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THE OIL SECTOR: TOWARDS THE LAST DROP?

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Review of the oil & gas sector based on 2021 data

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Summary

- **The oil and gas industry has been the lifeblood of our economy for over a century.** It irrigates all consumer sectors that are heavily dependent on hydrocarbons (agriculture, chemicals, transport, etc.).

- **Since the end of the 19th century, hydrocarbon production has grown steadily,** as have emissions generated by their combustion**.** The climate crisis we are facing calls for a drastic reduction in hydrocarbon production by 2050, essential in meeting our climate commitments.

- **Absolute emissions are rising steadily,** and companies' targets for reducing these emissions (and therefore their hydrocarbon volumes) are still far too unambitious. In our sample, hydrocarbon production volumes (in barrels of oil equivalent) rose by an average of 31% between 2016 and 2021. The biggest increase comes from North America (+66%), boosted by the shale oil and gas boom.

- **Transition risks are still largely inadequately considered**, and most companies in the sector are, in fact, highly exposed to stranded asset risks, which are generally not publicly assessed. The sector's highly capital-intensive companies are driven by a short-term economic logic, which is exacerbated by current energy prices. As a result, they continue to invest massively in hydrocarbon exploration and production.

- **Targets for reducing emissions linked to the combustion of products sold (scope 3) remain rare,** even though such emissions account for around 80% of the sector's total footprint. Reducing scope 3 emissions implies a reduction in volumes extracted and sold, a lever that oil & gas companies still do not consider sufficiently. Scope 1 and 2 emissions reduction targets are more common, but too few companies are committed to reducing their emissions in absolute terms.

- **Oil and gas discoveries are becoming increasingly rare,** despite growing resources devoted to exploration and production: it's the Red Queen's paradox - you have to "run" faster and faster to stay put. Residual resources are increasingly difficult to access, and their exploitation is increasingly harmful to the environment (shale oil, ultra-deep waters, etc.).

- **The oil and gas sector, boosted by its access to cheap credit, remains highly profitable, and does not seem ready to make the necessary shift.** In this context, financial players, led by banks and asset managers, have a key role to play – that of directing financing towards companies which have begun their energy transition, while at the same time pursuing ambitious shareholder engagement policies. This is the aim of the CIA methodology, which distinguishes between companies that are ambitious in their strategy, and those that are less so.

1. Introduction

The modern oil era began in 1859, when Edwin Drake drilled the first commercial oil well. Oil had been discovered long before, but until then its use had remained marginal, and its exploitation small-scale. Oil would soon become "the blood of mankind". This expression, coined by Matthieu Auzanneau, author of the book "Or Noir" illustrates the vital role played by oil (and, by extension, gas) in our thermo-industrial, fossil fuel-driven society.

Today, global hydrocarbon consumption approaches 100 million barrels of oil equivalent per day, and oil accounts for 33% of the world's primary energy mix, compared with 24% for gas[1]. In terms of greenhouse gas (GHG) emissions, oil accounts for 27% of global emissions, and gas for 18%[2]. Oil consumption has been rising steadily for around a century, bringing with it a dazzling rise in greenhouse gas emissions. Today, this trend has resulted in an unprecedented concentration of CO2 and other greenhouse gases in the atmosphere, contributing to a very rapid rise in global temperatures.

[1] Our World in Data, "Energy mix".
[2] International Energy Agency, "Global energy-related greenhouse gas emissions, 2000-2022".

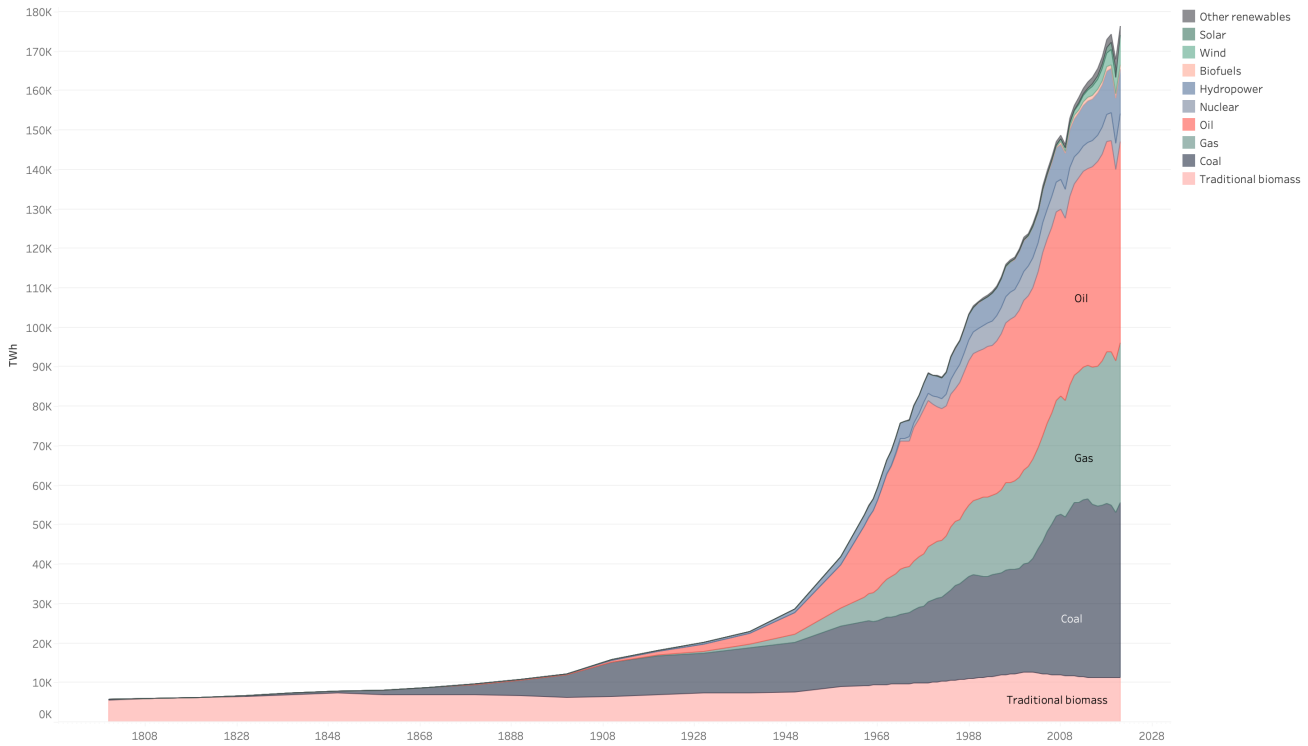


Figure 1: World primary energy consumption by source (Source: Our World in Data) [3]

Rising global temperatures threaten the equilibrium of human life on Earth and bring with them their share of climatic catastrophes. So much so that combating global warming and reducing greenhouse gas emissions has become humanity's most important challenge. Signed in 2015, the Paris Agreement aims to keep global temperature rises well below 2°C, or even 1.5°C by 2100, hence avoiding the worst consequences of climate change.

In concrete terms, meeting the 1.5°C target implies that human activities will have to become net-zero by 2050[4]. This objective calls for major paradigm shifts within our societies. As far as the oil and gas sector is concerned, according to the International Energy Agency (IEA), this should have resulted in a total halt of new oil and gas drilling by 2021[5]. However, numerous oil and gas projects are currently under development, all of which are incompatible with the 1.5°C warming trajectory, as shown in the graph below.

According to joint estimates by the IPCC (the Intergovernmental Panel on Climate Change) and the Global Carbon Project, the global carbon budget that must not be exceeded if we are to have a 66% probability of staying below the 1.5°C threshold is equivalent to 260 $GtCO2_e$ (billion tons of CO2 equivalent), from 2022 onwards[6]. At the current rate of emissions, this budget would be exhausted in six and a half years. However, oil and gas reserves known to date (the accuracy of these figures is open to debate) could emit 980 GtCO2 if exploited, i.e. two and a half times the

[3] Our World in Data, "Energy mix".
[4] Dugast, « Net Zero Initiative - Un référentiel pour une neutralité carbone collective ».
[5] International Energy Agency, "Net Zero by 2050: A Roadmap for the Global Energy Sector".
[6] CaCarbon Brief, "Guest post: What the tiny remaining 1.5C carbon budget means for climate policy".

carbon budget remaining to meet the Paris Agreement. It is therefore essential that a large proportion of these reserves remain in the ground: it is a condition *for* achieving our climate objectives. The graph below shows the IEA's *Net Zero Emissions* trajectory and that of the IPCC, both of which are compatible with 1.5°C warming. However, new oil fields and exploration (in orange and light orange) are largely incompatible with these trajectories.

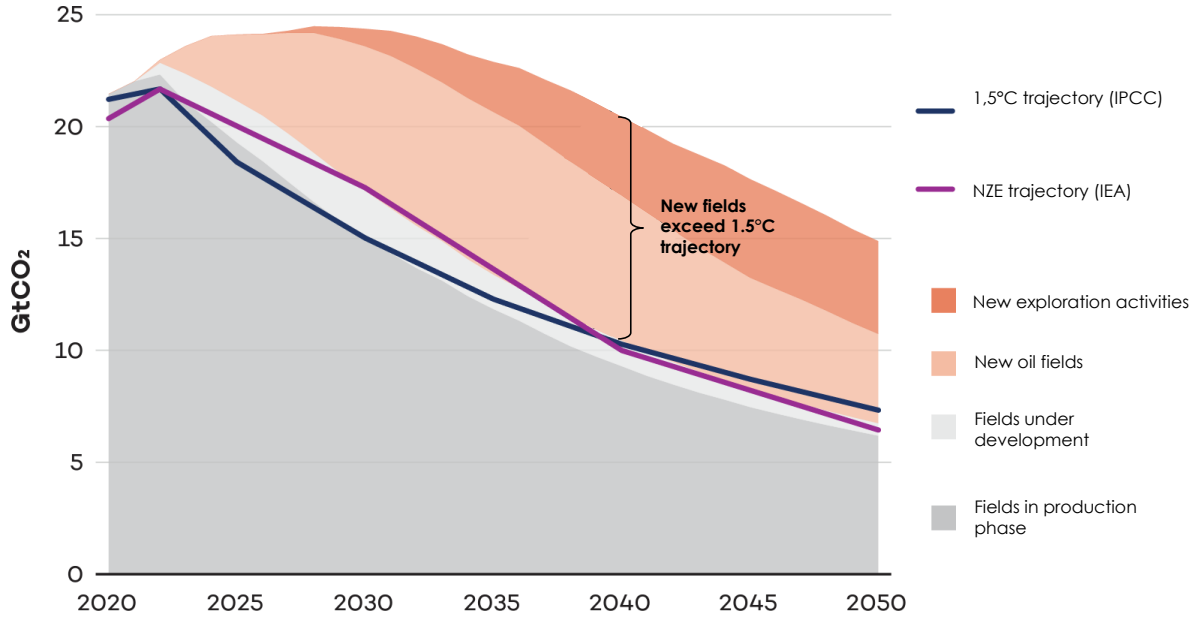


Figure 2: Global oil and gas production trends, based on IPCC and IEA 1.5°C scenarios [7]

Nevertheless, oil companies continue to invest heavily in the exploration and commissioning of new hydrocarbon deposits. This trend is largely driven by the massive development of unconventional hydrocarbons, particularly in North America. By 2030, the United States is expected to account for 60% of global growth in oil and gas production, driven largely by shale oil and gas[8]. According to estimates, the drilling of new oil and gas reserves in the USA - mainly shale - would induce emissions of the order of 120 GtCO2, or more than a quarter of the global carbon budget to be met if we are to have any chance of limiting global warming to 1.5°C by 2050[9]. Furthermore, this figure does not include emissions linked to methane leaks induced by the exploitation and transportation of hydrocarbons, which could increase emissions linked to the expansion of oil & gas activities in the United States by between 10% and 24%[10].

[7] International Institute for Sustainable Development, "Navigating Energy Transitions: Mapping the road to 1.5°C".
[8] Oil Change International, "Drilling Towards Disaster: Why U.S. Oil and Gas Expansion Is Incompatible with Climate Limits".
[9] Oil Change International, "Drilling Towards Disaster: Why U.S. Oil and Gas Expansion Is Incompatible with Climate Limits".
[10] *Ibid.*

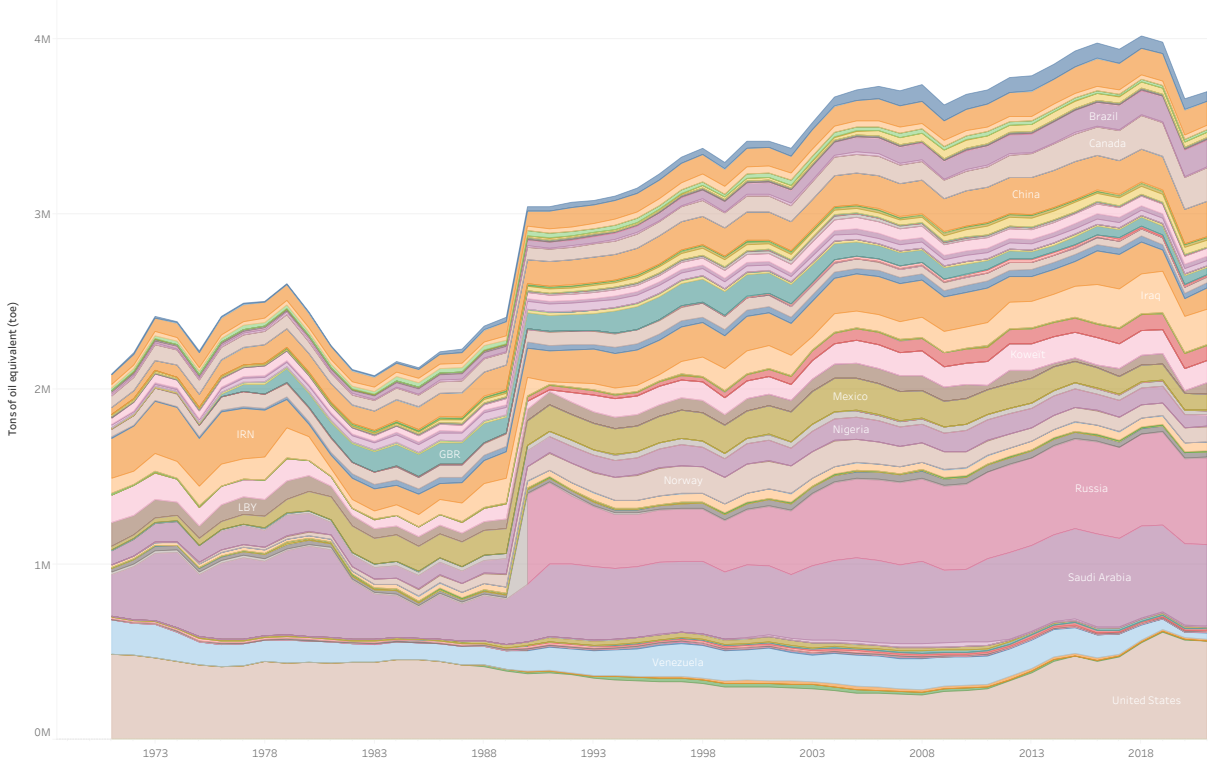


Figure 3: Oil production volumes by country since 1970 (Source: OECD)

The commissioning of new operations buries the objectives of the Paris Agreement. Oil companies appear to be unaware of the risks associated with climate change and have no plans to reduce their oil and gas production in the short to medium term. What is more, the recent surge in the price of hydrocarbons has given them considerable financial resources, enabling them to develop less profitable operations, thereby locking humanity in a warming trajectory largely superior to 1.5°C[11].

[11] Nakhle, "Oil and gas: The investment gap dilemma".

2. Sectoral dynamics and challenges

2.1 The challenges of access to resources

Since the discovery of oil, a total of over a trillion barrels of oil have been consumed[12]. The vast majority of this oil came from easily accessible and exploitable sources, requiring low levels of investment in relation to the quantities extracted. Today, the lowest-hanging fruits have been plucked, and access to residual resources has become increasingly difficult. In concrete terms, the Energy Return on Investment (EROI), i.e. the amount of energy contained in one extracted barrel of oil divided by the amount of energy used to extract it, is constantly falling. Indeed, this figure has fallen from around 100:1 at the beginning of the 20th century to around 10:1 today, as shown in the graph below. The deposits currently being discovered are generally smaller in size, and/or located in areas which are difficult to access (ultra-deep waters, the Arctic, etc.). Oil companies are also turning their attention to unconventional hydrocarbons (shale oil and gas, tar sands, etc.), which are more costly to exploit, have lower yields, and extremely harmful local environmental impacts.

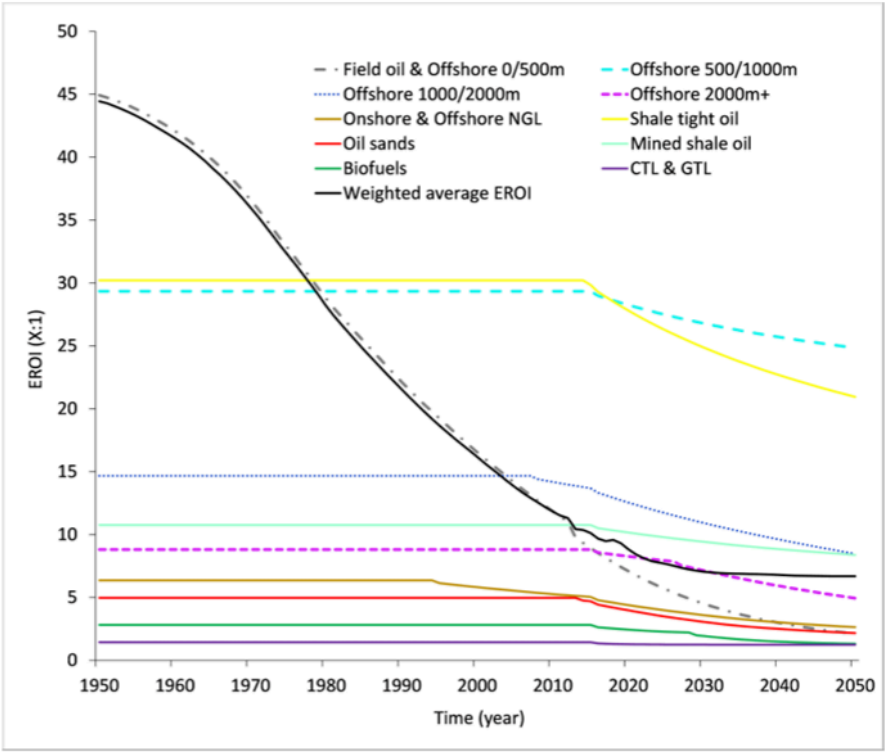


Figure 4: Evolution of EROI for selected hydrocarbons between 1950 and 2050 [13]

[12] Science Daily, "How Much Oil Have We Used?"
[13] Delannoy et al, "Peak Oil and the low-carbon energy transition: a net-energy perspective".

The United States, whose production had been in decline since the 1970s, has recently regained its position as the world's leading hydrocarbon producer. This comeback has been driven by a spectacular boom in shale oil and gas production since 2008. The exploitation of these hydrocarbons is made possible by two major technological innovations: hydraulic fracking and horizontal drilling. As a result, between 2009 and 2021, US oil production increased by a factor of 2.2, while gas production rose by 71%[14]. Numerous companies, buoyed by extremely low interest rates offered by the American Federal Reserve, quickly became major producers of shale hydrocarbons. Initially, shale oil and gas operators (mostly independents) sought a steady increase in production, at the cost of extremely high levels of debt and almost constantly negative cash flows. Following the global pandemic, the strategy changed, under pressure from shareholders: they increased production much more slowly, giving priority to profitability and avoiding the constant drilling of new wells. This strong increase in US shale hydrocarbon production has led to a surplus in emissions of over 2 billion tons of CO2 in 2022, compared with 2008.

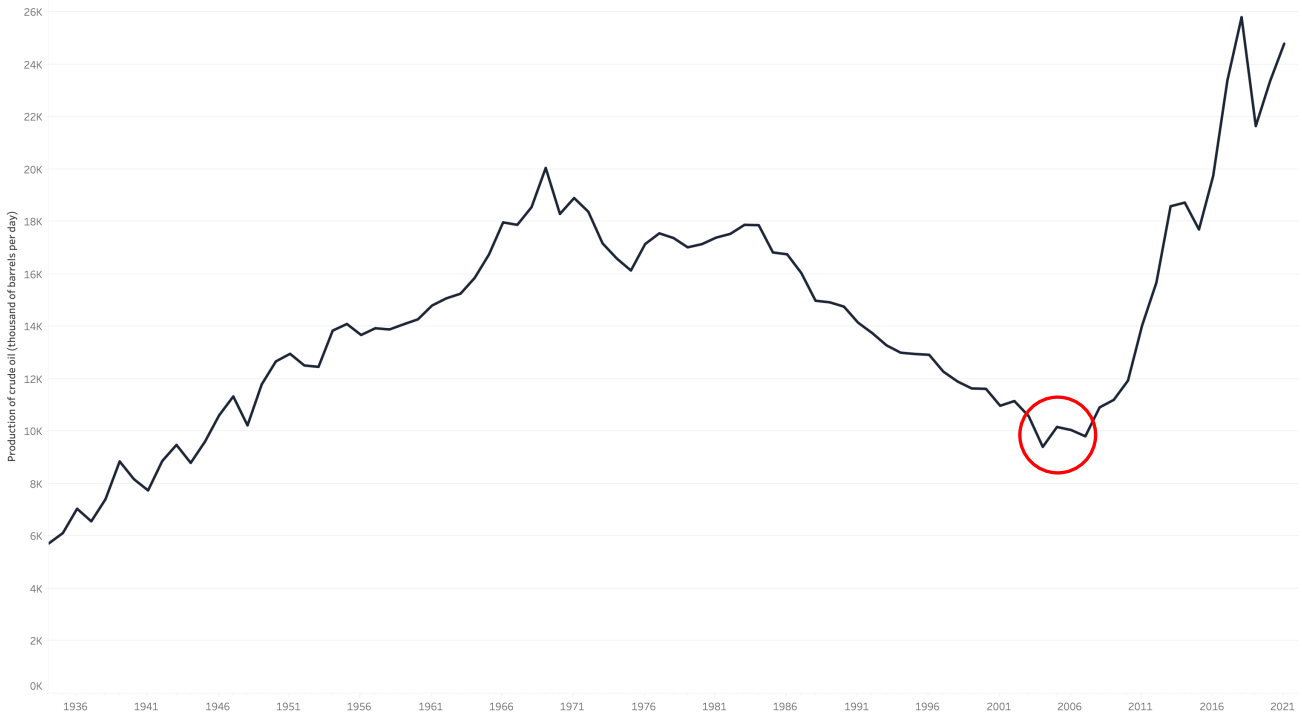


Figure 5: Evolution of oil production volumes in the United States between 1930 and 2021 [15]

[14] Carroué, "The shale oil and gas revolution in the United States: technological, territorial and geostrategic issues".
[15] U.S. Energy Information Administration, "U.S. Field Production of Crude Oil".

2.2 A sector at odds with climate objectives

In its *Net Zero Emissions by 2050* (NZE) scenario, the International Energy Agency models the quantity of energy available (and the underlying physical flows) by sector and by region of the world, while respecting the carbon budget compatible with a maximum global warming of 1.5°C. In this scenario, emissions from gas and oil combustion fall rapidly, starting today, to reach near-zero levels by 2050 (with the remaining emissions offset by carbon sinks).

The graph below shows the evolution of global demand for oil and gas (the distinction between the two fuels is important, we will come back to it later), according to different IEA trajectories. The NZE scenario naturally shows the steepest decline in volumes since it is designed to meet the 1.5°C target. The *Announced Pledges Scenario (*APS) and the *Stated Policies Scenario* (STEPS) are exploratory, defining a set of starting conditions, such as announced policies, and then estimating the warming trajectory which result from them, based on a model of energy systems, market dynamics and technological progress. The NZE scenario is by far the most desirable, from a climate point of view. However, hydrocarbon production is currently on an upward slope, and everything seems to agree that this trend will not be reversed quickly enough to enable us to meet our commitments.

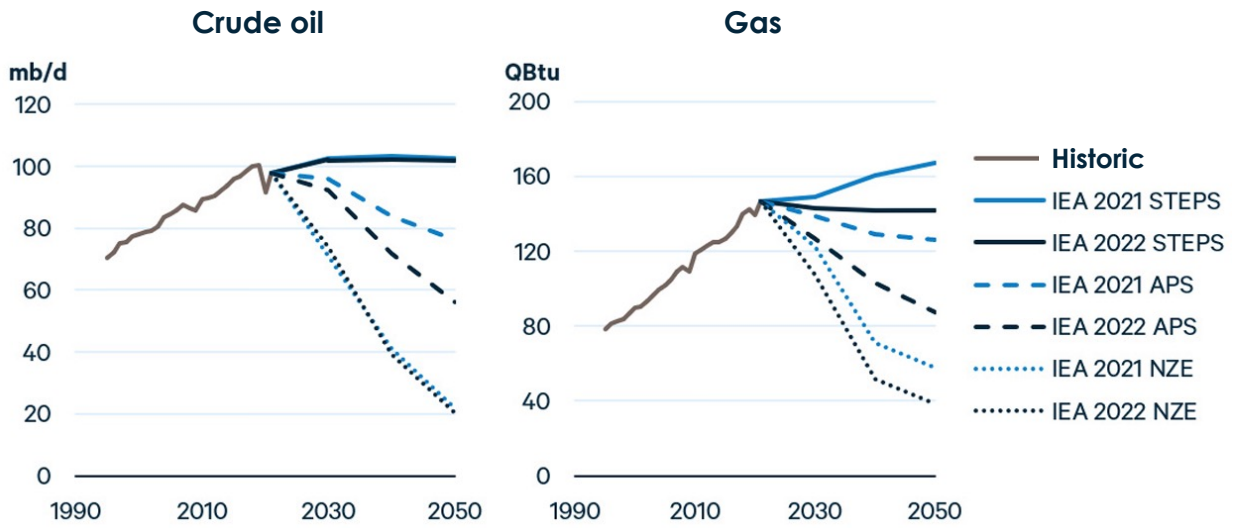


Figure 6: Past and future demand for oil and natural gas, according to different IEA trajectories (QBtu = quadrillion BTU (10^15), one BTU being equivalent to about 1000 joules) [16]

[16] Raimi et al, "Global Energy Outlook 2023: Sowing the Seeds of an Energy Transition".

The International Energy Agency (IEA), founded in 1974 in the wake of the first oil crisis, was initially dedicated to guaranteeing the energy security of its member countries by reducing supply difficulties on oil markets, in a context of price instability linked to geopolitical issues. Today, energy issues are no longer purely economic, they also take into account climate considerations. As such, the IEA is calling for a reduction in global fossil fuel consumption, on both the supply and demand sides. But to date, the IEA's calls to reduce hydrocarbon production and demand have gone unheeded.

2.3 Economic context and scope of our study

With a market capitalization of 5,660 billion euros, the oil & gas sector accounts for 5% of global market capitalization. Our study covers more than 150 major companies in the sector and focuses on the most highly capitalized companies in their respective indexes. Our sample thus covers 86% of the sector's market capitalization, including virtually all the 50 largest companies in the sector. However, we are unable to cover the major national (state-owned) oil companies, which do not seek financing on global markets and are therefore outside the scope of our study. Examples include National Iranian Oil Company, Qatar Petroleum, Iraq National Oil Company, Nigerian National Petroleum Company, etc.

Companies active at different stages of the value chain are included in this study, including exploration and production, transportation, refining, distribution, trading, and supply. Companies specializing in transport and distribution are treated separately from integrated companies and companies specializing in the upstream part of the value chain by the CIA methodology. This distinction is made with a view to analyzing issues specific to each type of company.

A significant proportion of the companies included in this campaign are multi-sectoral. Indeed, many oil companies have organic chemistry activities, since the raw materials they exploit and produce - oil, condensates, gas liquids, methane - constitute the inputs for refining and chemistry. In addition, a growing number of integrated companies are developing power generation activities, treated separately by the CIA methodology.

The map below shows the geographical distribution of companies in our sample. Most companies are headquartered in Europe (54), North America (43) and Asia (42).

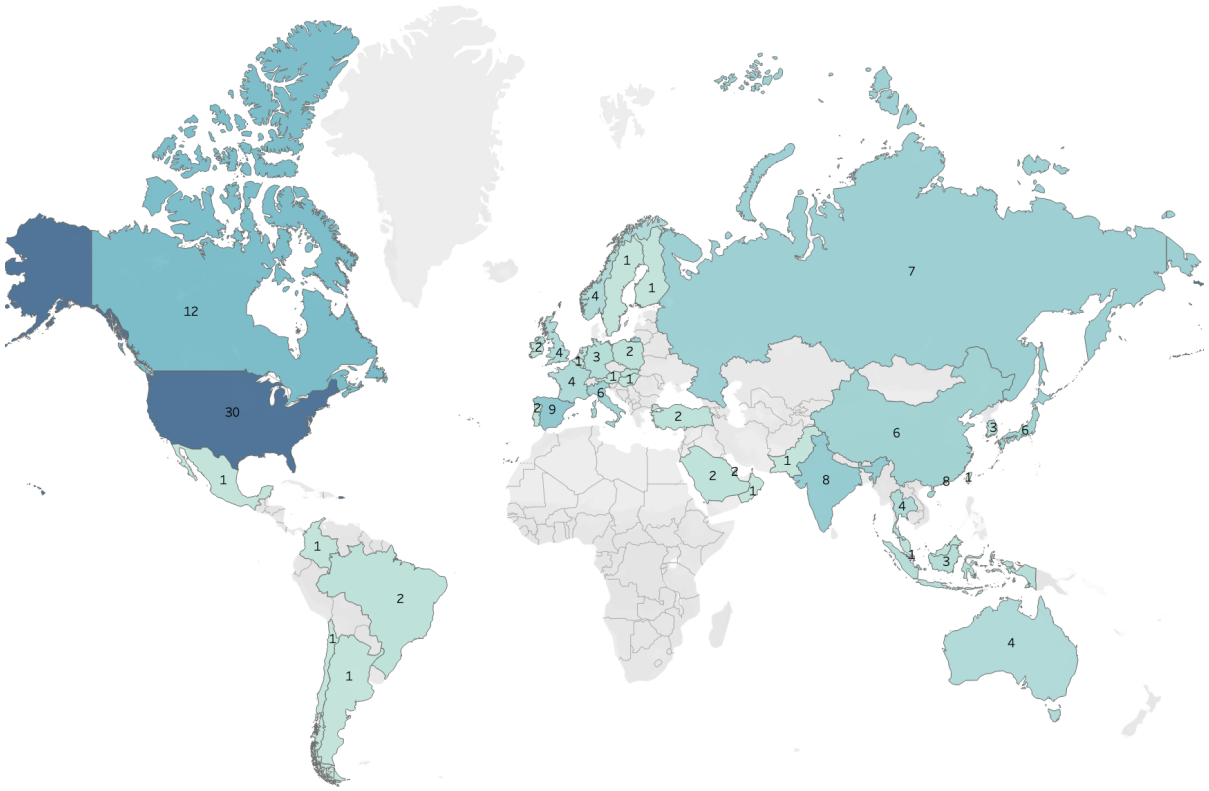


Figure 7: Geographical breakdown of companies in the sample

2.4 Transition risks

A company's transition risk is the risk associated with the effects of societal and/or economic change linked to the low-carbon transition, which can impact a company's business model throughout its value chain. The figure below summarizes the various transition risks that the oil & gas sector may face.

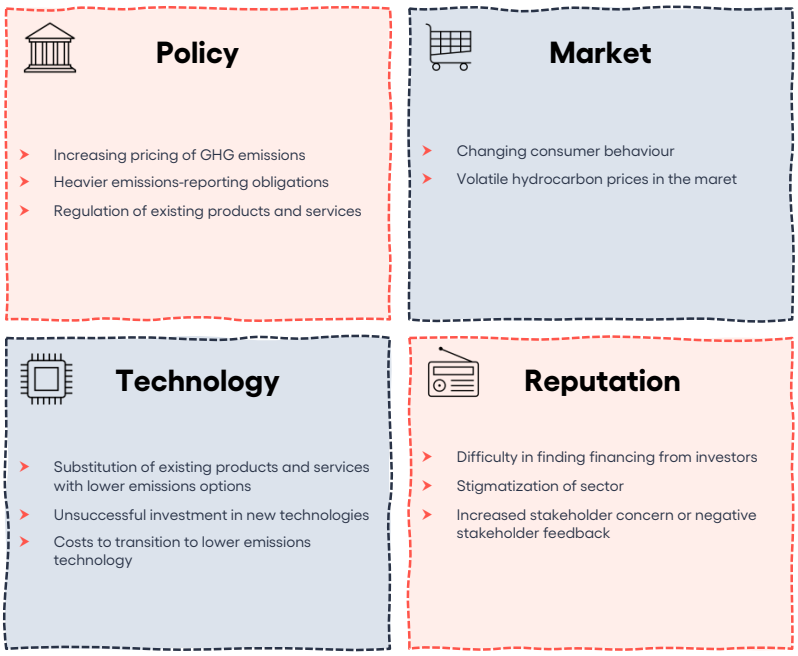


Figure 8: Generic representation of the various transition risks to which economic players are exposed

Regulation risks

A regulatory risk can be understood as the risk that a change in climate-related laws and regulations will have a significant impact on a company. In the case of the oil & gas sector, we have identified the following regulatory risks, on both the supply and demand sides:

- The introduction by national governments of a cap on the quantities of hydrocarbons that can be extracted by oil companies (in significant oil-producing states).
- The introduction of a cap on the carbon intensity of operating processes.
- The introduction of an increasingly stringent taxation of greenhouse gas emissions.
- And finally, on the demand side, the introduction of stricter regulations on usage, such as: a ban on oil-fired boilers, an end to sales of new combustion-powered cars in the European Union after 2035, the introduction of carbon quotas for polluting companies, etc.

Today, companies in the sector face no obligation to reduce their methane emissions, which are by far the biggest source of emissions linked to hydrocarbon exploitation. However, at COP26 in Glasgow in 2021, the *Global Methane Pledge* was signed by 111 countries, which committed to reduce their methane emissions by at least 30% by 2030 compared with 2020[17]. The European Parliament, as part of the *Fit for 55* – a package of legislative proposals designed to enable the European Union to reduce its emissions by 55% –, plans to strengthen its targets for reducing methane emissions, and has asked the European Commission to propose a binding target for reducing EU methane emissions by 2030, mainly from hydrocarbon transport and distribution operations in Europe.

According to a report by the International Energy Agency, methane emissions are currently underestimated by more than 50% by companies which report them[18]. More stringent regulations would put oil and gas companies at greater regulatory risk. What is more, the International Energy Agency estimates that at current gas prices, the value of captured methane is sufficient to cover the cost of abatement measures, providing a strong economic incentive to control methane leaks[19].

With the advent of shale gas and oil, a significant proportion of future extractions will be made possible by hydraulic fracturing. This practice has significant local environmental impacts (increased occupation of land, higher consumption of water, sand, and chemicals, etc.) and has already been banned in some US states. If the conditions for exploiting fossil resources were to become stricter, due to climate change pressure, the extension of these bans to other states or geographical areas would leave companies in the sector highly exposed to the risk of stranded assets.

In addition, the pricing of carbon emissions – via taxes or allowances – is a way of encouraging investors to invest more in low-carbon energies. As of the 1st of August 2022, 48 jurisdictions, representing 70% of the world's GDP, had a carbon price (tax or allowance market)[20]. Carbon prices vary widely from country to country, ranging from 1 cent to 134 dollars per ton of $CO2_{e.}$ To date, 60% of emissions regulated by carbon pricing are covered by a price of less than 10 dollars per ton, an amount far too low to render this mechanism effective.

Finally, the lack of consideration for environmental risks associated with oil and gas field development is a major issue. In the United States, for example, certain companies, under threat

[17] Climate & Clean Air Coalition, Global Methane Pledge.
[18] International Energy Agency, "Global Methane Tracker".
[19] International Energy Agency, "Driving Down Methane Leaks from the Oil and Gas Industry".
[20] Ministère de la Transition Énergétique, « La tarification du carbone dans le monde ».

of legal action, have had to spend several billion dollars to decontaminate polluted sites. What is more, environmental associations and some governments have begun to show a greater willingness to take legal action to hold oil and gas companies accountable for the climate change caused by fossil fuels they exploit. In 2021, for example, a Dutch court ordered Shell to reduce its greenhouse gas emissions by 45% by 2030, on the grounds that the company's climate policy was not ambitious enough. Today, there is no financial risk to this kind of condemnation, but this could become the case in the future.

Market risk

Market risks at company level lie mainly in the effects of climate change on the raw materials market, and in changes in consumer behavior. Financial players and end consumers, driven by economic, legal, or other rationales, can exert a strong influence on the demand for hydrocarbons. The rapid deployment of electric vehicles and renewable energies may play a role in the decline in demand.

In its *Sustainable Development Scenario* (SDS), the International Energy Agency predicts that oil demand will decline at an annual rate of 2 Mb/d by 2030[21]. This reduction would lead to an oversupply, and consequently to a sharp drop in oil prices. Such a drop in prices would make oil consumption attractive again for consumers and make difficult-to-develop fields less profitable. But it could also facilitate the abolition of fossil fuel subsidies and encourage the introduction of a carbon tax, making hydrocarbons less attractive.

Access to financing has also become more complex, following the first commitments made by financial players to reduce their exposure to fossil fuels. Far from being sufficiently ambitious – most major banks still finance oil projects on a massive scale – these commitments testify of a desire for change and highlight the potential difficulties of access to financing or capital that oil companies will face in the not-too-distant future.

Fossil fuel reserves held by the top 100 listed companies in the oil & gas sector represent potential emissions of 350 GtCO2e, or over 85% of the carbon budget which should not be exceeded to stay below 1.5°C of global warming[22]. In financial markets, most players believe that all known hydrocarbon reserves will be exploited and burned. Yet, this would lead us to emission levels which fall above our targets. It is therefore clear that compliance with the Paris Agreement requires a significant proportion of reserves to remain in the ground. The imposition of such a carbon constraint would in fact lead to a reduction in the value of the assets of listed companies: this is defined as the "carbon bubble", which could burst if constraints on hydrocarbon extraction were adopted[23].

[21] International Energy Agency, "The Oil and Gas Industry in Energy Transitions".
[22] Carbon Tracker Initiative, "Unburnable Carbon - Are the world's financial markets carrying a carbon bubble?"
[23] Carbon Tracker, "Unburnable Carbon: Ten Years On".

Technological risk

Technological risk can be defined as the risk of substitution of existing products and services by lower-emission options. It can also be linked to technological impasses that prevent emissions reduction targets from being met. Technological advances, together with government support for renewable energies, tend to make the latter increasingly competitive compared to hydrocarbons.

Yet, according to an IEA study[24], the largest oil companies invest on average less than 1% of their capital expenditure in renewable energies, carbon capture and storage, and biofuels. The study concludes that "there is little evidence of the significant reallocation of capital expenditure required to meet the Paris Agreement targets". One of the reasons for this is that the internal rate of return on fossil fuels remains well above that of renewable energies, financially encouraging oil companies to continue investing in hydrocarbons.

In another report from 2022, the International Renewable Energy Agency estimates that the current rate of investment in energy transition technologies is largely insufficient: it needs to quadruple to achieve an energy transition compatible with a 1.5°C scenario. This figure should be treated with caution, as it does not include the sobriety dimension, which plays a key role in the transition. The graph below shows the evolution of investments in fossil fuels and renewable energies since 2015. These figures do not consider the amount of energy, including storage, obtained per unit of investment. They present an investment point of view, which in fact structurally over-represents the share of renewable energies in investments. Even so, these figures clearly show that, after a decline in 2020 due to the pandemic, investment in fossil fuels picked up again in 2021 and 2022 and is now twice as high as investment in renewable energies.

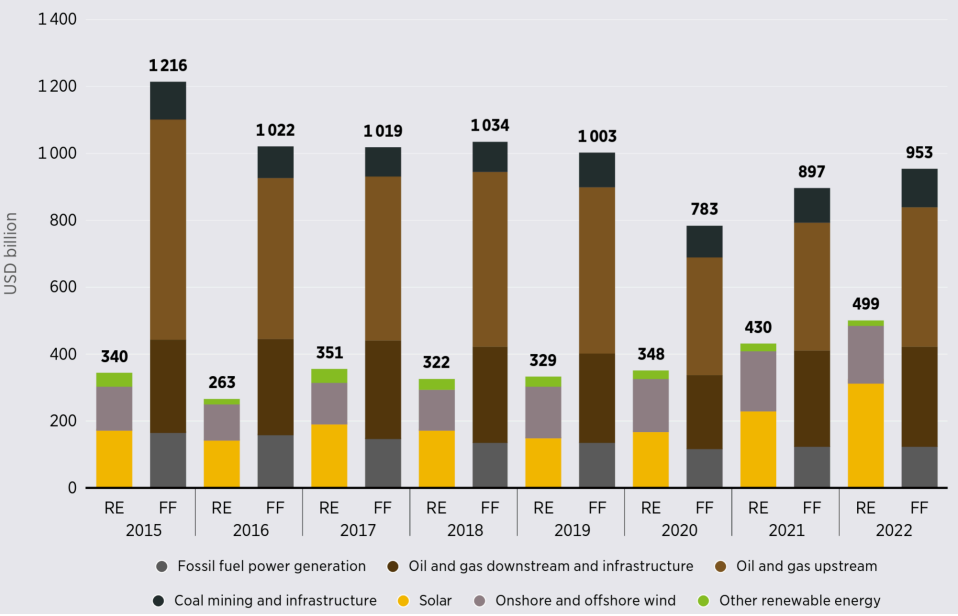


Figure 9: Annual investment in fossil fuels and renewable energies, 2015-2022 [25]

[24] International Energy Agency, "The Oil and Gas Industry in Energy Transitions".
[25] International Renewable Energy Agency, "Global Landscape of Renewable Energy Finance 2023".

However, competitive low-carbon technological alternatives that can be deployed at scale are already conceivable, and desirable. Nevertheless, fossil fuel projects are currently favored by higher internal rates of return, pushing companies to focus on extracting more hydrocarbons. The introduction of regulations and other strong financial incentives (such as carbon taxes and quotas) could tip the investment balance in favor of low-carbon alternatives.

Reputation risk

Growing climate awareness among civil society and certain financial players is putting oil companies under pressure. Fueled by local environmental phenomena, opposition movements to oil and gas projects are emerging, challenging the ambitions of certain companies in the sector. This is the case, for example, of the *Keystone XL* pipeline project in the United States, which came under pressure from strong local opposition and was definitively abandoned in 2021. What's more, some shareholders are getting involved, filing resolutions to try and influence the climate policies of companies in which they invest. The "*Say on Climate*" for example is a resolution tabled by the company itself or by its shareholders at the Annual General Meeting, with the aim of getting shareholders to vote on the company's climate policy and initiating a debate on the challenges of transition among shareholders. Despite this, climate resolutions are still all too rare.

Non-governmental organizations also have an important role to play in changing the behavior of financial players. BNP Paribas, for example, has been taken to court by three associations (*Notre affaire à tous*, *Oxfam* and *Les amis de la Terre*) for failing to comply with its duty of care. The three NGOs accused the bank of pursuing its financing of oil and gas companie, ignoring warnings and scientific consensus.

In France, TotalEnergies came under considerable pressure following its involvement in the EACOP (*East African Crude Oil Pipeline*) project. Many banks have finally decided to pull out of the financing; the project is considered a "climate bomb", a term used to describe mega-projects capable of causing global warming to spiral out of control. The project symbolizes the failure of oil and gas companies to meet the objectives of the Paris Agreement.

2.5 What are the solutions for decarbonizing the sector?

Reducing emissions from the oil and gas sector can be achieved through several levers, which are listed below in a non-exhaustive way:

- **Conversion to low-carbon energies, coupled with the electrification of energy uses**. Oil companies are well qualified to take on large-scale, complex projects (there are technical similarities between the installation of an offshore wind farm and an offshore oil platform, as well as between oil well drilling and geothermal energy). What's more, these companies

generally have the confidence of investors and benefit from privileged access to cheaper financing.

- **A drive for sobriety,** involving a reduction in the final consumption of hydrocarbons. Reducing demand for carbon-intensive modes of transport (especially road and air) is a major challenge, as is limiting energy requirements in buildings (heating and air conditioning) and reducing the use of single-use plastics derived from petroleum.

- **The reduction of methane leaks** in gas operations, and the implementation of leak detection and repair systems at compressor stations. The reduction, or even total cessation, of *venting* and *flaring* practices. According to the IEA, more than 260 billion cubic meters of natural gas are wasted through flaring and methane leaks in the world today. This is more than the European Union's gas imports from Russia before the invasion of Ukraine, and ending this waste would reduce the global temperature rise by almost 0.1°C by 2050[26].

- **The systematic installation of vapor recovery units (VOCs), as well as the** modernization of the gas transport and distribution network, to prevent gases from escaping into the atmosphere.

- **Increased use of renewable heat,** replacing the use of fuel oil for domestic heating.

- **Carbon capture, utilization, and storage (CCUS).** It should be remembered, however, that this technology is likely to play only a minor role in the overall decarbonization of the sector, compared with the reduction in operating volumes.

Carbon capture and storage: between myth and reality

Carbon capture, utilization, and storage (CCUS) encompasses methods and technologies for extracting CO2 from flue gases or the atmosphere, to recycle it for use or storage. In the oil & gas industry, CO2 is recovered from gas fields (which often contain CO2 that must be separated before the gas is sent into pipelines, to avoid a risk of corrosion of the pipelines), then, in most cases, it is reinjected to better exploit the fields, thanks to enhanced recovery techniques. In the United States, for example, this industry also uses CO2 piped in for enhanced oil recovery.

The use of CCUS could be relevant in sectors such as cement production or electricity generation from gas or coal. Hence, this technology is not to be condemned in its entirety: it's rather its use that should be open to debate.

Some defenders of the oil industry argue that increased oil and gas production is compatible with global climate objectives, on the grounds that induced emissions can be captured and stored. It should be noted that the use of CCUS at exploration and production sites in no way reduces scope

[26] International Energy Agency, "Global Methane Tracker".

3 emissions from extracted hydrocarbons, except for gas-fired power plants: the effect on overall emissions from the value chain is therefore marginal. In its NZE scenario, the International Energy Agency estimates the need for carbon storage capacity at around 1,300 MtCO2 per year by 2030. In 2022, total installed capacity was 44 MtCO2 per annum, and project developers have announced ambitions to have capture capacity of 220 MtCO2 per annum by 2030, six times less than projected in the NZE scenario[27].

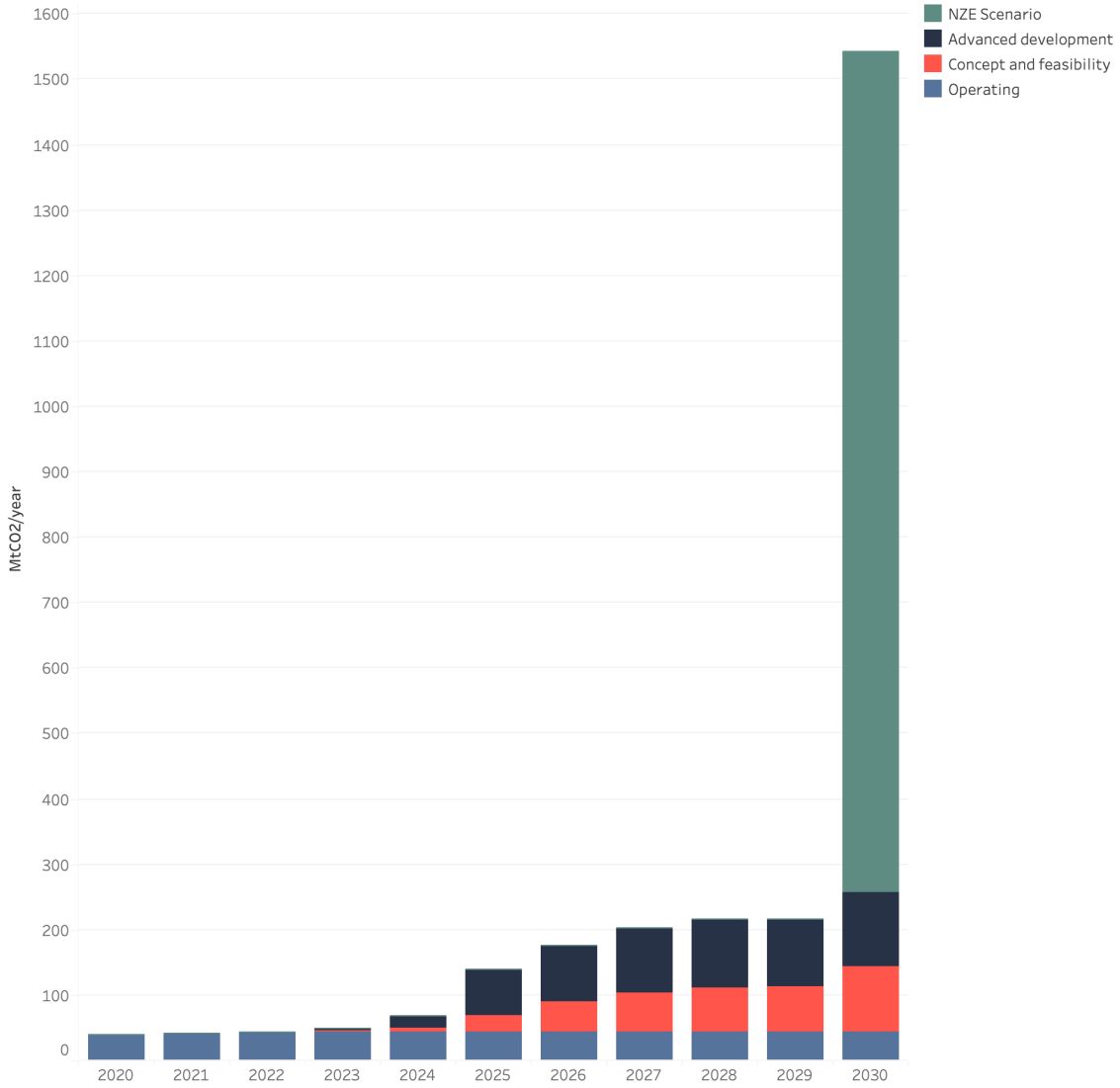


Figure 10: Development of CO2 capture and storage capacity

In its latest report, the IPCC states that this technology has not been proven on a large scale, that it is not available in the short term, and that its ability to decarbonize hydrocarbon operations is largely uncertain, particularly for mobile use[28]. Moreover, its economics are unfavorable, and the

[27] International Energy Agency, "Carbon Capture, Utilization and Storage".
[28] Center for International Environmental Law, "IPCC Unsummarized: Unmasking Clear Warnings on Overshoot, Techno Urgency of Climate Justice".

pilot projects carried out to date have proved more costly and less effective than expected[29]. Finally, for the most part, new CCUS projects at exploration and production sites generally result in a net increase in GHG emissions, since they allow more hydrocarbons to be extracted that would otherwise have remained in reserves. According to a figure from Carbon Tracker, 73% of the CO2 captured today is used for enhanced oil recovery, a technique that extracts more hydrocarbons from existing fields[30]. This technology does not, therefore, represent a means of reducing net emissions from oil extraction. It does, however, enable the company to extend its right to explore, by reducing its operational emissions (scope 1), without, however, reducing emissions from the combustion of extracted hydrocarbons (scope 3).

2.6 A sector in need of transparency

In our sample, only 15% of companies report scope 3 emissions for the sector's largest emissions item, the combustion of products sold. The graph below shows the breakdown of transparency ratings given by Carbon4 Finance to each company.

Score 1 - The company reports its Scope 1, 2 and 3 emissions transparently for the most significant items.
Score 2 - The company reports its emissions in a fairly transparent way, but they only cover scope 1 and 2.
Score 3 - The company reports its emissions with little detail and transparency.
Score 4 - The company does not report its emissions.

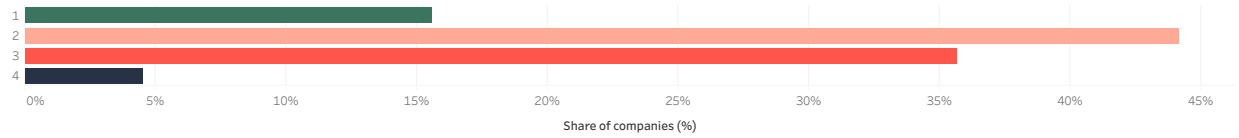


Figure 11: Transparency score of companies analyzed

[29] Center for International Environmental Law, "Oil, Gas and the Climate: An Analysis of Oil and Gas Industry Plans for Expansion and Compatibility with Global Emission Limits".
[30] *Ibid.*

3. Carbon Impact Analytics (CIA) methodology

The Carbon Impact Analytics (CIA) methodology applied to companies produces indicators for measuring their relative contribution to the transition to a low-carbon economy, and by extension, their exposure to transition risks. These indicators are constructed via a "*bottom-up*" analysis of entities and can be consolidated at portfolio level.

Each instrument in the portfolio is linked to an entity, and an analysis of the entity's physical (or monetary) flows is used to calculate the GHG emissions it generates, as well as a set of indicators to build a transition contribution score.

The "*bottom-up*" approach is based on public operational data specific to each company and favors the use of physical flows (tons produced, number of vehicles sold, etc.) over monetary flows (sales, OPEX, etc.), thus enabling GHG emissions to be calculated as close as possible to physical reality. In addition, a company is considered as a set of activities analyzed separately, with a methodology adapted to each one, enabling us to model the most significant GHG emissions for all the industrial processes that make up each activity - particularly Scope 3 emissions.

In addition to emissions induced by the company's activities, CIA can be used to assess the company's contribution to the transition to a low-carbon economy, thanks to various indicators. Firstly, saved emissions, which measure the emissions avoided thanks to the company's products and services, as well as emissions reduced thanks to improvements in its carbon efficiency. Secondly, the overall CIA score, based on indicators measuring the company's past, current and future performance. While past and current performance is measured by quantitative indicators,

future performance is assessed by means of both a qualitative and quantitative analysis of the company's strategy for reducing its exposure to transition risks (including its GHG emission reduction targets, investments earmarked for mitigation projects, and the governance rules put in place to ensure that transition risks are properly considered).

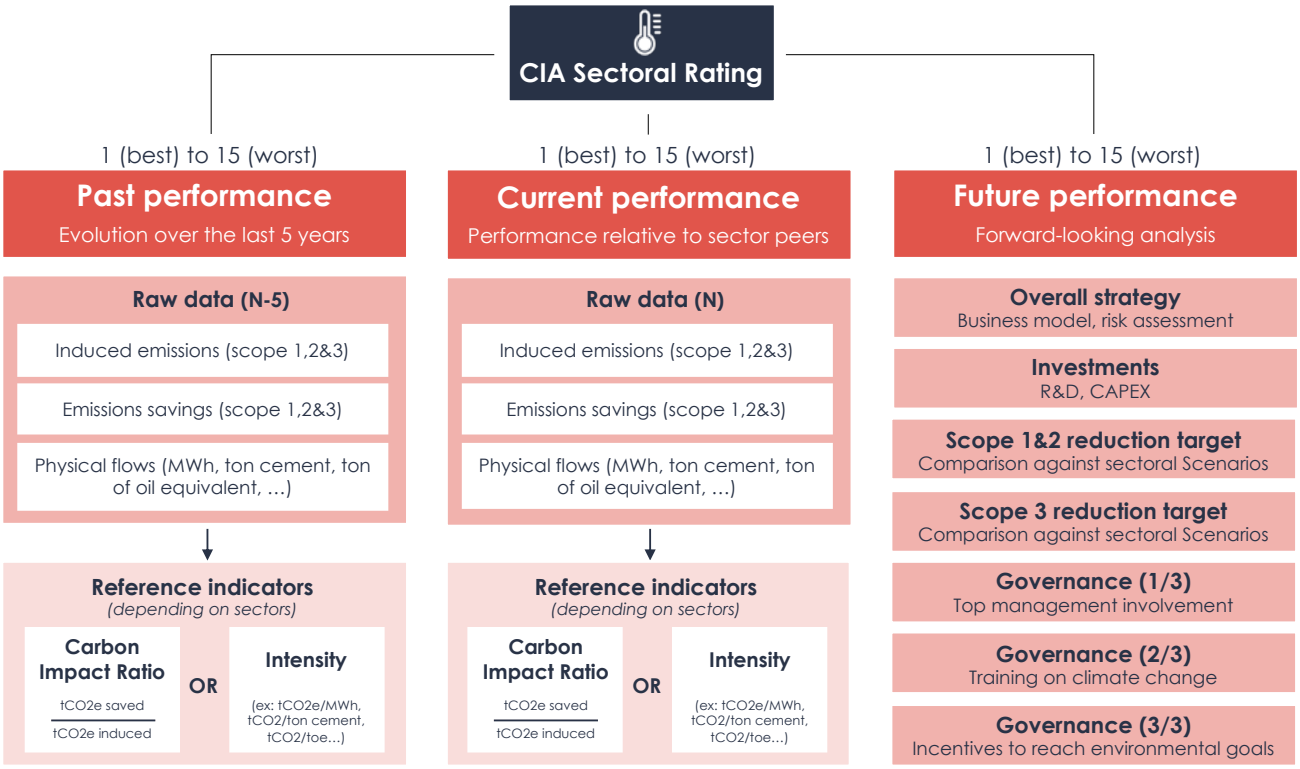


Figure 12: Composition of the overall CIA score for companies

The following section describes how the CIA methodology is applied to the oil & gas sector. For more details on the CIA methodology, please refer to our general CIA methodology guide.

3.1 Calculating GHG emissions

Scope 1 and 2 induced emissions

Scope 1 and 2 induced emissions are either published by the company or calculated using the CIA methodology. We consider published emissions as relevant when they are consistent with emissions calculated using the CIA methodology. Otherwise, we attribute calculated scope 1 and 2 emissions to the company, based on the company's energy consumption or published physical data.

Scope 3 induced emissions

The CIA methodology identifies the main source of scope 3 emissions for the oil & gas sector as downstream emissions linked to the combustion of fossil products sold by the company. These emissions are calculated using emission factors from various public databases, applied to the volumes produced, transported, refined and/or sold by the company.

We have chosen to retain only this scope 3 emissions category, as it is by far the most relevant and the largest in terms of volumes for companies in the oil & gas sector. Companies in this sector have extremely high scope 3 emissions linked to the combustion of products sold, representing on average 85% to 90% of their total emissions. However, they still do not systematically report their scope 3 emissions, and methodologies used to perform these calculations are somewhat opaque, despite the existence of clear protocols on this subject (GHG Protocol guidelines and IPIECA, the *International Petroleum Industry Environmental Conservation Association)*. For this reason, and to ensure comparability between companies in the sector, Carbon4 Finance systematically recalculates the companies' scope 3 emissions, based on physical volumes.

3.2 Overall carbon performance: the CIA rating

The CIA rating measures the contribution of a company's activity to the low-carbon transition. The more a company contributes positively, the less it is exposed to transition risks. Our methodology is adapted to the specific characteristics of each sector. The CIA score assigned to each company in the oil & gas sector combines several performance indicators, as described below.

Past performance

The past performance assessment provides a historical perspective on a company's activity. For **integrated companies and/or those active upstream in the value chain** (exploration, production, and refining), the past performance rating is based on changes in the company's absolute scope 1, 2 and 3 emissions, thus capturing the company's volume growth dynamic. For companies specializing in transport and distribution (known as *midstream*), past performance is assessed based on the evolution of scope 1 and 2 emissions per ton of hydrocarbon transported.

At this point, it is important to point out that integrated and/or upstream companies in the value chain and companies specializing in transport and distribution (*midstream companies*) are not rated with the same past performance indicator, but that they are all imputed with a portion of scope 3 emissions linked to the combustion of fossil products. The choice of a different past performance indicator for transport and distribution companies is justified by the fact that we believe that the main challenge for midstream companies is to reduce the direct carbon intensity of their transport activities, and in particular their methane leaks ("transporters" include operators of gas pipelines and LNG carriers). The company's past performance therefore seeks to capture the efforts made by the company to reduce the carbon intensity of its transport activities (considering methane emissions when these are reported).

Current performance

This performance is based on the average physical carbon intensity of the products processed by the company (*Corporate Carbon Intensity* or CCI, expressed in kgCO2/ton of oil equivalent, which measures the ratio of greenhouse gas emissions to available energy). Players with a production mix more oriented towards gas than petroleum products will be awarded a better score.

For *Midstream* companies, **a second indicator is used to calculate current performance**: this indicator estimates the company's fugitive methane emissions according to its geographical plate of operations. This statistical indicator is designed to compensate for the lack of transparency on methane emissions.

Future performance

Future performance analysis is an assessment of commitments made by companies to reduce their impact on climate change. It is made up of four main sub-categories, with different evaluation criteria for each sector analyzed.

In the case of players in the oil & gas sector, the analysis of future performance considers:

- The entity's **strategy** for the transition to a low-carbon economy

    - Defining a short- to medium-term plan for hydrocarbons phase-out
    - Development of renewable energy production capacity (solar, wind, low-carbon hydrogen, biofuels not derived from deforestation) and low-carbon hydrogen.
    - The development of electricity and heat storage services, to enable the integration of renewable energies
    - Improving energy efficiency and electrifying operations
    - The development of carbon capture and storage (CCS) technologies
    - Installation of methane leak detection and repair systems
    - Incorporation of low-carbon products into its distribution networks (green hydrogen, biogas, etc.).

- **Investments** and **R&D spending** that will help reduce GHG emissions

    - Investments in renewable energies and electric vehicle charging networks
    - Investments in the energy efficiency of extraction and refining processes, the electrification of operations
    - The development of technologies such as CCS and hydrogen

- **GHG emission reduction targets** for scope 1 and 2, as well as scope 3

    Reduction targets are compared with IEA's emission scenarios. These scenarios describe the evolution of the sector's emissions in absolute terms, and therefore enable us to evaluate the targets expressed in absolute terms. Where company targets are in intensity, we have converted them into absolute terms, using the evolution of production volume over the last 5 years (CAGR) to estimate future trends.

- The **governance structure** that oversees climate risks within the entity.

    We assess the existence of internal structures dedicated to energy-climate issues (usually the CSR department), their link with the executive committee, and the introduction of training and financial incentives to help and encourage employees to tackle climate-related issues.

	Integrated and specialized players	Midstream players
Past Performance	Scope 1, 2 and 3 emissions	Scope 1 and 2 intensity trends
Present Performance	Average carbon intensity of products sold	Average carbon intensity of products sold Geographic methane intensity
Future Performance	Strategy Low-carbon investments Emissions reduction targets Governance	

Figure 13: Summary of past, present, and future performance indicators for the oil and gas sector

3.3 Aggregation of CIA ratings

Sector-level aggregation

The chart below summarizes the various elements mentioned above and describes how the overall rating of a company in the oil & gas sector is composed. For *Midstream* companies, the approach is the same, with only the indicators and weightings changing slightly. The weighting of the indicators represents the importance given to each rating criterion. We believe that the current performance of a company plays an important role in determining its overall rating (40%), as it reflects its current impact on the climate: a company exposed mainly to oil products has a greater impact on climate change than one exposed to gas products. In addition, the future performance plays an important role in the overall rating (35%), as it reflects the company's willingness to align itself with global emission reduction targets.

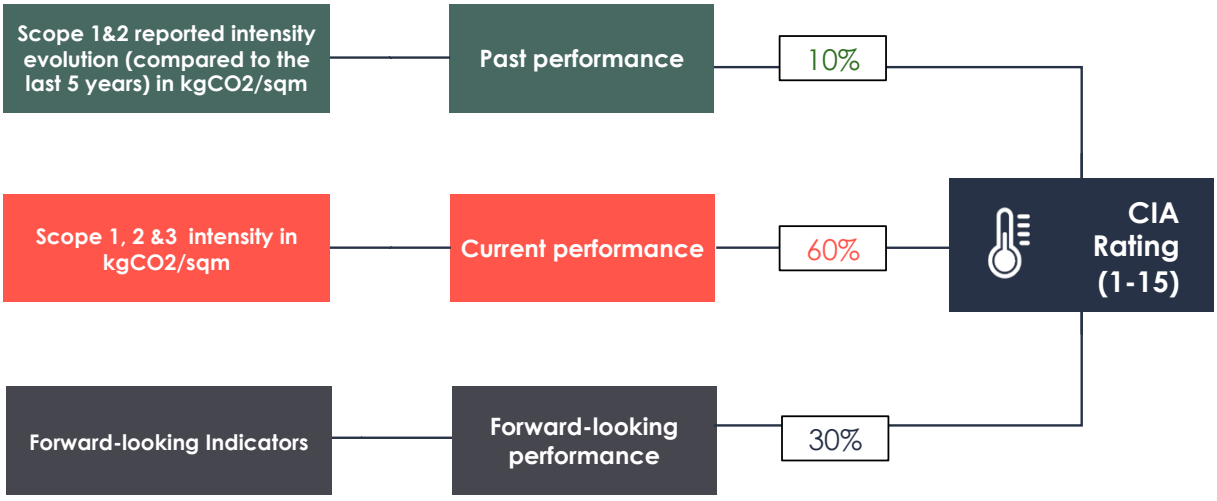


Figure 14: Aggregation of the three rating pillars for companies in the oil and gas sector

For more details on our Oil & Gas rating methodology, please refer to the appendix.

These scores are then standardized, to rank the different sectors of activity covered by CIA, according to their capacity to contribute or not to the transition (which determines the maximum possible score), and to contribute or not to contribute strongly to current emissions (which determines the minimum possible score). These limits are therefore based on the intensity of activities and their possible role in the decarbonization of our economy. Companies in the oil and gas sector will be awarded scores ranging from 8 to 15 (out of 15).

These scores are then standardized to classify the different sectors of activity covered by the CIA methodology, according to their ability to contribute to the transition. This standardization is based on the intensity of the activities and their possible role in decarbonizing our economy. Companies in the oil and gas sector will be given scores ranging from 8 to 15, with 1 being the best score and 15 the worst.

Aggregation at company level

When the company is multi-sectoral, we aggregate the different business sectors together based on their weighting in the company's total revenues. In fact, the analyses carried out using the CIA methodology are multi-sectoral, treating the different sectors of the same company separately, before aggregating them within an overall score. Let us illustrate this with an example:

EnergyCorp's revenue breakdown is as follows: 80% oil & gas and 20% power generation. To obtain the company's overall score, the calculation is as follows:

Overall score - EnergyCorp		
Sectors	Oil & Gas	Electricity generation
Weight	80%	20%
Sectoral score	13.2	3.3
Overall score	**11.2** (13.2 x 80% + 3.3 x 20%)	

Figure 15: Illustration of the aggregation method for a multi-sector company.

In addition, the CIA method produces other indicators for assessing contribution or exposure to transition risks:

- The **Carbon Impact Ratio (CIR) is** the ratio of saved emissions (in absolute terms) to induced emissions. It is a good measure of a company's contribution to the low-carbon transition: the CIR indicates, for each ton of CO2e emitted by a company's activities, the capacity of its products and services to avoid GHG emissions by offering a less carbon-intensive alternative to the market.
- The **taxonomy indicators** provide information on the proportion of sales generated by green, brown, fossil, or other activities, and thus provide information on the company's exposure to different types of activity.
- **GHG emission intensities**, calculated according to different approaches, also enable a relative comparison of companies, considering their respective size.

Indicators obtained using the CIA methodology therefore enable a detailed comparison of companies within their sector and produce an order of merit.

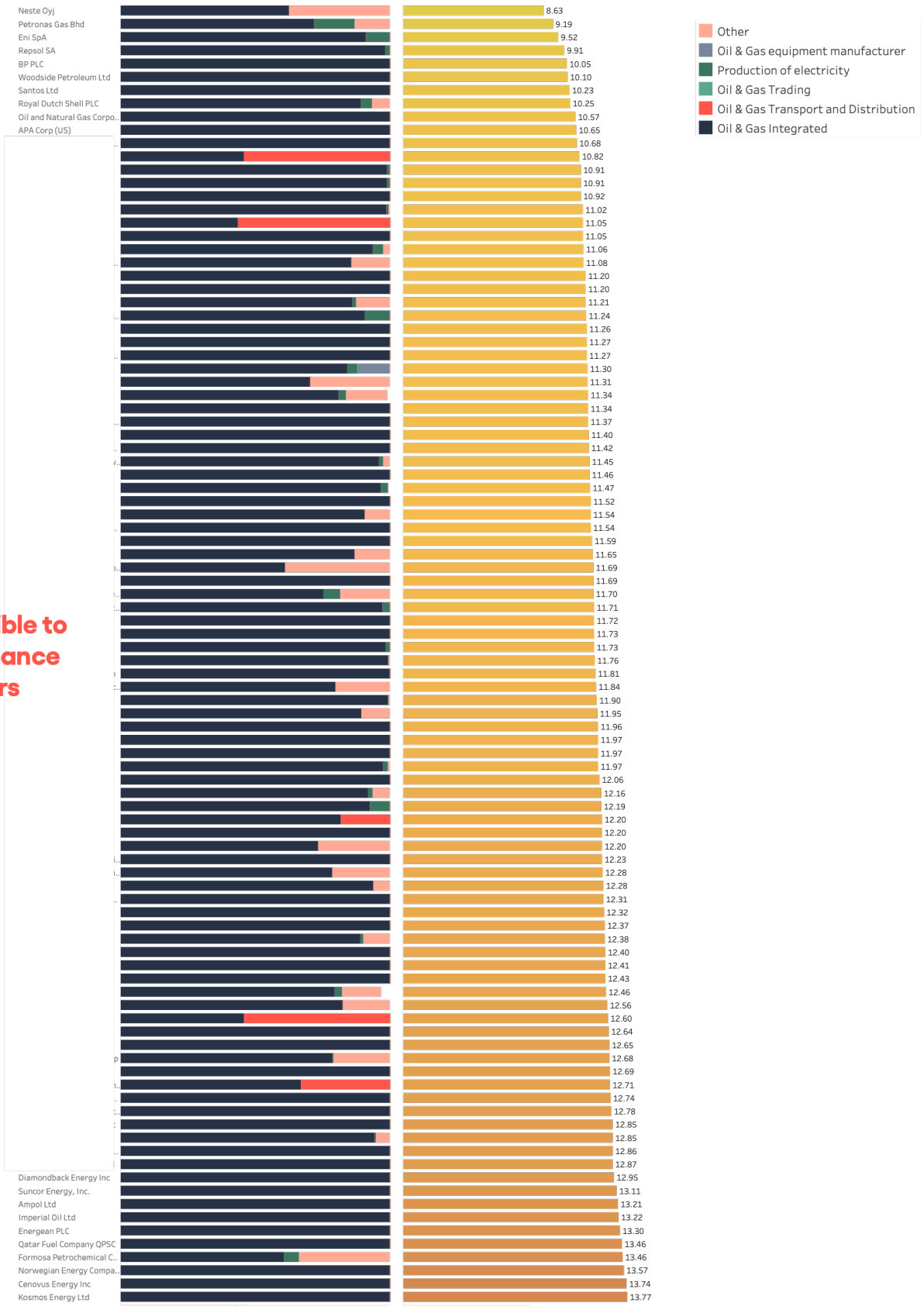
4. Results

This section presents a breakdown of the scores given to companies in our sample. The overall score considers all the company's activities. For example, an oil company with significant renewable electricity production will score higher than a company active solely in the oil & gas value chain.

4.1 Comparison of companies within the sector

The graph below shows the distribution of scores within the sample, as well as their breakdown by sector. To ensure consistency between the data, we present integrated companies and those specializing in transport and distribution separately. It is interesting to note that the latter score better on average (11.27) than integrated companies (11.80). This is mainly because *midstream companies* are more exposed to gas than to oil products, and therefore have a better average score on current performance.

Companies with the highest scores (at the top of the chart) have a lower transition risk, thanks to their lower carbon intensity, and a greater contribution to the energy transition. Conversely, companies with the lowest scores have both a more negative impact on the climate and are more exposed to transition risks.



Data accessible to Carbon4 Finance customers

*Figure 16: Ranking of **integrated and specialized** companies in the **upstream** oil & gas **value chain***

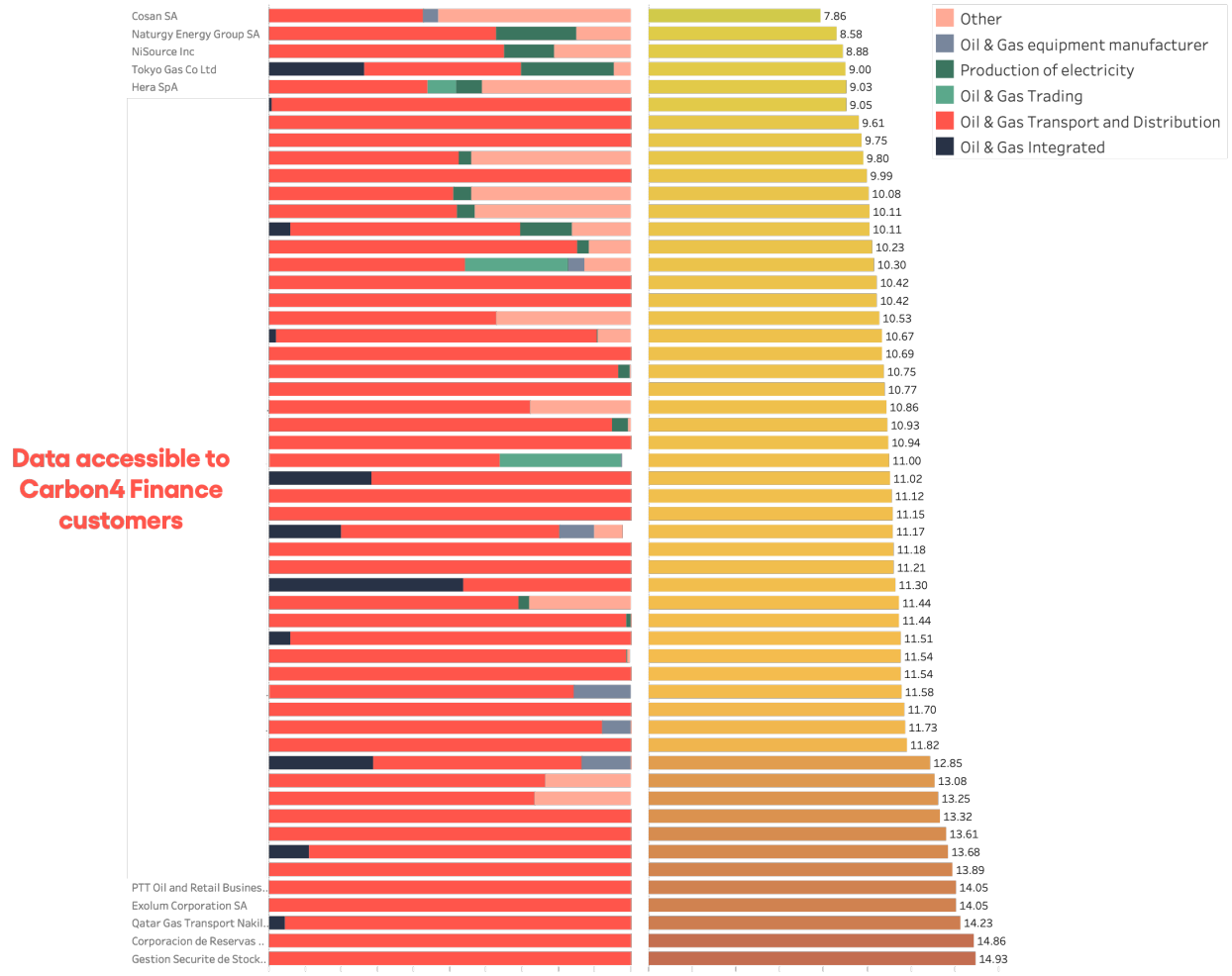


*Figure 17: Ranking of oil and gas **transport and distribution** companies*

In the graph above, we can see that midstream companies (in red) are over-represented among the highest-rated companies in the sample, while integrated or specialized production companies tend to be found towards the bottom of the graph.

4.2 Past performance ratings

The past performance of an integrated oil & gas company is based on the evolution of its calculated scope 1, 2 and 3 emissions. The table below shows companies that have reduced their hydrocarbon volumes over the last five years, and therefore their absolute emissions.

Company	Sector	Country	Past Performance /15	Past evolution of volumes (N-5/N)	Carbon intensity of products sold by the company	Total volumes (in tons of oil equivalent)
Puma Energy Holdings	O&G Integrated	Singapore	1	-48%	3021	28,150,151
APA Corp	O&G Integrated	United States	1	-28%	2744	37,061,182
Neste Oyj	O&G Integrated	Finland	1	-26%	3131	11,732,692
Petroleos Mexicanos	O&G Integrated	Mexico	1	-24%	2895	437,671,460
Royal Dutch Shell	O&G Integrated	Great Britain	1	-22%	2823	579,994,702

Figure 18: Companies that reduced their volumes the most between the analysis year and the reference year

While these five companies show a reduction in volumes over five years, most other companies in the sector have increased their volumes. The sectoral approach used in the Carbon Impact Analytics methodology, the practical application of which is explained in section 3.3.2, makes it possible to evaluate a company in terms of each of its sectors of activity. In other words, an oil company that tends to reduce its hydrocarbon volumes and develop low-carbon energies will obtain a good overall CIA rating.

The graph below shows the evolution of absolute emissions over the last five years. The size of the bubbles represents total volumes, while their color represents the average carbon intensity of each company.

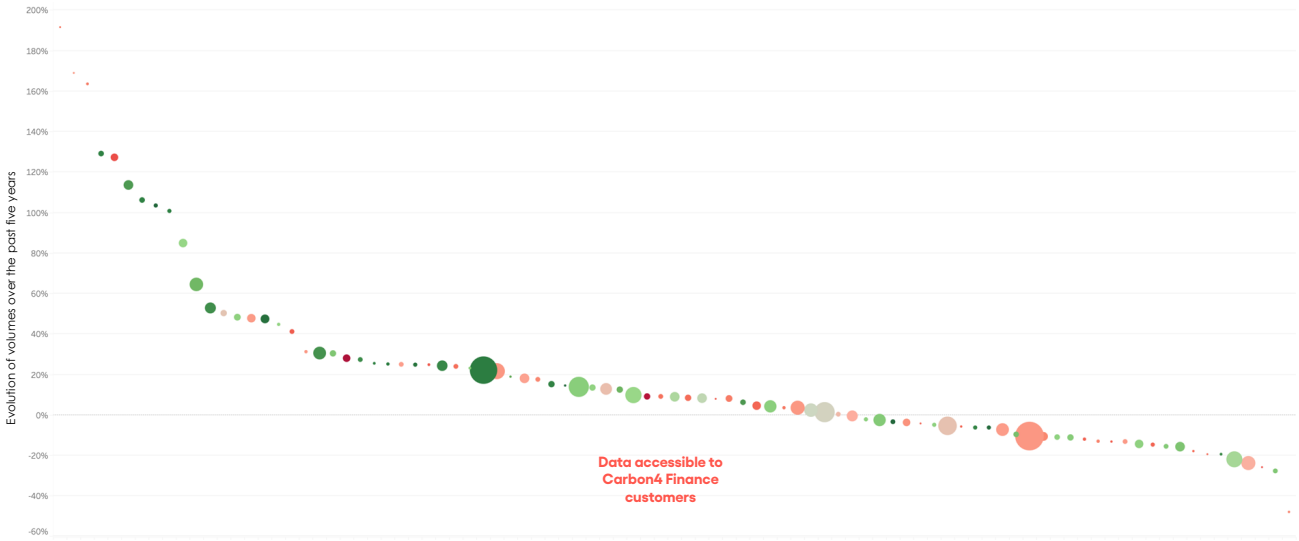


Figure 19: Absolute scope 1, 2 and 3 emissions trends for companies in the sector over the last five years

The graph above shows the evolution of scope 1, 2 and 3 emissions for integrated and upstream companies over the last five years. The size of the bubbles represents calculated scope 3 emissions, while the color of the bubbles represents the company's average scope 3 carbon intensity. Finally, the position of the bubble on the y-axis indicates the evolution of its absolute emissions between year N-5 and year N.

Most companies in the sample have increased their volumes over the last five years. This increase puts them on a warming trajectory well above 1.5°C by 2050. Another striking fact is that many North American companies have increased their volumes by more than 50% (some by more than 300%) over the past five years. Most of these companies are active in shale oil and gas development in the Permian Basin in Texas (EOG Resources, Pioneer, Diamondback, etc.).

The chart below shows the largest shale oil and gas producers in our sample. Most of these players are companies operating in the United States, among which are Occidental Petroleum, Pioneer and EOG Resources.

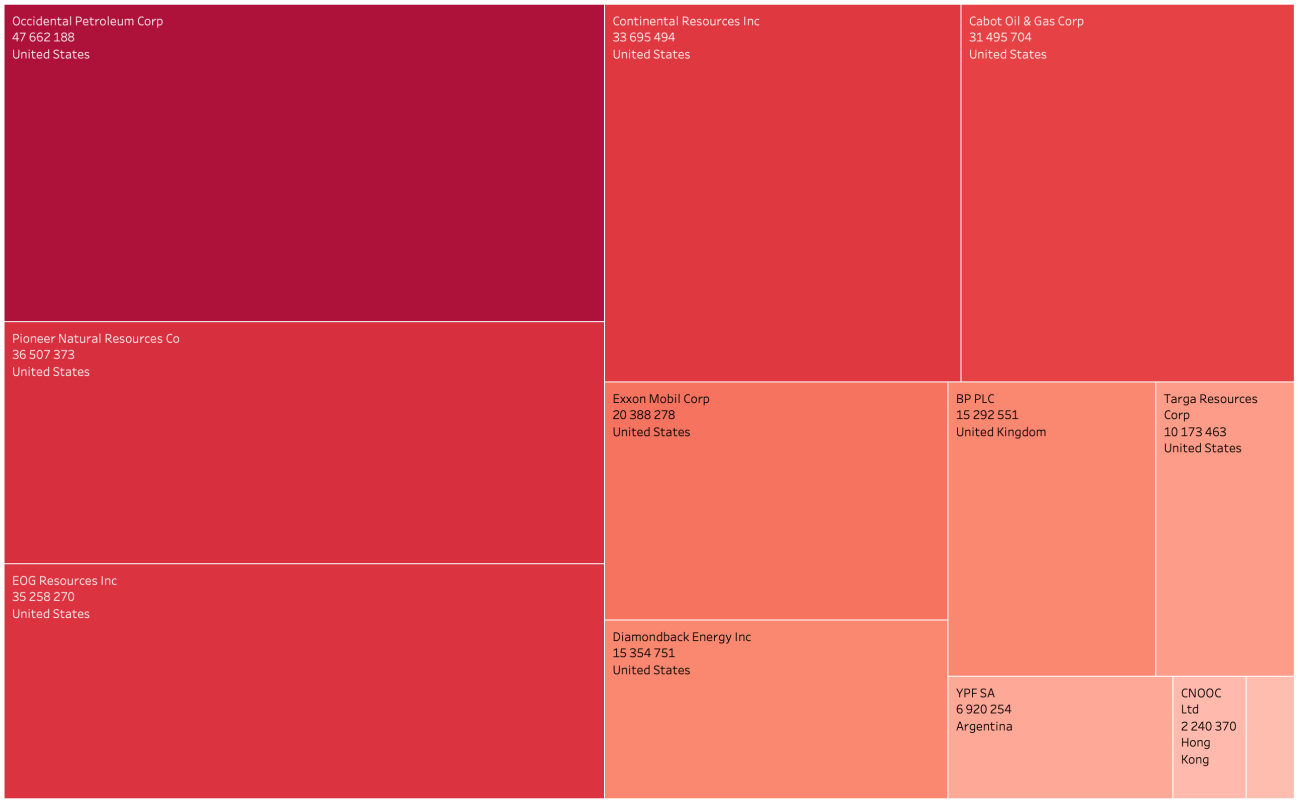


Figure 20: Major producers of shale oil and gas (in metric tons of oil equivalent)

As previously mentioned, it was *not possible to* calculate the past performance rating of most of the midstream companies. This score is based on the evolution of scope 1 and 2 intensity over the last five years. However, many of the companies in the sample do not declare their emissions in the reference year. As a result, the past performance of around three-quarters of these companies could not be calculated, limiting the interest of a comparison between players of this

type. Companies for which past performance could not be calculated are given a direct score of 15 on this indicator, thus sanctioning a lack of transparency.

4.3 Present performance scores

Players with the lowest carbon intensities are mostly exposed to gas, while those with the highest carbon intensities are mostly exposed to oil and other heavy oil products (such as tar sands). The graph below shows the distribution of companies according to the carbon intensity of products handled. The size of the bubble represents the quantity of volumes handled, while its color represents the company's overall score. Companies to the right of the graph have a higher carbon intensity.

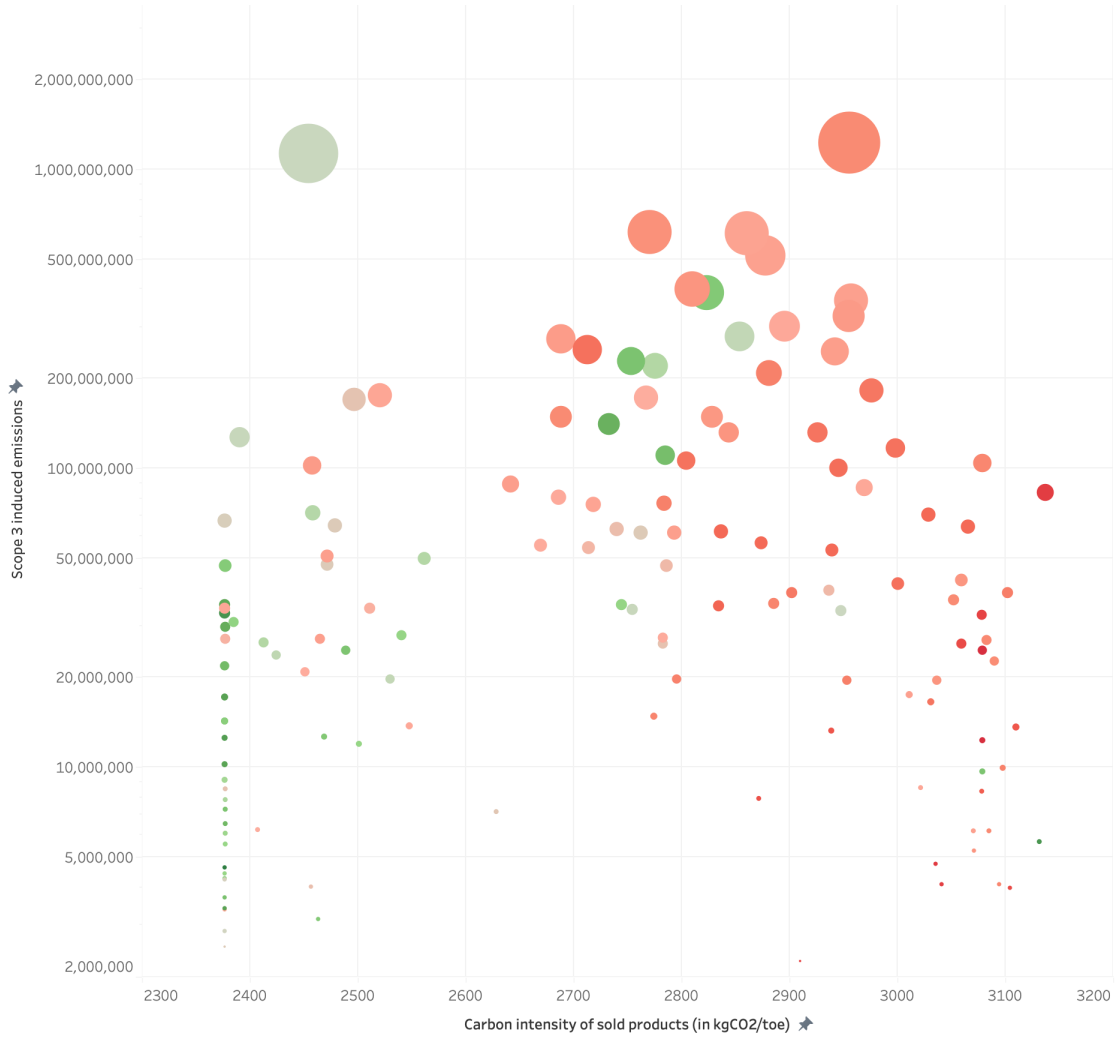


Figure 21: Average carbon intensity of products handled by companies in the sample (logarithmic scale)

Several observations can be drawn from the above graph:

- The players who generate the most emissions (y-axis) tend to have a more carbon-intensive energy mix (x-axis).
- Irrespective of emissions, players managing large quantities of hydrocarbons (bubble size) also tend to have a more carbon-intensive product range. In other words, they are currently more dependent on oil than gas.

The companies with the lowest scope 3 carbon intensity (*Corporate Carbon Intensity)* are generally:

- Independent producers or distributors who have chosen to focus primarily on natural gas (including shale gas).
- Companies specializing in the production and export of liquefied natural gas (LNG).
- Midstream players specializing in natural gas transport and distribution.

Conversely, companies with a high carbon intensity are producers and refiners of petroleum products, as well as purely downstream players specializing in distribution to consumers via service stations. Given the nature of the products they sell, these companies are more exposed to transition risk.

Gazprom is a special case (the large green bubble in the top left), since it operates mainly with fossil gas, and therefore has a lower carbon intensity than other large integrated companies.

The role of gas in the energy transition

Carbon4 Finance's rating considers the fact that gas emits less CO2 than petroleum products when burned. It is also more likely to replace coal and other petroleum products in power generation. This translates into a lower exposure to transition risks, a central element of the CIA methodology. However, even if it emits less carbon than oil or coal, gas still emits significant quantities of CO2 during combustion: for equivalent energy output, using gas only reduces emissions by 25% compared with oil, and by 40% compared with coal. However, these figures should be treated with caution, as they do not incorporate (at least not entirely) emissions linked to methane leaks for gas, which are still difficult to estimate precisely.

Yet, many players in the oil and gas industry give natural gas a positive image, sometimes even calling it a "green" energy. It is important to remember that a transition to gas will not suffice to reduce global greenhouse gas emissions sufficiently to meet the objectives of the Paris Agreement. In its Taxonomy, the European Union considers gas to be a "*transitional energy*" when used to generate electricity, provided that the carbon intensity of the electricity produced does not exceed a certain threshold, and that gas replaces a more polluting fossil fuel. This is by no means a blank check for the development of gas-fired power plants, as their use is subject to significant constraints in terms of carbon intensity.

It should also be remembered that gas production and transport is a major source of methane leakage, accounting for around 11% of global methane emissions. These emissions are themselves

responsible for around 30% of the rise in global temperatures since the industrial revolution. In fact, methane is removed from the atmosphere more rapidly than carbon dioxide, but it contributes more to the greenhouse effect per unit of weight while in the atmosphere. This leads methane to be around 30 times more warming per unit of weight than CO2 over a century[31].

4.4 Future performance ratings

The understanding of issues at stake remains immature

The future performance rating examines the company's decarbonization strategy:

- Ability to identify the risks and opportunities associated with climate change (does the company use benchmark scenarios? Is it able to quantify the impact of transition risks? Etc.)
- The entity's strategy for the transition to a low-carbon economy
- Investments that will help reduce GHG emissions
- The entity's GHG emissions reduction targets
- The governance structure that oversees climate risks within the entity.

The graph below shows the breakdown of ratings given by Carbon4 Finance on the Strategy criterion.

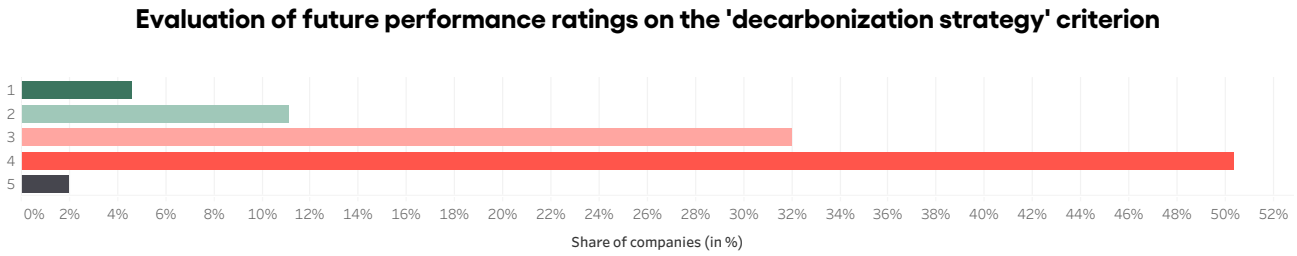


Figure 22: Distribution of scores (percentage of companies)

More than 50% of companies in the sector scored 4 or 5 on the Strategy criterion, corresponding respectively to an irrelevant strategy and no strategy at all. Only a handful of companies scored 1. This distribution of scores within the sample indicates an overall lack of ambition across the sector.

[31] International Energy Agency, "Methane and climate change".

Scope 1 and 2 emissions reduction targets are often irrelevant and/or unambitious

In our sample, we found that over 60% of companies either had no target for reducing their scope 1 and 2 emissions, or that they did have a target, but that it was qualified as "irrelevant" by the CIA methodology. An irrelevant target can be defined by several criteria: if it is too unambitious compared with the reference scenarios, if it does not consider the most important sources of emissions, if it is based solely on the purchase of guarantees of origin, etc. Furthermore, only 8% of companies have reduction targets in line with the NZE scenario, which is compatible with a global warming of 1.5°C.

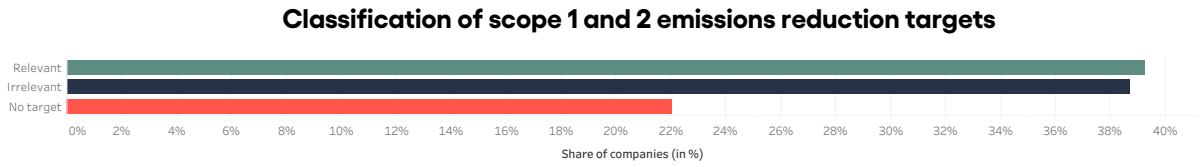


Figure 23: Distribution of scores (percentage of companies)

Scope 3 emissions reduction targets are still too rare

Within our sample, very few companies have defined an absolute reduction target for their scope 3 emissions. Furthermore, targets generally refer to net emissions, which consider "negative" emissions from carbon credits that companies may purchase to "offset" their total emissions. This method of aggregating emissions amounts to adding together very different physical objects. We would like to point out that this way of accounting for emissions is not compatible with the principles of the Net Zero Initiative[32].

The chart below shows the breakdown of scope 3 reduction targets by continent. First observation: most companies in the sector have no scope 3 reduction targets. Secondly, almost all reduction targets which are considered relevant are from European companies (9), while only a tiny minority of North American companies (3) have a relevant target, and none in Asia.

[32] Dugast, "Net Zero Initiative - A framework for collective carbon neutrality".

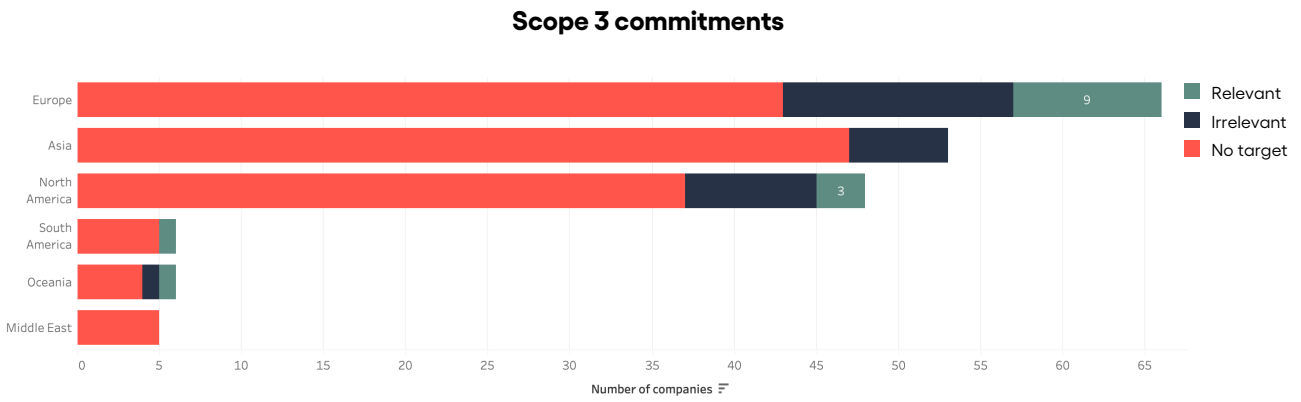


Figure 24: Breakdown of Scope 3 reduction targets by continent

Companies in the oil and gas sector rely heavily on carbon capture, storage, and utilization (CCUS) technologies to reduce their operational emissions, as well as emissions from the combustion of the fossil fuels they bring to market. However, as presented hereinabove, this technology is still in its infancy and is far from proven for large-scale development. Today, carbon capture accounts for around 0.1% of total fossil fuel emissions[33].

Detailed presentation of the strategies of five companies

The table below details some key elements in the strategy of five major oil and gas companies: British Petroleum (BP), Eni, TotalEnergies, ExxonMobil, and Saudi Aramco. The first four belong to the category of so-called *supermajors* (the world's largest private oil companies), while Saudi Aramco is the world's largest oil company, largely owned by the Saudi state. Europe's BP, Eni and TotalEnergies receive significantly better future performance ratings than their peers ExxonMobil and Saudi Aramco, justified by greater commitments to the energy transition.

[33] Allen, "A magical CCUS unicorn will not save the oil industry".

Company	Strategy	Low-carbon investments	Scope 3 emissions reduction targets
BP	○ BP plans to reduce operational emissions (Scope 1&2) by around 50% by 2030 ○ BP has set a short-term deadline for reducing its hydrocarbon volumes	○ BP invests around 17% of its CAPEX in low-carbon activities (renewable energies, recharging of electric vehicles, etc.)	○ BP plans to reduce emissions linked to the combustion of products sold by around 35% by 2030 (using 2019 as the reference year).
Eni	○ Eni plans to reduce its Scope 1&2 emissions by 40% by 2025 (using 2018 as the base year) ○ Eni expects gas to account for 90% of its production in 2050, but does not cap its gas volumes	○ Eni invests 25% of its CAPEX in low-carbon activities (renewable energies, energy efficiency, carbon capture and storage, etc.) ○ 60 GW of renewable electricity generation capacity by 2050	○ Eni has set itself a target of reducing its Scope 3 emissions by 35% by 2030 compared with 2018 levels
Total Energies	○ TE plans to reach a plateau in petroleum production by 2025, while significantly increasing its gas volumes ○ TE plans to increase its renewable energy production capacity tenfold between 2021 and 2030	○ TE is investing around 25% of its CAPEX in low-carbon activities (renewable energies, biofuels, green hydrogen, etc.). ○ 100 GW of renewable electricity generation capacity by 2050	○ TE has defined two Scope 3 reduction targets: the first aims to cap these emissions at their current level (400 Mt) in 2030, and the second aims to reduce the intensity of products sold by 20% by 2030 (using 2015 as the reference year).
ExxonMobil	○ ExxonMobil has not defined a cap on its hydrocarbon volumes and is investing heavily in unconventional resources. ○ ExxonMobil has, however, set itself a target of reducing its Scope 1&2 emissions by 20% by 2030, using 2016 as the base year.	○ ExxonMobil invests 10% of its CAPEX in low-carbon activities, but the exact content of these investments is difficult to verify. ○ ExxonMobil invests a significant proportion of its CAPEX in E&P.	○ ExxonMobil has not set a target for reducing its Scope 3 emissions.
Saudi Arabian Oil Co.	○ Saudi Aramco has set a Scope 1&2 emissions reduction target in intensity, which is considered irrelevant. ○ Saudi Aramco has no plans to reduce its hydrocarbon production volumes, on the contrary, it plans to increase them.	○ The overwhelming majority of Saudi Aramco's investments are aimed at oil and gas development and production projects.	○ Saudi Aramco has not set a Scope 3 emissions reduction target.

Figure 25: Detailed strategies of five companies in the sector

American companies consider themselves more as hydrocarbon producers, while European companies increasingly see themselves as integrated energy providers. In concrete terms, this is reflected in their strategies: North American companies tend to aim for a reduction in their operational emissions, without seeking to reduce the volumes of hydrocarbons they produce. European companies, on the other hand, have for the most part begun to develop renewable energies on a large scale. Some are planning to reduce their production volumes, sometimes constrained by the depletion of resources.

This distinction between European and non-European companies is reflected in the future ratings given to the companies in our sample. The graph below shows the distribution of future performance ratings by region. The size of the bubbles represents absolute scope 3 emissions, their color indicates the overall score for each company, and their position on the x-axis indicates the future performance score.

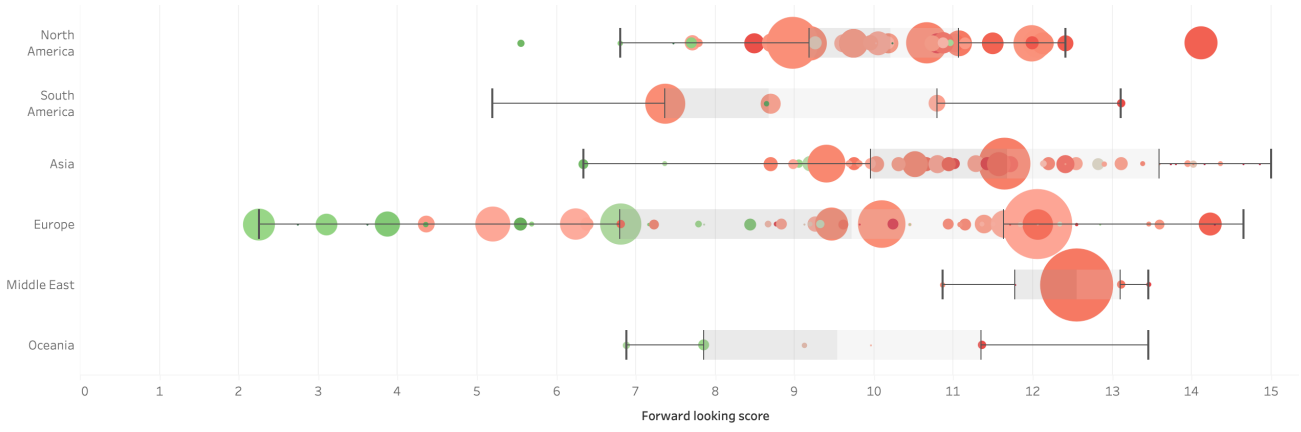


Figure 26: Breakdown of future performance ratings by continent

In Europe, more companies have good future performance ratings (the three green bubbles on the left represent BP, Repsol and Eni), while in Asia and North America future performance ratings are on average weaker.

The importance of defining short-term targets

Defining short- and medium-term reduction targets helps to motivate company management to act with all the urgency required. Above all, it illustrates the understanding that it is the overall quantity of emissions into the atmosphere that is important. Indeed, reducing emissions immediately does not have the same impact as postponing this reduction: the total quantity of greenhouse gases in the atmosphere will not be at all the same depending on the timeframe of the reduction target.

4.5 Top ten market capitalizations and main issuers

The ten largest market capitalizations in the sector receive an overall score between 10 and 12.6. They are therefore all exposed and vulnerable to transition risks. As a reminder, ratings for companies in the oil & gas sector range from 8 to 15.

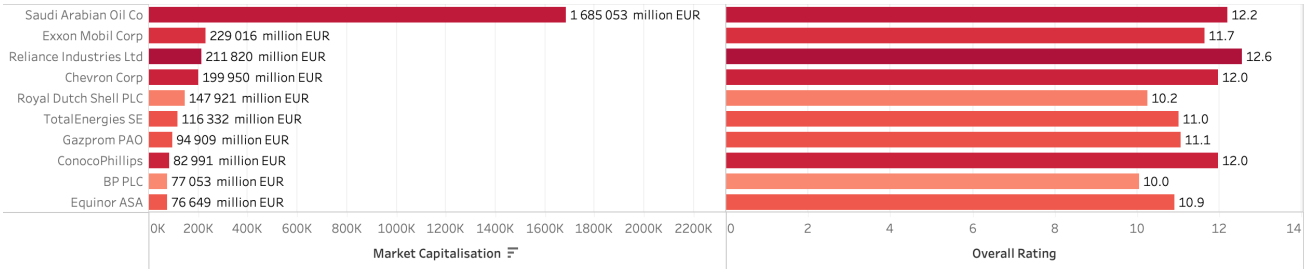


Figure 27: Breakdown of future performance ratings by continent

The chart below shows the largest emitters in our sample. The color of the square indicates the carbon intensity of their scope 3 emissions. It shows that companies with a lower average carbon intensity emit less greenhouse gas. These include oil and gas transport and distribution companies, which are smaller on average.

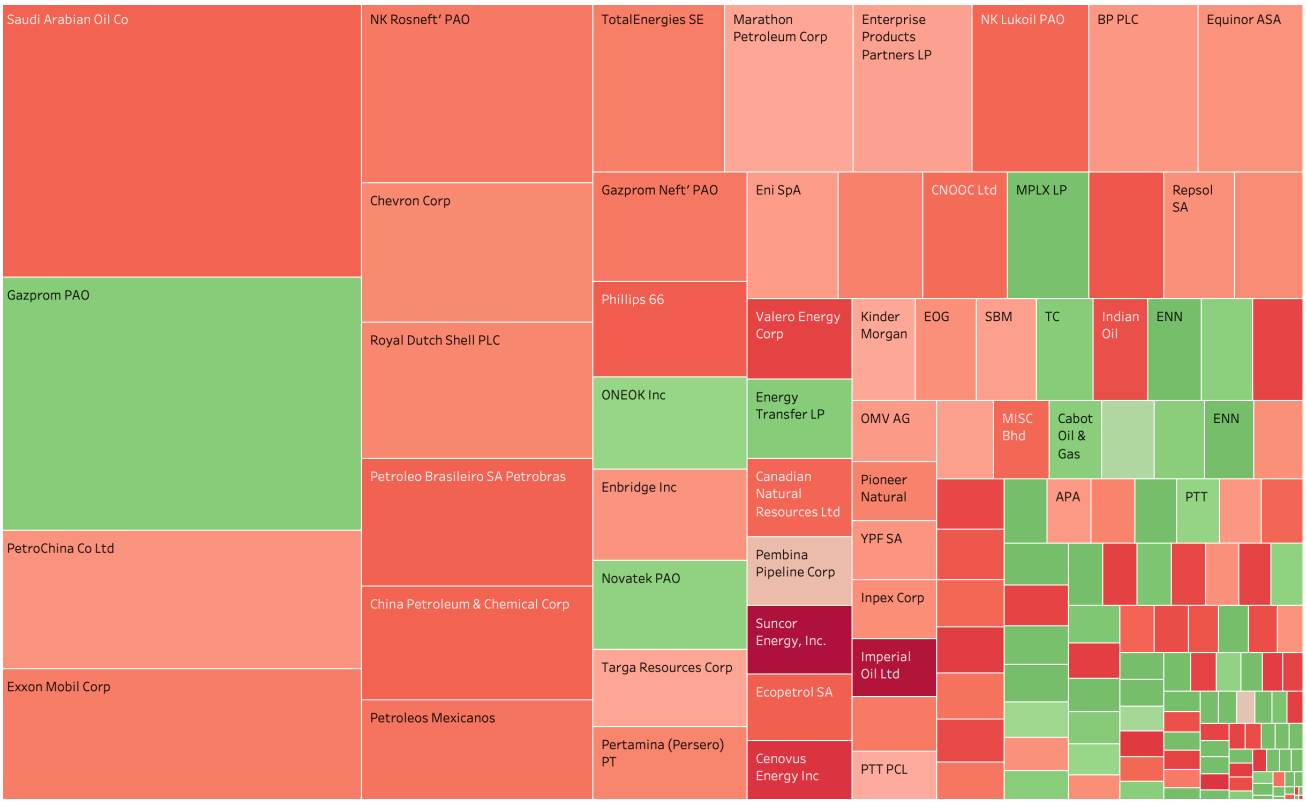


Figure 28: The largest transmitters in our sample

4.6 Can oil and gas companies forgo record profits in favor of the climate?

The years 2021-2022 were marked by high inflation in hydrocarbon prices. As a result, all the major oil companies posted record profits: BP, for example, doubled its profits between 2021 and 2022. Significantly, the announcement of these record profits was accompanied by a downward revision of BP's climate objectives. In fact, the company has indicated that it intends to reduce its oil production volumes by 25% by 2030, rather than by 40% as announced in 2020. Investors welcomed positively these news, with BP's share price rising significantly following the announcement, reaching its highest level in three years.

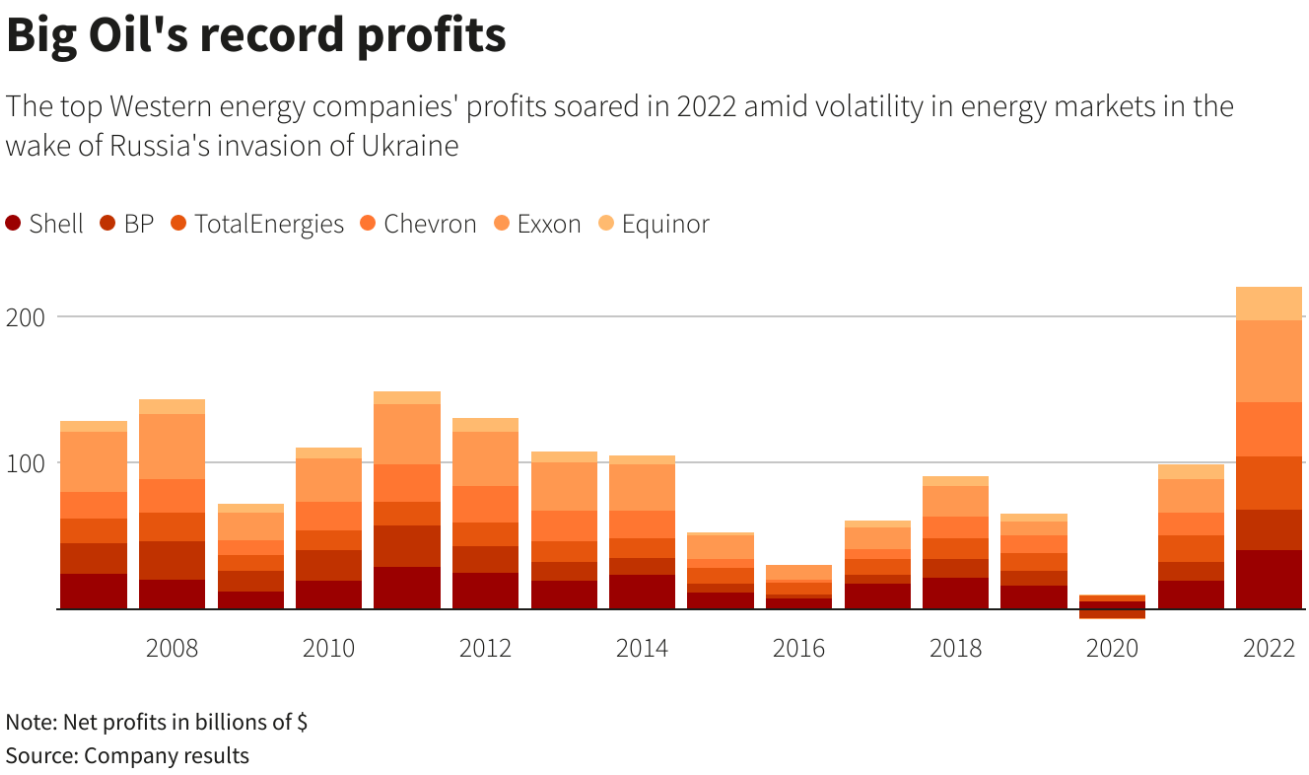


Figure 29: Record profits for the majors in 2022 [34]

In an interview in early 2023, BP CEO Bernard Looney stated that "governments are now clamoring for more investment in the current energy system so that their populations can get what they want, which is safe, rapidly accessible, affordable energy" [35]. Translation: society needs hydrocarbons. BP's decision is undoubtedly motivated by current hydrocarbon prices and the

[34] Bousso, "Big Oil doubles profits in blockbuster 2022".
[35] Fortune Editors, "BP CEO Bernard Looney pushes beyond recent headlines to detail the company's upcoming plans".

prospect of high profits, to the detriment of global climate objectives. This vision reflects a short-term approach to corporate investment, particularly in the oil and gas sector.

In 2022, major Western oil companies paid out a record $110 billion in dividends and share buybacks. This practice allows shareholders to be remunerated in the same way as dividends: resources that are not directed towards low-carbon investments and the energy transition. The graph below shows the evolution of shareholder returns for the five oil majors. These returns have tripled between 2020 and 2022.

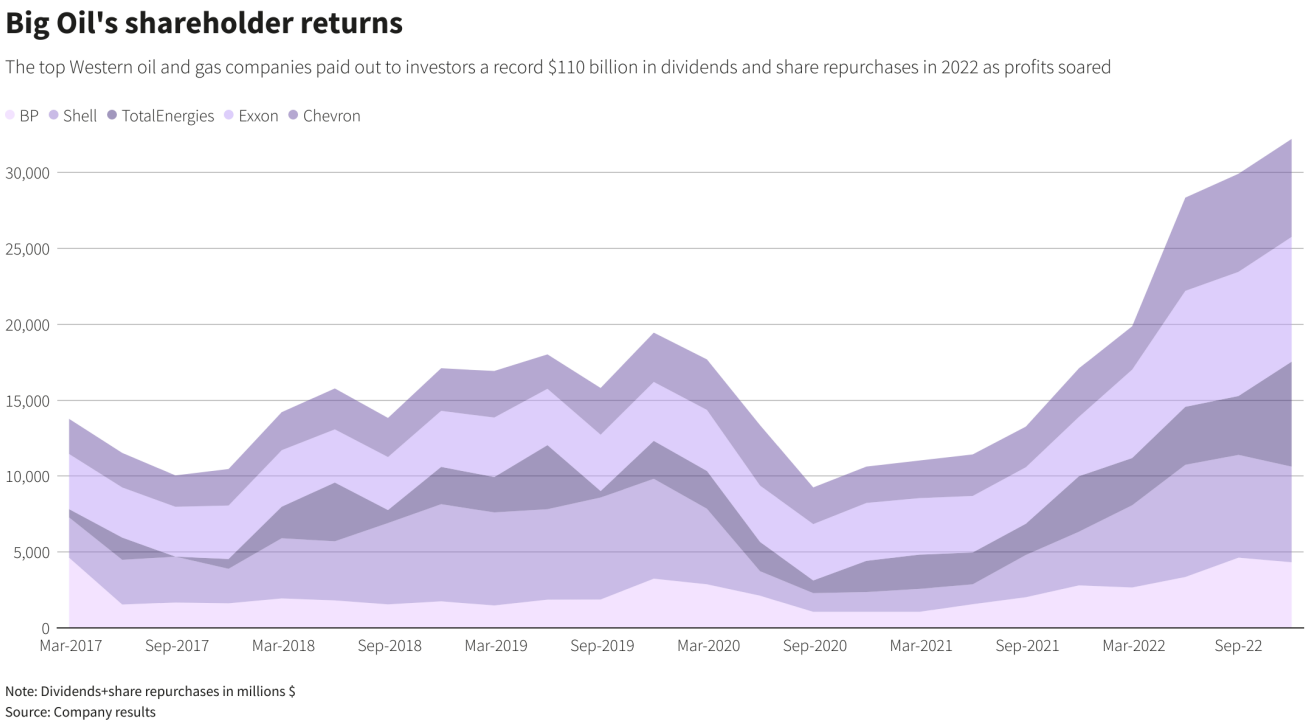


Figure 30: Shareholder returns for the five oil majors

4.7 Investments by companies in the sector are still largely geared towards fossil fuel exploration

According to the *Global Oil & Gas Exit List, the* world's largest oil and gas companies (led by Saudi Aramco, Qatar Energy and Gazprom) have expansion plans that are largely incompatible with the IEA's NZE scenario[36]. Access to funds to finance these expansion projects is made possible by continued easy access to capital for companies in the sector. Many banks have committed to financing fossil fuel projects that exceed the limit set to reach the 1.5°C target: it is estimated that

[36] Allen, "A magical CCUS unicorn will not save the oil industry".

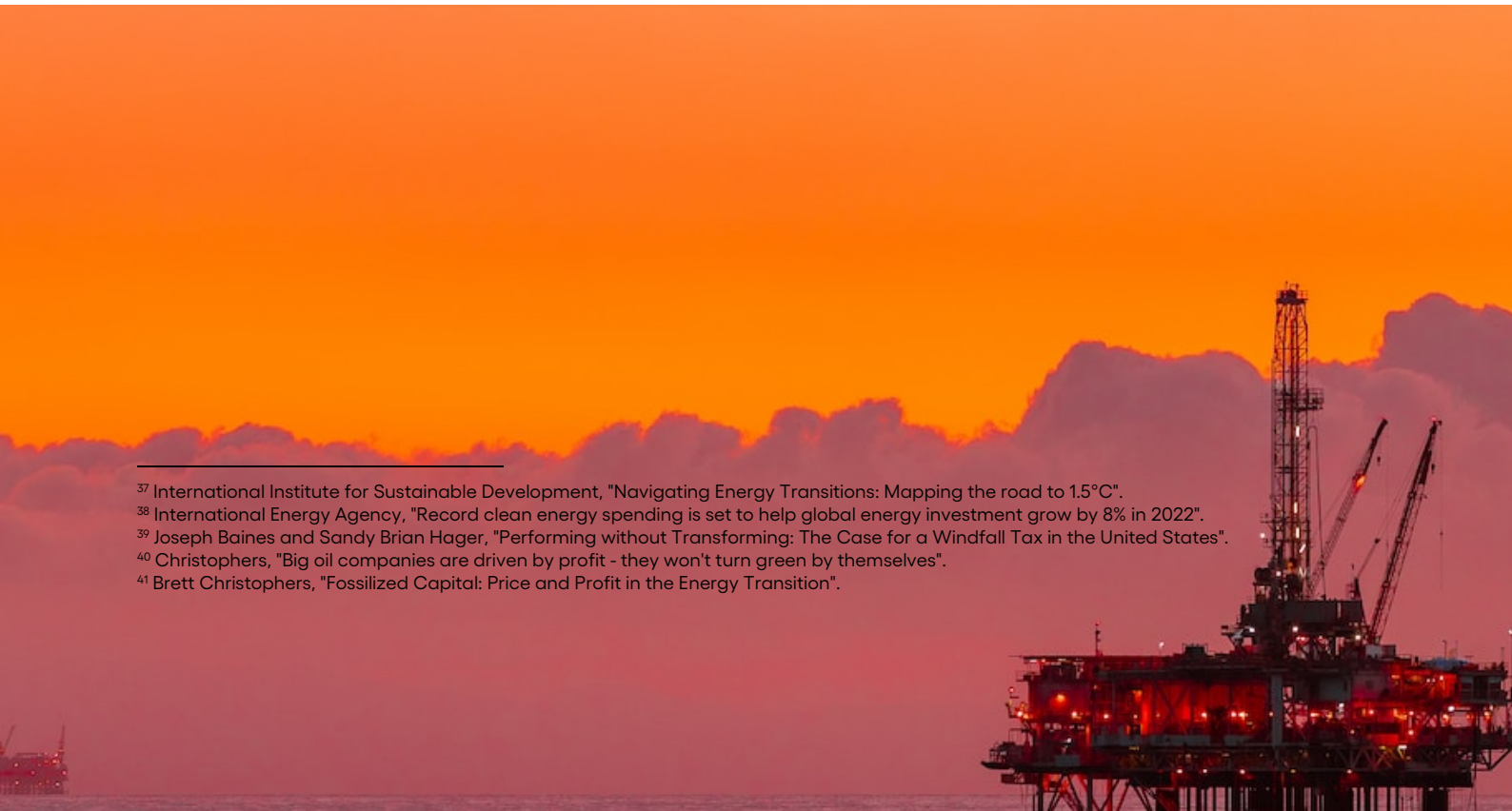
around 520 billion euros will be spent on exploring and prospecting for new oil and gas fields every year until 2030, far exceeding the carbon budget set to stay below 1.5°C of warming[37].

According to a report by the International Energy Agency from 2022, less than 5% of oil and gas company investments are earmarked for so-called clean energies[38]. This proportion is far from sufficient to comply with the NZE scenario and to have any chance of limiting global warming to 1.5°C by 2100. Chevron and ExxonMobil, for example, two of the biggest companies in this sector, invested respectively 2% and 0.16% of their CAPEX in 2022 in renewable energies and other so-called "low-carbon" investments (the exact nature of which is unclear)[39]. The transition strategies of these companies, very much like those of the overwhelming majority of companies in the sector, are far from ambitious enough to follow a warming trajectory of 1.5°C.

Low-carbon investments, really?

Most companies in the sector include "low-carbon investments" in their reports, while deliberately remaining vague about the exact content of these investments. This practice makes it impossible to know the actual amounts invested in renewable energies and other low-carbon investments. Investors must demand greater transparency, so that they can make informed investment decisions in line with the low-carbon transition.

One of the main reasons for this lack of ambition lies in the profitability of hydrocarbons compared with renewable energies. The *Internal Rate of Return* for hydrocarbons is around 20%, compared with 5-6% for renewables[40]. This is partly because the costs of entry into the renewable energy sector are much lower than in the hydrocarbon sector, thus considerably increasing competition in the renewable energy sector. TotalEnergies, for example, recently reported internal rates of return (IRR) of around 15-20% on some of its projects, at a barrel price of $50 (at the time of writing, the barrel price was around $80)[41].



[37] International Institute for Sustainable Development, "Navigating Energy Transitions: Mapping the road to 1.5°C".
[38] International Energy Agency, "Record clean energy spending is set to help global energy investment grow by 8% in 2022".
[39] Joseph Baines and Sandy Brian Hager, "Performing without Transforming: The Case for a Windfall Tax in the United States".
[40] Christophers, "Big oil companies are driven by profit - they won't turn green by themselves".
[41] Brett Christophers, "Fossilized Capital: Price and Profit in the Energy Transition".

Conclusion

Our analysis of a sample of around 150 companies in the oil and gas sector, using a bottom-up approach, has enabled us to identify the main trends, dynamics and decarbonization paths in the sector.

Despite the existence of global climate targets, most companies in the oil and gas sector have not embarked on any serious transformation capable of drastically reducing emissions from fossil fuel combustion. As a result, they continue to allocate most of their investment capacity to the exploration and exploitation of new deposits, often to the detriment of low-carbon energies.

To date, virtually no company in the oil & gas sector has voluntarily committed to reducing its scope 3 emissions to absolute levels, nor has it been forced to do so by local authorities. Instead, companies in the sector tend to focus on reducing their operational emissions (scope 1 and 2), an interesting but clearly second-rate metric.

It is true that oil and gas companies have for some time been making rapid and comfortable financial returns from their historic hydrocarbon activities. But when it comes to the outlook for the future, plans to withdraw from fossil fuels are still extremely rare. Investors with a medium-term investment horizon may rightly consider that their exposure to these companies represents an increasingly obvious transition risk. In a world that respects planetary limits and the objectives set by the Paris Agreement, the oil and gas sector will have to contract sharply, and companies in the sector will have to turn their backs on fossil fuels quickly, to reinvent their business model, or disappear.

Appendix

CIA methodology for the oil and gas sector

Integrated companies

The **past performance of** integrated players corresponds to the company's Scope 1, 2 & 3 emissions over the last 5 years. These emissions are calculated using the CIA methodology. Past performance accounts for 25% of the overall score**.**

The **present performance** compares the player's current carbon intensity with that of its peers. The current performance of integrated players corresponds to the weighted average carbon intensity (scope 3 only, expressed in kgCO2e/toe) of the products handled by the company across the entire oil and gas value chain. Performance accounts for 40% of the overall score**.**

The **future performance** assesses the company's ability to undertake an ambitious and effective low-carbon transition. Integrated players are assessed on their ability to reduce the volumes of hydrocarbons handled, or at least to define an ambitious and credible deadline by which their volumes will cap. They are also judged on their ability to increase their renewable energy production capacity. Finally, a less important, but non-marginal, lever for integrated players lies in reducing the scope 1&2 intensity of their operations (notably with CCUS).

Companies' emission reduction targets are rated according to their alignment with IEA scenarios specific to the oil & gas sector.

Companies are also rated on governance criteria common to all sectors in the CIA methodology. For more information, see xxx.

Finally, we apply an affine transformation to obtain an overall CIA score ranging from a theoretical maximum (increase) to a theoretical minimum (decrease). The thresholds for the oil & gas sector (integrated and midstream players) range from 8 to 15.

Midstream companies

The **past performance of** Midstream players corresponds to the observed evolution of the player's carbon intensity over the last 5 years.

Their **current performance can be** broken down into two parts:

- The weighted average carbon intensity (scope 3 only, expressed in kgCO2e/toe) of the products handled by the company, compared with that of its peers (best-in-class approach).
- The methane intensity of the company's majority geographic plate, taken from IEA data.

Regarding their **future Performance,** Midstream players are rated on their ability to reduce fugitive methane emissions from the transportation of hydrocarbons. According to IEA data, only 75% of the associated gas extracted during oil extraction is put to productive use (sold to end consumers, used on-site as a source of electricity or heat, or reinjected into oil wells to create pressure for the recovery of secondary liquids. The remainder is flared or vented directly into the atmosphere. Emissions linked to these processes represent around 40% of Scope 1 and 2 emissions associated with oil production[42].

Midstream players are also rated on their ability to increase the share of low-carbon products (decarbonated hydrogen, biofuels, renewable electricity) transported and/or distributed via their networks.

[42] International Energy Agency, "The Oil and Gas Industry in Energy Transitions".

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Created in 2016 and based in Paris, **Carbon4 Finance** brings the Carbone 4 consultancy expertise to the financial sector, which since 2007 has been providing carbon accounting, scenario analysis and consultancy services in all economic sectors.

Carbon4 Finance offers a comprehensive set of climate data solutions covering both physical risk (the CRIS methodology: Climate Risk Impact Screening) and transition risk (the CIA methodology: Carbon Impact Analytics). These proven methodologies allow financial organisations to measure the carbon footprint of their portfolio, assess their alignment with a 2°C compatible scenario and measure the level of risk arising from climate change events.

Carbon4 Finance applies a rigorous bottom-up, research-based approach, which means that each asset is analyzed individually and in a rigorous manner.

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