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The Climate Implications of New Oil and Gas Fields in the UK – An overview of the evidence

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Executive summary

In July 2024, a new government took office in the UK, committed to cease issuing new licences for oil and gas exploration. The Government has since stated that it will take a global standard-setting, 1.5°C and climate science-aligned approach to future oil and gas production. The Court of Session in Edinburgh has found that the previous Government's granting of development consent for Rosebank, the largest undeveloped field, and a smaller field (Jackdaw), were unlawful, as these decisions did not consider the climate impact of consuming the oil; this court ruling means the Government must make a fresh decision about whether to grant a development consent to these fields. In opposition, the Labour Party said it would not have supported Rosebank, but was more equivocal on whether it would grant production consents to already-licensed fields more broadly; since it took office, it has suggested support for development of already-licensed fields.

This report aims to inform both public debate and policy design, by reviewing the latest scientific evidence and other scholarly literature on the climate implications of new oil and gas extraction projects. It shows that:

The world has more oil and gas in existing fields than can be consumed while achieving the Paris goals

- "Committed emissions" from consuming the oil and gas in the world's existing fields (those already producing or that have received production consent or final investment decision) would exceed the remaining global carbon budget for 1.5°C by a long way. Exploring for or developing new oil and gas fields would exacerbate that excess.
- Projected production from existing fields is sufficient to meet or exceed demand in 1.5°C scenarios published by the International Energy Agency, the Intergovernmental Panel on Climate Change and others.
- To stay within the 1.5°C carbon budget, some oil and gas fields will need to close before the end of their economic life, and all undeveloped fields will need to remain untapped.

Opening new oil and gas fields will make it harder to achieve the Paris goals, and lead to economic and social disruption

- Existing fossil fuel infrastructure causes "carbon lock-in", as there are major economic, political and legal barriers to closing oil and gas fields once they start operating. Therefore allowing any additional fields will make it harder to achieve the Paris goals.
- Opening new fields will leave companies with stranded assets if governments achieve the Paris goals, leading to losses for companies, financial institutions and the wider economy, and undermining the prospects for a just transition. A less costly and more orderly path is to cease opening new fields.

Considerations of international equity and economic efficiency suggest the UK should make greater efforts to phase out production than poorer countries or those whose existing fields can produce at lower cost

- Opening new oil and gas fields in the UK—a high-income, diversified economy—means that achieving the Paris goals would impose the costs and disruption of field closure on more vulnerable countries, thus undermining sustainable development.
- The UK has some of the world's most expensive oil and gas to extract. Opening new fields would make the path to achieving the Paris goals economically inefficient.

Policy actions by the UK can set an example for other countries, amplifying their effect

- Countries are currently updating their climate contributions under the Paris Agreement, following the recent Global Stocktake of progress toward meeting the Agreement's goals. This important juncture comes at a time of great uncertainty in international relations.
- Decisions by the UK Government about oil and gas production have an important "signalling effect", influencing decisions in other countries.
- The UK has long been recognised as a climate leader; ending new UK licences and consents for oil and gas exploration and production would send a powerful signal to other countries at this important moment for international climate cooperation.

This evidence provides strong support for the policy of ending new licences for oil and gas exploration, and shows how the UK can achieve international influence through its leadership. It also shows that limiting warming to 1.5°C implies going at least one step further: ending the granting of development consents for already-licensed but as yet undeveloped fields, such as Rosebank and Jackdaw.

Table of contents

Executive summary 1

1. Introduction 3

2. New oil and gas extraction is inconsistent with climate goals 6

2.1 New oil and gas would exceed carbon budgets 6
2.2 New oil and gas fields are not needed in 1.5°C scenarios 8
2.3 Total reserves exceed what can be safely extracted 10

3. New fields impede emissions reduction 11

3.1 New fields would lock in emissions 11
3.2 New fields will cause stranded assets 12

4. The UK should lead in phaseout efforts 15

4.1 International equity: The UK as a wealthy, diversified economy 15
4.2 Economic efficiency: The UK as a marginal producer 16
4.3 Carbon intensity: Why it is not a useful measure 19

5. UK climate leadership has an outsized impact 20

5.1 The importance of climate leadership 20
5.2 Restraining global oil and gas production: the UK's climate leadership role 21

6. Conclusion 22

Glossary of abbreviations

°C	degrees Celsius
BOGA	Beyond Oil and Gas Alliance
CCC	Climate Change Committee
COP	Conference of the Parties
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
DESNZ	Department for Energy Security and Net Zero
EUR	euros
GHG	greenhouse gas
Gt	gigatonnes
HMRC	His Majesty's Revenue and Customs
IEA	International Energy Agency
IISD	International Institute for Sustainable Development
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
kg	kilogrammes
LNG	liquefied natural gas
Mt	megatonnes
NDC	nationally determined contribution
NSTA	North Sea Transition Authority
NZE	Net Zero Emissions by 2050 scenario
PPCA	Powering Past Coal Alliance
PRT	petroleum revenue tax
SEI	Stockholm Environment Institute
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	US dollars
WEM	World Energy Model

1. Introduction

In July 2024, a new government took office in the UK, committed to ending new licensing of oil and gas.[1] A subsequent consultation on how to implement the policy, launched by the Department for Energy Security and Net Zero in March 2025, gives more details on the Government's thinking:

> Britain is sprinting to clean energy because it's the only way to deliver energy security, good jobs for the long-term, and a managed, orderly and prosperous transition for the current workforce and communities. At the same time, a science-aligned approach to future oil and gas production is the only way to deliver climate security for future generations.[2]

Home to BP and Shell, two of the world's five supermajor oil companies, the UK was once the world's fifth largest oil producer.[3] New fields in the North Sea were a key driver of growth in the international oil industry in the 1970s and 1980s, marking a shift of the industry's focus from low-cost Middle Eastern fields to ever more technically challenging offshore fields. However, UK oil and gas production peaked in 1999, and is now at just a quarter of its peak level.[4]

The Infrastructure Act of 2015 sought to stem the decline by creating a statutory duty to "maximise economic recovery" of oil and gas. In the words of one Chancellor of the Exchequer, this meant "to ensure that we extract every drop of oil and gas that it is economic to extract".[5] This objective has sat uneasily alongside the Paris Agreement of the same year, a contradiction that drew attention during the UK hosting of the COP26 climate summit in Glasgow in 2021.[6] The need for a change of course became clearer still in 2023 with the commitment by the world's governments to "transition away from fossil fuels in energy systems" at COP28 in Dubai.[7]

Two recent court decisions create further pressure for change. In the 2024 *Finch* case, the UK Supreme Court ruled that Surrey County Council's approval of an onshore oil field was unlawful because it failed to consider the climate impacts that would occur when the oil is consumed. The court noted,[8]

> The whole purpose of extracting fossil fuels is to make hydrocarbons available for combustion. It can therefore be said with virtual certainty that, once oil has been extracted from the ground, the carbon contained within it will sooner or later be released into the atmosphere as carbon dioxide and so will contribute to global warming.

A case in the Court of Session in Edinburgh in January 2025 applied the *Finch* principle to reach a similar conclusion, ruling that the previous Government's decisions to grant production consents for Rosebank – the largest proposed new offshore oilfield – and for a smaller field, Jackdaw, were also unlawful.[9]

As the government has recognised, over 80% of the oil extracted in the UK is exported rather than providing for the UK's own energy needs.[10] The prices of oil and gas are determined internationally, so UK extraction does very little to reduce energy bills. Revenues from oil and gas account for just 0.5% of total UK Government revenues,[11] with the long-term trend downward as production decreases and increasing amounts are deducted for the taxpayer contribution to decommissioning costs. The number of jobs supported by oil and gas extraction has halved in the last ten years.[12]

This report aims to inform both public debate and policy design, by reviewing the latest scientific and social-scientific literature on the impact of new oil and gas fields. Section 2 assesses the space and need for new oil and gas fields within atmospheric limits aligned with the Paris goals. Section 3 examines the political-economy consequences of new field development. Section 4 considers the principles that should inform how the pace of phaseouts may differ between countries, and the implications for the UK. Section 5 addresses how UK leadership to stop new oil and gas production and ensure a just transition away from oil and gas can influence other countries.

Tackling climate change requires measures to address *demand* for oil and gas as well as its supply; we need to "cut with both arms of the scissors".[13] This report focuses exclusively on issues of supply, and assumes that the UK will continue to take steps to reduce its demand for oil and gas in order to achieve its domestic carbon budgets and legislated net zero by 2050 target. Enabling a just transition for workers and communities is also crucial but beyond the scope of this report, except insofar as it informs the equity considerations in section 4.

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1 Scott, E. (2024). *King's Speech 2024: Energy security, net zero, environment and agriculture*, House of Commons Library.
2 Department for Energy Security and Net Zero (DESNZ) (2025). *Building the North Sea's Energy Future: Consultation*, p. 3.
3 Energy Institute (2024). *Statistical Review of World Energy 2024*.
4 Energy Institute, above note 3.
5 UK Parliament (2017). *Economic Growth, Hansard* Vol. 627, debated on Tuesday 18 July 2017 (comment by Mr Philip Hammond, Chancellor of the Exchequer).
6 Wright, O. (2021). UK prepares to approve oilfield despite Cop26 climate conference, *The Times*, 23 June 2021.
7 United Nations Framework Convention on Climate Change (2023). *Outcome of the first global stocktake: Proposal by the President. Draft decision -/CMA.5*, para. 28(d).
8 *R (on the application of Finch on behalf of the Weald Action Group) v Surrey County Council* [2024] UKSC 20, para [2].
9 *Greenpeace Limited v Advocate General for Scotland* [2025] Court of Session Outer House 10.
10 DESNZ, above note 2, p.17.
11 HM Revenue & Customs (2024). *Government revenues from oil and gas production: September 2024*.
Keep, M. (2025). *Tax statistics: an overview*. House of Commons Library.
12 Bol, D. (2023). North Sea supported jobs halved in last decade despite Tory support, *Herald Scotland*, 29 November 2023.
Carthy, A. & Jones, D. (2024) The truth about North Sea jobs and why workers need a plan, Uplift UK, 11 June 2024.
13 Green, F. & Denniss, R. (2018). Cutting with both arms of the scissors: the economic and political case for restrictive supply-side climate policies. *Climatic Change* 150: 73–87.

The key stages in developing an oil or gas field

Since oil and gas occur deep beneath the ground, they have to be found before they can be extracted. The first stage in a company's activities is therefore to **explore** an area, through geological studies, seismic testing and drilling exploration wells. If it finds oil and gas in commercial quantities, the company will then **appraise** the discovery: examine it more closely, and assess how it can be extracted most economically. Only after exploration and appraisal will a company be ready to **develop** the field: to drill production wells and build the necessary platforms, pipelines and other facilities. It is in this development phase that large amounts of capital (generally in the billions or tens of billions of dollars) are invested: a company's final investment decision to proceed with development is therefore the moment at which it becomes committed. Only after development is completed can a company start to **produce** and sell the oil and gas. Production thus begins several years after a company first starts work, but then may proceed for decades before the company finally **decommissions** the project: dismantling the equipment, cleaning up pollution and remediating the area.

Within this process, there are two key moments at which government decisions are required:

First, the **award of a licence** gives a company the right to explore for oil and gas over a defined geographical area. Licences typically also grant the right to develop and produce oil and gas subject to further consent (see next point). Licences are generally awarded at the end of a process that includes study of prospective areas, announcement of the areas on offer, inviting companies to bid for them, and a decision on which areas to award to which company.

Second, a **development consent** is required if a company wants to develop a field it has discovered, in order to produce oil and gas from that field. The decision whether to grant such a consent rests with the Secretary of State for Energy Security and Net Zero and the North Sea Transition Authority, and is based on the company's detailed plans for what it wants to build and how, how much it intends to extract, and the likely significant environmental effects of the project. The company must provide a detailed Environmental Impact Assessment at this stage, to inform the decision about the project's environmental effects.

The UK Government has committed to ceasing the award of new oil and gas licences. This will mean that no new exploration can occur, except in areas that have already been licensed.

However, there are many fields that were previously licensed that do not yet have development consents. For example, the Rosebank field straddles three licences that were awarded between 2001 and 2005. In opposition, the Labour Party said it did not support the Rosebank approval, but was equivocal on its broader approach to new consents.[14] In its 2025 consultation on the future of the North Sea, the Government suggests an intention to allow development to proceed where licences had previously been issued.[15]

14 Aurora, M. (2023). Green light for Rosebank oil field helps Labour label Tories as the party of the past, *Sky News,* 27 September 2023.
15 DESNZ, above note 2, p.49.

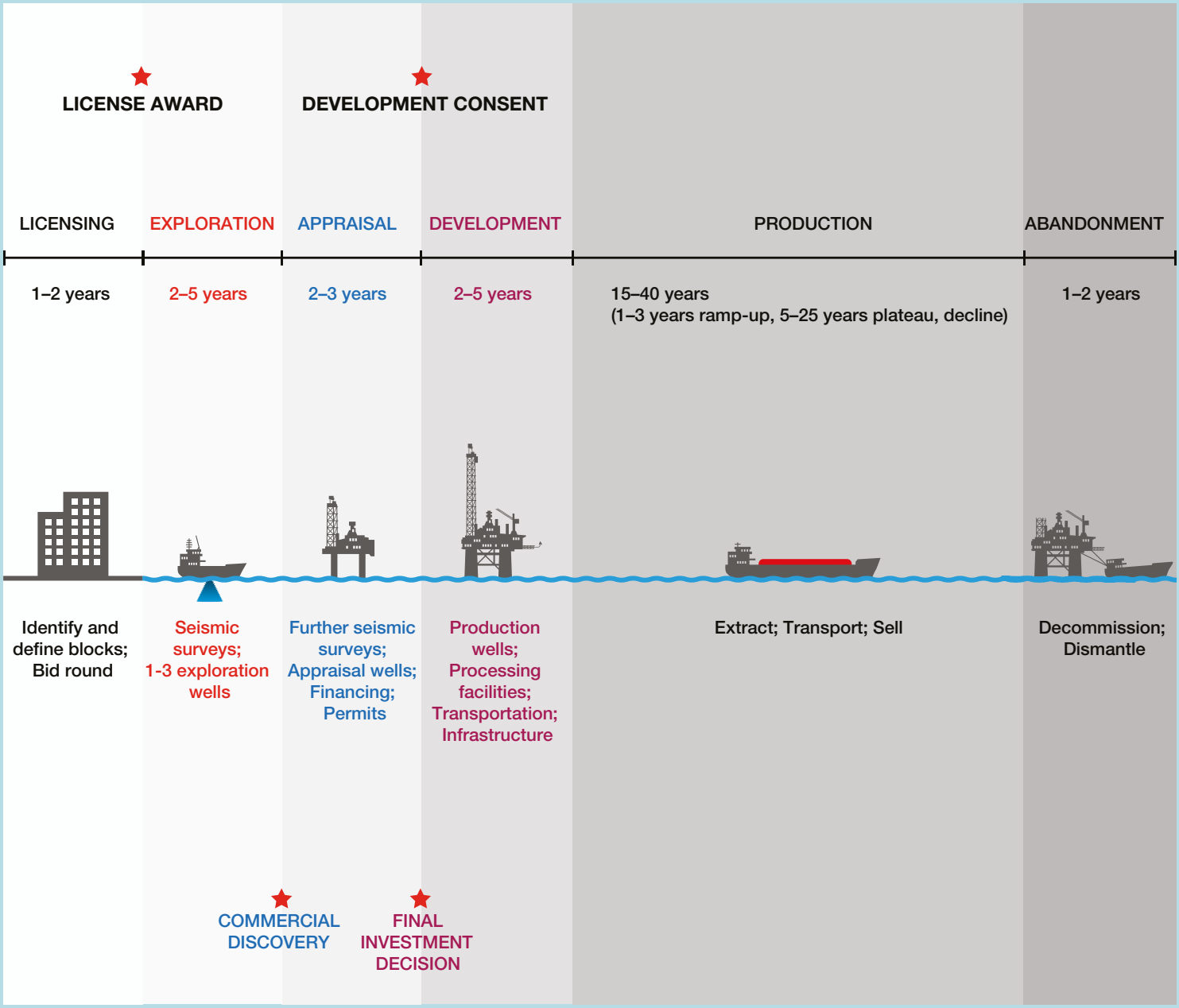

Figure 1: *Stages in development of an oil or gas field*

Graphic adapted from Oil Change International

2. New oil and gas extraction is inconsistent with climate goals

This section focuses on quantitative analysis of the global situation: how much room is there for new oil and gas fields, or new exploration, in the remaining global carbon budget; and how much new oil and gas is needed in scenarios aligned with 1.5°C?

2.1 New oil and gas would exceed carbon budgets

The remaining global carbon budget provides a powerful tool for understanding how much future emissions humanity can "afford" while limiting warming to a given level. Its scientific basis lies in three landmark papers in 2009, which found that the global average temperature rise is approximately proportional to cumulative emissions of carbon dioxide (CO_2) over the centuries.[16] In other words, above a certain "budget" of cumulative emissions, temperature goals will be exceeded. Numerous subsequent studies have refined our understanding of the budget. Drawing together these various studies, carbon budgets were a key theme of the Intergovernmental Panel on Climate Change's (IPCC's) *Fifth Assessment Report* in 2013 and 2014,[17] and also featured in its *Sixth Assessment Report* in 2021 to 2023.[18]

One consequence of this finding of near-proportionality is that for as long as CO_2 is emitted, temperatures will continue to rise.[19] Therefore, stabilising temperature *at any level* requires global CO_2 emissions to fall to net-zero or lower.[20] The cumulative global CO_2 emissions that occur before they reach zero determines how much temperatures will rise. The remaining global carbon budget for limiting warming to 1.5°C is now about 150 Gt of CO_2, which is equivalent to less than four years of current global emissions.[21]

Fossil fuel infrastructure generally lasts several decades. We can compare the remaining global carbon budget with the emissions expected to be produced from existing infrastructure over its lifetime. The term "committed emissions" is widely used to refer to the lifetime emissions associated with existing (currently operating or under-construction/development) fossil fuel infrastructure.[22] There have been numerous assessments of committed emissions from existing fossil fuel-*consuming* projects, in comparison with carbon budgets.[23] The IPCC states in its *Sixth Assessment Report*,[24]

> Estimates of future CO_2 emissions from existing fossil fuel infrastructures already exceed remaining cumulative net CO_2 emissions in pathways limiting warming to 1.5°C... Decommissioning and reduced utilisation of existing fossil fuel installations in the power sector as well as cancellation of new installations are required.

Another way of accounting for committed emissions, which is more relevant to the present discussion, focuses on fossil fuel-*producing* infrastructure and assesses the emissions that would occur when the fossil fuels from existing fossil fuel production projects are ultimately combusted (whether in the process of production, or, as is the case for the vast majority of emissions from the fossil fuel life cycle, by the end consumer).[25] A 2022 study[26] finds that the "committed emissions" from the oilfields, gasfields and coal mines that are already in operation or under development—i.e. the emissions that would occur

16 Allen, M., Frame, D.J., Huntingford, C., Jones, C.D., Lowe, J.A., Meinshausen, M. & Meinshausen, N. (2009). Warming caused by cumulative carbon emissions towards the trillionth tonne. *Nature* 458(7242): 1163–1166.
Matthews, H.D., Gillett, N.P., Stott, P.A. & Zickfeld, K. (2009). The proportionality of global warming to cumulative carbon emissions. *Nature* 459(7248): 829.
Meinshausen, M., Meinshausen, N., Hare, W., Raper, S.C.B, Frieler, K., Knutti, R., Frame, D.J. & Allen, M.R. (2009). Greenhouse-gas emission targets for limiting global warming to 2 °C. *Nature* 458: 1158–1162.

17 IPCC (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, sections 2.1-2.2.

18 IPCC (2023). *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, section 3.1.

19 To be precise, temperatures will continue to rise as long as more CO_2 is emitted than is removed by human intervention. One key attribute of CO_2 is that it persists in the atmosphere over many centuries (aside from the portion absorbed by the oceans and biosphere through the carbon cycle). This gives CO_2 very different physical dynamics from shorter-lived greenhouse gases (GHGs) such as methane, which persists in the atmosphere for 12 years on average. Thus carbon budgets relate to CO_2 only. The size of carbon budgets is calculated based on an assumption of stringent reductions in non-CO_2 greenhouse gas emissions; if those emissions are higher than assumed, carbon budgets will be correspondingly smaller.
Technically, stabilising temperatures requires net zero emissions of long-lived GHGs and constant emissions of short-lived GHGs. If the world achieves net zero GHG emissions, temperatures will start to decrease.

20 The UK was the first country to legislate a net zero target, in 2019. Now 107 countries have net zero targets [UNEP (2024). *Emissions Gap Report 2024: No more hot air … please!*].

21 More precisely, this is the budget for a 50% probability of limiting warming to less than 1.5°C. The most recent assessment put the remaining budget at 200 Gt CO_2 as of the start of 2024 [Forster, P. et al (2024). Indicators of Global Climate Change 2023: annual update of key indicators of the state of the climate system and human influence. *Earth System Science Data* 16: 2625-2658]. Global CO_2 emissions are about 40 Gt per year [Friedlingstein, P. et al (2025). Global Carbon Budget 2024. *ESSD* 17: 965-1039].

22 The term "committed emissions" was coined by Davis S.J., Caldeira K. & Matthews H.D. (2010). Future CO2 emissions and climate change from existing energy infrastructure, *Science* 329: 1330–3.

23 Davis S.J. & Socolow R.H. (2014). Commitment accounting of CO2 emissions, *Environmental Research Letters* 9: 8.
Pfeiffer, A., Millar, R., Hepburn, C. & Beinhocker, E. (2016). The '2°C capital stock' for electricity generation: Committed cumulative carbon emissions from the electricity generation sector and the transition to a green economy. *Applied Energy* 179: 1395-1408.
Smith, C.J., Forster, P.M., Allen, M., Fuglestvedt, J., Millar, R.J., Rogelj, J. & Zickfield, K. (2019). Current fossil fuel infrastructure does not yet commit us to 1.5 °C warming. *Nature Communications* 10:101.
Tong, D., Zhang, Q., Zheng, Y., Caldeira, K., Shearer, C., Hong, C., Qin, Y. & Davis, S.J. (2019). Committed emissions from existing energy infrastructure jeopardize 1.5°C climate target. *Nature* 572: 373-377.
Fisch-Romito, V., Guivarch, C., Creutzig, F., Minx, J.C. & Callaghan, M.W. (2021). Systematic map of the literature on carbon lock-in induced by long-lived capital. *Environmental Research Letters* 16(5): 053004.

24 IPCC (2022). *Climate Change 2022: Mitigation of Climate Change. Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, p.68.

25 Matthews H.D. (2014). A growing commitment to future CO2 emissions, *Environmental Research Letters* 9:11.

26 Trout, K., Muttitt, G., Lafleur, D., van de Graaf, T., Mendelevitch, R., Mei, L. & Meinshausen, M. (2022). Existing fossil fuel extraction would warm the world beyond 1.5 °C. *Environmental Research Letters*, 17(6), Article 064010.

from burning the oil, gas and coal extracted over the lifetime of those existing fields and mines—amount to 936 gigatonnes (Gt) of CO_2.[27] That amount is more than six times today's remaining 1.5°C carbon budget.

Any new fields or mines that are opened, beyond those already under development, would add to this excess of committed emissions. Achieving the 1.5°C goal would then require closing an even larger proportion of fields and mines before the end of their economic life than would otherwise need to occur.

That study estimates committed emissions from existing oil and gas fields alone at 488 Gt of CO_2, which would exceed the 1.5°C budget more than threefold, even in the hypothetical scenario where the world completely stopped consuming coal with immediate effect.[28]

The United Nations Environment Programme's (UNEP's) *Emissions Gap Report* visualises the committed emissions, as estimated by studies of both extraction and consuming projects, in a powerful graphic, shown in Figure 2;[29] the graphic compares these committed emissions with the remaining global carbon budgets for 1.5°C (50% probability) and 2°C (67% probability) as at the start of 2023 (as noted above, the remaining budgets have since diminished, with the budget for a 50% chance of 1.5°C now likely to be around 150 Gt of CO_2).

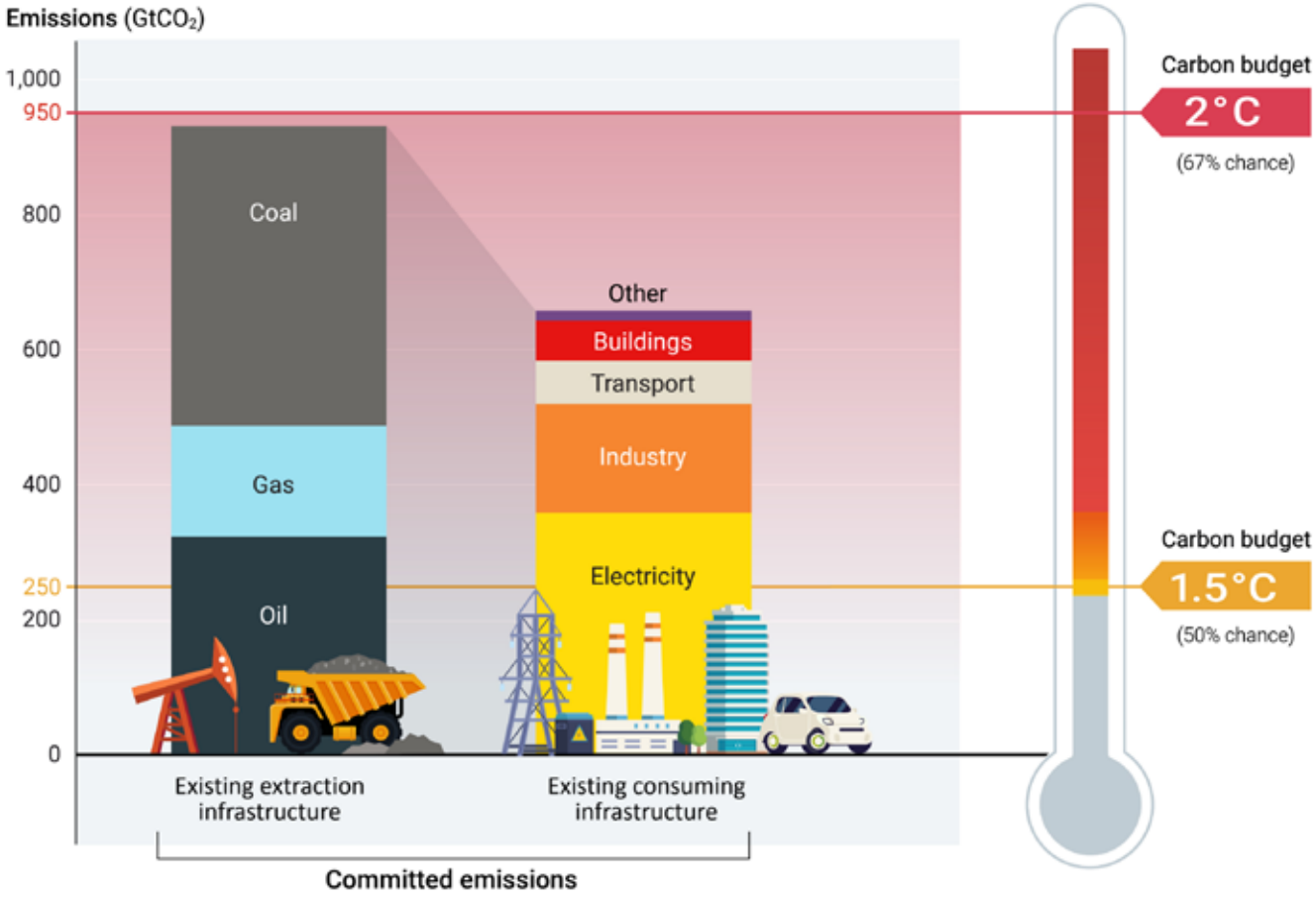

Figure 2: *Committed emissions from existing oil and gas fields and coal mines, and from existing fossil fuel-consuming infrastructure*

Graphic reproduced from UNEP

27 Trout et al's assessment was based on the situation in 2019 (the most recent year for which full data were available). An update puts the oil and gas figures at 469 Gt CO_2 as at the start of 2023; combining with the 2019 coal estimate gives a total of 915 Gt CO_2 [Trout, K. (2023). *Sky's Limit Data Update*, Oil Change International].

28 The update reduces this to 469 Gt CO2. Trout, above note 27.

29 UNEP (2023). *Emissions Gap Report 2023: Broken Record – Temperatures hit new highs, yet world fails to cut emissions (again)*.

2.2 New oil and gas fields are not needed in 1.5°C scenarios

While carbon budgets tell us the limit to the cumulative emissions that may occur for a given temperature goal, detailed models of the energy, economy and climate systems are used to project how those systems will evolve over time given certain assumptions, when constrained by an emissions limit. The models work by either simulating the decisions of energy actors or optimising the whole system, usually by minimising total costs.

In 2021, the International Energy Agency (IEA) published the results of the 1.5°C Net Zero Emissions (NZE) scenario for the first time, generated using its World Energy Model (WEM).[30] It finds that "no new oil and natural gas fields are required beyond those that have already been approved[31] for development".[32] Following publication, IEA executive director Fatih Birol spelled out the policy implication: "If governments are serious about the climate crisis, there can be no new investments in oil, gas and coal, from now – from this year".[33]

Like other models of the whole energy system, the WEM does not have enough resolution to examine what happens to individual fields; rather the finding is that the demand can be met by existing fields, so no new fields are needed.[34] The reason is that in order to limit warming to 1.5°C, demand for oil and gas in the NZE scenario decreases at roughly the same rate as extraction from existing fields decreases as reservoir pressures decline.[35]

Some financial institutions suggested that this finding was a quirk of the IEA's model, and that they would continue to invest in new fields, using other scenarios as their guide, such as those reviewed by the IPCC.[36] However, our own assessment (with our co-author Olivier Bois von Kursk), published in *Science*,[37] finds that no new fields are needed in the median 1.5°C scenario reviewed in the IPCC's *Sixth Assessment Report (AR6)*.[38] An earlier study[39] finds that the same conclusion also broadly follows from all major 1.5°C scenarios produced by universities, intergovernmental organisations, private consultancies and even oil companies, as shown in Figure 3.

While energy system models do not have resolution at the individual field level, they do break the world into regions, and in some models, the UK itself is a region. A previous UCL policy brief, using the TIAM-UCL model, finds that based on necessary production decline rates under a 1.5°C scenario, new UK oil and gas fields are not compatible with limiting warming in line with the Paris Agreement.[40]

These studies tell us two things. First, they show that it is possible to meet society's energy needs in an economically efficient way from existing fields alone (alongside other energy sources such as expanded renewable energy[41]). Second, they show that if new fields are opened, there will be more oil and gas supply globally than is needed, and so if the 1.5°C goal is achieved, more fields will have to close early than would otherwise be the case.

The *Production Gap Report*, co-published by SEI, UNEP and others, assesses the path of global fossil fuel extraction if individual governments' plans and projections for their own countries are combined; that is, if they continue to support new field development. It finds that governments' plans and projections collectively exceed fossil fuel production in IPCC pathways consistent with 1.5°C or 2°C, as shown in Figure 4.[42] In fact, this combined level of production is even greater than projections of future demand under existing policies.

One limitation of the scenario-based analysis is that there is significant variation between scenarios, as Figure 3 shows.[43] Since scenario assumptions and model architectures differ, the models rely to varying degrees on the available mitigation levers to meet the emissions constraint: greater oil and gas consumption becomes possible if coal consumption or land use emissions are lower, or if greater use is made of carbon capture and

30 In addition to limiting warming to 1.5°C, the NZE scenario assumes that the other energy-related Sustainable Development Goals are achieved: universal access to modern energy services by 2030, and a reduction in health damage caused by air pollution.

31 By this, the IEA means no fields beyond those that have already received a final investment decision, as of the end of 2021.

32 IEA (2021). *Net Zero by 2050: A Roadmap for the Global Energy Sector*, p.99.
The IEA has repeated this finding in all subsequent editions of the *World Energy Outlook* (*WEO*), and in the update to the NZE scenario [IEA (2023). *Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach*, pp.75-76, 105]. The message has been slightly qualified since *WEO 2022*, expressed as not needing "any new long lead-time upstream conventional oil and gas projects". This means that new fracked wells can be drilled, largely to rapidly replace Russian supply, but even in this case no new infrastructure is needed [IEA (2023). *The Oil and Gas Industry in Net Zero Transitions*, p.36]. Conversely, *WEO 2023* onwards have found that in the NZE some existing fields need to close early, mostly in the 2030s.

33 Harvey, F. (2021). No new oil, gas or coal development if world is to reach net zero by 2050, says world energy body, *The Guardian*, 18 May 2021.

34 Like many other energy system models, the WEM starts by estimating future energy needs, based on demographic, behavioural and other trends, and then estimates which fuels and supply can best meet those needs, within the emissions limit.

35 Demand for oil and gas in the NZE scenario decreases at 2.5% per year to 2030, and then 5.5% and 6.3% respectively to 2050 [IEA, *The Oil and Gas Industry in Net Zero Transitions*, above note 32]; production from existing conventional fields generally declines by about 4.5% per year [at p.101]; there will be a slower decline in the early years, as projects that are already under construction come online. Note that this decline rate assumes ongoing investment in existing fields, for infill drilling, maintenance of equipment etc; without ongoing investment, production would decline by about 8% per year.

36 Walker, O. & Morris, S. (2021). Big banks resist most direct road map to net zero emissions, *Financial Times*, 11 October 2021.

37 Green, F., Bois von Kursk, O., Muttitt, G. & Pye, S. (2024). No new fossil fuel projects: The norm we need. *Science* 384(6699): 954–957.

38 To be more precise, this is the median of the *AR6* scenarios whose reliance on carbon dioxide removal or on fossil-carbon capture and storage does not exceed IPCC feasibility or sustainability thresholds.

39 Bois von Kursk, O. et al (2022). *Navigating energy transitions: Mapping the road to 1.5°C*, International Institute for Sustainable Development.
See also Green et al, above note 37, Supplementary Material p.8

40 Welsby, D., Price, J. & Pye, S. (2022). *UK oil and gas policy in a 1.5 °C world*, UCL Policy Brief.

41 Teske, S. & Niklas, S. (2021). *Fossil Fuel Exit Strategy: An orderly wind down of coal, oil and gas to meet the Paris Agreement*, Institute for Sustainable Futures, University of Technology Sydney.

42 SEI, Climate Analytics, E3G, IISD, UNEP (2023). *The Production Gap: Phasing down or phasing up? Top fossil fuel producers plan even more extraction despite climate promises*.

43 Note from Figure 3 that in some scenarios, such as BP's Net Zero scenario, future oil and gas consumption exceeds the projected production from future fields; however even in these cases they exceed it only very slightly, meaning that the large majority of new fields remain unaligned with 1.5°C. Similarly, the Energy Transitions Commission finds that demand in its scenario slightly exceeds supply from existing fields, but this only suggests "some limited new developments" of new fields [Energy Transitions Commission (2023). *Fossil Fuels in Transition: Committing to the phase-down of all fossil fuels*. pp.109-113, 124-127]. In most scenarios, oil and gas consumption is less than existing fields' production, and in some cases by a large amount.

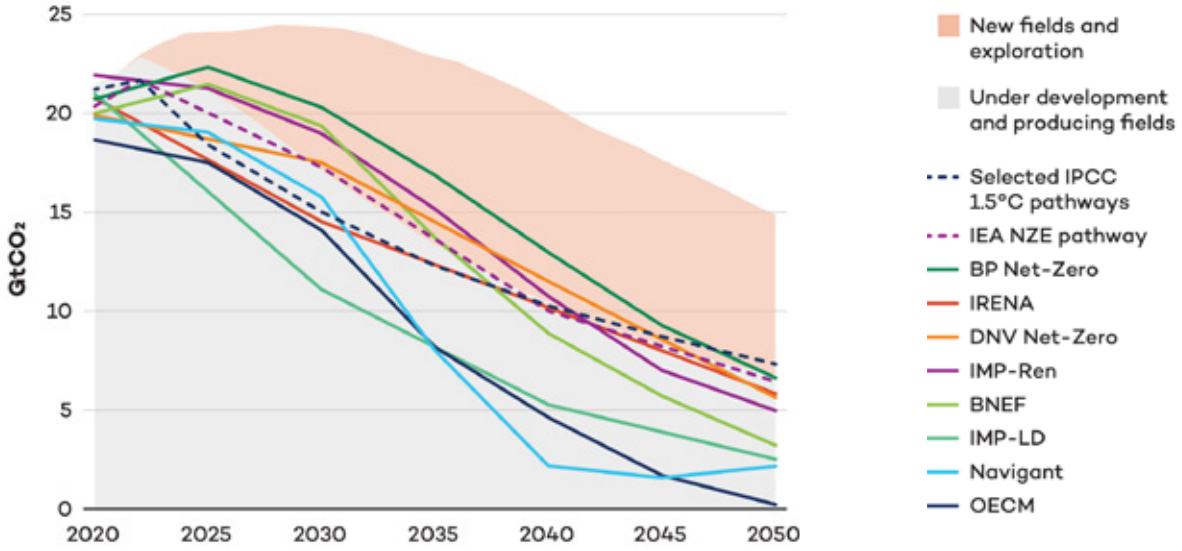

Figure 3: *Projected global oil and gas production from existing (shaded grey) versus new (shaded pink) fields, compared to oil and gas consumption in 1.5°C scenarios*

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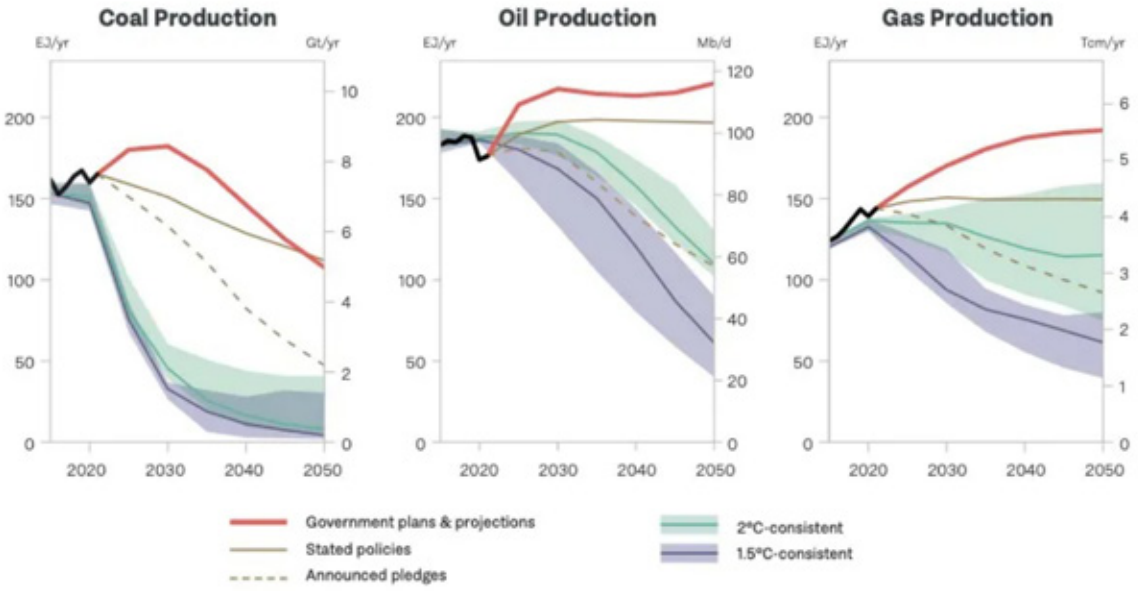

Figure 4: *Global fossil fuel production under combined government plans and projections, compared with production under stated policies, with announced net-zero pledges, and in 1.5°C and 2°C modelled pathways.*

Graphic reproduced from SEI et al

storage, or of carbon dioxide removal.[44] One reason the oil and gas supply from existing fields is roughly equal to demand in 1.5°C-aligned scenarios but much higher than the 1.5°C remaining carbon budget is that the scenarios mostly assume that significant amounts of CO_2 will be removed from the atmosphere in the future (often after 2050) either by new technologies or by expanding global forest area. Indeed, scenarios that rely on more modest amounts of carbon dioxide removal or carbon capture and storage not only imply no new fields being opened, but some existing ones being closed early.[45]

44 Achakulwisut, P., Erickson, P., Guivarch, C., Schaeffer, R., Brutschin, E. & Pye, S. (2023). Global fossil fuel reduction pathways under different climate mitigation strategies and ambitions. *Nature Communications* 14(1), 5425.
Bois von Kursk, O., Culbert, V., Darby, M., Gerasimchuk, I., Jones, N., Kuehl, J., Muttitt, G., Picciariello, A., Ullah, F. & Yanguas Parra, P. (2024). *Transitioning Away From Oil and Gas: A production phase-out primer*. IISD.

45 Teske & Niklas, above note 41.

What is a "new field"?

The term "field" refers to a delineated geological structure in which oil or gas has been discovered. Usually, a field is also defined in relation to an investment and development plan for extracting the oil and gas, so it is not considered a field until it has been explored, discovered, and appraised.

For this reason, in common industry, policy and scientific usage, the distinction between "new" and "existing" fields is defined as occurring at the point of development/construction. In the UK Government's consultation on the future of the North Sea, the term is contrarily defined as a block or area that has not yet been licensed.[46] This unusual definition may cause confusion, as a field is not the same thing as a licence, and a new field is not the same as a new licence.

All of the scientific studies in sections 2.1 and 2.2 distinguish between fields that are either already producing or under development, versus those that have not begun development. For these purposes, development begins when a company makes its final investment decision (FID): hence a "new field" in these studies is one that has not yet received an FID. From a policymaking perspective, the equivalent moment is when a development consent is granted,[47] since an FID generally occurs shortly after this, and without any additional physical work or major expenditure occuring.

2.3 Total reserves exceed what can be safely extracted

While emissions from the combustion of fossil fuels from existing fields clearly exceed the 1.5°C carbon budget, leaving no room for new production, other studies have focused on the implications of *all* fossil fuel reserves yet to be extracted (whether in developed or undeveloped fields). This perspective is important, as the strategy of governments and commercial producers is shaped by the reserves that they hold. Reserves are defined as the fraction of fossil fuel resources that are known (i.e. have been discovered) and are considered recoverable under current economic and technological conditions.

One of the first studies to explore this, in *Nature* in 2009, estimated that only 43% of the world's fossil fuel reserves could be burned before 2050 while limiting heating to 2°C. This was estimated by comparing the remaining global carbon budget for a 2°C target (then 1,000 Gt of CO_2) with the total reserves of fossil fuels (then 2,800 Gt of CO_2).[48]

Building on the idea of 'unburnable carbon',[49] a seminal paper in 2015, also in *Nature*, explored this issue in more detail, estimating what proportion of reserves could not be extracted, by fuel and geographic region, in a 2°C scenario.[50] Again, by comparing reserves to the remaining carbon budget, the study estimated that around half of gas and a third of oil could not be extracted. An update to this analysis in 2021 estimates the reserves that would need to stay in the ground under a 1.5°C scenario.[51] This study found that around 60% of oil and gas reserves would need to remain unextracted, and production would need to decline globally by 3% each year until 2050.

Since it includes undeveloped fields too, the stock of total reserves is even larger than that of reserves in developed fields (described in section 2.1). Since we cannot afford to consume existing reserves, no further exploration is needed, as it would add yet more reserves. At best, this exploration effort could be a waste of money; at worst, it could push the world beyond climate limits. Since oil and gas licensing gives a right to explore, this finding speaks especially strongly in favour of the proposed UK policy to stop issuing new oil and gas licences.

46 DESNZ, above note 2, p. 49.
47 For example, "new field" has been defined in this way in the fiscal regime pertaining to UK oil and gas.
HM Revenue & Customs. *Oil Taxation Manual OT15830*, HMRC Internal Manuals.
North Sea Transition Authority. *Field determinations*.
48 Meinshausen et al, above note 16.
49 Carbon Tracker Initiative (2011). *Unburnable Carbon – Are the world's financial markets carrying a carbon bubble?*
50 McGlade, C. & Ekins, P. (2015). The geographical distribution of fossil fuels unused when limiting global warming to 2 °C. *Nature* 517: 187–190.
51 Welsby, D., Price, J., Pye, S. & Ekins, P. (2021). Unextractable fossil fuels in a 1.5 °C world. *Nature* 597: 230–234.

3. New fields impede emissions reduction

The previous section has explained that global emissions from the oil and gas in existing fields alone would exceed carbon budgets aligned with 1.5°C and would be sufficient to meet energy demand in 1.5°C scenarios. But this does not say anything about specific fields. *In theory*, new fields could be opened, as long as existing fields resulting in at least an equivalent amount of emissions were closed down early. This section considers whether that is a viable approach, and the likely consequences.

3.1 New fields would lock in emissions

Based on an analysis of research on political-economy and law, our 2024 study in *Science* finds that it is much harder to close existing fields than to prevent new ones opening, due to the significant economic, political and legal barriers to closing fields before the end of their economic life.[52] As such, developing new fields can cause "carbon lock-in", where it becomes harder to make policies or investments to advance the energy transition.[53]

The main economic barrier is that once a field is opened, the company will be incentivised to operate it for its full economic life, as long as the marginal cost of producing an extra barrel is less than the oil or gas price.[54] When this condition is met, producing each extra barrel has a positive economic effect on the project (i.e. income exceeds expenditure), so even if this is not sufficient to fully pay back the capital already invested, it will reduce the losses.[55] In contrast, an undeveloped field will not proceed if the price is insufficient to make a return on as-yet-uncommitted capital.

Whilst some in the oil industry suggest that opening new fields can lead to lower-cost production becoming available[56]—with the implication that production could stay within climate limits by more costly existing fields closing—this idea neglects the effect of capital having already been sunk into existing projects. For the most part, the most competitive fields are the ones that are already operating, because they do not have to incur the capital costs of new field development.

The main political barrier is that sunk investments create vested interests in keeping the field running. These political interests are so strong that they can often secure policy *support to help fields stay open* in economic hard times. For example, the fall in oil price after 2014 was a key factor in the industry's success in lobbying for major tax breaks in the UK's 2015 and 2016 Budgets.[57] Such lobbying will be all the more powerful in opposing policies that themselves could lead to closure.

Biases in human psychology toward avoiding losses rather than reaping equivalent-value gains lead firms, unions, individuals and governments to defend existing projects more than they press for new ones.[58] Accordingly, firms with sunk capital can be expected to lobby more vociferously against regulations that diminish the value of their sunk assets than against regulations that diminish the value of future planned investments.[59] Similarly, trade unions' natural political role is to defend the jobs of their existing members more than engaging in the uncertain process of trying to create new jobs for future members.[60] Conversely, communities often oppose new developments on grounds of local land-use, environmental or public health implications (as well as climate impacts),[61] but are generally more likely to tolerate existing projects. Because of these political pressures, legislators (where they support climate-related regulation) typically prefer to enact more stringent regulations on new fossil fuel projects than on existing projects.[62]

The main legal barrier is that many fossil fuel investments are effectively protected against the adverse financial impacts of climate policy, thanks to international investment law. Many international investment treaties protect foreign investors against a wide range of host-state actions affecting the expected profitability of their investments and confer procedural rights to sue governments alleged to have violated these rights in private tribunals for investor-state dispute settlement. For example, whilst the UK has withdrawn from the Energy Charter Treaty, it remains a party to 85 in-force bilateral investment treaties that are less known

52 Green et al, above note 37.
53 Unruh, G.C. (2000). Understanding carbon lock-in. *Energy Policy* 28: 817–830.
54 Chignell, S. & Gross, R.J.K. (2013). Not locked-in? The overlooked impact of new gas-fired generation investment on long-term decarbonisation in the UK. *Energy Policy* 52: 699–705.
Seto, K.C., Davis, S.J., Mitchell, R.B., Stokes, E.C., Unruh, G. & Ürge-Vorsatz, D. (2016). Carbon Lock-In: Types, Causes, and Policy Implications. *Annual Review of Environment and Resources* 41: 425–452.
55 Green & Denniss, above note 13.
56 Latham, A. (2023). Scraping the barrel: Is the world running out of high-quality oil and gas?, Wood Mackenzie.
57 InfluenceMap (2017). *North Sea Oil and Gas Taxation and Lobbying: How the oil majors and their lobbyists work to gain huge tax relief subsidies from HM Treasury*.
Osborne, G. (2016). Budget 2016: George Osborne's speech, *HM Treasury*, 16 March 2016.
58 Thaler, R. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behavior & Organization* 1(1): 39-60.
Vis, B. (2011). Prospect Theory and Political Decision Making. *Political Studies Review*, 9(3): 334-343.
59 Green et al, above note 37.
60 Snell, D. & Fairbrother, P. (2010). Unions as environmental actors. *Transfer: European Review of Labour and Research* 16(3): 411–424.
61 Green, F. (2018). Anti-Fossil Fuel Norms. *Climatic Change* 150: 103–116.
62 Keohane, R. & Stavins, R. (1998). The Choice of Regulatory Instruments in Environmental Policy. *Harvard Environmental Law Review* 22: 313–367, 364.

but provide similar protections.[63] International investment tribunals commonly award compensation valued in terms of lost future profits, rather than merely compensating money that has already been spent.[64] The awards can therefore reach into the tens of billions of dollars, creating a powerful disincentive for governments to enact policies that would close existing fields before the end of their profitable life.[65] This is no abstract threat. The upstream oil and gas industry has sued governments under investment treaties more than any other sector.[66] In contrast to these barriers to closing an existing field, it is much less difficult to prevent a new field from being opened. In the case of a new, undeveloped field, capital has not yet been sunk, and from a company perspective, it is simply a prospect for future investment, which is weighed against the returns that could be obtained if the money is invested elsewhere.

Combining the quantitative analysis of section 2 with the political-economy and legal analysis of this section, it follows that opening new fields is not consistent with limiting warming to 1.5°C. Since fields will tend to keep operating, and there are barriers to closing them, adding new fields will put downward pressure on the price of oil and gas, causing more oil and gas to be burned than would otherwise be the case and thus making it harder to achieve the Paris goals.

3.2 New fields will cause stranded assets

Opening new fields will make it harder to achieve the Paris goals. But if governments collectively manage to overcome the above barriers and restrict emissions to Paris-aligned levels, this will lead to less oil and gas being consumed than existing fields could produce. Consequently, some fields will be forced to close earlier or to produce less than planned.

A 2011 report by Carbon Tracker Initiative was the first to warn of the financial losses that could be experienced in fossil fuel investments due to the global energy transition.[67] "Stranded assets" are investments that fail to achieve commercial returns due to changes in policy or in markets from what was expected at the time of investment.[68] Several studies have estimated the scale of the economic risk as being in the trillions of dollars in present value.[69]

Other studies have warned that such impacts on the fossil fuel sector can have knock-on effects on financial stability as asset values rapidly change and some borrowers default on debts.[70] The compound effects of stranded asset shocks can lead to contagion, where a spiralling loss of confidence and resulting destabilisation spread through the financial system.[71] Unproductive investments, policy uncertainty and loss of consumer confidence can in turn constrain economic growth.[72] These systemic economic impacts grow worse, the later the transition away from fossil fuels begins.[73]

The IPCC reports that "A lock-in to fossil fuel-intensive production systems (carbon lock-in) will increase the societal, economic and political strain of a rapid low-carbon transition after 2030".[74] For example, in addition to economic losses associated with stranded assets, such an unplanned, rapid transition could mean less time to ensure a just transition for existing fossil fuel workers.[75] The more economically and socially desirable path is to refrain from opening new fields.

As outlined in the previous section, once a company has sunk its capital into a field, it is incentivised to keep producing, as long as the marginal operating cost of extracting a barrel is less than the price it can be sold for. So even while making a loss on capital, the field keeps running. Thus stranded assets tend to deliver the worst of both worlds: financial losses for companies, while total volumes of oil exceed what would be consistent with the Paris goals.

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63 UNCTAD (2024). *International Investment Agreements Navigator.*
64 UNCTAD (2024). *Compensation and Damages in Investor-State Dispute Settlement Proceedings, IIA Issues Note*.
65 Tienhaara, K. (2018). Regulatory Chill in a Warming World: The Threat to Climate Policy Posed by Investor-State Dispute Settlement. *Transnational Environmental Law* 7(2): 229–250.
Meager, E. (2022). Cop26 targets pushed back under threat of being sued, *Capital Monitor*, 14 January 2022.
66 Di Salvatore, L. (2021). *Investor–state disputes in the fossil fuel industry.* International Institute for Sustainable Development.
67 Carbon Tracker Initiative, above note 49.
68 Caldecott, B. (2017). Introduction to special issue: Stranded assets and the environment. *Journal of Sustainable Finance & Investment*, 7(1): 1-13.
69 Mercure, J-F., Pollitt, H., Viñuales, J.E., Edwards, N.R., Holden, P.B., Chewpreecha, U., Salas, P., Sognnaes, I., Lam, A. & Knobloch, F. (2018). Macroeconomic impact of stranded fossil fuel assets, *Nature Climate Change* 8: 588–593.
Semieniuk, G., Holden, P.B., Mercure, J-F., Salas, P., Pollitt, H., Jobson, K., Vercoulen, P., Chewpreecha, U., Edwards, N.R. & Viñuales, J.E. (2022). Stranded fossil-fuel assets translate to major losses for investors in advanced economies. *Nature Climate Change*, 12(6): 532–538.
70 Van der Ploeg, F. & Rezai, A. (2020). The risk of policy tipping and stranded carbon assets. *Journal of Environmental Economics and Management* 100, 102258.
71 Roncoroni, A., Battiston, S., Escobar-Farfán, L.O.L. & Martinez-Jaramillo, S. (2021). Climate risk and financial stability in the network of banks and investment funds. *Journal of Financial Stability* 54, 100870,
Daumas, L. (2023). Financial stability, stranded assets and the low-carbon transition – A critical review of the theoretical and applied literatures. *Journal of Economic Surveys* 38(3): 601-716.
72 Semieniuk, G., Campiglio, E., Mercure, J-F., Volz, U. & Edwards, N.R. (2021). Low-carbon transition risks for finance, *WIREs Climate Change* 12, e678.
Network for Greening the Financial System (2024). *The Green Transition and the Macroeconomy: A monetary policy perspective*.
73 European Systemic Risk Board Advisory Scientific Committee (2016). *Too late, too sudden: Transition to a low-carbon economy and systemic risk*.
74 IPCC (2022). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, p. 349.
75 Skjølsvold, T.M. & Coenen, L. (2021). Are rapid and inclusive energy and climate transitions oxymorons? Towards principles of responsible acceleration. *Energy Research & Social Science* 79, 102164.

Some common myths:

Myth 1: keeping UK oil and gas in the ground won't do anything to reduce global emissions, because another producer will just supply the demand and reap the benefit

This common myth is a gross oversimplification of the way markets work. According to the United Nations Environment Programme (UNEP), the idea that other fossil fuel producers will fully substitute for foregone production "defies basic economics of supply and demand".[76] Stopping new oil and gas fields from being developed reduces the long-run supply of oil and gas globally, resulting in an increase in its price which, though often small, will cause less oil and gas to be consumed. Conversely, expanding oil and gas production would have the opposite effect, leading to more oil and gas being consumed.[77] As UK Government advisers at the Climate Change Committee (CCC) have acknowledged, "the extra gas and oil extracted will support a larger global market overall" for petroleum.[78] One study from Norway finds that the most cost-effective way for Norway to reduce global emissions is by restricting both supply of and demand for oil and gas, with about two thirds of the reductions through supply measures.[79] Even in cases where less emissions-intensive oil production substitutes for some alternative supply, the emissions from the overall increase in oil consumption will almost always outweigh any improvement in upstream emissions intensity.[80]

Myth 2: We should open new oil and gas fields because the UK will need oil and gas for some time to come

The CCC has confirmed that the expansion of fossil fuel production is not in line with net zero. It acknowledges that the UK will continue to need some oil and gas until it reaches net zero, but states that "this does not in itself justify the development of new North Sea fields".[81] Meeting the UK's net zero goal requires, among other things, rapidly phasing out its reliance on oil and gas. This phaseout could be accelerated with a stronger focus on energy demand reduction than is currently being considered in many of the modelled UK emission reduction pathways.[82] The oil and gas needed during this transition can be met from various sources. Since oil and gas are traded globally and (in the case of pipeline gas) regionally, it is appropriate to balance demand and supply at global/regional levels rather than domestically.

Myth 3: UK oil and gas production is already "Paris-aligned" because it exceeds global oil and gas industry decline rates in modelled 1.5°C scenarios

In 1.5°C scenarios (such as those featured in the *Production Gap Report*), global oil and gas production declines at around 3-4% per year. The North Sea Transition Authority (2022) has argued that since the UK's decline rate is faster than this, the UK is aligned with 1.5°C. However, a UCL policy brief modelling a cost-optimal energy transition that stays within 1.5°C finds that UK decline rates need to be much faster than the global average. These projected UK decline rates are actually closely aligned with the European region decline rates projected in the IEA NZE analysis, supporting the conclusion that no new oil and gas fields should therefore be opened in the UK.[83]

In any event, the argument based on relative decline rates is flawed for three reasons. First, in line with its commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and Paris Agreement, the UK and other developed countries should act on climate sooner and faster than developing countries, hence at a rate faster than the global average (see section 4, below). Second, the argument mischaracterises how fossil fuel markets work. Whereas all countries have territorial emissions, and countries in similar circumstances should reduce them at similar speeds, fossil fuel production is not like this. Only some countries produce fossil fuels, and some do so in much greater quantities than others. This is shaped by geology and economics. If the same logic were applied, one might conclude that countries like Switzerland and Japan have world-leading climate ambition, because they do not extract fossil fuels. The UK has marginal oil and gas reserves (see section 4.2, below), and should therefore decline more rapidly than others whose production is cheaper. Third, climate scenarios always propose pathways that look forward from the time at which they are published: they do not judge past behaviour. UK production increased for four years after the Paris Agreement; it would be wrong to reset the clock to the present to assess the Paris-alignment of UK production.

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76 SEI, IISD, ODI, Climate Analytics, CICERO & UNEP (2019). *The Production Gap: 2019 Report*, p. 50.
There will typically be *partial* substitution: if a new oil and gas project opens, it will typically lead to *some* existing oil and gas no longer being produced, albeit a smaller volume than that in the new project.
77 SEI et al, above note 76.
78 Climate Change Committee (2022). *Letter to The Rt Hon Kwasi Kwarteng MP: Climate Compatibility of New Oil and Gas Fields, 24 February 2022*.
79 Fæhn, T., Hagem, C., Lindholt, L., Mæland, S. & Rosendahl, K.E. (2017). Climate policies in a fossil fuel producing country: Demand versus supply side policies. *Energy Journal* 38(1): 77–102.
80 Prest, B.C., Fell, H., Gordon, D. & Conway, T.J. (2024). Estimating the emissions reductions from supply-side fossil fuel interventions. *Energy Economics* 136, 107720.
81 Climate Change Committee (2023). *2023 Progress Report to Parliament*.
82 Price, J., Pye, S. & Broad, O. (2023). *UK Energy Independence: Mapping out potential pathways to a more energy independent UK*. UCL Bartlett Energy Institute Research Report.
83 Welsby et al, above note 40.

4. The UK should lead in phaseout efforts

The previous sections have considered the global picture: how much room there is for new fields, and what the consequences of opening them would be. This section turns to countries' different circumstances, to consider whether the UK should phase out oil and gas extraction faster or more slowly than other countries. Two principles for answering that question are international equity and economic efficiency, which are discussed in turn. The section finishes by discussing the limitations of carbon intensity as an alternative principle.

4.1 International equity: The UK as a wealthy, diversified economy

A fundamental principle, enshrined in the UN Framework Convention on Climate Change and its subsidiary Paris Agreement, is that countries should act on climate change according to their "common but differentiated responsibilities and respective capabilities".[84] This phrase encapsulates two moral principles. First, those that did most to cause the climate problem (countries with the largest historic emissions) should contribute most to solving it. And second, in a collective endeavour, the greatest efforts should fall on those most capable of contributing. Thus the Paris Agreement states that developed countries should take the lead in reducing emissions, while developing countries are given more time.[85]

Whilst there is a large and long-standing literature on how countries should equitably reduce their territorial emissions of greenhouse gases,[86] a newer literature examines how equity should shape the phaseout of fossil fuel extraction. Several studies have explored mechanisms that prioritise extraction in the countries with lowest development levels, least historical extraction, and least availability of alternative sources of energy or drivers of development.[87]

Other researchers argue that when it comes to phasing out fossil fuel extraction, countries' capability is not just about their income and institutions, but also how much their economies depend on fossil fuels. In some countries, too fast a phaseout could cause major loss of jobs or incomes, and/or prevent people from meeting their energy needs. Thus phasing out of fossil fuel extraction should proceed fastest where it incurs the least social cost, i.e. where economic dependence is lowest.[88]

The UK has a high level of human development and income per capita. It has historically extracted large amounts of fossil fuels and been responsible for high levels of emissions per capita. It has ample renewable energy resources, and a diversified, resilient economy, with oil and gas generating only about 0.5% of UK fiscal revenues.[89] By contrast, there are 22 countries where oil and gas account for more than 20% of public revenues, the International Monetary Fund's (IMF's) definition of resource dependence (Figure 5). In 11 of these, it is 50% or more. In six countries – Libya, Iraq, South Sudan, Equatorial Guinea, Timor Leste and Oman – it is over 75%. In these countries, not only are people employed in oil and gas extraction itself, but significant proportions of public sector workers also depend on the revenue provided by oil and gas. These revenues also provide the public services on which their citizens depend. 18 of these 22 countries are low- or middle-income.

As summarised in Section 2, there is strong evidence that limiting warming to 1.5°C implies no new oil and gas fields being opened. Since there is a finite amount of CO_2 that can be emitted globally, this means that if the UK continues to open new fields, the only way to limit warming to 1.5°C will be for other countries—likely developing countries—to wind down their production faster than they otherwise would need to, and incurring costs that they can ill afford. The result would be worsening poverty, and noting the high levels of economic dependence in some producers, perhaps even failed states.

Instead, the above equity criteria imply that the UK should make greater efforts to phase out oil and gas than other countries.

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84 UNFCCC (2015). *The Paris Agreement*, preamble, art 2, art 4.

85 *Paris Agreement*, above note 84, art 4.

86 IPCC (2014). *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Chapter 4.

87 Caney, S. (2016). *Climate change, equity and stranded assets*, Oxfam America.
Pye, S. Bradley, S., Hughes, N., Price, J., Welsby, D. & Ekins, P. (2020). An equitable redistribution of unburnable carbon. *Nature Communications* 11, 3968.
Lenferna, G.A. (2018). Can we equitably manage the end of the fossil fuel era? *Energy Research & Social Science* 35: 217–223.
Kartha, S., Caney, S., Dubash, N.K. & Muttitt, G. (2018). Whose carbon is burnable? Equity considerations in the allocation of a 'right to extract'. *Climatic Change* 150: 117–129.

88 Muttitt, G. & Kartha, S. (2020). Equity, climate justice and fossil fuel extraction: Principles for a managed phaseout. *Climate Policy* 20(8): 1024–1042.
Calverley, D. & Anderson, K. (2022). *Phaseout pathways for fossil fuel production within Paris-compliant carbon budgets*. International Institute for Sustainable Development.

89 HMRC (2024). *Government revenues from oil and gas production: September 2024*.
Keep, M. (2025). *Tax statistics: an overview*. House of Commons Library Research Briefing CBP-8513, 10 March 2025.

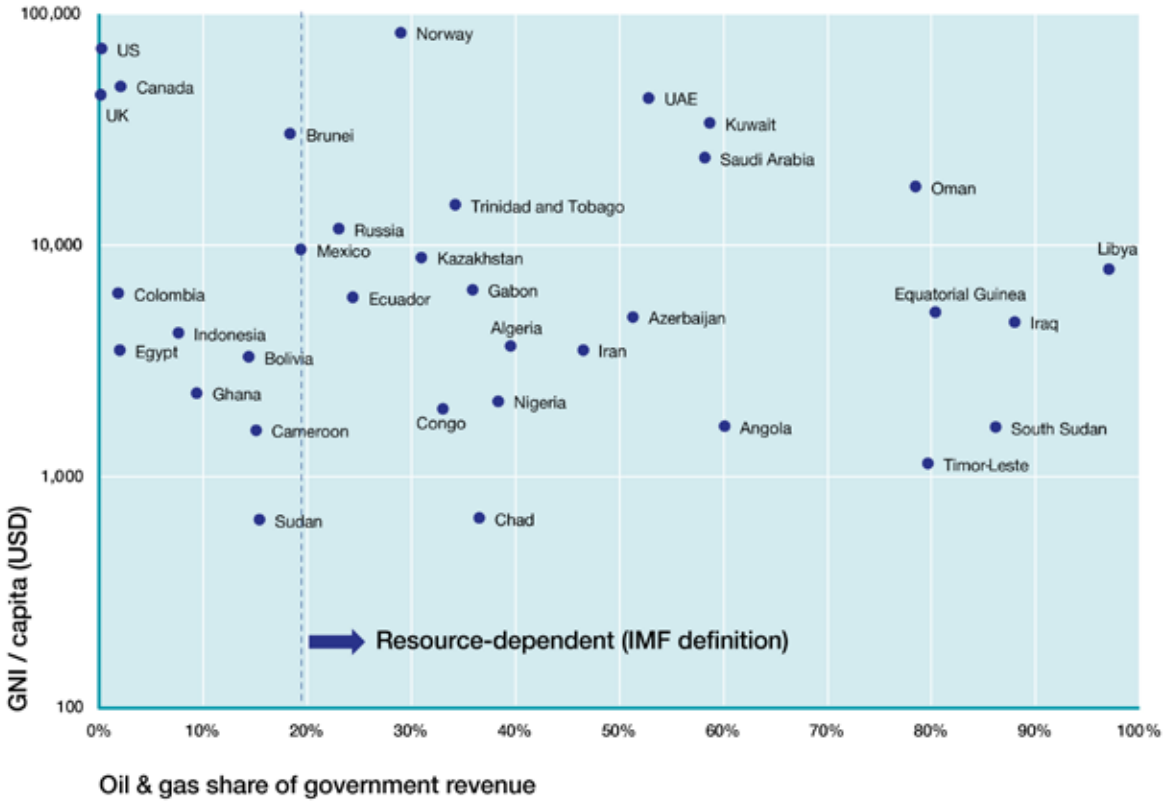

Figure 5: *Dependence on oil and gas as a share of government revenues*

Source: Data compiled from IMF Article IV reports, national accounts and World Bank Development Indicators.

4.2 Economic efficiency: The UK as a marginal producer

A common answer to the question of how global carbon budgets should be shared between fossil fuels from different countries is that the lowest-cost production should be prioritised. This reflects the neoclassical economic underpinnings of much climate policy analysis, including integrated assessment modelling, and the dominant policy framing of aiming for least-cost policy interventions.[90] On this view, the costliest production should be left untapped, as it is economically inefficient to have expensive, uncompetitive oil and gas when cheaper supplies are available.

In terms of capital and operating costs, the UK is among the most expensive producers in the world, as shown in Figures 6 and 7.[91] The high capital and operating costs are because the remaining UK fields are small and technically complex. As the figures show, the UK Government takes a smaller share of the value of a barrel than governments in other regions, which is what makes the fields economically viable. In addition to particularly low oil tax rates,[92] the UK provides a range of subsidies for oil and gas production, including an Investment Allowance that reduces taxable profits,[93] and provisions that the taxpayer will cover up to half of the costs of decommissioning.[94] According to the Fossil Fuel Subsidy Tracker compiled by the Organisation for Economic Cooperation and Development (OECD) and the International Institute for Sustainable Development (IISD), the UK provided USD 3.8 billion of subsidies to oil and gas extraction in 2023.[95]

90 Green, F. (2017). The normative foundations of climate legislation in A. Averchenkova, S. Fankhauser & M. Nachmany (eds.), *Trends in Climate Change Legislation* (London: Edward Elgar), pp. 85–107.

91 This is simply the total cashflow in each of these headings in 2024, divided by the total production in each region. In a declining oil producer like the UK, this simplified measure in fact understates the per-barrel costs, as the denominator is higher now than it will be in future.

92 Tax rates rose with the introduction of the Energy Profits Levy (windfall tax) in 2022. The present Government increased the rate of the levy from 35% to 38%, and extended its duration to 2030. Figures 6 and 7 show the picture with the levy at 35%; prior to that, Government take was always below £1.5 billion, and in some years negative. See HMRC (2024) above note 89.

93 While the 2024 Budget removed the Investment Allowance on the Energy Profits Levy, an Investment Allowance remains for calculation of Supplementary Charge. Introduced in the 2015 Budget, this allowance reduces taxable profits by 62.5% of capital expenditure.

94 Muttitt, G., Markova, A. & Crighton, M. (2019). *Sea Change: Climate Emergency, Jobs and the North Sea Oil and Gas Industry*, Platform, Oil Change International, Friends of the Earth Scotland. Seely, A. (2024). *Taxation of North Sea oil and gas*. Commons Library Research Briefing No. 341, House of Commons Library, 23 December 2024.

95 OECD & IISD. *Fossil Fuel Subsidy Tracker.*

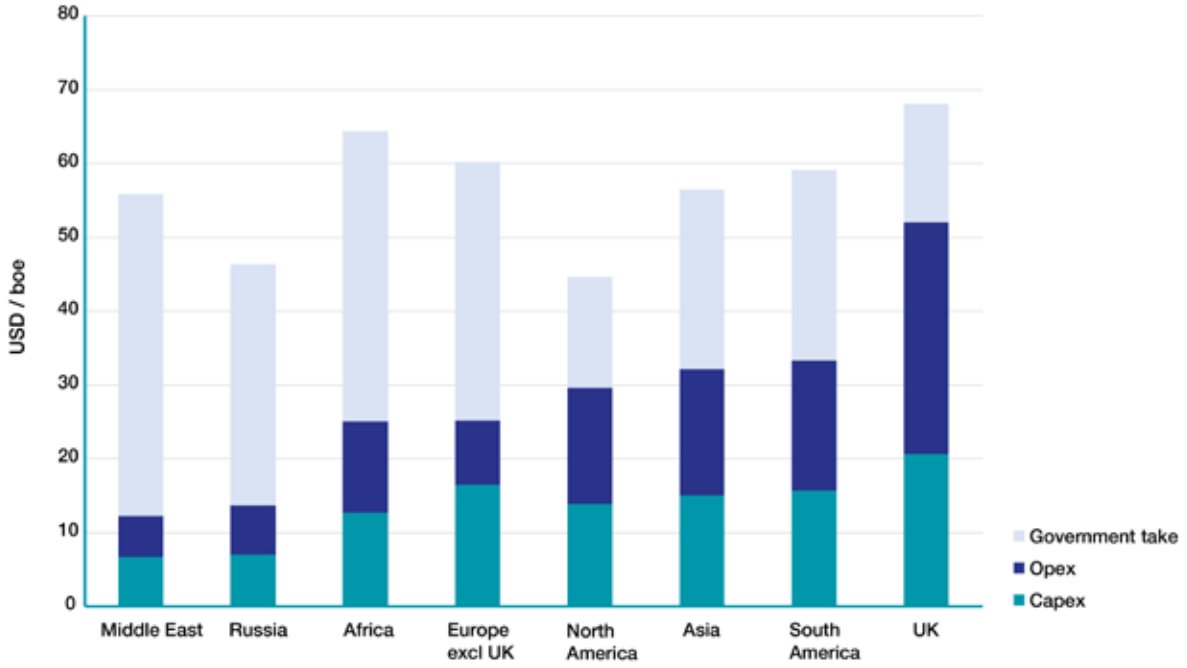

Figure 6: *Weighted average costs per barrel of oil production: UK compared to other regions (2024)*

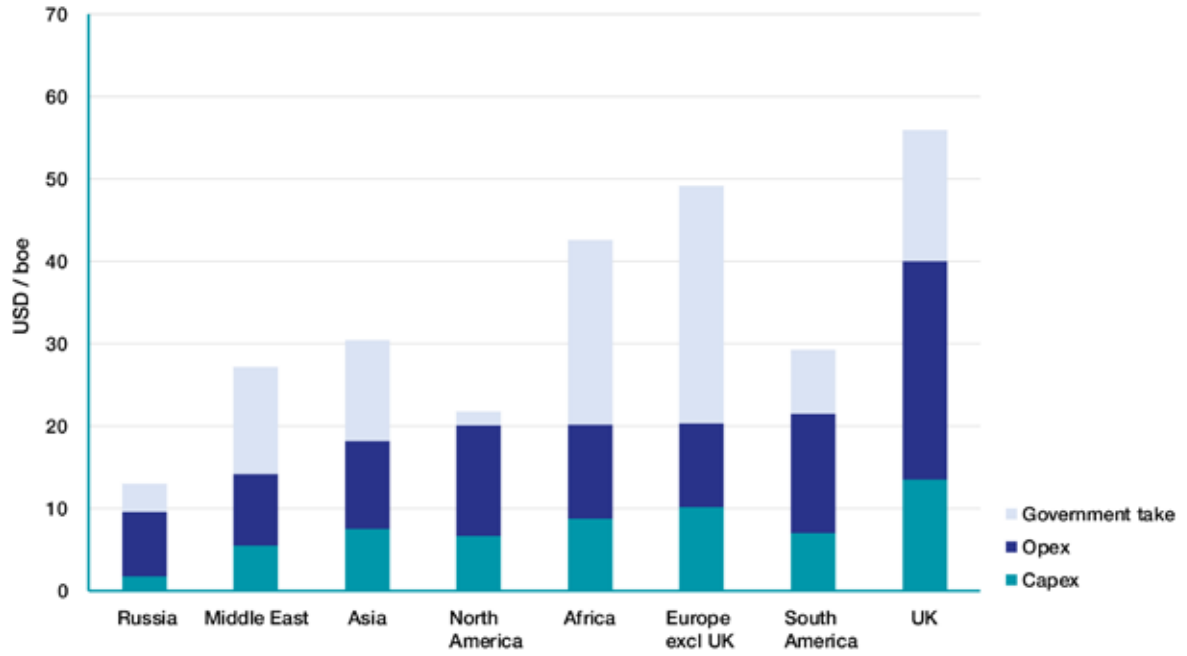

Figure 7: *Cost per barrel-of-oil-equivalent of gas production: UK compared to other regions (2024)*

Source: data from Rystad UCube

UK production has twice peaked and gone into decline, only to be revived by major fiscal changes, in the 1993, 2015 and 2016 Budgets.[96] The 1993 Budget abolished Petroleum Revenue Tax (PRT) for all new fields developed after that date (and decreased the rate on existing fields from 75% to 50%). The 2015 Budget reduced the PRT rate for the latter fields to 35%, and the 2016 Budget to zero per cent.[97] PRT was the principal mechanism by which the Government obtained its share of the value from the non-renewable resources owned by the Crown. The then Oil and Gas Authority, the UK's oil and gas regulator later renamed the North Sea Transition Authority (NSTA), estimated that the 2015 and 2016 fiscal changes, together with other policy measures designed to "maximise economic recovery" of oil and gas, increased the amount that will be cumulatively extracted from 2016 to 2050 by more than 30%, compared to what would have happened without those measures.[98]

In a world committed to economic efficiency, these interventions would not have been made, and the UK's costly production would have continued its natural decline, as dictated by its geology and economics. Production would likely have mostly ended in the late 1990s. Yet UK Governments have continued to intervene to make greater production economically viable.[99]

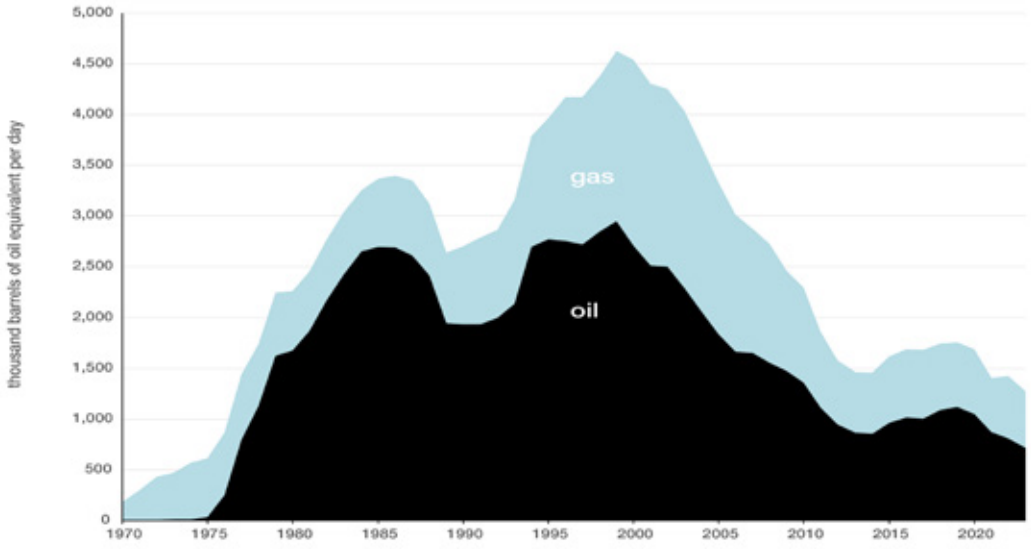

Figure 8: *UK oil and gas production*
Source: Energy Institute (2024)

96 Muttitt et al and Seely, above note 94.
97 The reason for taxing at zero percent rather than abolishing the tax was to allow companies to still claim rebates on earlier tax payments; thus the Government has received negative PRT payments (i.e. has transferred money to the companies) every year since 2016. See HMRC (2024), above note 89.
98 Oil & Gas Authority (OGA). *Projections of UK Oil and Gas Production and Expenditure*, p.5.
99 Green Alliance (2022). *The last drop: Why it is not economic to extract more oil and gas from the North Sea*.

4.3 Carbon intensity: Why it is not a useful measure

Another approach that is sometimes proposed as a basis to differentiate which country should phase out fastest is carbon intensity of production, suggesting that the highest-emitting production should be stopped first. Global benchmarking published by the NSTA identifies the UK sector as being 13 kg of carbon dioxide equivalent (CO_2e) less emissions-intensive than the global average.[100] However, research suggests that the UK industry is three times more emissions-intensive than Norway, the other key North Sea operator.[101] And the UK has actually been getting more polluting over time.[102] Moreover, the UK is likely underestimating its methane emissions.[103]

The previous Government pointed out that imported liquefied natural gas (LNG) has nearly four times the emissions intensity of UK-produced gas, mainly due to the additional energy used in the liquefaction process.[104] This was a somewhat misleading comparison, as LNG accounts for less than 30% of UK supply, whereas pipelines from Norway provide a larger share, with less than half of the UK's emissions intensity.[105] Even so, the 79 kg of CO_2e for the LNG is still small compared with the full lifecycle emissions of gas.

By comparison, combustion of a barrel of oil by the end-consumer emits about 420 kg of CO_2; a barrel (equivalent) of gas emits about 350 kg.[106] In other words, the total volume of oil and gas matters a great deal more than how they are extracted: a reduction of 12 kg compared to the global average is relatively insignificant. In the context of a debate about whether to allow new oil and gas fields, comparing small differences in the upstream emissions intensity of UK and overseas oil and gas producers is thus a distraction from the bigger issue: the additional greenhouse gases emitted from *consuming* the extra oil and gas that new fields produce.[107] A recent economic study concludes that limiting oil supply will almost always lead to lower overall emissions, even when accounting for differences in upstream emissions intensity.[108]

Indeed, focusing on the marginal differences in emissions intensity, rather than the volumes of fossil fuels, at best reflects an outdated way of thinking about climate mitigation. In the early stages of climate policy in the 1990s, policies commonly focused on reduction of emissions relative to business-as-usual baselines, as any incremental improvement could help start to bend the curve. However, scientific understanding has moved on since then, revealing the cumulative effect of CO_2 emissions (section 2.1), the limited space for residual emissions,[109] a worse-than-feared level of climate impacts,[110] and an extremely small remaining global carbon budget for avoiding the worst dangers of climate change.[111] In light of present scientific understandings, today the appropriate question is not whether a fossil fuel investment reduces emissions compared with a business-as-usual counterfactual, but rather whether a project adds emissions compared with not having the project.

100 North Sea Transition Authority (2024). *Emissions Monitoring Report 2024*.
101 S&P Global, Two thirds of UK and Norway North Sea oil and gas production has lower than average greenhouse gas intensity, new analysis finds. 28 November 2022.
102 North Sea Transition Authority above note 100. The reason is that the rate of production is declining faster than emissions across UK fields collectively. This is common in mature basins as more power is needed to maintain similar (or dropping) production levels for older fields (and production assets).
103 Riddick, S.N. & Mauzerall, D.L. (2023). Likely substantial underestimation of reported methane emissions from United Kingdom upstream oil and gas activities. *Energy & Environmental Science* 16: 295–304.
104 Roach, S. (2023). FactCheck: Sunak claims North Sea gas four times less polluting than imports, *Channel 4 News*, 2 August 2023.
105 NSTA (2023). *Gas import fact sheet*.
106 IPCC (2006). *Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1: Introduction*.
IPCC (2019). *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 1: Introduction*.
107 90% of the lifecycle GHG emissions from a barrel of oil produced in the UK comes from the combustion of the oil, while 10% is associated with the upstream process. See Climate Change Committee, above note 78.
108 Prest et al, above note 80.
109 Edelenbosch, O.Y. et al. (2024). Reducing sectoral hard-to-abate emissions to limit reliance on carbon dioxide removal. *Nature Climate Change* 14: 715–722.
110 IPCC (2023). *Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*.
111 Forster et al, above note 21.

5. UK climate leadership has an outsized impact

5.1 The importance of climate leadership

The Paris Agreement sets out a series of collective goals that the Agreement aims to achieve, including that of holding global temperature increase to "well below" 2°C, while pursuing efforts to limit the increase to 1.5°C.[112] But the Agreement allows countries to make their own "nationally-determined contributions" (NDCs) toward meeting those collective goals. It was recognised at the time the Agreement was negotiated that the collective effect of all countries' *initial* NDCs would be inadequate to achieve the temperature goals—and indeed this "emissions gap" remains large, a decade later.[113]

To bridge the gap, the Agreement establishes a "Global Stocktake" process to assess the gap with a view to encouraging higher ambition,[114] and it requires countries periodically (at least every five years) to submit updated NDCs informed by the Global Stocktake.[115] Each successive NDC must represent a progression relative to the preceding one and reflect the country's highest possible ambition (the so-called "ratchet" mechanism).[116] The assumption is that as governments, businesses and civil society take action to decarbonise, it will become progressively easier and less costly to do so over time thanks to *reinforcing feedback effects*.[117] Such feedback effects include, for example, the development and diffusion of new institutions, technologies, behaviours and social norms.[118] Since many such feedback effects operate across borders, actions taken in one country can ultimately make it more feasible for all countries to commit to stronger NDCs in future.[119]

For feedback effects to get off the ground, *leadership* is required. In other words, for the Paris Agreement to work as intended, some governments (along with businesses and citizens, etc.) need to be the early-movers, enacting stronger climate policies and investing more in decarbonisation than others.[120] The Paris Agreement envisages that developed country parties will be the leaders, consistent with the principles of equity and common but differentiated responsibilities and respective capabilities (see section 4.1, above).[121]

The outcome of the first Global Stocktake, concluded at COP28 in 2023, encourages parties to submit new NDCs that are aligned with limiting warming to 1.5°C.[122] It also proposes the mechanisms by which countries can drive change, including "transitioning away from fossil fuels in energy systems, in a just, orderly and equitable manner".[123] Countries are expected to submit their new NDCs by September 2025, ahead of COP30. This means that now is a crucial time for developed countries to be demonstrating the leadership expected of them, by strengthening their contributions to tackling climate change, including in transitioning away from fossil fuels.

Yet, it is also a moment of great uncertainty in international relations generally, and mixed signals on climate change specifically. While the United States under President Trump appears set on expanding domestic fossil fuel production,[124] this should not cause climate leaders like the UK to be less ambitious. On the contrary, the Trump Administration's approach, at such a critical time for global climate efforts, makes UK climate leadership more important than ever.

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112 *Paris Agreement*, above note 84, art 2.1.
113 UNEP, above note 20.
114 *Paris Agreement*, above note 84, art 14.
115 Ibid, arts 3, 4(2), 4(9).
116 Ibid, arts 3, 4(3).
117 Hale, T. (2020). Catalytic cooperation. *Global Environmental Politics* 20(4): 73–98.
118 Bernstein, S. & Hoffmann, M. (2019). Climate Change, Metaphors and the Fractal Carbon Trap. *Nature Climate Change* 9: 919–925.
Besley, T. & Persson, T. (2023). The Political Economics of Green Transitions. *The Quarterly Journal of Economics* 183(3): 1863–1906.
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119 Green, F. (2015). Nationally Self-Interested Climate Change Mitigation: A Unified Conceptual Framework. Centre for Climate Change Economics and Policy Working Paper No. 224 / Grantham Research Institute on Climate Change and the Environment Working Paper No. 199. London: London School of Economics and Political Science.
120 Green, F. (2025). Beyond the Emissions Paradigm: Climate Governance as System-Transformation. *SSRN Working Paper*.
Green, above note 61.
Hale, above note 117.
121 *Paris Agreement*, above note 84, arts 4(3), 4(4).
122 UNFCCC (2023). *First Global Stocktake*, UN Doc FCCC/PA/CMA/2023/L.17, Decision 1/CMA.5, para. 39.
123 Ibid, para. 28(d).
124 Friedman, L., et al. (2025). Trump signs orders to promote fossil fuels and end climate policies, *New York Times*, 20 January 2025.

5.2 Restraining global oil and gas production: the UK's climate leadership role

The UK—across governments of different political stripes—has long portrayed itself, and enjoyed an international reputation, as a climate leader.[125] Importantly, UK Government policy aims to contribute to limiting warming to 1.5°C above pre-industrial levels. The UK's 2035 NDC, announced by Prime Minister Starmer at COP29, was "informed by the outcomes of the Global Stocktake from COP28 and is aligned with limiting global warming to 1.5°C".[126] The Government also acknowledges that "Climate action must be accelerated drastically to reduce emissions and keep the annual average global temperature rise below 1.5°C." Foreign secretary David Lammy has, moreover, vowed to use the UK's diplomatic capabilities to "push for the ambition needed to keep 1.5 degrees alive".[127]

Keeping 1.5°C alive, as we have shown, requires (at least) stopping new fossil fuel production projects globally. Climate leaders who aspire to keep 1.5°C alive would, rationally, use diplomacy to persuade other countries to cease new fossil fuel projects and seek to build a global norm against such projects.[128] In this vein, IEA director Fatih Birol has encouraged the UK to be an "inspiration for the rest of the world" on climate action, with decisions on new oil fields "an important step in that direction".[129] Conversely, as the UK CCC has acknowledged, allowing new oil and gas extraction would send the opposite signal to other countries, undermining the UK's climate diplomacy.[130] Countries in the Global South, at least, are unlikely to begin phasing out fossil fuel extraction while the UK continues to open new fields.[131]

But, by not approving new oil and gas production, the UK could do a lot more than *inspire* other countries —important though that is. It could also join the Beyond Oil and Gas Alliance (BOGA). BOGA is a "club" of (currently) 25 national and subnational governments, which aims to "Capture and leverage momentum from first movers on oil and gas phaseout and encourage others to take action".[132] The idea is for leading countries to work together to convince other countries to work toward phasing out oil and gas production, in the process building a norm against new oil and gas projects. Countries are eligible for BOGA core membership if they stop new oil and gas licensing and set a Paris-aligned date to end production. If it joins as a BOGA core member, the UK would be the largest oil and gas producer to do so to date.

The UK believes firmly in the theory of change underpinning such "climate clubs", which have become widely used by countries who want to move faster in particular areas of climate action than the cumbersome COP process allows.[133] We know this because the same theory of change underpins the Powering Past Coal Alliance (PPCA), which the UK Government established along with Canada in 2017, and which the two countries co-chair. According to the PPCA website:[134]

> Inspired by the first movers [the UK and Canada], more governments and companies stepped up to the plate and introduced measures to end coal power generation, starting to create an unstoppable tide. By launching the Powering Past Coal Alliance (PPCA) at COP23 in 2017, the UK and Canada brought the leaders together, turning their individual commitments into a diplomatic offensive to advance the transition from coal power across the world. … The Alliance was hailed as a 'political watershed' and [established] a new 'anti-fossil fuel norm'.

The PPCA's membership doubled in the first month after its launch, and now numbers 60 national governments, including those of major coal power consumers Germany and the United States.[135]

The UK already chairs a suite of international energy transition alliances, which focus respectively on the phaseout of coal-fired power (PPCA), the scale-up of renewables (Global Clean Power Alliance),[136] and the provision of finance and technical support for these transitions (the Clean Energy Transition Partnership and the Energy Transition Council).[137] Joining BOGA would plug a gap in the UK's otherwise substantial influence over the international energy transition, bolstering the diplomatic mechanisms by which it can seek to keep 1.5°C alive.

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125 Aylett, C. & Townend, R. (2024). *How to restore the UK's international reputation on climate change*. Chatham House, 11 July 2024.
126 Miliband, E. (2024). The UK's 2035 Nationally Determined Contribution emissions reduction target under the Paris Agreement—Statement made on 12 November 2024. Written Statement UIN HCWS206, UK Parliament, 12 November 2024.
127 Lammy, D. (2024). The Kew Lecture: Foreign Secretary's speech on the climate crisis. *GOV.UK*, 17 September 2024.
128 Green et al, above note 37.
129 Thompson, A. (2021). IEA director hopes UK will be 'inspiration for the rest of the world' on climate action ahead of decision on Cambo oil field, *Channel 4 News*, 22 July 2021.
130 Climate Change Committee, above note 78.
131 Alcoba, N. (2024). How the Global South told the North to stop lecturing it on climate, *Corporate Knights*, 18 June 2024.
132 *Beyond Oil and Gas Alliance*.
133 van Asselt, H. & Newell, P. (2022). Pathways to an International Agreement to Leave Fossil Fuels in the Ground. *Global Environmental Politics* 22(4): 28–47.
Falkner, R., Nasiritousi, N. & Reischl, G. (2022). Climate clubs: politically feasible and desirable? *Climate Policy* 22(4): 480–487.
The COP process operates by consensus among the nearly 200 countries that have ratified the UNFCCC, which means its ambition reflects the 'lowest common denominator'.
134 Powering Past Coal Alliance. *Our story*.
135 Powering Past Coal Alliance. *Members*.
136 UK Government (2024). *Prime Minister launches Global Clean Power Alliance as UK leads the global energy transition*, Press Release, 19 November 2024.
137 Camilleri, H. & Roberts, L. (2024). *Building a Clean Power Alliance*, E3G.

6. Conclusion

This report has shown that there is strong evidence that it is necessary to cease opening new oil and gas fields, in order to achieve the Paris climate goals. This is because there is more oil and gas in the world's existing fields than humanity can afford to burn, and because it is much harder to close an existing field than to prevent a new one being opened. In addition, considerations of both equity and economic efficiency suggest that the UK should make greater efforts to phase out oil and gas production than other countries. At the same time, UK leadership can have an outsized effect on global emissions, by setting an example that influences other countries.

This provides powerful scientific support for the UK policy of ending new licensing of oil and gas exploration. Indeed, in light of the evidence, it would be hard to justify the UK continuing to award new oil and gas licences, which would add yet more oil and gas to the world's excess.

However, the findings also suggest a need to go further. The studies reviewed in sections 2.1 and 2.2 find that there is too much oil and gas in the fields that are already producing or under development: this implies no new fields should be developed, including those that already have licences.

The lifecycle of an oil or gas field involves two sets of administrative decisions. First, the award of a licence grants a company rights to explore a defined area. Second, if the company finds oil or gas, it requires a development consent to build the necessary facilities to extract it (such as platforms, subsea tiebacks and pipelines). This second decision has been controversial in the case of consents granted by the previous Government for development of the Rosebank and Jackdaw fields. As noted in section 1, the Scottish Court of Session found those consents to have been granted unlawfully, because they did not consider the climate impacts of consuming the oil and gas. It is now up to the present Government to decide whether to grant those consents. The evidence summarised in this report suggests it should refuse those consents due to the overwhelming public interest in increasing the chances of limiting global warming to within 1.5°C above pre-industrial levels.

The UK has long been seen as a leader on climate change, pioneering policy measures to drive down emissions and transform the UK's energy system, in line with bold objectives informed by climate science. The UK was the first country to enact a legally binding framework to reduce greenhouse gas emissions, in the Climate Change Act of 2008. During the 2010s, the UK reduced its coal power generation by 95%, faster than any other country. And in 2019, the UK became the first country to adopt a net zero emissions target. Now, with oil and gas production, the UK has an opportunity to lead again, and to seize the opportunities that come with clean energy.

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