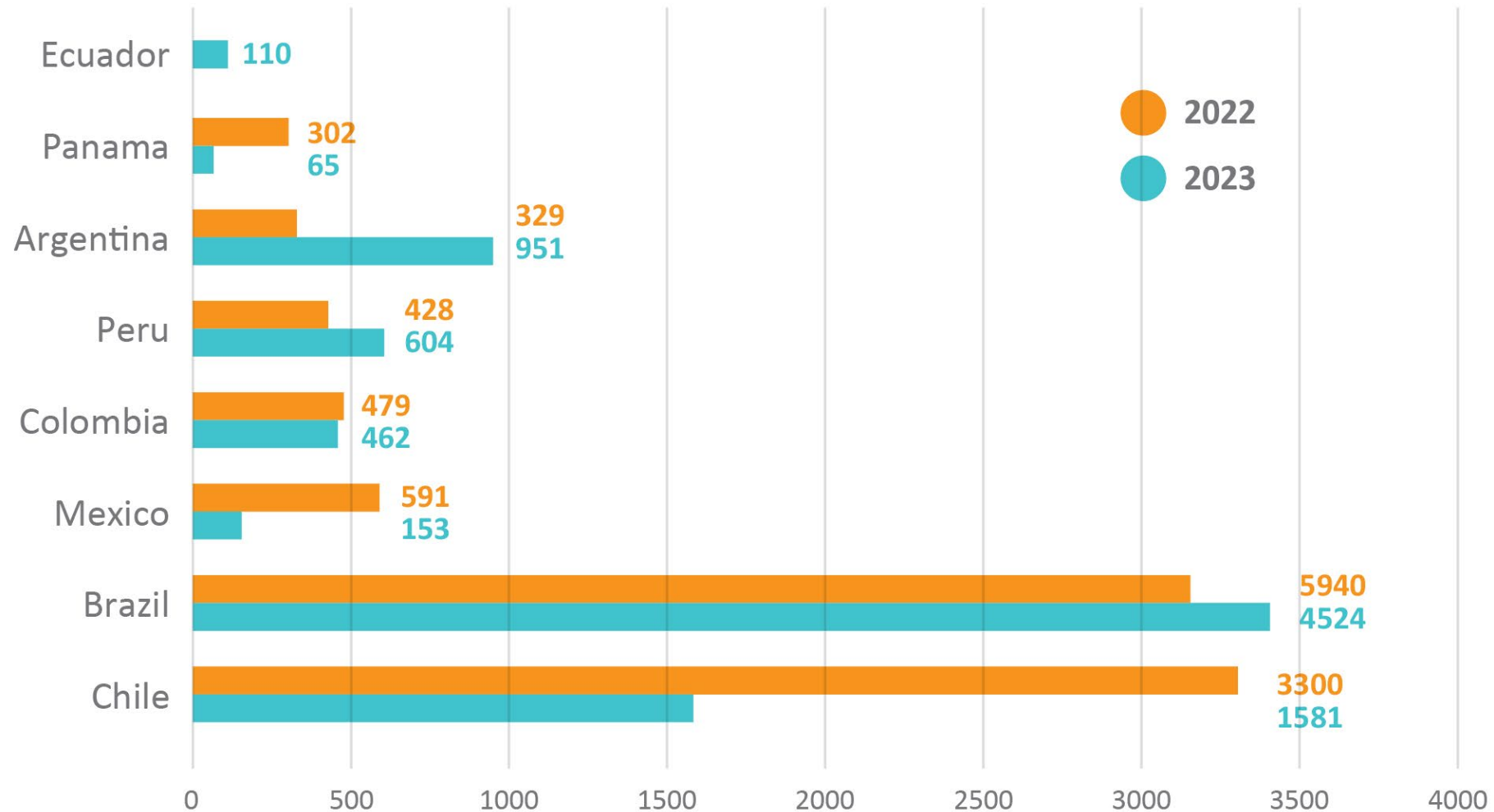
Construction phase start for solar plants: 2022 vs 2023 (MW)



Source: bnamericas

Brazil and Chile also leaders in Wind

Construction phase start for wind farms: 2022 vs 2023 (MW)



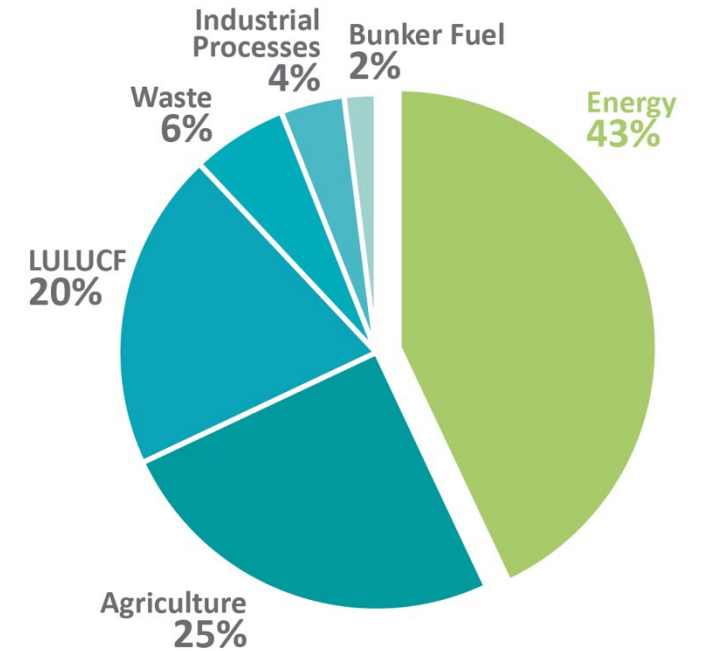
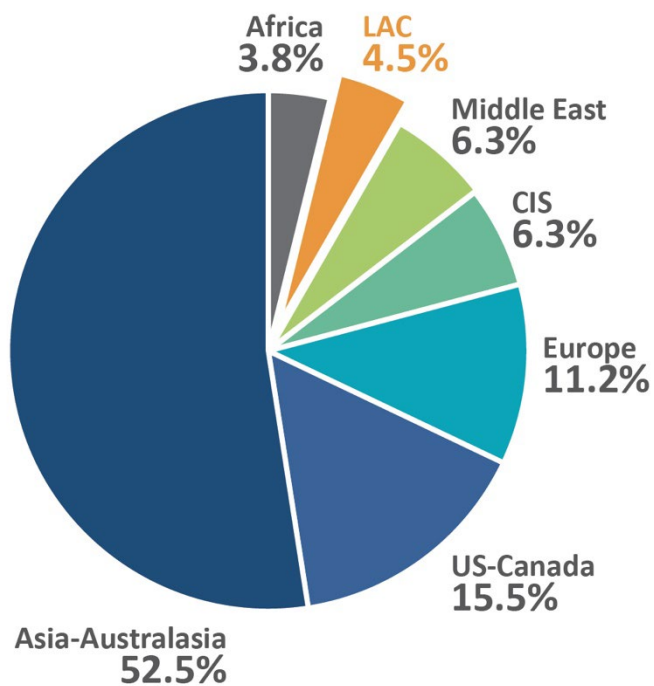
Source: bnamericas

LAC is a marginal contributor to CO₂ and GHG Emissions

Global 2019 CO₂ Emissions:
33,812 Mt
LAC: 4.5%

Global 2019 GHG Emissions:
49,758 Mt
LAC: 8.3%

LAC 2019 GHG Emissions by Sector:
4,117 Mt CO₂e
Energy: 43%



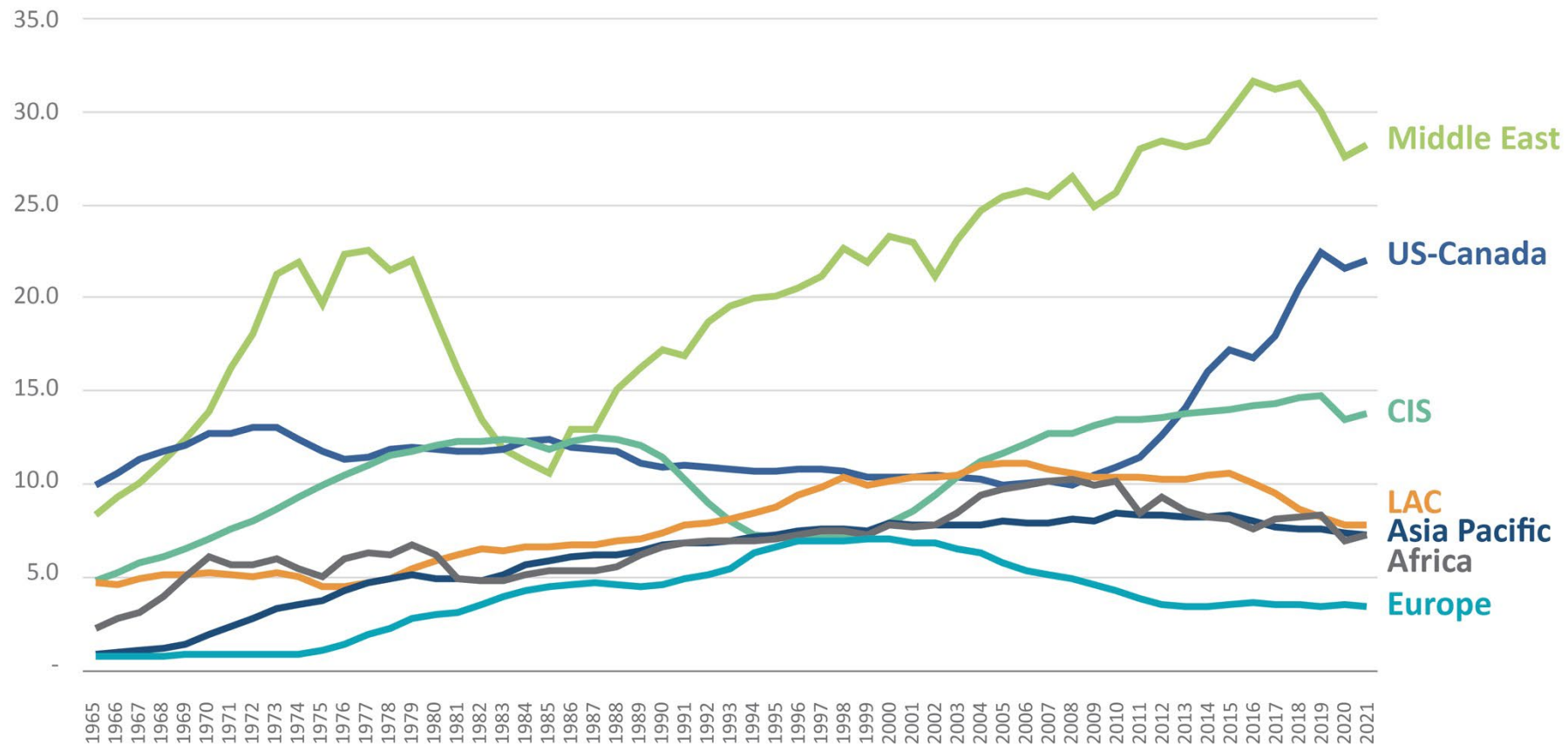
Source: OLADE

Energy sector in LAC not the single culprit of GHG Emissions in LAC (43% vs. 75% globally)

LAC contributes with 9% of Global Petroleum Production



Global Oil Production (Mbo/d)

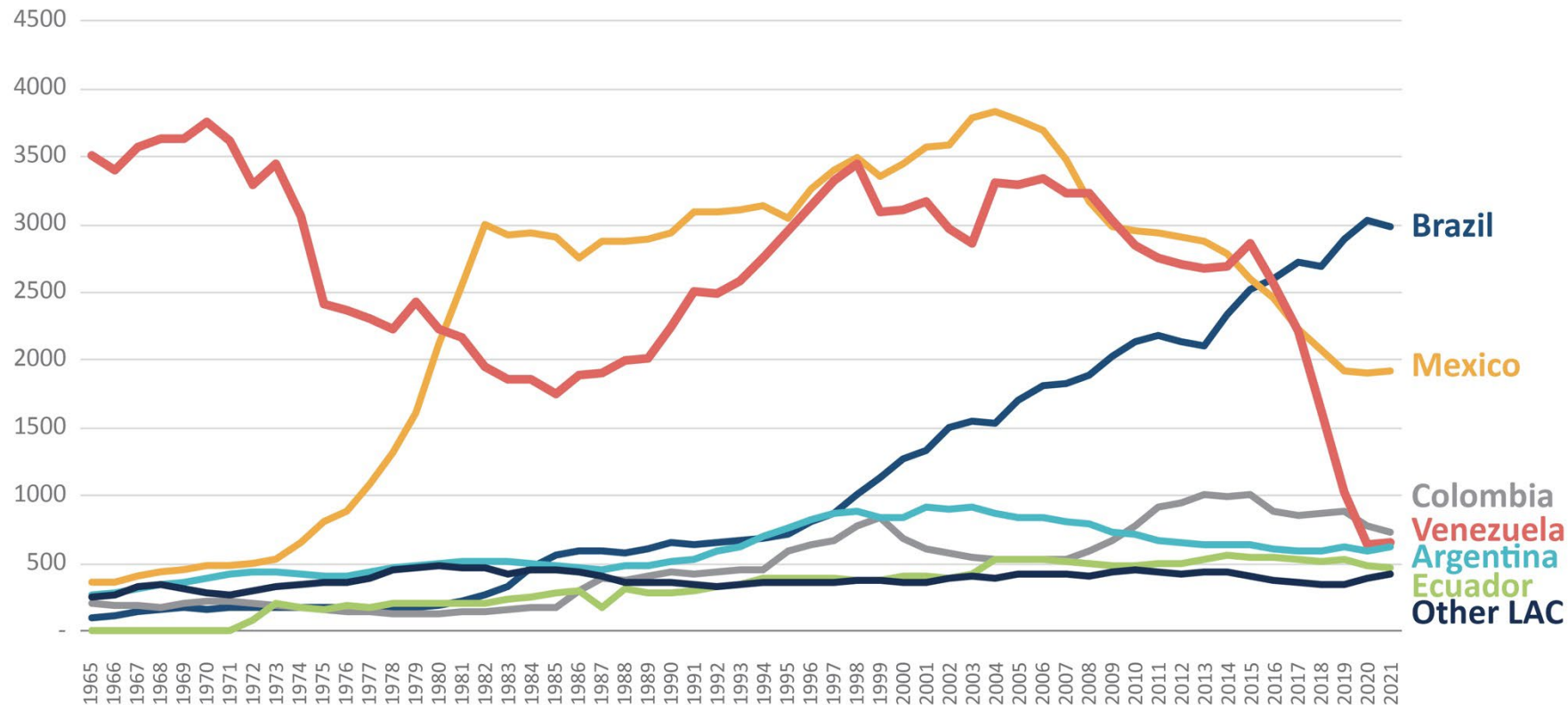


LAC's contribution has ranged 9-15%

9% in 2021 and seems in decline

Brazil now leading in LAC's Petroleum Production

LAC Oil Production (Kbo/d)



Historically dominated by Venezuela and Mexico

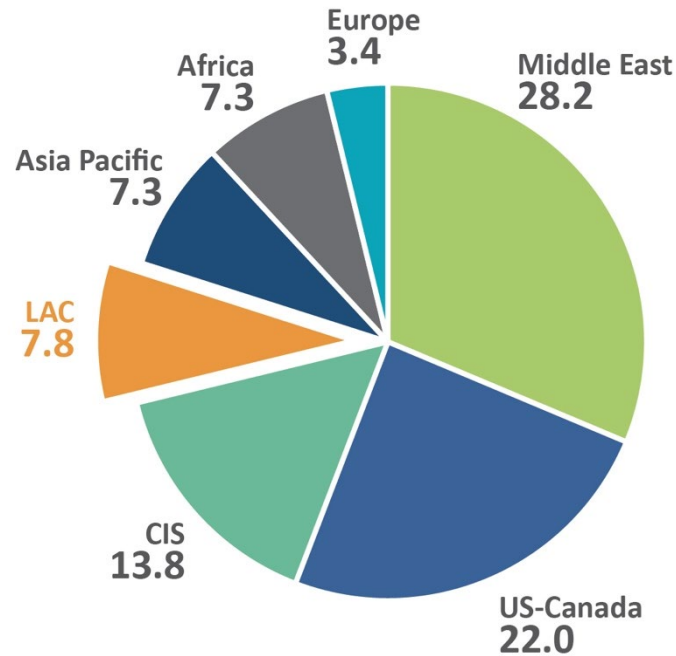
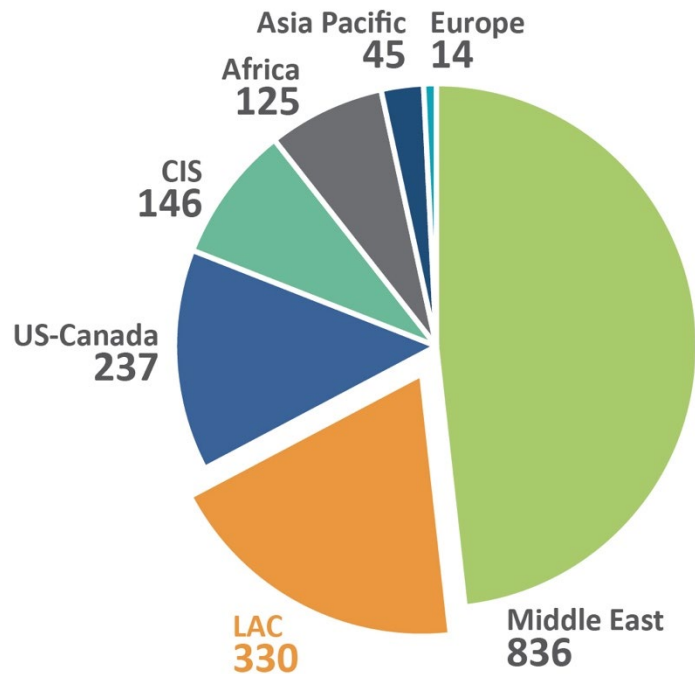
Currently dominated by Brazil

Colombia, Argentina and Ecuador in a second tier

LAC 2nd in Proved Petroleum Reserves but 4th in Production

Global EOY 2020 Proved Oil Reserves:
1,732 Bbo
LAC: 19%

2021 Production:
89.9 Mbo/d
LAC: 9%



Region	EOY 2020 R/P (y)
Middle East	83
LAC	115
US-Canada	30
CIS	30
Africa	49
Asia Pacific	17
Europe	10
Global	54

Source: BP Statistical Review 2022

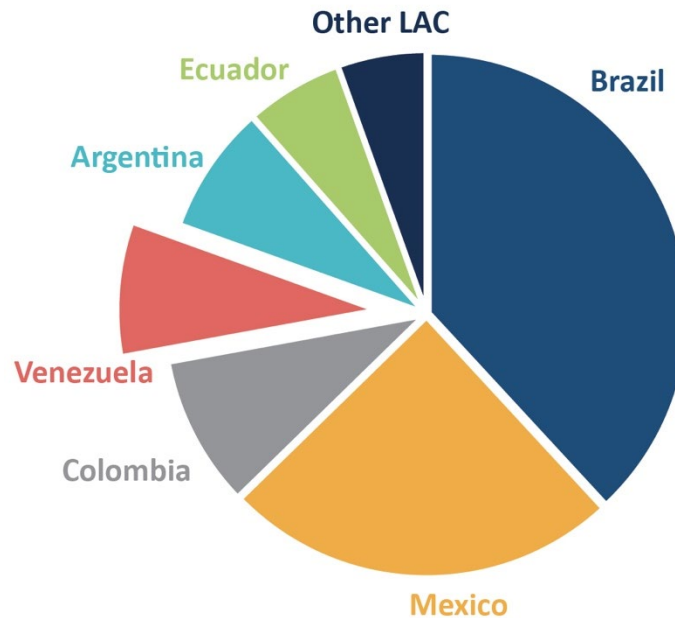
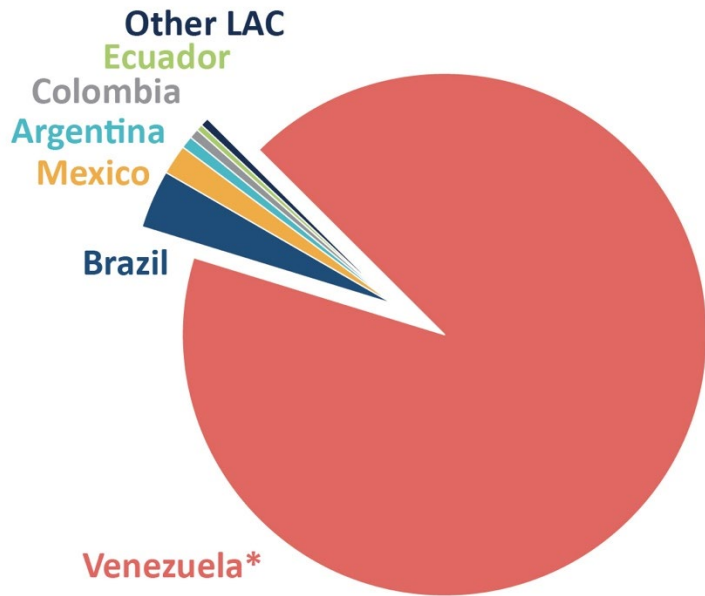
Apparent dissonance between contributing 9% of production and holding 19% of Proved Reserves

Evident in the R/P

Venezuela 1st in Proved¹ Petroleum Reserves but 4th in Production

LAC EOY 2020 Proved Oil Reserves:
330 Bbo
Venezuela: 92%

2021 Production:
7,837 Kbo/d
Venezuela: 8%



LAC	EOY 2020 R/P (y)
Venezuela	1,301
Brazil	11
Mexico	9
Argentina	13
Colombia	7
Ecuador	7
Other LAC	12
Region	115

Source: BP Statistical Review 2022

Apparent dissonance between Venezuela contributing 8% of production and holding 92% of Proved Reserves

Evident in the R/P. Even at historical peak levels of 3.5 Mbo/d, R/P would be 238 y. Resources are there (ultra-heavy oil) → likely a reserve classification issue. Proved Reserves should be ~ 75 (60% H-EH) in lieu of 303 Bbo

¹ Expected to be extracted with 90% certainty from well established/known reservoirs with existing equipment, under existing operating conditions, and by economically profitable means

Northern Cone: rising Guyana-Suriname



Mexico | Arrested Development

- Deep sector reform backtracked
- Strong offshore exploration by Pemex and private incumbents
- No further private licensing

Venezuela | In Decline

- Investor-unfriendly terms and government intervention deterred many foreign investors
- Under OFAC sanctions
- Heavy oil projects not as attractive as before
- Huge gas potential, with infrastructure capacity in T&T

Ecuador | Reopening Slowly

- History of expropriations of Oxy, Petrobras, Inpex-Cayman and Perenco-ConocoPhillips
- Service contracts with PetroAmazonas attracted those not obsessed with reserve booking (Schlumberger, Tecpetrol, etc.)
- Reopening again, albeit very slowly (Intracambios, Sacha?)

Colombia | Newly Frozen

- No further licensing under new administration
- No fracking
- Security risk abating, but hard to approve environmental permits

Peru | Thin Market

- Modest potential
- Political instability
- Stranded discoveries in Marañón

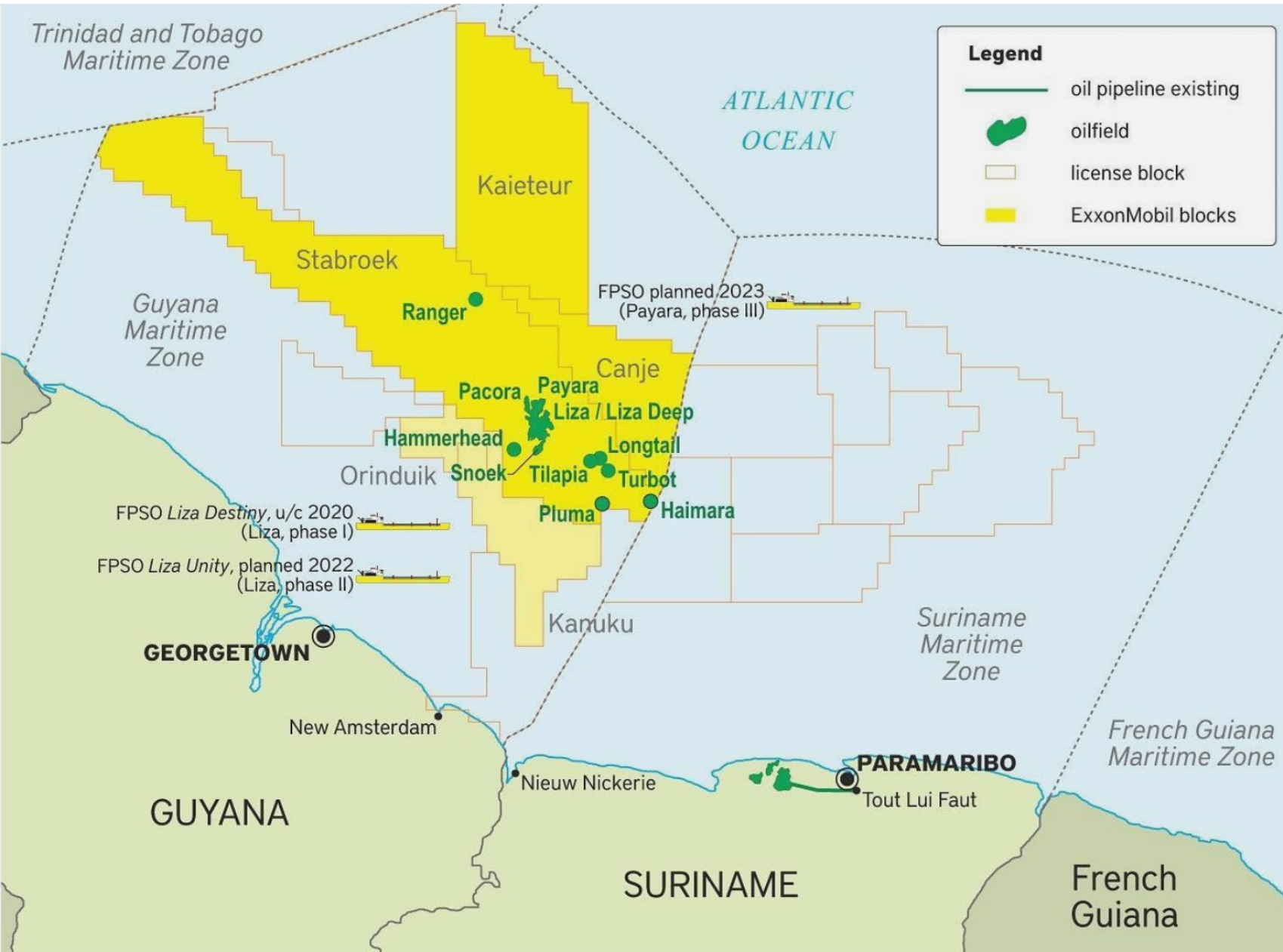
Guyana-Suriname | Exploration Boom

- Spectacular new fairway
- > 31 discoveries since 2015 (~12 Bbo)
- 1,200 kbo/d by 2027

Venezuela and Mexico in production decline

Guyana-Suriname on the up

Play Highlight: Guyana-Suriname Equatorial Margin



Prolific source rock and large influx of reservoir-prone sands from Guyana Shield

Efficient conduits from platform/slope canyons to slope and basin floor fans

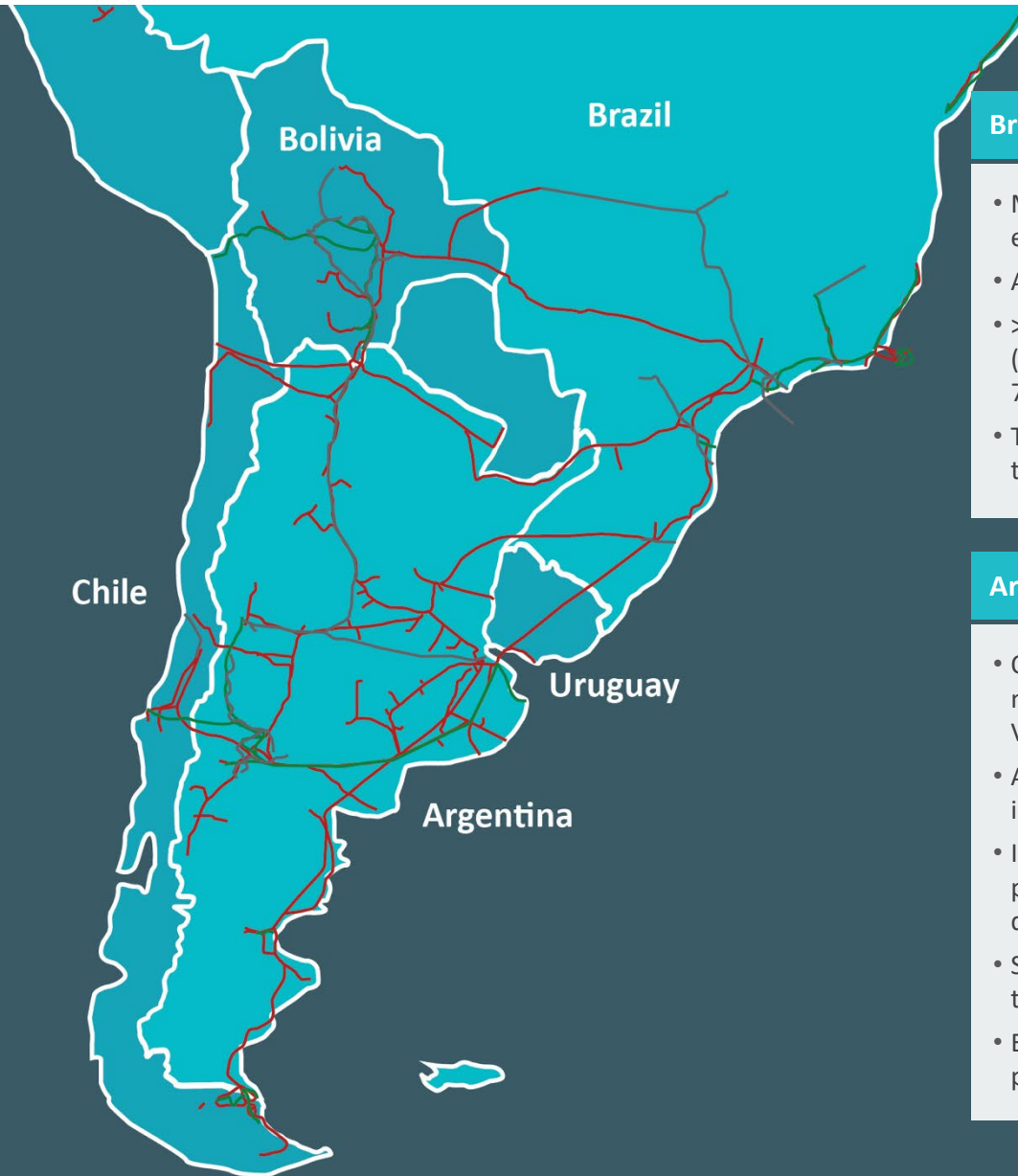
> 31 discoveries (and still counting)

Very immature; far from saturation in creaming and breakeven cost curves

Producing 380 Kbo/d.
Expected to reach 1,200 Kbo/d by 2027

Source: Plata Energy

Southern Cone: Brazil outstanding and Argentina emerging



Brazil | Spectacular Potential

- Most important current exploration play in the world
- Attracted most major IOCs
- > 30-40 Bbo in reserves in Presalt (70% of country's reserves and 72% of its output)
- Top in region in M&A transactions

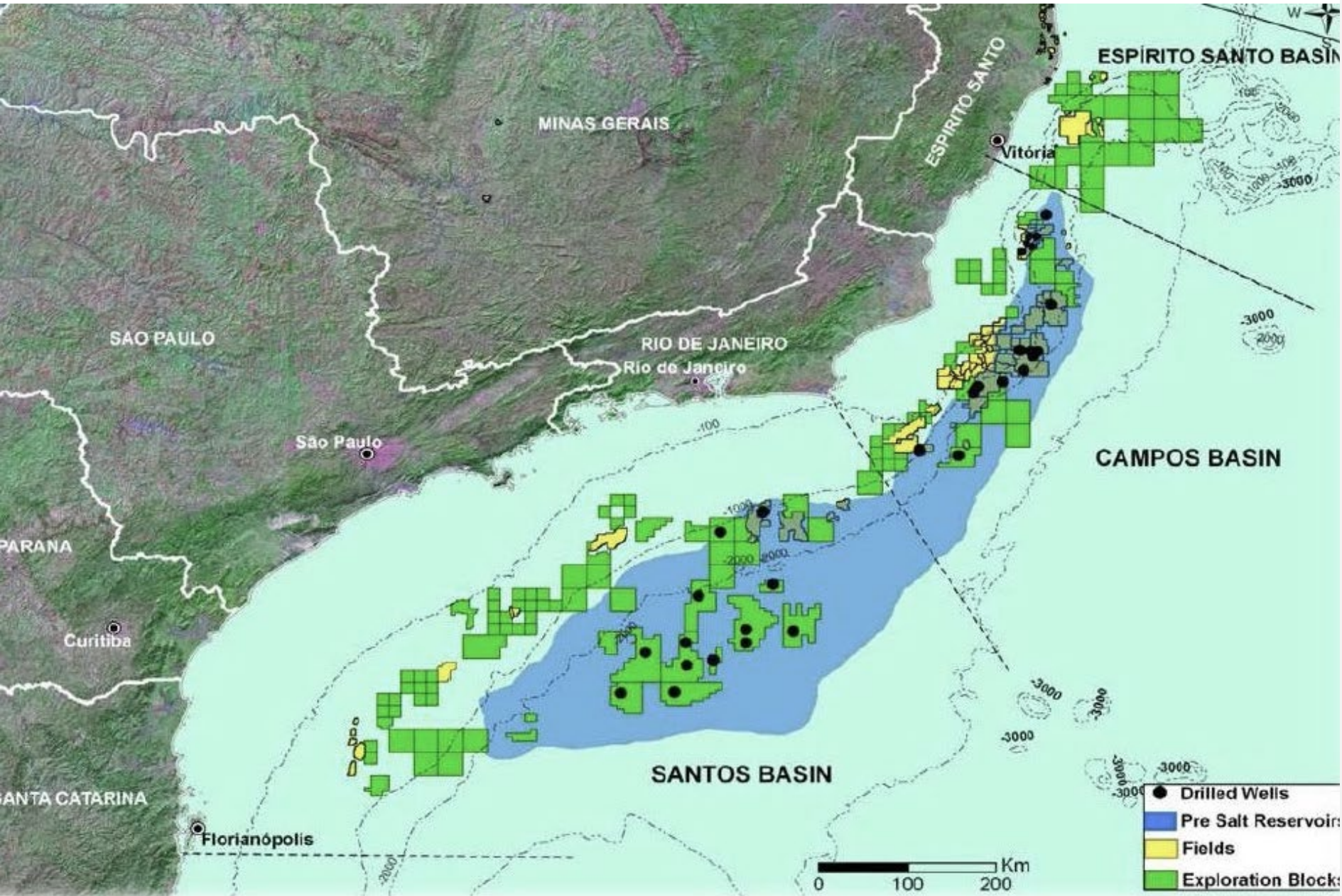
Argentina | Politics in the Way

- Offers growth potential for majors and local independents in Vaca Muerta, fairly de-risked
- Attracted major IOCs and local independents
- Interesting emerging offshore play; interest buoyed by Namibia discovery
- Second in region in M&A transactions
- Economic, institutional and political volatilities

Brazil's petroleum booming

Argentina's shale potential supported by specific incentives but hindered by general economic and institutional volatility

Play Highlight: Brazil Presalt



Giant and supergiant fields

Excellent quality carbonate reservoirs

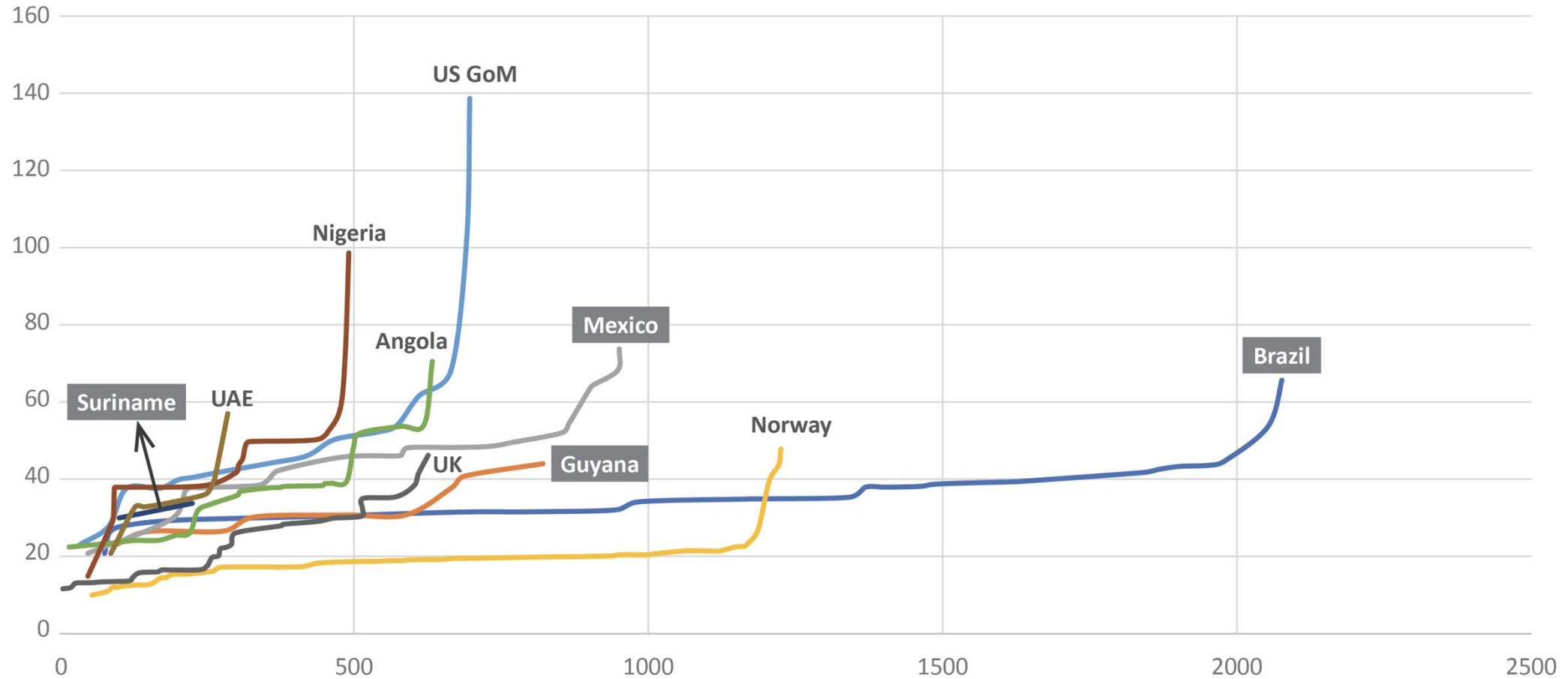
Play at 5,000-6,000 mbsl, below a 2,100 m water column and sediments including ~ 1 Km of salt

Wells deliver 17 Kbo/d on average, and can reach 60 Kbo/d

By 2035 Brazil could be producing 7-9 Mbo/d

Breakeven Curves (\$/bo): room to grow

Potential supply from 2020-25 sanctioning activity among top offshore countries



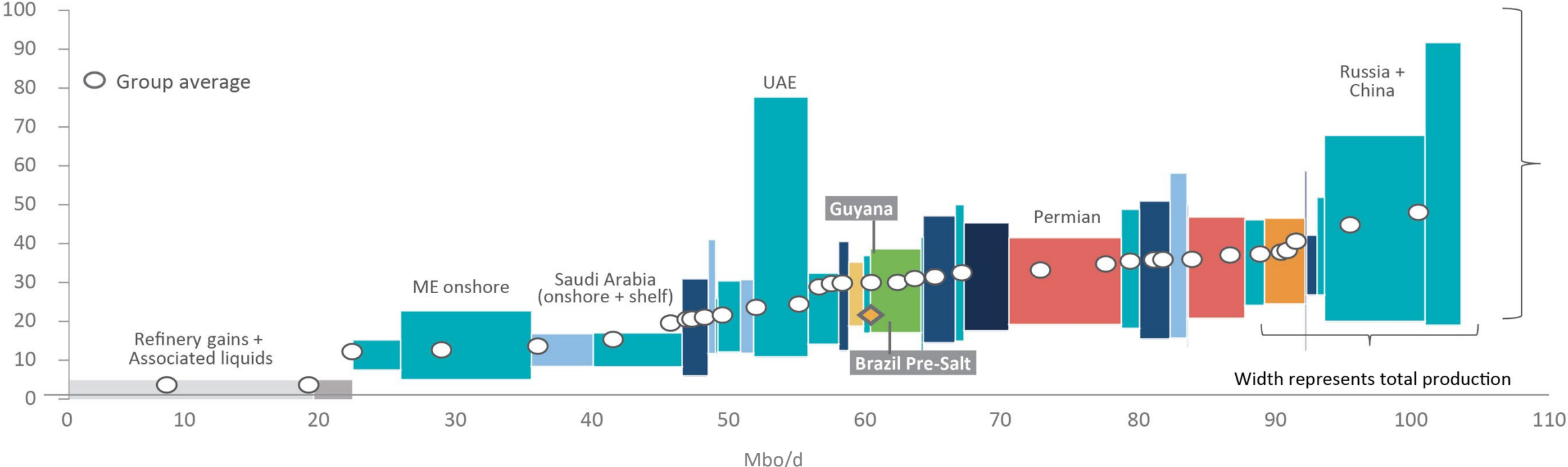
Planned production capacity in thousand barrels per day

Breakeven Prices (\$/bo): Guyana and Brazil are competitive

2030 Global Oil Cost of Supply

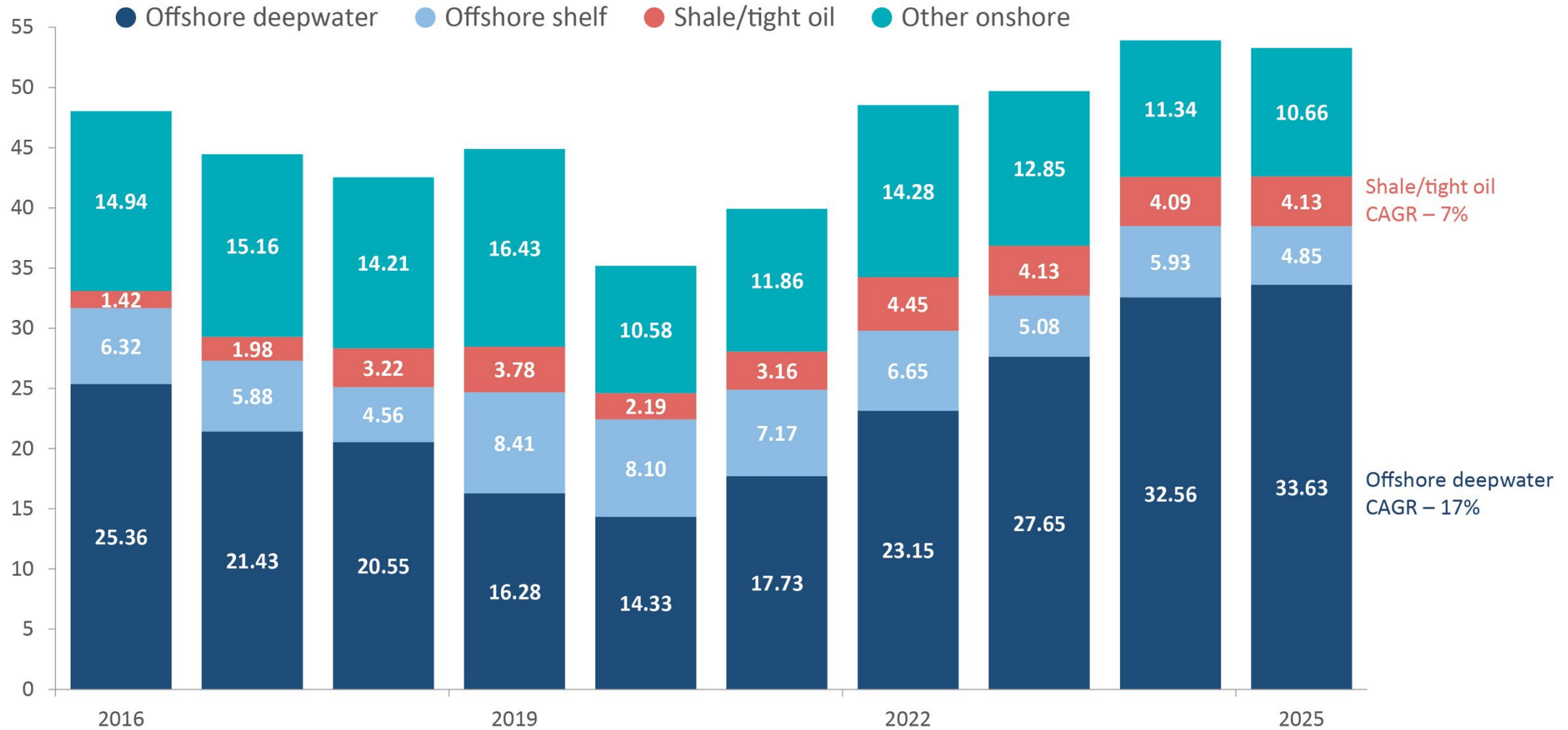


● Oil sands
 ● Heavy oil
 ● Shale
 ● Associated liquids
 ● Deepwater
 ● Shelf
 ● Conventional onshore

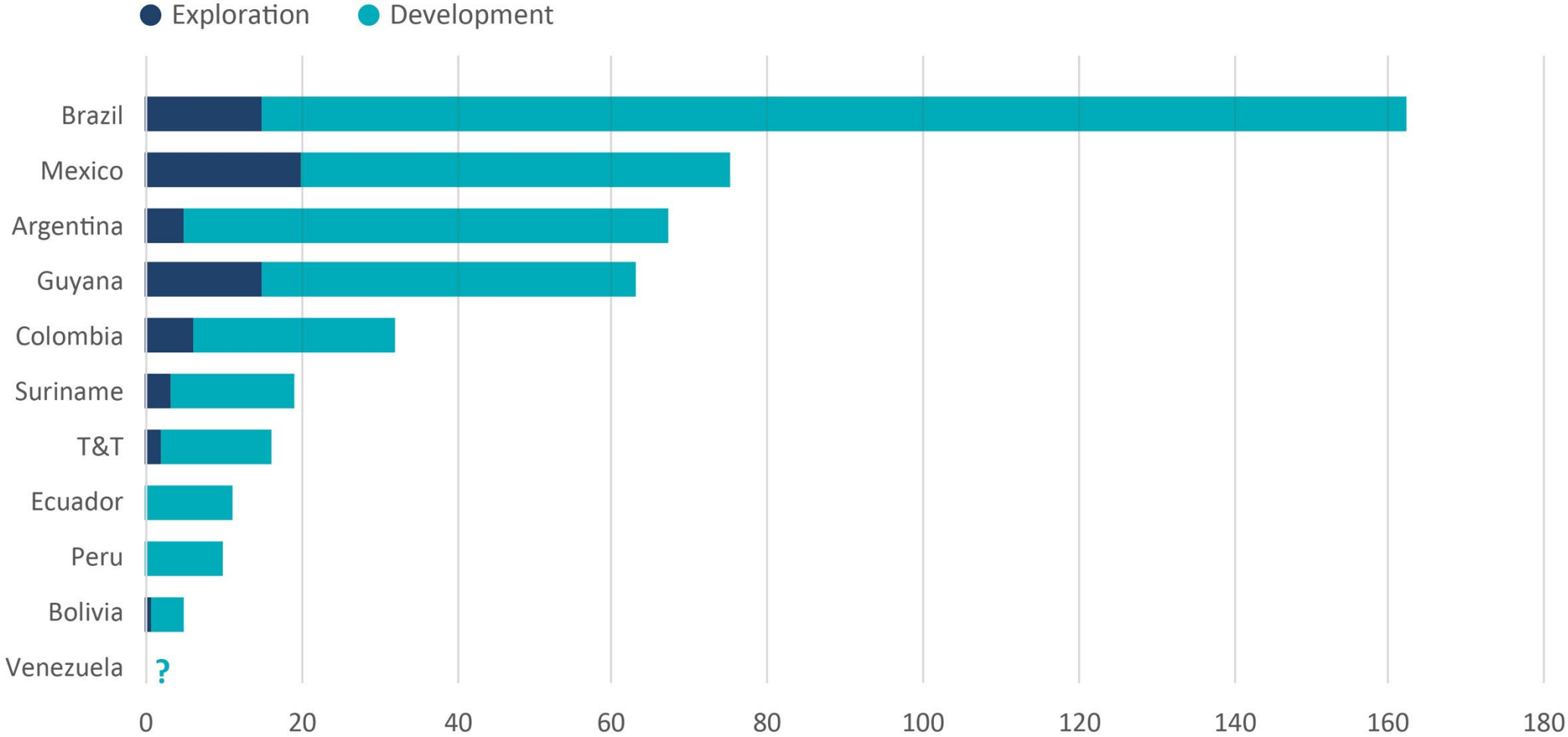


Source: Rystad

Investment Trends driven by Offshore (BUSD)



2021-2030 Upstream Investments led by Brazil (BUSD)



Source: Rystad

Region holds ~ 60% of the heavy oil resources of the planet (mostly in Venezuela; fairway extends to Colombia, Ecuador and Peru)

Many refineries have marginal scale and outdated configuration, in countries that export crude and lower quality products and must import high quality products

Growing competition from biofuels and electric mobility, growing operational and regulatory standards, growing emission, pollution and water demands for maintaining/renewing their social licenses

Shrinking refining profit margins and very high costs of structural transformation in scale and in configuration

Societal pressures less exacerbated than in the EU, but growing

Barriers to debt and equity funding for E&P, even for decarbonization of O&G operations



They control most of the oil reserves



Specific weight in the economies and employment in their countries: must supply energy at accessible prices to lift significant population segments from poverty



Some have higher difficulties accessing capital and technology

Due to fiduciary duties and political scrutiny, they tend to have **lesser decision and financial independence and to be more conservative** and risk-averse

They require clear alignment of Government policies addressing the tension between developing and monetizing their resources, and social apprehensions about the environment and climate change

Countries facing the “energy trilemma”:

Energy Security (and Sovereignty) – Equitable Access – Environmental Sustainability, are sometimes lacking clear policies, plans, and regulatory frameworks to navigate their Energy Transitions

Eclectic energy and climate vulnerability region

→ one path doesn't fit all (Transitions are plural)

- Some net exporters, some crude exporters that are significant product importers, some are practically self-sufficient, others are net importers
- Coastal areas and insular countries especially vulnerable to climate risk

Transitions must be “just”:

- LAC a marginal contributor to global emissions: 4.5% CO2 and 8.3% GHG
- 61% of power from renewable sources
- 1/3 of population below the poverty lines and 13% extremely poor
- → **Right to develop and monetize natural resources in a sustainable way**

Notwithstanding, decisively embarked in

Transformation, decarbonizing operations and diversifying energy matrixes with renewable energies

Many of our regional and national

O&G companies have adopted net zero targets

and are venturing into solar, wind, geothermal, lithium mining, blue and green hydrogen, and reforestation

Future Trends in LAC?



Challenging financing,
permitting and/or marketing,
particularly for heavier crudes

**More gas-weighted
production, better
infrastructure integrations**
in North Cone and in South Cone,
more LNG exports

**Improve energy efficiency
and decarbonize** upstream,
midstream and downstream
operations and facilities

Increase complexity and adapt refining configurations
to accept biomass feeds, produce biofuels and blue H₂, and integrate
with petrochemicals

**Seek “super basin”
synergies with renewables**

**Natural gas as an
uninterruptible-basis
partner for renewables**

Huge sun belts: **growing
solar for local generation**

High wind alleys in Patagonia and
coastal areas: **highly efficient
wind plants, green H₂**

Thank you!

My card:



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