CATAVENTO

climate intelligence®

Factsheet 21 · November 2024 · catavento.biz

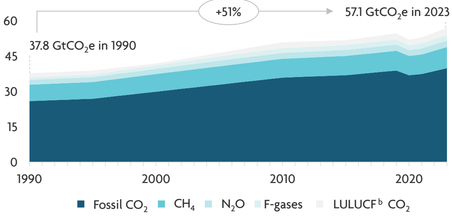
clarissa.lins@catavento.biz · guilherme.ferreira@catavento.biz · bernardo.correa@catavento.biz

Transitioning away from oil and gas (1/2): trade-offs ahead

At COP28, nearly **200 countries acknowledged the need** for "deep, rapid and sustained reductions in greenhouse gas emissions in line with 1.5°C pathways", committing to "**transitioning away from fossil fuels**[a] in energy systems, in a **just, orderly, and equitable manner**, accelerating action in this critical decade, in order to achieve **net zero by 2050, in keeping with the science**." This implies complex **trade-offs, dilemmas, and implications for producers and consumers**, which must be understood if society is to fulfill its climate goals

Growing greenhouse gas (GHG) emissions have led global 10-year average temperatures to 1.2°C above pre-industrial levels[1]

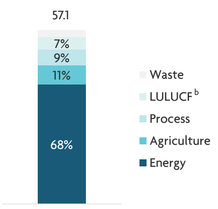
Total net anthropogenic GHG emissions[2]
$GtCO_2e$/year, 1990-2023



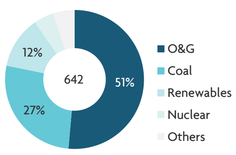
- Total economic losses from natural disasters **increased 8x** from the 1970s decade to the 2010s (US$ 184 bn vs. US$ 1.4 tn)[3]
- Current policies (STEPS)[c] would lead to **at least 2.4°C of warming by 2100**, causing **severe damage** to natural and economic systems[4]

The oil and gas (O&G) industry accounts for a large share of energy-related emissions, due to its major role in energy systems

Global GHG emissions[2]
$GtCO_2e$, 2023



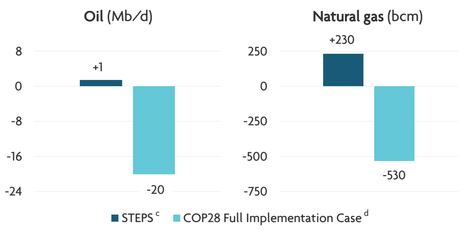
Global energy mix[4]
EJ, 2023



- The O&G industry is responsible for around **55%** of total energy-related GHG emissions (21.3 $GtCO_2e$)[5]
- Of this percentage, approximately **15%** is related to **operations** (scope 1 and 2) and **40%** to the **combustion** of O&G (scope 3)[5]

In this context, the COP28 "transitioning away" commitment was agreed, signaling profound transformations in the energy sector

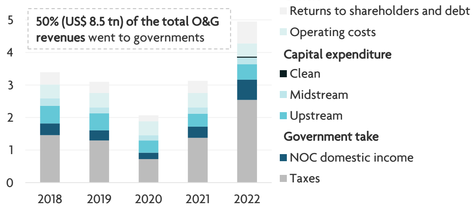
Change in O&G demand from 2023 to 2030 by scenario[6]



- Achieving COP28 commitments means a **20% absolute reduction** in O&G demand by **scaling up clean energy and energy efficiency**[6]
- **Coordination** among policy makers, consumers and producers is crucial to ensure a **"just, orderly and equitable" transition**

However, a reduction in both O&G demand and supply must take into consideration the industry's economic relevance...

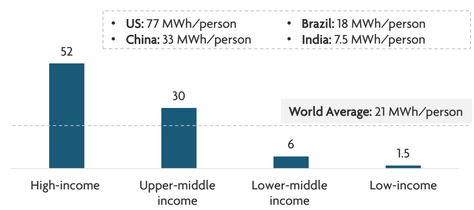
Use of revenue by the O&G industry[7]
US$ tn, 2018-2022



- O&G represents over **15% of GDP**[8] **and 70% of exports**[9] in less diversified producing countries, such as Saudi Arabia and the UAE[8]
- In 2022, the industry accounted for around **11.7 mn jobs** (47% of the energy sector – 7.6 mn in oil and 4.1 mn in gas)[10]

...as well as the need for emerging economies to raise standards of living and meet growing energy demand

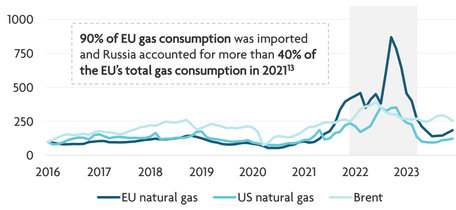
Average energy use per capita by country income level[11]
MWh/person



- Petrochemical feedstocks will be the **largest force for growth in oil demand** to 2030 (+2.8 Mb/d), led by China (+1.3 Mb/d)[12]
- India's car fleet is expected to **increase 40% by 2030**, with EV's expected to account for just 5% of the total fleet[12]

Looking ahead, it is also crucial that supply and demand work in tandem to avoid disturbances to energy security

Impact of Russia's invasion of Ukraine in energy prices[13]
Index (Jan 2016 prices = 100)



- Abrupt disruptions in the supply of O&G can lead to **price volatility** and **economic shocks, such as those experienced recently**
- If this happens, **public support** for the energy transition may diminish, **slowing the progress** towards decarbonization

Coordinating the transition away from O&G in the global energy system entails **high costs and the need for international cooperation** amid an **increasingly complex geopolitical landscape**. Therefore, for this commitment to advance, it is critical to analyze **each country's readiness** to deal with a reduction in both O&G supply and demand, as well as the **implications for energy security, socioeconomic development and global emissions**. Despite this, there is no time for delays, as the **cost of inaction could lead to even greater impacts.**

Check out the second part of this factsheet here, which explores the main dimensions to be considered when analyzing each country's exposure to the O&G industry and readiness to transition away from O&G.

---

[a] This study does not include coal, only oil and natural gas; [b] Land use, land use change and forestry; [c] The IEA's Stated Policies Scenario (STEPS) accounts for energy, climate and related industrial policies that are in place or that have been announced; [d] The COP28 Full Implementation Case is consistent with the IEA's Net Zero Emissions by 2050 Scenario (NZE)

1 / WMO. State of the global climate. 2024; 2 / UNEP. Emissions Gap Report. 2024; 3 / WMO. Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970-2019). 2023; 4 / IEA. World Energy Outlook. 2024; 5 / IEA. Emissions from O&G Operations in Net Zero Transitions. 2023; 6 / IEA. From Taking Stock to Taking Action. 2024; 7 / IEA. The Oil and Gas Industry in Net Zero Transitions. 2023; 8 / World Bank. Oil rents (% of GDP). 2021; 9 / World Bank. Fuel exports (% of merchandise exports). 2023; 10 / IEA. World Energy Employment. 2023; 11 / Our World in Data. Energy use per person. 2023.; 12 / IEA. Oil 2024. 2024; 13 / IEA.Strategies for Affordable Fair and Clean Energy Transitions. 2024

CATAVENTO

climate intelligence®

Factsheet 21 · November 2024 · catavento.biz

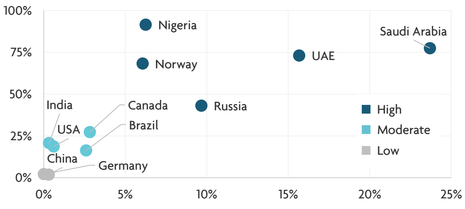
clarissa.lins@catavento.biz · guilherme.ferreira@catavento.biz · bernardo.correa@catavento.biz

Transitioning away from oil and gas (2/2): a multidimensional approach

To **deepen and advance the discussion** around the commitment of "transitioning away from fossil fuels[a]", a sample of 11 countries[b] was selected based on oil and gas (O&G) consumption and production, as well as regional factors. In this context, a **wide-ranging set of dimensions** were identified to analyze each **country's exposure to the O&G industry** and **readiness to transition away**: **i) O&G relevance; (ii) O&G competitiveness; (iii) energy security and transition readiness; (iv) emissions profile; and (v) institutional and social resilience**

(i) O&G producing countries with diversified economies are less exposed to the potential impacts of the transitioning away

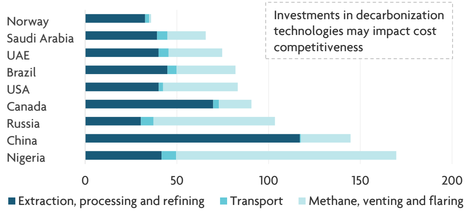
O&G economic relevance in selected countries[1,2,3,4]
Fuel exports % of total exports (y-axis) and oil rents % of GDP (x-axis)



- Producing countries with **established O&G infrastructure** and **less diversified economies** rely on revenues from the sector's activities
- A decline in O&G demand may lead to **fiscal imbalances and slower GDP growth**, further amplified by **exposure to stranded assets[c,5]**

(ii) Meanwhile, countries that are less competitive in terms of costs and emissions are not well-positioned for the future O&G market

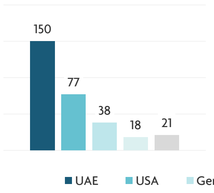
Average emissions intensity of oil in producing countries[6,7]
$kgCO_2e$/boe, 2022



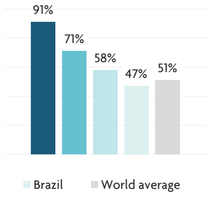
- In terms of cost, **Middle Eastern onshore fields** stand out for the **lowest average breakeven prices** and the **largest resource base[8,9]**
- Along with Norway, they would be **better positioned** to provide low-cost and low-emissions O&G in a scenario of diminishing demand

(iii) Some countries will face energy security challenges, as O&G play an important role in their energy systems

Primary energy consumption per capita[10], MWh/person



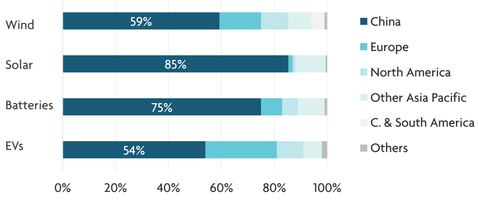
Share of O&G in energy mix[11]
%



- Countries with a **large share of O&G** in their energy mix and **high energy consumption levels** face barriers in transitioning away
- At the same time, shifting to clean energy can **increase energy security and affordability**, especially in **net O&G importers**

(iii) Additionally, countries need an enabling environment for clean technologies to successfully transition away from O&G

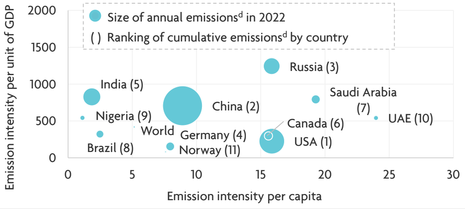
Share of clean energy manufacturing by region[12]
%



- Onshore wind and solar PV, are now **increasingly competitive with fossil fuel generation** in most countries[13]
- Still, **capital availability and an affordable cost of borrowing** are crucial factors to **mobilize investments** in the energy transition

(iv) The sooner top-emitting countries transition, the greater the impact on global emissions

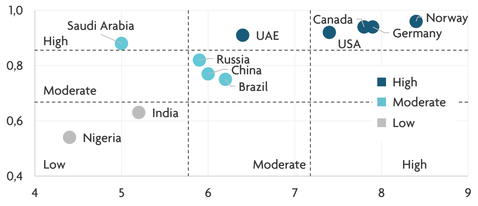
Current and historical emissions[d] by country[14]
tCO_2e/US$ mn GDP (y-axis), tCO_2e/person (x-axis)



- The United States, China and Russia have **profited the most** from energy and industry emissions, and are **still among the top emitters**
- The pace of the transition away from O&G in these countries has a **large impact on the global carbon budget**

(v) A successful transition away from O&G also requires strong societal and institutional resilience

Country rankings based on institutional and social capacity[15,16]
Human Development Index (y-axis), State Resilience Index (x-axis)



- The transition away from O&G might pose **significant challenges** and **potential disruptions** to the energy system
- Countries that are more likely to experience political instability or social unrest have a **lower ability to transition away at a faster pace**

Based on the five dimensions considered, countries can be categorized into **three distinct groups**, which aim to reflect the varying degrees of each **exposure to the O&G industry** (both economically and in terms of energy dependency) as well as their **readiness to lead a secure and orderly energy transition**. The category names were chosen to represent each country's **unique conditions** for gradually transitioning away from O&G, although it **remains imperative for all to advance toward this goal, both on the supply and demand sides**.

Front-runners – Diversified economies with lower exposure to the O&G industry and greater readiness to transition away

Movers – Less diversified economies with moderate exposure to the O&G industry and readiness to transition away

Adapters – Largely O&G-dependent economies with weaker readiness to transition away

---

[a] This study does not include coal, only oil and natural gas; [b] United States, Canada, Russia, China, India, Saudi Arabia, United Arab Emirates, Norway, Germany, Brazil and Nigeria; [c] Asset stranding is the process of collapsing expectations of future profits from invested capital (the asset) as a result of disruptive policy and/or technological change; [d] Energy and industry emissions

1 World Bank. Fuel exports (% of merchandise exports). 2023; 2 / World Bank. Oil rents (% of GDP). 2021; 3 / IMF. Key Challenges Faced by Fossil Fuel Exporters during the Energy Transition. 2024; 4 / Oxford Institute for Energy Studies. Follow the money: understanding Russia's oil and gas revenues. 2024; 5 / Nature climate change. Stranded fossil-fuel assets translate to major losses for investors in advanced economies. 2022; 6 / IEA. The Oil and Gas Industry in Net Zero Transitions. 2023; 7 / RMI. Know Your Oil and Gas. 2022; 8 / S&P Global. Global crude oil cost curve shows 90% of projects through 2040 breaking even below $50/bbl. 2021; 9 / Rystad. Shale project economics still reign supreme as cost of new oil production rises further. 2043; 10 / Our World in Data. Energy use per person. 2023; 11 / IEA. Countries and regions. 2024; 12 / IEA. Energy Technology Perspectives. 2023; 13 / IRENA. Renewable Power Generation Costs in 2023. 2024; 14 / Climate Watch. Historical GHG Emisions. 2022; 15 / UNDP. Human Development Index. 2022; 16 / Fund for Peace. State Resilience Index (SRI). 2022