OILCHANGE INTERNATIONAL

Briefing
August 2023

Sky's Limit Data Update: Shut Down 60% of Existing Fossil Fuel Extraction to Keep 1.5°C in Reach

In May 2021, the International Energy Agency (IEA) sent shockwaves through the fossil fuel industry and its allies in government by concluding that no new coal mines or oil and gas fields should be developed if the world is to hold global warming to 1.5 degrees Celsius (°C), the limit agreed by governments to preserve a livable climate. The IEA's logic was clear: Already-developed extraction projects – those actively producing fossil fuels or under construction – contain enough oil, gas, and coal to fulfill declining levels of demand aligned with limiting warming to 1.5°C. Developing more fields and mines would come with climate and/or economic costs that could be avoided by simply saying "no" to new extraction.

One year later, in May 2022, Oil Change International and a team of researchers published a peer-reviewed study in the journal *Environmental Research Letters* (ERL) that went a step further than the IEA's analysis (building on OCI's path-breaking 2016 study).

We found that developed extraction projects hold not only *enough* fossil fuels to meet 1.5°C-aligned demand but way *too much*. Extracting the oil, gas, and coal within already developed fields and mines would push the world well beyond 1.5°C of warming. In fact, our study concluded nearly 40% of developed fossil fuel reserves need to stay in the ground to keep the 1.5°C limit in reach. Thus, in addition to ceasing new oil, gas, and coal development, as per the IEA's recommendation, governments must also ensure a significant portion of existing extraction sites are shut down and decommissioned prematurely.

Unfortunately, since the IEA and OCI studies were published, governments (with a few exceptions) and oil and gas companies (with zero known exceptions) have continued approving and investing in new extraction projects, and global fossil fuel emissions hit a new record high in 2022.

In this analysis, we provide an updated estimate of the steep and deep climate hole the fossil fuel industry has dug us into. Because of the lag time between research and final publication (and the difficulty of compiling quality coal mine data), the ERL study was based on estimates of committed carbon-dioxide (CO_2) emissions from developed fossil fuel reserves and remaining carbon budgets aligned with global climate goals as of January 1, 2018. Here we update the oil and gas reserves and carbon budget estimates to a baseline of January 1, 2023.

The key findings are stark:

- **The majority of the fossil fuel reserves within active fields and mines must now stay in the ground.** Using updated 2023 data, the proportion of coal, oil, and gas reserves that must remain unextracted to meet the 1.5°C limit has increased from nearly 40% in 2018 to almost 60% in 2023.

- As of 2023, developed oil and gas reserves alone, if fully extracted, would cause cumulative carbon emissions nearly 25% greater than the world's remaining 1.5°C carbon budget. Thus, even in the theoretical scenario where coal mining stops immediately, developed oil and gas reserves alone could push the world beyond 1.5°C.

- **A significant portion – almost one-fifth (20%) – of oil and gas fields must be shut down, even if no new fields are developed and coal extraction stops tomorrow.**

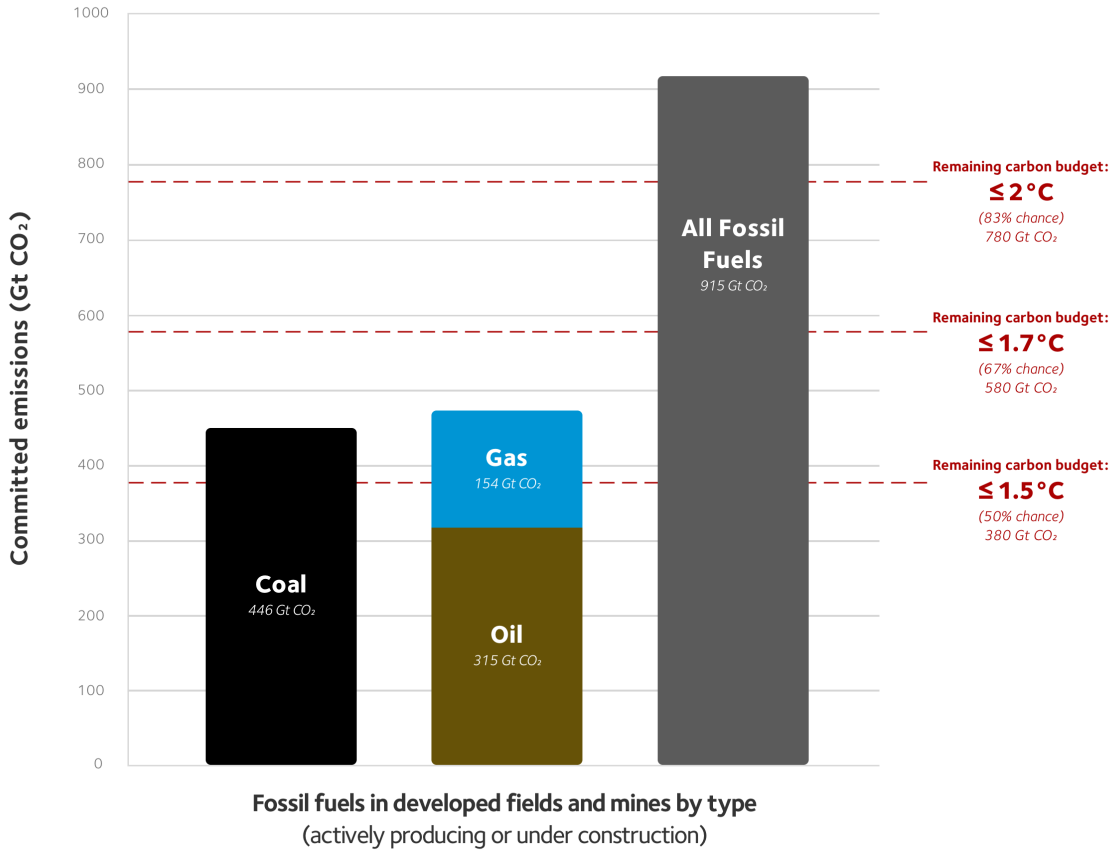
- Developed fields and mines contain enough fossil fuel to push the world beyond 2°C, a significantly more dangerous threshold that could make parts of our planet newly uninhabitable.

These findings underscore why governments must show up to the upcoming United Nations-hosted climate summits, the Climate Ambition summit in September in New York and COP28 in December in the UAE, with super-charged commitments to:

1. Stop licensing and permitting new fossil fuel development, and

2. Initiate a fast and fair global phase-out of fossil fuels. To be fair, wealthy fossil fuel-producing countries must move fastest to revoke permits for and retire polluting infrastructure while fully funding a just transition to renewable energy.

Figure 1: CO2 emissions committed by developed oil and gas fields and coal mines, compared to remaining carbon budgets from the start of 2023



Source: Oil Change International analysis of Rystad Energy data (2023) (oil and gas); Trout and Muttitt et al (2022) (coal); Intergovernmental Panel on Climate Change (2021) and Global Carbon Project (2022) (carbon budgets).

There have been some rays of light. Core members of the Beyond Oil and Gas Alliance have committed to stop licensing new oil and gas exploration and phase out their oil and gas production on a 1.5°C-aligned timeline. A group of six Pacific Island nations recently issued a call committing to a fossil-free Pacific and demanding "a global, just and equitable phase out of coal, oil and gas." And, at last year's United Nations COP27 climate summit, over 80 countries pushed for the summit conclusions to include a call to phase out fossil fuels.

Yet, many of the same countries ostensibly backing the call for a fossil fuel phase-out at COP27 – including the United States, Canada, Australia, the United Kingdom, and Norway – have turned around and hypocritically continued developing more fossil fuels.

When you are in a hole, the first step is to stop digging. It is time for countries to heed the call of United Nations Secretary-General António Guterres and come to New York in September with new and accelerated commitments to phase out fossil fuels backed by concrete policy action. To be credibly 1.5°C aligned, these commitments must include, at minimum, action to end licensing, permitting, or funding of new fossil fuel production – and, for the wealthiest countries, to fund a just global transition to renewable and sustainable energy.

Read on for more of the technical analysis comparing our updated results on developed fossil fuel reserves to those in the ERL study published last May.

Rapidly Dwindling Room to Pollute

The shrinking size of the remaining 1.5°C carbon budget is the key difference maker in the results between the study we published in ERL and this update. The 'remaining carbon budget' refers to the

maximum cumulative amount of CO2 pollution that can be emitted for a given likelihood of holding global temperature rise below a certain limit.

From the start of 2018, our ERL study baseline, the Intergovernmental Panel on Climate Change (IPCC) estimated that the world needed to limit future CO2 pollution to 580 billion tonnes (Gt) to preserve a 50% chance of holding warming below 1.5°C. Since 2018, the world has exhausted more than one-third of that budget, emitting around 40 Gt of CO2 pollution annually, 90% of which came from burning fossil fuels.

From the start of 2023, the world's remaining carbon budget for a 1-in-2 chance of limiting global warming to 1.5°C is only 380 Gt CO2 – equivalent to just nine years of carbon pollution at 2022 levels. This is the scary math that led the world's leading climate scientists to warn of "a rapidly closing window of opportunity to secure a liveable and sustainable future for all" in the latest synthesis report released by the IPCC in March.

Newer analysis finds the remaining budget may be even smaller. An authoritative group of scientists have updated the IPCC estimates of the remaining carbon budget based on more recent science. They estimate that, as of the start of 2023, the carbon budget for a 50% chance of limiting warming to 1.5°C is just 250 Gt CO2, or 6 years of carbon pollution at 2022 levels.

Developed Oil and Gas Fields Alone Break the 1.5°C Budget

Our ERL study provided the first bottom-up, peer-reviewed assessment of the cumulative emissions that could result from extracting just the fossil fuel reserves within actively producing or under-construction oil and gas fields and coal mines. As we wrote in the study, developed reserves "reflect the cumulative quantity of oil, gas, and coal that companies have already discovered and for which a financial and regulatory commitment to extraction has been made." It is not inevitable that they will be extracted – but preventing their extraction will require policy intervention to reverse the "inertia created by sunk investments and previous policy decisions."

The ERL study found that, as of 2018, developed fossil fuel reserves would produce 936 Gt of cumulative CO2 pollution if fully extracted, 488 Gt CO2 from oil and gas fields, and 446 Gt CO2 from coal mines. To stay within a carbon budget of 580 Gt CO2, nearly 40% of the emissions committed by developed extraction projects would need to be avoided, a large portion of their reserves left unextracted.

Unfortunately, aside from a slowdown at the start of the Covid-19 pandemic, fossil fuel expansion has continued apace since the ERL study data was

Table 1: Estimates of developed oil and gas reserves and committed CO2 emissions from oil and gas extraction from a baseline of 2018 vs 2023, compared to the remaining 1.5°C carbon budget

	Remaining 1.5°C carbon budget (50% chance), Gt CO_2	Developed reserves		Committed emissions from reserves extraction, Gt CO_2		
		Oil, Billion barrels	Gas, Trillion cubic feet	Developed oil	Developed gas	Developed oil and gas
Trout and Muttitt et al - from 1 January 2018	580	870	3,027	323	165	488
This analysis - from 1 January 2023	380	852	2,858	315	154	469

Source: Oil Change International analysis of Rystad Energy data (2023); Trout and Muttitt et al (2022); IPCC (2021) and Global Carbon Project (2022).

collected. Updated estimates of developed oil and gas reserves and the emissions their extraction would cause reflect this reality.

As of the start of 2023, we estimate developed oil and gas reserves would cause 469 Gt of cumulative CO2 pollution if fully extracted. This estimate is based on using the same source for oil and gas data as in the ERL study, Rystad Energy's UCube database, and a simplified but comparable methodology. This is effectively unchanged from the 2018 estimate, meaning that new fields have opened to largely replace the reserves that have been extracted over the last five years. Achieving the Paris goals requires that extracted reserves not be replaced, and that production winds down.

As a result, there is now an even larger mismatch between the oil and gas contained in active fields and the room remaining in the 1.5°C carbon budget:

- Committed emissions from developed oil and gas fields alone exceed the remaining 1.5°C budget by 25%.
- Even in the theoretical scenario where coal mining stops immediately, and no new fields are opened, nearly 20% of developed oil and gas reserves must remain unextracted to stay within the remaining 1.5°C budget of 380 Gt CO2.

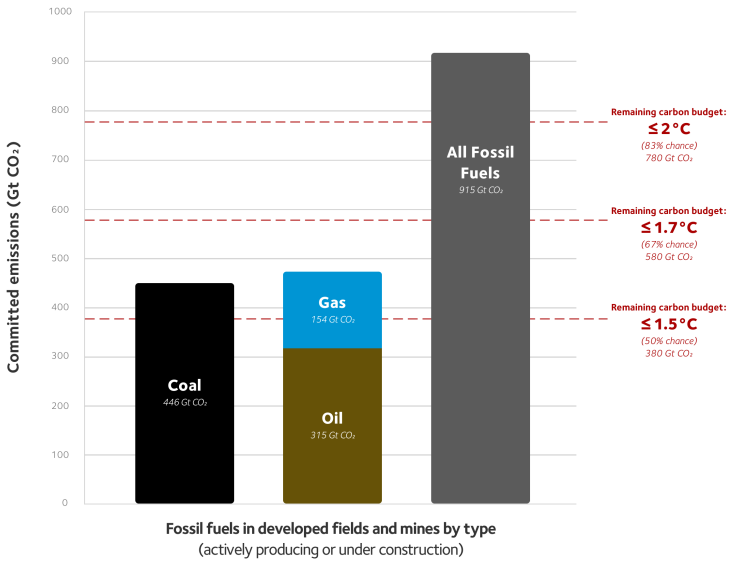
The Majority of Developed Fossil Fuel Extraction Must Be Phased Out Prematurely

Here, we compare carbon budgets remaining from the start of 2023 to our estimates of committed emissions from developed oil, gas, and coal reserves combined.

A note on coal: In the case of developed coal reserves, it is not possible to update our estimate to a 2023 baseline for the purpose of this analysis. Unlike for oil and gas, there is no single, regularly updated source for global data on developed coal mines; the ERL study entailed a months-long process to develop mine-level datasets covering some of the world's largest coal-producing countries. However, as with oil and gas, it is highly unlikely that there has been a meaningful drop in global developed coal reserves since 2018. According to Global Energy Monitor's Global Coal Mine Tracker, 246 new coal mines with a production capacity of at least 1 million tonnes per annum opened up worldwide from 2018 through 2022. This outpaced the annual rate of new mine openings from 2015 through 2017, the previous three years for which data is available.

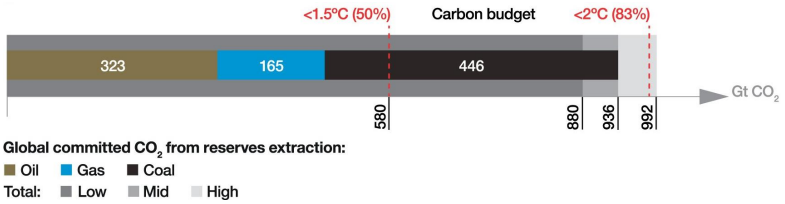
Figure 1 (extended): CO2 emissions committed by developed oil, gas, and coal reserves, compared to remaining carbon budgets

1a) This analysis, 1 January 2023 baseline (for oil and gas and carbon budgets)



Source: Oil Change International analysis of Rystad Energy data (2023) (oil and gas); Trout and Muttitt et al (2022) (coal); Intergovernmental Panel on Climate Change (2021) and Global Carbon Project (2022) (carbon budgets).

1b) ERL study, 1 January 2018 baseline



Source: Trout and Muttitt et al (2022)

Based on the updated oil and gas data and previously compiled coal data, developed fossil fuel reserves would produce 915 Gt of CO2 pollution from 2023 onwards if fully extracted. Given our greatly diminished remaining carbon budget, **this means almost 60% of the fossil fuels within already operating or under-construction extraction sites cannot be burned if the world is to stay within the 1.5°C limit.**

Additionally, developed fields and mines threaten to push the world beyond even 2°C, a significantly more dangerous threshold. Fifteen percent of developed reserves must remain unextracted to avoid overshooting the carbon budget that gives an 83% chance of staying below 2°C of warming.

The First Step: Stop Digging the Hole Deeper

Our updated analysis of developed fossil fuel reserves underscores why governments must urgently respond to the call issued earlier this year by United Nations Secretary-General António Guterres. If the world is to stop "hurtling towards disaster, eyes wide open," he underlined, governments must dramatically step up action – and that action must "start with the polluted heart of the climate crisis: the fossil fuel industry."

When you are in a hole, the first step is to stop digging. All governments must stop issuing new licenses or permits for new fossil fuel exploration or extraction. Second, even if new development stops immediately, the majority of fossil fuel reserves within existing extraction sites must remain in the ground. This requires urgently putting policies in place to manage a rapid and just phase-out of fossil fuel production and tackling profound questions of how to do this in the most equitable way possible.

What is crystal clear is that the wealthiest countries with the least economic dependence on the fossil fuel economy have a responsibility to move first and fastest and to fund a just transition globally. These countries include the United States, Canada, Norway, Australia, and the United Kingdom – all of which are failing this test miserably to date.

Secretary General Guterres has asked governments, particularly the world's wealthy governments and largest emitters, to show up to his Climate Ambition Summit this September with commitments to end new oil, gas, or coal expansion and initiate a just and equitable phase-out backed by "massively boosting renewable investment in a just transition." The data in this analysis underscores: **no country can claim adequate climate ambition without, at a bare minimum, a commitment to stop making the problem worse – to stop enabling further expansion of fossil fuel reserves that the world can never afford to burn.**

This briefing was written by Kelly Trout of Oil Change International. For more information, contact research@priceofoil.org.

This analysis builds on and updates previous OCI research: The Sky's Limit: Why the Paris Climate Goals Require a Managed Decline of Fossil Fuel Production, published in 2016, and the peer-reviewed version of that study, "Existing fossil fuel extraction would warm the world beyond 1.5 °C," published in 2022 in the journal Environmental Research Letters.

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