



SHELL VS. THE CLIMATE:

**EXPANDING OIL AND GAS,
FUELING THE CLIMATE CRISIS**

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Oil Change International is a research, communications, and advocacy organization focused on exposing the true costs of fossil fuels and facilitating the ongoing transition towards clean energy.

Milieudedefensie is a Dutch Environmental Organisation and a member of Friends of the Earth International, the largest grassroots environmental network in the world.

1 INTRODUCTION & SUMMARY



As one of the world's largest producers of oil and gas, Shell is a top historical global climate polluter.¹ Recognizing that Shell's business activities have been a relevant cause of the climate damage that is putting people's lives at risk, the Dutch district court of The Hague handed down a verdict on May 26, 2021² requiring Shell to take responsibility for its ongoing climate pollution and align its business plans with the goals of the Paris Agreement on climate change.

For the first time, a judge ordered a major polluter to align its plans with what is required to curb the climate crisis.

The climate case verdict, which Shell is appealing,³ requires the company to reduce the net carbon-dioxide (CO₂) emissions caused by its business activities, including the oil and gas it sells to customers, by 45% below 2019 levels by 2030. This rate of reduction aligns with the scientific imperative to cut carbon-dioxide emissions in half globally within this decade in order to preserve a 1-in-2 chance of holding global warming at or below 1.5 degrees Celsius (°C).⁴

In this briefing, we provide an updated assessment of Shell's fossil fuel extraction plans in light of both the court verdict and the latest climate science. This analysis builds on a data briefing released in September 2022 by Oil Change International and Milieudefensie.⁵

4 Since the previous briefing, Shell has pursued its appeal of the climate case ruling and walked back stated climate ambitions,⁶ whilst announcing record fossil fuel profits.⁷ At the same time, global temperature rise has reached 1.2°C and the impacts of scorching heat, drought, flooding, and other weather extremes escalated globally, with communities in the Global South and Indigenous Peoples, people of colour, and low-income people across the world being hit hardest. As companies and governments have continued to approve new fossil fuel extraction and infrastructure, carbon pollution hit a new record high in 2023, increasing an estimated 1.1% above 2022 levels.⁸

The vast majority of emissions caused by Shell's business activities stem from the production, processing, and sales of oil and gas. Thus, to meet the verdict, Shell must begin winding down these fossil fuel business activities across the board. **In this briefing, we focus specifically on the production and emissions stemming from Shell's upstream extraction:** the oil and gas that Shell directly extracts from the ground and the end use carbon pollution caused when it is burned. This makes up less than half of the fossil fuels Shell sells to customers. Thus, the findings and recommendations in this briefing address only part of the actions the company must take to reduce its emissions.

Our analysis shows that Shell continues to plan for levels of oil and gas production and investment that undermine the world's chances of curtailing climate disaster and are incompatible with holding global temperature rise to 1.5°C.

Specifically, we find that:

- Shell has approved development of at least 20 new extraction assets since the Dutch court verdict of May 2021. Together, these projects commit more than 2.1 billion barrels of new oil and gas equivalent (BOE) to extraction, threatening 753 million tonnes (Mt) of CO₂ pollution cumulatively. That is more than 5 times the CO₂ emissions of the Netherlands in 2021.⁹
- Rather than writing off undeveloped oil and gas as unextractable under the 1.5°C warming limit, Shell is actively seeking more of it. According to data from Rystad Energy, close to 60% (813) of 1,386 oil and gas extraction assets owned in whole or part by Shell are undeveloped. The projected volume of undeveloped oil and gas in Shell's portfolio (14.7 billion barrels) has grown by 24% since our 2022 briefing.
- By ceasing approval of new oil and gas fields as of 2024, Shell could help keep 14.7 billion BOE of undeveloped oil and gas in the ground and 5.3 billion tonnes (Gt) of CO₂ emissions out of the atmosphere. That is equivalent to 38 times the CO₂ emissions of the Netherlands in 2021. An additional 6.7 Gt of CO₂ emissions are already committed by Shell's producing and under construction projects.
- If Shell were to extract all its economically viable oil and gas resources (developed and undeveloped) the resulting CO₂ pollution (11.9 Gt CO₂) could exhaust as much as 5.7% of the world's remaining carbon budget for a 50% chance of holding warming to 1.5°C.^A This is before accounting for the additional carbon emissions caused by the oil and gas Shell sells but does not directly produce.

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A Based on an estimated remaining budget of 210 Gt CO₂ from the start of 2024.

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- In the summer of 2023, Shell dismissed its target to reduce oil production by 1-2% annually, announcing plans to keep oil production steady through 2030. If Shell continues approving new fields for development, Rystad Energy modelling indicates that Shell's oil and gas production and the CO₂ emissions caused by burning it could increase by 10% between 2022 and 2030. In that case, CO₂ emissions from Shell's oil and gas production could rise at a higher rate between 2022 and 2030 than global oil and gas emissions under the IEA's Stated Energy Policies Scenario (STEPS) – a scenario aligned with a disastrous 2.4°C of global temperature rise.
 - By contrast, Shell could go a long way towards aligning its oil and gas production with the climate case verdict and the 1.5°C limit by ceasing to develop new extraction. If Shell were to stop approving new projects and cease construction of projects not yet producing as of 1 January 2024, the decline in production from already operating fields would lead to a 41% drop in CO₂ emissions from burning oil and gas extracted by Shell by 2030, relative to 2019 levels. This would still be lower than the 45% overall reduction mandated for Shell's total CO₂ emissions by the climate case verdict, but it would be a significant step in that direction.



2 THE 1.5°C LIMIT REQUIRES AN END TO EXPANSION AND A RAPID FOSSIL FUEL PHASE-OUT



Since we last assessed Shell's fossil fuel production plans in September 2022, the impacts of the climate crisis have escalated, and the scientific case for immediate and swift action to phase out fossil fuels has only become stronger.

Against this backdrop, the world's governments agreed at the 2023 UN climate conference in Dubai (COP28) that fulfilling the Paris Agreement requires "transitioning away from fossil fuels in energy systems in a just, orderly and equitable manner, accelerating action in this critical decade."¹⁰

As of the start of 2024, the world's remaining allowable carbon budget for a reasonable (50%) chance of limiting global temperature rise to 1.5°C is vanishingly small – just 210 to 275 billion tonnes (Gt) from the start of 2024 based on the latest science.^{11,B} That is equivalent to just five to seven years of emissions at recent rates.¹²

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B The IPCC Working Group I report, Climate Change 2021: The Physical Science Basis, estimated the remaining 1.5°C carbon budget (50% probability) at 500 Gt CO₂ from the start of 2020. Updated estimates, factoring in both CO₂ emissions since the start of 2020 and more recent science, reduce best estimates of the remaining 1.5°C budget to just 210 to 275 Gt CO₂ from the start of 2024. See Forster et al (2023), Lamboll et al (2023), and Friedlingstein et al (2023).

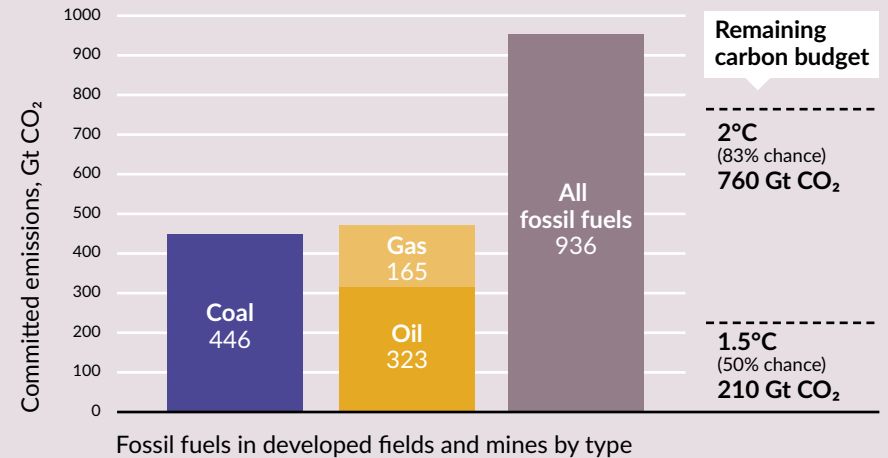
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The world's existing fossil fuel extraction and consumption infrastructure already threatens to push the world well beyond 1.5°C of warming.¹³ Peer-reviewed research finds that extracting just the oil, gas, and coal in existing and under-construction fields and mines globally would cause 936 Gt CO₂.¹⁴ That is at least three times more carbon pollution than fits within the remaining 1.5°C carbon budget (Figure 1). **Thus, the majority of the oil, gas, and coal in existing extraction sites must stay in the ground to safely stay within the 1.5°C budget.**



FIGURE 1:

CO₂ emissions committed by developed oil and gas fields and coal mines, compared to remaining carbon budgets from 1 January 2024



Source: Trout et al (2022),¹⁵ Forster et al (2023),¹⁶ Friedlingstein et al (2023)¹⁷

The implications of this math are twofold. Keeping the 1.5°C limit in reach will require: 1) ending development of new fossil fuel extraction and infrastructure; and 2) closing a significant portion of the infrastructure already developed before it reaches the end of its economic lifetime.

Recent reports by the Intergovernmental Panel on Climate Change (IPCC) and International Energy Agency (IEA) reiterate this finding:

- The IPCC's 2023 synthesis report warns that "projected CO₂ emissions from existing fossil fuel infrastructure without additional abatement would exceed the remaining carbon budget for 1.5°C."¹⁸
- The IEA first warned in 2021 that approving new oil and gas fields and mines for construction, let alone exploring for new fossil fuels, is incompatible with its 1.5°C-aligned Net Zero Emissions (NZE) scenario.¹⁹
- In its updated 2023 NZE scenario,²⁰ the IEA underlines that, due to the failure to rein in fossil fuels since 2021, declines in oil and gas use must accelerate after 2030,²¹ such that "a number of projects are closed before they reach the end of their technical lifetime."²²
- The IEA additionally finds that "none of the [liquefied natural gas] export projects under construction today are required"²³ under its 1.5°C pathway; after 2030, a significant portion of existing LNG capacity will need to be scaled back.²⁴

At this stage of the climate crisis, any new fossil fuel development risks dire climate and/or economic consequences. This is because, once fossil fuel infrastructure is built, it "locks in" carbon dioxide emissions over the lifetime of the infrastructure (an effect called 'carbon lock in'²⁵).

Developing new oil and gas fields would either lock in more dangerous degrees of global warming beyond 1.5°C, or require a larger and more rapid shutdown of existing extraction to stay within that limit (increasing the economic and social costs of achieving the 1.5°C limit).²⁶

The fossil fuel industry's current investment trajectory is pushing the world towards this dangerous future. The IEA warns that between 2023 and 2035, cumulative investments in fossil fuel supply, fossil-based power generation, and end-uses are currently planned to be USD 3.6 trillion higher than in the NZE Scenario. According to the IEA, "Much of this investment would be for assets with long lives in which operations would need to be curtailed or lifetimes shortened if the goal of returning the temperature increase to below 1.5 °C is to be achieved."²⁷

New oil and gas fields and LNG facilities require large upfront capital investment to develop and are typically expected to operate for several decades. The largest portion of capital is committed when companies take a final investment decision (FID) and begin construction. After capital is sunk, companies have an incentive to keep producing as long as the prevailing market price exceeds marginal operating costs – first to recoup their invested capital and then to maximise profits.²⁸ Once licences and permits are issued and production begins, governments

9 also face increasing legal hurdles to intervene to shut projects down.²⁹ While Shell and other oil and gas companies commonly claim they are merely 'meeting demand' in investing in new fossil fuel supply, this view ignores the fact that new supply actively shapes demand, through price effects and by 'locking out' renewable energy alternatives.³⁰

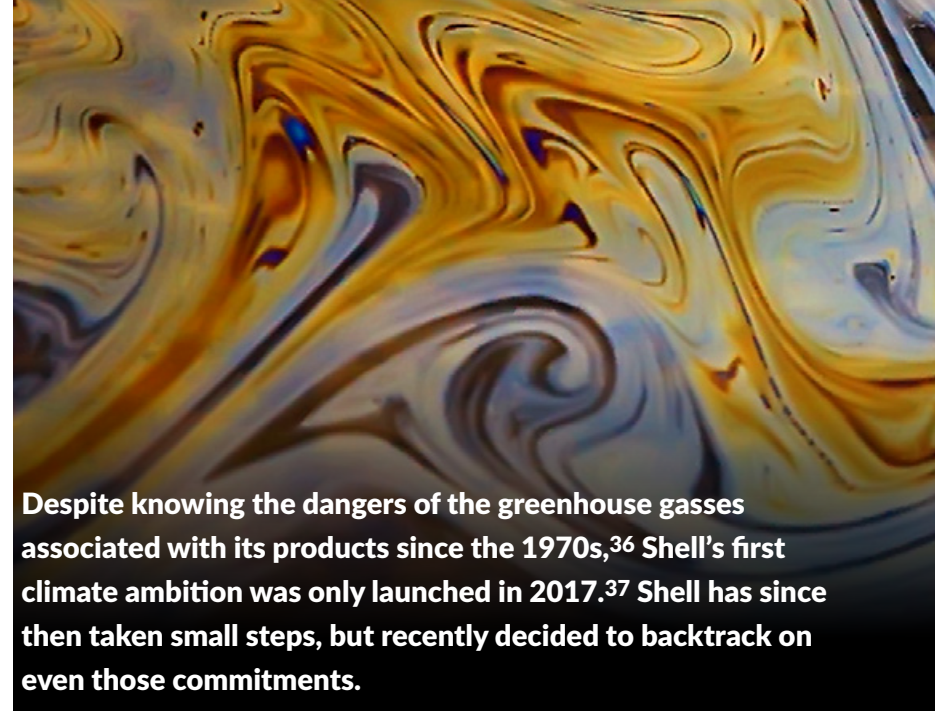
When you are in a hole, the first step is to stop digging. Ending new oil and gas development is a common-sense step towards ensuring the immediate and swift declines in oil and gas production that are required for a liveable climate. Oil and gas fields already in production decline at an observed rate of 4.5% annually, on average.³¹ Under the IEA's 1.5°C-compatible NZE scenario, global oil and gas supply declines by 5.2% per year, on average, between 2022 and 2050.³² Thus, ceasing to bring new fields into production would go a substantial way towards meeting the needed annual average decline for oil and gas supply. It is important to underscore that oil and gas will need to decline even faster than indicated by IEA and median IPCC scenarios to avoid gambling the survival of vulnerable communities and ecosystems on technologies such as carbon capture and storage (CCS) and engineered carbon-dioxide removal.^{33, C}

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C For example, the IPCC-assessed illustrative mitigation pathway that avoids CCS or carbon-dioxide removal in the fossil fuel sector shows the need for oil and gas to decline by 6.8% per year, on average, between 2020 and 2050.

Just as the case for a full and fast phase-out of fossil fuels is clearer than ever, renewable and energy efficiency solutions are better positioned than ever to rapidly replace fossil fuels in the energy system. According to the IEA, the key actions required to slash fossil fuel emissions by 2030, led by tripling renewables and doubling rates of energy efficiency, "are mature, tried and tested, and in most cases very cost effective."³⁴ Energy systems built on renewables also promise to be more secure, affordable, healthy, and accessible.³⁵



3 SHELL'S SHRINKING CLIMATE AMBITION



Despite knowing the dangers of the greenhouse gasses associated with its products since the 1970s,³⁶ Shell's first climate ambition was only launched in 2017.³⁷ Shell has since then taken small steps, but recently decided to backtrack on even those commitments.

NET CARBON INTENSITY

Shell has adopted a so-called Net Carbon Intensity (NCI) target to reduce the carbon intensity of the products it sells. The carbon intensity targets have been adjusted over the years. In Shell's 'Powering Progress' strategy (launched in February 2021) the company has committed to a reduction in carbon intensity of 9-13% by 2025, 20% by 2030, 45% by 2035 and 100% by 2050.³⁸ An intensity target such as the NCI can be misleading because it does not guarantee that CO₂ emissions will be reduced. Shell can lower its NCI by divesting from oil and gas and producing or trading more renewable energy. If Shell maintains or even increases the current size of its oil and gas activities and expands its renewable energy and low carbon fuels sales by the same or greater volume, Shell can achieve its ambition.

11 Shell states in its annual report of 2022 that it has reduced its emissions intensity by 3.8%, compared to 2016 levels.³⁹ However, the Australasian Centre for Corporate Responsibility (ACCR) found that Shell is not accounting for the impact of its sales of oil and gas assets (i.e., divestments) correctly in its reporting, as is required according to the Greenhouse Gas Protocol. ACCR estimates that Shell's net carbon intensity increased by 5% from 2016 to 2022, instead of decreasing by 3.8%, after accounting for the effect of divestments.⁴⁰

DIVESTMENT

Across Shell's annual reports, the company lists "divestments" as a core driver of its reductions in oil and gas production and absolute emissions from its operations between 2019 and 2022.⁴¹

According to the Greenhouse Gas Protocol, companies are required to recalculate the base year emissions they track reductions against when: 1) a change such as a divestment occurs, and 2) if it has a significant impact on the inventory.⁴² This is because divestments do not drive reductions in global greenhouse gas emissions – rather, they transfer the emissions associated with an asset from one company's books to another.⁴³ Shell defines significant impact as divestments that have an impact of more than 10% with regards to their scope 1 and 2 emissions.⁴⁴ Shell reported its emissions to be 68 Mt carbon-dioxide equivalent (CO₂e) in 2021. This dropped by 7.5 Mt CO₂e due to divestments in 2022, amounting to a 11% decrease.⁴⁵ This would appear to classify as a significant impact under Shell's own 10% threshold.⁴⁶ However, Shell did not adjust its base year, creating a

false perception. Even if this was the cumulative calculation of small divestments Shell should have adjusted its base year because, according to the GHG Protocol "[s]ignificant changes result not only from single large changes, but also from several small changes that are cumulatively significant."⁴⁷

ABSOLUTE EMISSIONS

Shell has no target to reduce the company's total carbon

emissions by 2030. In October 2021 Shell announced it would halve its absolute emissions of scope 1 and 2 by 2030. In its 2022 annual report, Shell stated that it had reduced its scope 1 and 2 emissions by 30% compared to the base-year 2016.⁴⁸ Shell's own reporting indicates that divestments, rather than the company's direct emissions reduction efforts, accounted for over 70% of this reduction to 2022.⁴⁹ Between 2022 and 2030, Shell expects its scope 1 and 2 emissions from oil and gas to increase, whilst it plans to achieve further reductions through among other things improving energy efficiency, the capture and storage of carbon, and "carbon credits".⁵⁰ However, more importantly, the target for scope 1 and 2 only covers about 5% of Shell's total emissions as the majority of Shell's emissions is in scope 3 (Figure 2). Thus, Shell's Scope 1 and 2 target only guarantees a reduction of 2.4% of Shell's total CO₂ emissions by 2030. For 95% of Shell's emissions, there is no absolute emission reduction target in place before 2050, as is confirmed by Shell's Annual Report 2022.⁵¹

FIGURE 2:

Shell's reported emissions reduction targets

Scope	Absolute emissions million tonnes of CO ₂ e				Targets	
	2016	2020	2021	2022	Target 2030	Target 2050
Scope 1	72	63	60	51	50% reduction compared with 2016 levels on a net basis	0
Scope 2	11	8	8	7		0
Scope 3	1,545	1,305	1,299	1,174	No target	0

Source: Shell's 2022 Annual Report.

Shell still has no 2030 absolute emissions target for scope 3.⁵²

BACKTRACKING ON BOTH FRONTS: OIL AND GAS & RENEWABLES

In the summer of 2023, Shell dismissed its annual target to reduce oil production by 1-2% by announcing it will keep the oil production steady until 2030.⁵³ Shell claims that it has reached the planned reduction earlier due to its divestments, e.g., by selling oil and gas to be produced by other companies rather than keeping it in the ground. However, as mentioned above this use of divestment is considered a transfer of responsibility, allowing Shell to continue its business as usual while backtracking on its commitments.⁵⁴

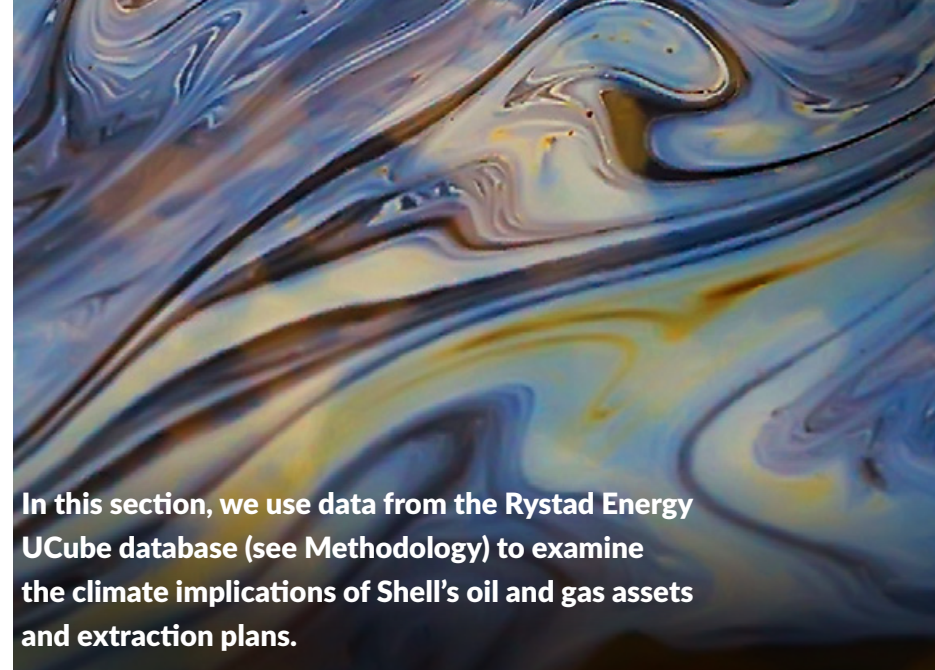
In October 2023, Shell's new CEO Wael Sawan emphasized the importance of 'discipline' in capital spending. This focus is mainly affecting the company's renewables and energy solutions segment, as is evidenced by a 39% decrease in capital spending Q3 2023 compared to Q3 2022 in this segment.⁵⁵ Shell spent just 1.5% of its total investment expenditure in renewable energy in 2021, followed by a total of 8% in 2022.⁵⁶ However, after these small steps Sawan decided to "make disciplined and difficult choices" in its renewable energy business, "such as stepping back from opportunities that do not [...] generate enough returns,"⁵⁷ after the most profitable year in the business.⁵⁸

SHELL'S PLEDGE TO STOP NEW 'FRONTIER' EXPLORATION BY 2025

An oil and gas company cannot claim to be aligning its business with the 1.5°C warming limit while continuing to explore for and develop new oil and gas reserves: The world's stock of oil, gas, and coal projects already operating or being constructed hold far more fossil fuel reserves than can be burned under the Paris Agreement. Even in this case Shell's ambition may appear more significant than it is in reality. Shell says it anticipates ending new 'frontier' exploration post-2025 (meaning exploration in regions without existing oil and gas discoveries and extraction).⁵⁹ Yet, the company is actively pursuing new frontiers at present and Shell has no plans to stop exploration in areas where it already has significant production assets.

In 2022, Shell spent USD 1.7 billion on new oil and gas exploration,⁶⁰ and Shell has indicated it plans to continue spending around USD 1.5 billion per year on exploration through to 2025.⁶¹ Shell's 2022 Annual Report shows the company continues to explore for more oil and gas in 24 countries,⁶² and touts that it is actively pursuing 'new frontiers' in Uruguay, São Tomé and Príncipe, and South Africa.⁶³

4 DOUBLING DOWN ON NEW OIL AND GAS



In this section, we use data from the Rystad Energy UCube database (see Methodology) to examine the climate implications of Shell's oil and gas assets and extraction plans.

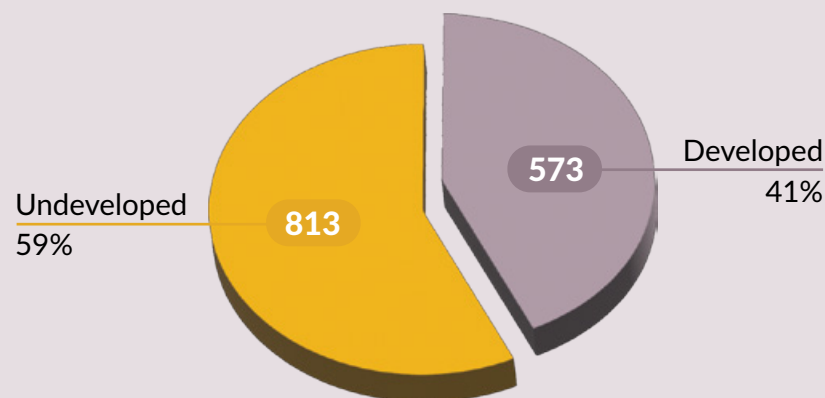
Shell's extraction assets can be broken down into four basic categories according to their stage of development, with different implications for global climate goals and Shell's own finances:

- **Developed assets (existing projects):**
 - Producing: Assets actively producing oil and gas.
 - Under construction: Assets for which a final investment decision (FID) has been made, but production has not yet started.
- **Undeveloped assets (potential new projects):**
 - Discovered: Assets Shell has already explored and announced discoveries of oil and gas it could choose to develop, but no FID has been made.
 - Undiscovered (licensed but not yet explored): Assets where Shell has a stake in an exploration licence but has not yet finished exploration and/or confirmed a discovery.

Given the fossil fuels already developed are more than can be safely extracted and burned (see Section 2), a company aligning its business plans with the 1.5°C limit should be planning to leave all its undeveloped oil and gas in the ground.

FIGURE 3:

Count of Shell's Oil and Gas Extraction Assets, by Developed vs Undeveloped



Source: Oil Change International using data from the Rystad Energy UCube (January 2024).

We exclude marginal assets estimated to have less than 50 thousand barrels of commercial resources.

SHELL'S OIL AND GAS RESOURCES

According to data from Rystad Energy, Shell has close to 1,400 oil and gas extraction assets that it owns in whole or in part.⁶⁴ Just over 40% (573) of these assets are already developed, whilst close to 60% (813) are undeveloped (Figure 3).

In total, Shell's oil and gas extraction assets (existing and undeveloped) hold an estimated 32.9 billion barrels of oil equivalent (BOE) of oil and gas (Table 1). This volume of oil and gas is equivalent to 31 times Shell's production at 2022 levels.⁶⁵ If Shell extracts and burns all of these resources, they would emit 11.9 billion tonnes (Gt) of CO₂, equivalent to 85 times the total CO₂ emissions of the Netherlands in 2021.⁶⁶ Shell's oil and gas extraction could exhaust as much as 5.7% of the world's remaining carbon budget for a 50% chance of holding warming to 1.5°C (based on a remaining budget of 210 Gt CO₂ from the start of 2024).^D This is before accounting for the larger portion of carbon emissions caused by the oil and gas Shell sells but does not directly produce.

When only considering Shell's developed assets (both producing and under construction), the volume of these assets is still equivalent to more than 17 times Shell's production at the 2022 level.⁶⁷ While only

^D Shell's oil and gas resources threaten to exhaust a significantly higher proportion of the remaining 1.5°C carbon budget than found in our 2022 briefing (2.8%) due to the fact that Shell's oil and gas resources have grown slightly while the remaining budget has shrunk considerably, based on 80 Gt CO₂ of additional emissions and more recent scientific modelling. Forster et al (2023) and Lamboll et al (2023) estimate a remaining 1.5°C budget of 250 Gt CO₂ from the start of 2023, which has been reduced by around 40 Gt CO₂ emitted in 2023.

16 producing assets amount to a volume of 14 times Shell's production at the 2022 level. For comparison, the carbon budget for a 50% chance of limiting global warming to 1.5°C would be depleted in five to seven years of worldwide emissions at current rates.

Shell's estimated oil and gas resources and the carbon emissions that would result from burning them are comparable to (though slightly higher than) the results of our September 2022 analysis (Table 1).

While Shell's volume of resources in producing assets has declined (driven in part by asset divestments⁶⁸), Shell's volume of resources in every other category has risen, which is indicative of new final investment decisions, exploration, and acquisitions. **Alarmingly, Shell's volume of undeveloped oil and gas has grown by 24% (from 11.9 billion BOE to 14.7 billion BOE) since our 2022 briefing.** Rather than writing off undeveloped oil and gas as incompatible with 1.5°C, Shell is actively seeking more of it.

TABLE 1:
Shell's commercially extractable oil and gas resources and estimated CO₂ emissions from combustion by stage of development (as of 1 January 2024)

Stage of development	Oil and gas resources, Billion BOE	Projected CO ₂ emissions from combustion, Billion tonnes CO ₂	% Change in projected CO ₂ emissions by category, compared to Sept. 2022
Producing	14.6	5.4	-15%
Under construction	3.5	1.2	+30%
Discovered	10.3	3.7	+26%
Undiscovered	4.4	1.6	+16%
Sum	32.9	11.9	+3%

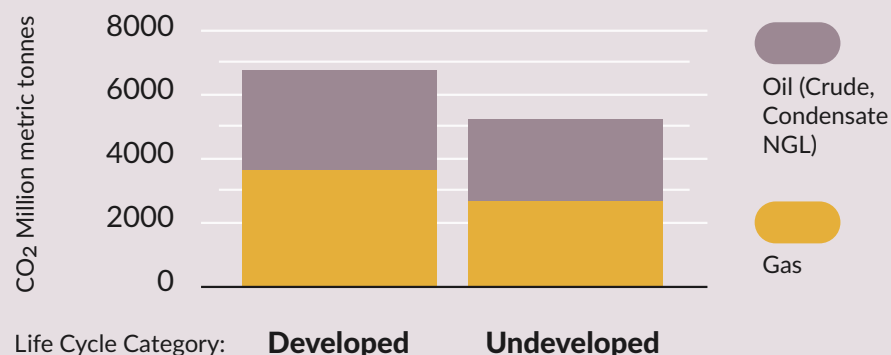
Source: Oil Change International calculations using data from the Rystad Energy UCube (January 2024), Oil Change International and Milieudefensie (2022)⁶⁹

Shell's undeveloped resources (i.e., in the discovery and exploration phases) account for close to 45% of the carbon pollution threatened by Shell's future extraction (Figure 4), up from 37% as of September 2022.

By ceasing new oil and gas development as of 2024, Shell could help keep 14.7 billion BOE of oil and gas in the ground, and 5.3 Gt of carbon pollution out of the atmosphere (Table 1; Figure 4). For reference 5.3 Gt of CO₂ emissions is equivalent to 38 times the CO₂ emissions of the Netherlands in 2021.^{70,E}

FIGURE 4:

Projected CO₂ emissions from burning Shell's remaining oil and gas resources, by fuel and developed vs undeveloped resources



Source: Oil Change International calculations using data from the Rystad Energy UCube (January 2024)

E As of our September 2022 analysis, Shell's undeveloped resources of 11.9 billion BOE would have caused 4.3 Gt of CO₂ emissions, around 30 times the CO₂ emissions of the Netherlands in 2021.

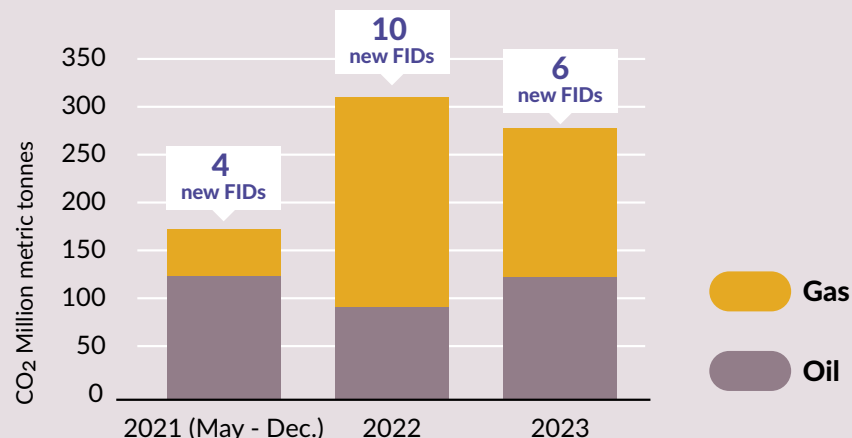
NEW OIL AND GAS APPROVED FOR EXTRACTION SINCE THE CLIMATE CASE VERDICT

As of 2021, when the Dutch court issued its climate case verdict, the science was already clear that there was no room for new oil and gas development.⁷¹ As of September 2022, we tracked that Shell had made final investment decisions to develop 10 new oil and gas assets containing over 900 million barrels of oil and gas since the court's May 2021 verdict.⁷² As of January 2024, the total has risen to 20 assets approved for construction, committing more than 2.1 billion barrels of new oil and gas to extraction (see Appendix Table).

Figure 5 shows the cumulative CO₂ emissions that these 20 assets could cause – if their reserves are brought into production and fully extracted. Cumulatively, Shell's new assets approved between May 2021 and the end of 2023 could cause 753 million tonnes of CO₂ pollution, equivalent to more than 5 times the CO₂ emissions of the Netherlands in 2021.⁷³

FIGURE 5:

Projected cumulative CO₂ emissions from Shell's new oil and gas approved for development (Final Investment Decisions) since May 2021, by CO₂ emissions approved per year

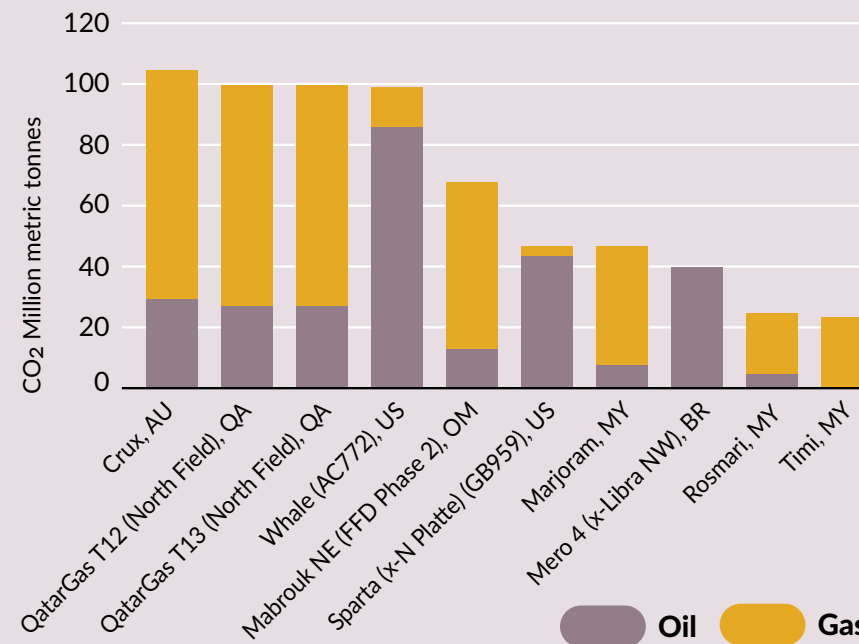


Source: Oil Change International analysis using data from the Rystad Energy UCube (January 2024)

Figure 6 shows the recently approved assets with the largest potential CO₂ emissions. Although we track 20 new assets approved for construction since May 2021, the top 10 new projects alone account for more than 80% of the total CO₂ emissions threat, led by offshore developments in Australia and the U.S. and by Shell's growing stake in a massive liquefied natural gas (LNG) expansion project in Qatar. The Qatar LNG project is one of the largest 'carbon bombs' under development in the world.⁷⁴

FIGURE 6:

Top 10 new extraction assets approved for development since May 2021, by projected CO₂ emissions from combustion of reserves



Source: Oil Change International calculations using data from the Rystad Energy UCube (January 2024)

OIL AND GAS PRODUCTION: ON TRACK TO REBOUND IF NEW DEVELOPMENT CONTINUES

As discussed in Section 3, Shell announced in 2023 that it has abandoned plans to steadily cut oil production to 2030 and instead plans to stabilise its current oil production until 2030. At the same time, Shell continues to invest heavily in new gas extraction projects, as part of company plans to increase LNG production and sales by 20 to 30 percent between 2022 and 2030.⁷⁵

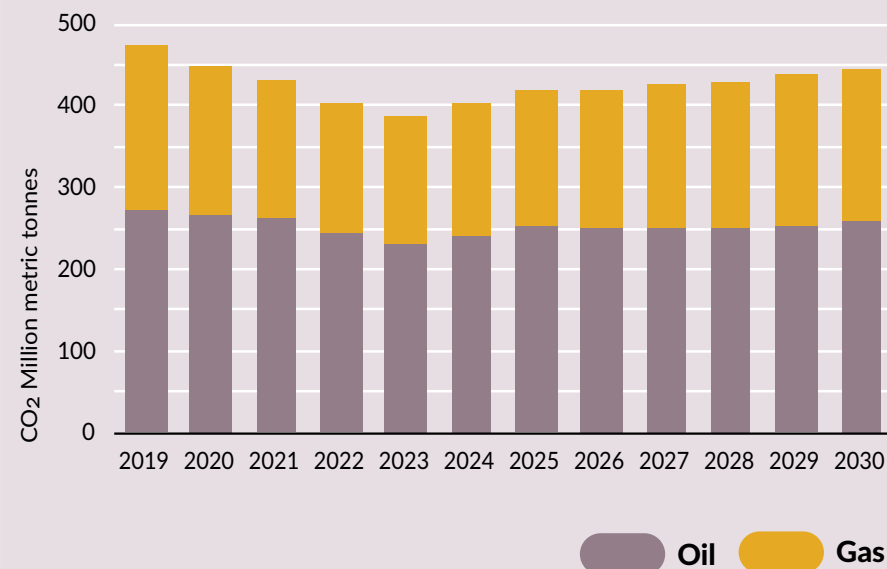
These trends are reflected in Rystad Energy's projections of Shell's oil and gas production trajectory to 2030 (Figure 7). Shell's oil and gas production, and the CO₂ emissions associated with burning extracted oil and gas, fell by 15% from 2019 to 2022, based on our analysis of Rystad Energy data.^F As noted in Section 3, part of this decline was driven by selling oil and gas assets to other companies. Looking forward, Rystad Energy modelling indicates that Shell's production and associated emissions could rebound – with a 10% increase projected between 2022 and 2030, led by growing gas production (Figure 7).^G

^F Using Rystad Energy data, we calculate 475 Mt CO₂ emissions in 2019, compared to 404 Mt CO₂ emissions in 2022. Shell's own reporting shows a 22% decline in production between 2019 (3.67 million boe/d) and 2022 (2.86 million boe/d). See Methodology for an explanation of reporting differences. Shell, "[Annual Report 2022](#)," p. 29; Shell, "[Annual Report 2021](#)," p. 34.

^G Rystad projects Shell's oil and gas production could rise to 3.25 million boe/d in 2030, compared to 2.94 million boe/d in 2022, an increase of 10%. We calculate that emissions from burning that production would also increase by 10%, from 404 Mt CO₂ in 2022 to 444 Mt CO₂ in 2030.

FIGURE 7:

Projected CO₂ emissions from Shell's annual oil and gas extraction, 2019-2030, by oil vs gas



Source: Oil Change International calculations using data from the Rystad Energy UCube (January 2024)

Figure 8 depicts how the trajectory of Shell's oil and gas production to 2030 would change, depending on whether Shell heeds the clear science to stop new oil and gas development or not.

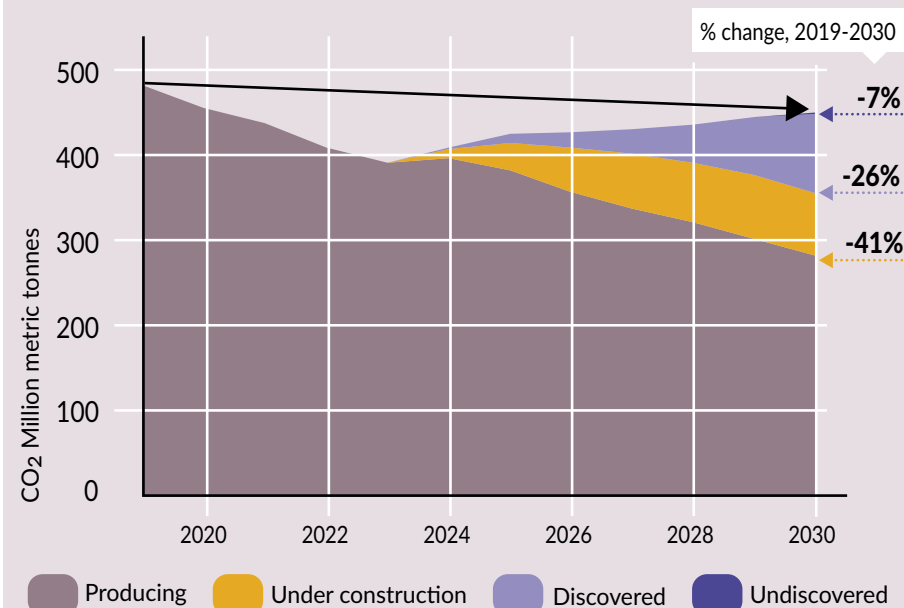
If Shell proceeds with construction of recently approved projects, and approves development of new fields, the annual emissions from burning Shell's extracted oil and gas are projected to decline by only 7% between 2019 and 2030. This indicates a significant gap between Shell's current extraction pathway and its legal obligation under the climate case verdict to reduce CO₂ emissions across its business by 45% over the same period.

By contrast, Shell could go a long way towards aligning its oil and gas production with the climate case verdict by ceasing to develop new projects. If Shell were to stop approving new extraction projects as of 1 January 2024, this would lead to a projected reduction of CO₂ emissions from burning its extracted oil and gas of 26% below 2019 levels by 2030 (Figure 8). This would still be lower than the 45% overall reduction mandated by the climate case verdict, but it would be a step in that direction. If Shell were to additionally cease construction of projects under development, this would result in a projected 41% drop in CO₂ emissions from extracted oil and gas by 2030, compared to 2019 levels.

Again, we note that the CO₂ emissions discussed here and depicted in Figures 7 and 8 relate only to the climate impact of Shell's upstream production, which accounts for less than half of the company's total oil and gas sales to end users.

FIGURE 8:

Projected CO₂ emissions from Shell's annual oil and gas extraction, 2019-2030, by producing, under construction, and undeveloped fields ^H



Source: Oil Change International calculations using data from the Rystad Energy UCube (January 2024)

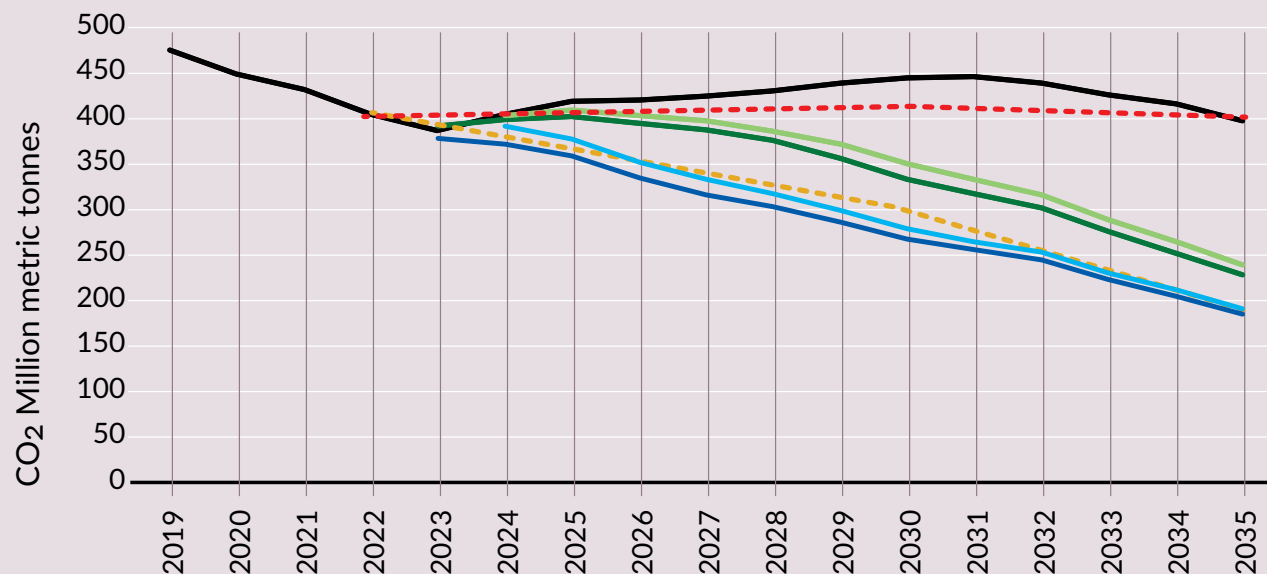
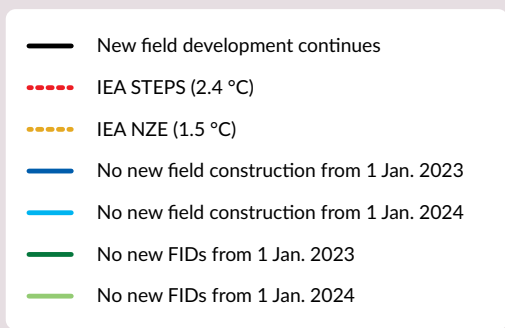
^H Undeveloped fields include those that are discovered or undergoing exploration as of January 2024. Virtually all (98%) of the emissions associated with undeveloped fields through 2030 would come from those already in the discovery stage, with a small fraction also projected to come from fields in exploration. This reflects the long lead times between making a discovery and bringing a new field into production.

21 With every year that Shell delays ending new oil and gas development, the more misaligned its upstream extraction becomes when compared to global climate goals. This is also illustrated by Figure 9. Figure 9 shows Shell's oil and gas production, represented in CO₂ emissions, under a business-as-usual scenario in which new development continues (black line), compared to scenarios in which Shell were to stop approving new fields from 1 January 2023 (dark green line) or

1 January 2024 (light green line), or to stop constructing new fields from 1 January 2023 (dark blue line) or 1 January 2024 (light blue line). We then compare these scenarios to the change in CO₂ emissions from oil and gas under the IEA's NZE scenario and its Stated Energy Policies Scenario (STEPS) – which could lead to a disastrous 2.4°C of global warming (50% probability).⁷⁶

FIGURE 9:

CO₂ emissions from Shell's annual oil and gas extraction by scenario, compared to oil and gas CO₂ emissions under IEA scenarios¹



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 1 The NZE and STEPS pathways are represented by taking the percent change in global CO₂ emissions from oil and gas between 2022 (the scenario baseline year) and future years (2030 and 2035) and indexing those percent changes to the emissions from Shell's 2022 production. In the NZE scenario, CO₂ emissions from oil and gas decline somewhat faster to 2030 than total oil and gas supply due to assumptions regarding CO₂ emissions avoided via CCS and oil used for non-energy uses.

Source:
 Oil Change International analysis of data from the Rystad Energy UCube (January 2024), IEA (2023)⁷⁷

If Shell continues approving new fields, the resulting increase in its oil and gas production and associated CO₂ emissions from 2022 to 2030 tracks even higher than the increase in oil and gas emissions under the IEA STEPS scenario – a scenario aligned with climate disaster. By contrast, if Shell had stopped approving new fields as of 1 January 2023, its production and associated CO₂ emissions would be expected to decline by 17% from 2022 to 2030 (Table 2). If Shell had gone further and stopped constructing new fields as of 1 January 2023 (limiting future production to already operating fields) the CO₂ emissions from the company’s production would be expected to decline

by 34% from 2022 to 2030 (Table 2). This latter scenario – of ceasing to bring new fields into production as of 2023 – would bring about a 44% drop in CO₂ emissions by 2030 when compared to the 2019 baseline. That decline from 2019 to 2030 would almost match the 45% overall reduction mandated for Shell’s total CO₂ emissions by the climate case verdict. The data from Rystad shows that all but two of the fields still under construction as of 1 January 2023 were approved for development after 2018, with the vast majority (around two thirds) being approved in 2021 or later.

TABLE 2:

Percent change in oil and gas CO₂ emissions in Shell production scenarios

	Shell production scenarios, CO ₂ emissions from extracted oil and gas				
	BAU - new field development continues	No new field construction from 1 Jan. 2023	No new field construction from 1 Jan. 2024	No new field approval from 1 Jan. 2023	No new field approval from 1 Jan. 2024
% change, 2019 to 2030	-7%	-44%	-41%	-30%	-26%
% change, 2022 to 2030	+10%	-34%	-31%	-17%	-13%

Source: Oil Change International analysis of data from the Rystad Energy UCube (January 2024)

FINANCING NEW FOSSIL FUELS

Shell's projected investment further reveals a concerning lack of alignment with climate objectives. From 2024 through 2030, Shell is on track to invest USD 13.4 billion (real \$2024) per year in upstream oil and gas extraction, accumulating up to USD 93.8 billion over seven years, based on Rystad Energy projections. These Rystad projections align closely with Shell's own stated plans to "spend some \$13 billion per annum in Integrated Gas and Upstream going forward," and to continue directing the majority of its investment into oil and gas.⁷⁸

A significant portion of Shell's upstream investment is projected to go towards developing new oil and gas extraction assets, despite the clear evidence that new fossil fuel supply threatens to push the world beyond 1.5°C of warming.

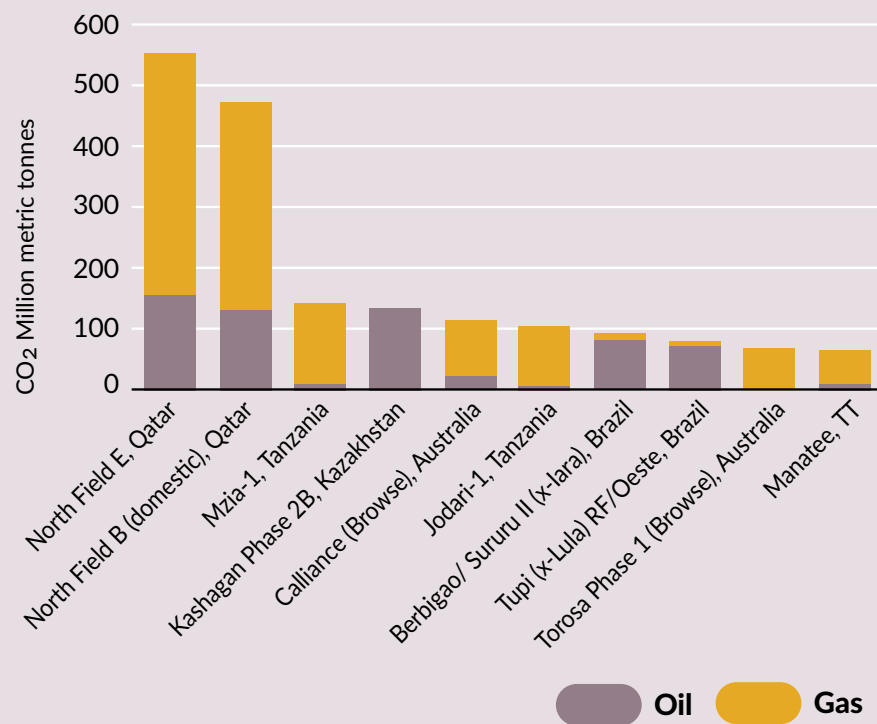
From 2024 through 2030, Rystad projects that Shell will direct 43% (USD 40 billion) of upstream production capex towards developing new oil and gas assets that have not yet received a final investment decision as of January 2024. An additional 17% of capex (USD 16 billion) is projected to go towards assets under construction, but not yet producing as of January 2024. This includes capex being spent on the 20 expansion projects Shell approved since the May 2021 court verdict. Capital expenditure for new upstream development, including currently under construction and pre-FID projects, is thus on track to account for 60% of Shell's upstream production capex from 2024 to 2030, compared to 40% projected to go towards assets already producing oil and gas.

These data capture only the capex Shell is projected to spend exploring for, developing, and sustaining upstream production. This compares to what Shell reports as Upstream capex, plus Shell's Integrated Gas segment capex going towards upstream LNG production (which Shell does not disaggregate in its own Integrated Gas reporting). These data exclude projections for Shell's capex on midstream and downstream fossil fuel and petrochemical infrastructure. Thus, Shell's total capex on oil and gas activities is much higher.

Figures 10 and 11 depict some of the most significant undeveloped conventional (eg, non-shale) assets that could receive Shell's future investment if the company continues to finance new oil and gas extraction. Both figures indicate Shell's focus on developing new extraction in Qatar, Brazil, Australia, Kazakhstan, Tanzania, the United States, and Namibia. While gas is the primary resource in the discovery stage, oil dominates among the most significant exploration assets. Whilst Shell sold off its major fracking assets in the U.S., Shell still holds significant undeveloped resources in the Vaca Muerta and Montney shale plays in Argentina and Canada, respectively, the largest fracking hotspots outside of the U.S.

FIGURE 10:

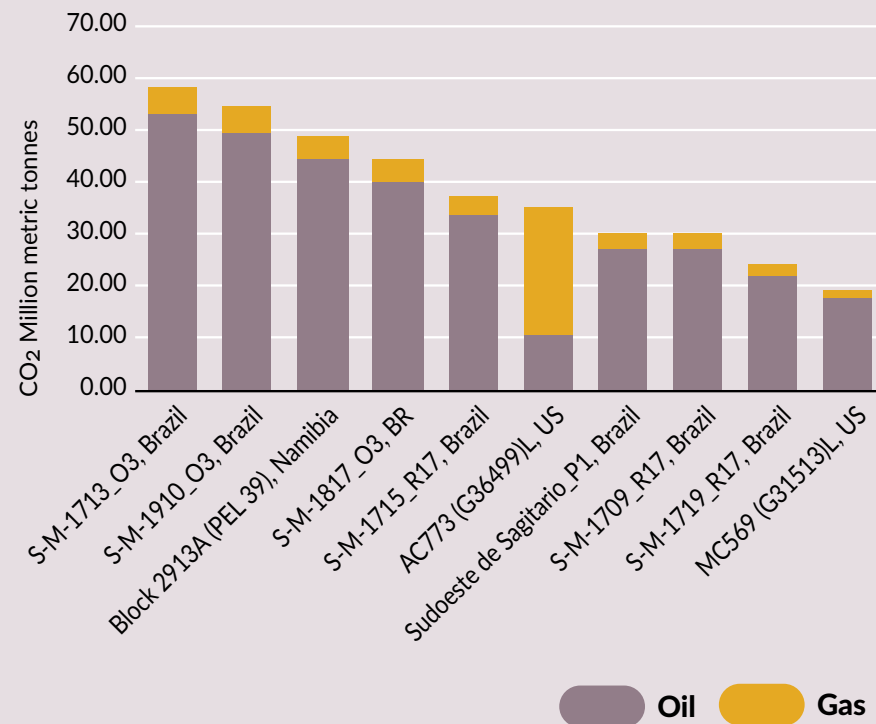
Top 10 Shell discovered assets by projected cumulative future CO₂ emissions



Source: Oil Change International calculations using data from the Rystad Energy UCube (January 2024)

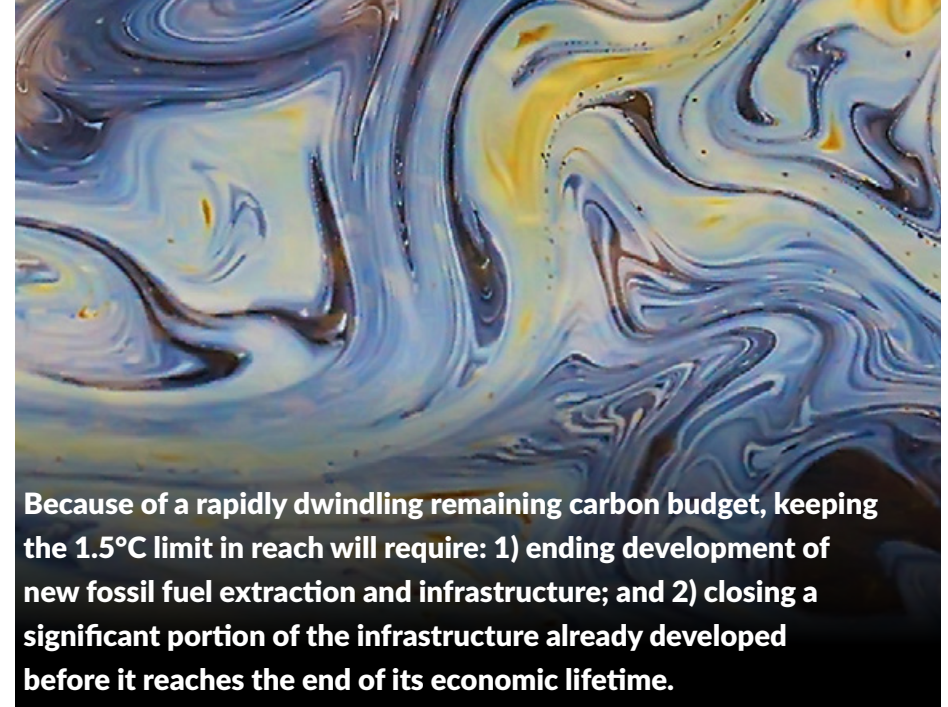
FIGURE 11:

Top 10 Shell undiscovered assets by projected cumulative future CO₂ emissions



Source: Oil Change International calculations using data from the Rystad Energy UCube (January 2024)

5 CONCLUSION



Because of a rapidly dwindling remaining carbon budget, keeping the 1.5°C limit in reach will require: 1) ending development of new fossil fuel extraction and infrastructure; and 2) closing a significant portion of the infrastructure already developed before it reaches the end of its economic lifetime.

When one is in a hole, the first step is to stop digging. Shell could go a long way towards aligning its oil and gas production with 1.5°C and the Dutch court verdict by ceasing to develop new extraction. If Shell were to stop approving and constructing new extraction projects as of 1 January 2024, this would result in a projected 41% drop in CO₂ emissions from extracted oil and gas by 2030, compared to 2019 levels. While this would be a welcome step in the right direction, it would not guarantee that Shell would achieve an overall 45% emissions reduction as the court dictates. This calculation limits itself to the production and emissions stemming from Shell's upstream extraction activities, which amount to less than half of Shell's total CO₂ emissions.

Yet, Shell continues to approve new oil and gas development and plans for levels of oil and gas production and investment that are incompatible with holding global temperature rise to 1.5°C.

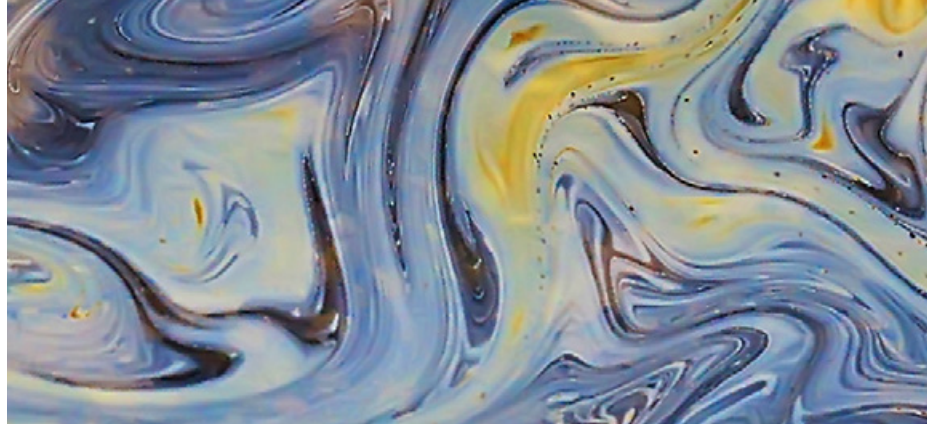
**NEVA DA PESCA,
PRESIDENT FISHERS ORGANISATION
IN SERRA, ESPÍRITO SANTO:**

“THIS NEEDS TO STOP NOW.”

“Shell is planning more and more oil projects in our sea. But the oil exploration is destroying our sea and our incomes as fisherwomen and fishermen. This needs to stop now. We are afraid this oil exploration will lead to irreversible environmental harm to our sea, lands and livelihoods. We need to start thinking about our lives and our future generation, our children, grandchildren and generations to come. That’s why we must say no to every new fossil fuel project in or around Brazil.”

Rather than writing off undeveloped oil and gas as unextractable under the 1.5°C warming limit, Shell is actively seeking more of it. The company approved at least 20 new extraction assets since the Dutch court verdict of May 2021 that together threaten to cause more than 5 times the CO₂ emissions of the Netherlands in 2021. Shell’s volume of undeveloped oil and gas, all of which is incompatible with the 1.5°C limit, has grown by 24% since our 2022 briefing. While Shell’s production declined between 2019 and 2022, the company cites divestments as the primary reason, instead of directly winding down its oil and gas production. Shell’s use of divestments essentially transfers its emissions responsibility to another company. If Shell continues to approve new oil and gas extraction, Rystad Energy modelling shows Shell’s production could rebound to 2030, at a rate higher than in the IEA’s energy scenario aligned with 2.4°C of warming.

Ending new oil and gas development is a common-sense step towards ensuring the immediate and swift declines in oil and gas production that are required for a liveable climate. By contrast, every decision Shell makes to invest in new fossil fuel extraction and infrastructure pushes the world closer to breaching the 1.5°C limit – to potentially irreversible climate devastation.



APPENDIX

A1. METHODOLOGY

The data and projections in this briefing relate to Shell's current upstream oil and gas asset base as of January 2024. Data on Shell's commercial oil and gas resources and future oil and gas production and upstream capex are derived from Rystad Energy's UCube database, unless otherwise specified.

Rystad Energy's UCube is a commercial, asset-based database and model that contains reserves, production, economics and valuation data for every oil and gas field, discovery and exploration licence globally. Historical data and forward projections span 1900 to 2100, and are updated monthly. Projections are based on Rystad's assessment

of the geology and costs of each asset – using governmental databases, company presentations, professional and scientific reports, media reports, and independent analysis – and the asset's expected rate of return, under a future oil price forecast.

The projections used in this analysis are sensitive to Rystad's base Brent oil price case as of January 2024. This base price case sees an average oil price of USD 70/bbl over the medium to long term (in real \$2024). For context, this base price case assumption falls in between long-term price cases associated with the IEA's Stated Energy Policies Scenario and Announced Policies Scenarios.⁷⁹

The estimates of Shell's recoverable oil and gas resources and future production represent net volumes, according to Shell's ownership share in each asset and excluding production owed to governments and thus not saleable by Shell. Oil volumes include crude oil, condensate, and natural gas liquids. The data accounts for asset divestments executed by Shell before December 2023. Thus, the results in the briefing do not account for asset sales Shell has announced but not yet completed, such as Shell's planned sale of Nigerian onshore production assets.⁸⁰

Calculations of the CO₂ emissions that would result from burning Shell's resources and production in the future are done by Oil Change International. We apply CO₂ emissions factors of 0.421 tCO₂/bbl of crude oil and condensate, 0.235 tCO₂/bbl of natural gas liquids, and 54.7 tCO₂/Mmcf of gas to the oil and gas volumes taken from Rystad. These emissions factors are derived from the IPCC.⁸¹

A2. SHELL'S APPROVAL OF NEW OIL AND GAS EXTRACTION SINCE THE CLIMATE CASE VERDICT

TABLE A1:

Shell Final Investment Decisions (FIDs) to approve new oil and gas extraction tracked from May 2021 through the end of December 2023

Asset	Country	Oil and gas reserves, Million BOE *	Projected CO ₂ emissions from combustion, Million tonnes CO ₂	Year of Final Investment Decision
Whale (AC772)	United States	242	98	July 2021 ⁸²
Mero 4 (x-Libra NW) (Alexandre de Gusmao)	Brazil	93	39	August 2021 ⁸³
Timi	Malaysia	69	22	August 2021 ⁸⁴
Ormen Lange Subsea Compression	Norway	37	12	September 2021 ⁸⁵
Mabrouk North East (FFD Phase 2)	Oman	198	68	2022 ⁸⁶
Crux	Australia	309	104	May 2022 ⁸⁷
Jackdaw (30/2a- 6)	United Kingdom	58	20	July 2022 ⁸⁸
Rydberg (MC525)	United States	33	13	September 2022 ⁸⁹
Marjoram	Malaysia	138	46	September 2022 ⁹⁰
Rosmari	Malaysia	75	24	September 2022 ⁹¹
Geronggong	Brunei	22	9	October 2022 ⁹²
Jagus East	Brunei	20	8	October 2022 ⁹³

TABLE A1 (CONTINUED):

Asset	Country	Oil and gas reserves, Million BOE *	Projected CO ₂ emissions from combustion, Million tonnes CO ₂	Year of Final Investment Decision
Karachaganak Expansion 1B	Kazakhstan	23	9	November 2022 ⁹⁴
Irpa (Asterix)	Norway	13	4	November 2022 ⁹⁵
QatarGas T12 (North Field)	Qatar	298	99	2023 ⁹⁶
QatarGas T13 (North Field)	Qatar	298	99	2023 ⁹⁷
Lapa (x-Carioca) Southwest (BM-S-9)	Brazil	22	9	January 2023 ⁹⁸
Dover (MC612)	United States	48	20	March 2023 ⁹⁹
WDDM Phase 10	Egypt	9	3	July 2023 ¹⁰⁰
Sparta (x-N Platte) (GB959)	United States	111	46	December 2023 ¹⁰¹
Sum		2,115	753	

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* Based on Shell's ownership share in the asset.

Source: Oil Change International calculations using data from the Rystad Energy UCube (January 2024)

A3. COMPARING TO SHELL'S REPORTED DATA ON RESERVES, PRODUCTION, AND SCOPE 3 EMISSIONS

RESOURCE ESTIMATES

Reserves of oil and gas are a measure of how much can be extracted, given a company's plan for investments and operations. They constitute a subset of the total amount of the oil and gas resources that are geologically in place.

Given their inherent uncertainty, oil and gas resources are generally quoted in terms of low estimates, best estimates, and/or high estimates. The three common measures of reserves are 1P (P90, or proven), 2P (P50, or proven+probable), and 3P (P10, or proven+probable+possible).^J Shell and other companies are required to report proven, or 1P, reserves in their financial statements and annual reports because this provides investors with a highly conservative estimate for evaluating financial risk. Proven reserves represent a likely underestimate of future extraction from projects already producing or under development – by definition, the amount ultimately extracted is very likely to be higher.^K

^J P90, P50 and P10 refer to the probabilities that the amount extracted will be higher than the stated estimate. In this sense, P50 (also known as a median) may be considered a “best estimate,” in that the amount extracted is as likely to be higher as it is to be lower.

^K For proven reserves, there is a 90% probability that the amount ultimately extracted will exceed the reserves estimate.

Rystad's estimate of Shell's 1P reserves closely aligns to that of Shell.^L

The Rystad UCube estimates used in this analysis are best estimates of what will eventually be extracted: in technical terms, the expectation value or probabilistic mean.^{102,M} This measure is appropriate for assessing the climate risk of Shell's future production, as it reflects the most likely amount that will be extracted. For developed fields, Rystad UCube estimates used in this briefing are similar (though not equivalent to) 2P estimates. For undiscovered fields, they are comparable to best estimates of commercially recoverable, prospective resources (or ‘unrisked’, i.e., less certain, shale).

To our knowledge, Shell does not publish estimates of its commercial resources that are directly comparable to Rystad's. Shell's June 2023 Capital Markets Day presentation includes a graph illustrating Shell and Wood Mackenzie estimates of commercial 2P+2C resources of Shell compared to other oil and gas majors. In this graph, Shell's estimate of its commercial resources (2P+2C) is around 25 billion BOE (with the exact amount and date of the estimate unspecified).¹⁰³

^L The Rystad UCube estimates Shell's 1P reserves as 9603 million BOE at 1 January 2023, compared to Shell's reported 1P reserves of 9943 at 31 December 2022. See Shell, “[Annual Report 2022](#),” p. 54.

^M In technical terms, this is the ‘PMean’ value. For aggregating resource estimates across many fields, the mean is a better estimate of expected future extraction than the median (P50) value because it accounts for the lower-probability, larger quantities (the right-hand tail of the distribution), which become significant when considered across many fields. In practice, the median and mean will often be similar values, although they differ depending on the probability distribution.

PRODUCTION

We use the Rystad UCube for data on Shell's historical production as well as forward looking projections in order to maintain comparability across the data. The Rystad UCube's data on Shell's historical production is aligned with that reported by Shell but differs slightly due to methodology (e.g., Rystad data differs from Shell's by -5% to +3% for years 2019 through 2022). Rystad's production data is sourced by asset, and then distributed across companies based on their ownership in each asset. These bottom-up estimates are then benchmarked against company reporting.

CO₂ EMISSIONS

Our estimates of CO₂ emissions resulting from combusting Shell's oil and gas production represent a portion of Shell's total Scope 3 emissions. A larger portion of Shell's reported Scope 3 emissions come from oil and gas Shell sells but does not directly produce. In 2022, Shell reported 1174 Mt CO₂e of Scope 3 emissions, 910 Mt CO₂e of which are attributed to oil and gas sold by Shell (scope 3, category 11). Under Shell's reporting methodology, the company classified 332 Mt CO₂e (36%) of emissions from sold products as from "own production" and 578 Mt CO₂e (64%) as from third-party production sold by Shell.¹⁰⁴ In this case, Shell bases estimates of emissions from its own production on its refinery and gas processing facility production, rather than its total production from the point of extraction.¹⁰⁵ This is a key reason

our estimates of annual emissions attributable to combustion of Shell's extracted oil and gas (eg, 404 Mt CO₂ in 2022 in Figure 7) differ from Shell's reporting of end-use emissions from direct sales of "own production." We estimate emissions based on total upstream extraction volumes. In either case, Shell sells more oil and gas than it directly produces.



A4. INTERPRETING THE IEA'S NZE SCENARIO

The IEA's 2021 NZE scenario states, "Beyond projects already committed as of 2021, there are no new oil and gas fields approved for development in our pathway, and no new coal mines or mine extensions are required."¹⁰⁶ In subsequent updates to the scenario, the IEA has reconfirmed that "there is no need for investment in new coal, oil and natural gas," whilst also making a technical clarification that 'new oil and gas' refers to "new long lead time conventional oil and gas projects."¹⁰⁷ By definition, this includes final investment decisions to develop new conventional oil and gas fields. The IEA clarifies that its scenario includes some ongoing investment in unconventional shale production because of its high decline rates, but this is in the context of steady declines in shale drilling and does not justify new infrastructure.¹⁰⁸ Otherwise, investment is limited to existing oil and gas fields in terms of minor field extensions, infill drilling, and other measures to moderate decline rates from those fields.¹⁰⁹ Because global fossil fuel production and use has tracked higher to date in the 2020s than in the 2021 NZE scenario, leading to higher carbon pollution, the IEA now sees significantly faster declines in oil and gas supply in the 2030s compared to the 2021 version. The implication is that a higher proportion of production from fields already operating or approved as of 2021 and 2022 will need to be shut in prematurely.¹¹⁰

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