2022 Report

The Production GAP

1 Glossary

Countries' plans and projections (CPP)

A global pathway of fossil fuel production estimated in this report, based on our review and assessment of recent national energy plans, strategy documents, and outlooks published by governments and affiliated institutions.

Extraction-based emissions accounting

An accounting framework that attributes greenhouse gas emissions from the burning of fossil fuels to the location of fuel extraction.

Fossil fuel production

A collective term used in this report to represent processes along the fossil fuel supply chain, which includes locating, extracting, processing, and delivering coal, oil, and gas to consumers.

Greenhouse gases (GHGs)

Atmospheric gases that absorb and emit infrared radiation, trap heat, contribute to the greenhouse effect, and cause global warming. The principal GHGs are carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), as well as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6).

Just transition

In the context of climate policy, this refers to a shift to a low-carbon economy that ensures disruptions are minimized for workers, communities, consumers, and other stakeholders who may be disproportionately affected (ITUC 2017; UNFCCC 2016).

Long-term low greenhouse gas emission development strategies (LT-LEDS)

Under the Paris Agreement and its accompanying decision, all countries are invited to communicate LT-LEDS by 2020, taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

Nationally determined contributions (NDCs)

Submissions by Parties to the Paris Agreement that contain their stated ambitions to take climate change action towards achievement of the Agreement's long-term goal of limiting global temperature increase to well below 2°C, while pursuing efforts to limit the increase to 1.5°C. Parties are requested to communicate new or updated NDCs by 2020 and every five years thereafter.

Production gap

The discrepancy between countries' planned fossil fuel production and global production levels consistent with limiting warming to 1.5°C or 2°C.

Stranded assets

Assets that suffer from unanticipated or premature write-offs or downward revaluations, or that are converted to liabilities, as the result of a low-carbon transition or other environment-related risks (Ansar et al. 2013).

Subsidy

A financial benefit accorded to a specific interest (e.g. an individual, organization, company, or sector) by a government or public body including direct transfer of government funds; tax expenditure, other revenue foregone, and underpricing of goods and services; induced transfers (price support); and transfer of risk to government.

2 Abbreviations

AFOLUA.. griculture, forestry, and other land use
Bcf..... Billion cubic feet
BECCS .... Bioenergy with carbon capture and storage
CCS ..... Carbon capture and storage
CDR..... Carbon dioxide removal
CH4..... Methane
CO2 ..... Carbon dioxide
CO2e ..... Carbon dioxide equivalent
CPP ..... Countries' plans and projections
°C ..... Degree Celsius
DFI..... Development finance institution
ECA ..... Export credit agency
EITI ..... Extractive Industries Transparency Initiative
EJ ..... Exajoule
EU..... European Union
FPIC..... Free, prior, and informed consent
G7 ..... Group of Seven
G20 ..... Group of Twenty
GDP ..... Gross domestic product
GHG..... Greenhouse gas
Gt..... Gigatonne (billion tonnes or metric tons)
IEA..... International Energy Agency
ILO..... International Labour Organization
IMF..... International Monetary Fund
IPCC ..... Intergovernmental Panel on Climate Change
LNG ..... Liquefied natural gas
LT-LEDS . Long-term, low-emission development strategies
Mb/d ..... Million barrels per day
MDB ..... Multilateral development bank
Mt ..... Million tonnes (metric tons)
NDC..... Nationally determined contribution
NOC..... National oil and gas company
NZE ..... IEA's Net Zero by 2050 pathway for the energy sector
OECD ..... Organization for Economic Co-operation and Development
OPEC ..... Organization of the Petroleum Exporting Countries
PFI..... Public finance institution
PGR..... Production Gap Report
SDG..... Sustainable Development Goal
SOE..... State-owned enterprise
TCFD ..... Taskforce for Climate-Related Financial Disclosures
UAE ..... United Arab Emirates
UN ..... United Nations
UNEP..... United Nations Environment Programme
UNFCCC . UN Framework Convention on Climate Change
UK ..... United Kingdom
US..... United States
WTO ..... World Trade Organization

3 Executive Summary

Governments plan to produce more than twice the amount of fossil fuels in 2030 than would be consistent with limiting warming to 1.5°C. The production gap has remained largely unchanged since our first analysis in 2019.

Global fossil fuel production must start declining immediately and steeply to be consistent with limiting long-term warming to 1.5°C.

Most major oil and gas producers are planning on increasing production out to 2030 or beyond, and several major coal producers are planning on continuing or increasing production.

G20 countries have directed more new funding to fossil fuels than clean energy since the beginning of the COVID-19 pandemic.

International public finance for the production of fossil fuels from G20 countries and multilateral development banks (MDBs) has significantly decreased in recent years.

Governments have a primary role to play in closing the production gap and in ensuring that the transition away from fossil fuels is just and equitable.

This report first introduced and quantified the production gap in 2019, finding that the world's governments planned to produce far more fossil fuels than consistent with their Paris Agreement commitment to limit global warming. Two years on, with the climate crisis clearer and more urgent than ever, governments continue to bet on extracting far more coal, oil, and gas than is consistent with agreed climate limits.

Specifically, this report's production gap analysis, the first full update since 2019, finds that the world's governments still plan to produce more than double the amount of fossil fuels in 2030 than would be consistent with limiting global warming to 1.5°C, and 45% more than consistent with limiting warming to 2°C. Collectively, although many governments have pledged to lower their emissions and even set net-zero targets, they have not yet made plans to wind down production of the fossil fuels that, once burned, generate most of those emissions. The latest Intergovernmental Panel on Climate Change report issued an important call to action: we are running out of time to limit long-term global warming to 1.5°C or even 2°C. This report shows that doing so requires steep and sustained reductions in fossil fuel production and use. The world's governments must take urgent action to close the production gap.

As countries set net-zero emission targets, and increase their climate ambitions under the Paris Agreement, they have not explicitly recognized or planned for the rapid reduction in fossil fuel production that these targets will require. Rather, the world's governments plan to produce more than twice the amount of fossil fuels in 2030 than would be consistent with limiting warming to 1.5°C. The production gap has remained largely unchanged since our first analysis in 2019.

Since the release of the first Production Gap Report in 2019, many governments have announced new, more ambitious greenhouse gas (GHG) emission reduction targets, including net-zero pledges. While this is a positive development, only a few fossil-fuel-producing countries have begun to grapple with how zeroing out global GHG emissions will affect their future coal, oil, and gas production.

As shown in Figure ES.1, according to our assessment of recent national energy plans and projections, governments are in aggregate planning to produce 110% more fossil fuels in 2030 than would be consistent with limiting global warming to 1.5°C, and 45% more than would be consistent with limiting warming to 2°C, on a global level. By 2040, this excess grows to 190% and 89%, respectively.

Collectively, governments are planning and projecting production levels higher than those implied by their emission reduction goals, as announced in their nationally determined contributions (NDCs) under the UN climate process and other climate policies as of mid-2020.

Global fossil fuel production must start declining immediately and steeply to be consistent with limiting long-term warming to 1.5°C.

However governments are collectively projecting an increase in global oil and gas production, and only a modest decrease in coal production, over the next two decades. This leads to future production levels far above those consistent with limiting warming to 1.5°C or 2°C.

The production gap is widest for coal in 2030: governments' production plans and projections would lead to around 240% more coal, 57% more oil, and 71% more gas than would be consistent with limiting global warming to 1.5°C.

Compared to global production levels under the 2°C-consistent pathways, governments' production plans and projections would lead to 120% more coal, 14% more oil, and 15% more gas in 2030. The production gaps for all fuels grow much wider by 2040 under both temperature limits

This disconnect could be even worse than our analysis implies. As explored in Chapter 2, our estimate of the size of the production gap depends on model assumptions and conceptions of how the low-carbon transition unfolds, such as how much carbon dioxide can be captured and stored or sequestered, and the tradeoffs among different emission-reduction strategies. If carbon dioxide removal technologies fail to develop at large scale, or if methane emissions are not rapidly reduced, the production gap would be wider than estimated here. Furthermore, Chapter 2 shows that minimizing methane emissions from fossil fuel extraction and distribution alone is not a substitute for a rapid wind-down in fossil fuel production itself.

G20 countries have directed nearly USD 300 billion in new funds towards fossil fuel activities since the beginning of the COVID-19 pandemic, more than they have toward clean energy. In contrast, they have significantly decreased new international public finance for fossil fuel production in recent years; multilateral development banks (MDBs) and G20 development finance institutions (DFIs) holding a total of over USD 2 trillion in assets have adopted policies that exclude fossil fuel production activities from future finance.

The trajectory of fossil fuels will be shaped by the unprecedented levels of investment that many governments are now injecting into their economies, as part of their COVID-19 recovery efforts. Since January 2020, G20 countries have directed USD 297 billion of new public financial commitments towards fossil-fuel-consuming and -producing activities. Though governments have begun to shift more of their COVID-19 recovery spending to clean energy, they still spend more on support for fossil fuels.

While international public finance institutions continue to support fossil fuel extraction, distribution, and processing, there are promising trends: new public finance for the production of fossil fuels from MDBs and G20 countries has significantly decreased since 2017, and, increasingly, MDBs and G20 DFIs have policies that exclude future investment in these activities.

This report details the government strategies, support, and plans for fossil fuel production in 15 major producer countries. Most major oil and gas producers are planning on increasing production out to 2030 or beyond, while several major coal producers are planning on continuing or increasing production.

This report provides country profiles for Australia, Brazil, Canada, China, Germany, India, Indonesia, Mexico, Norway, Russia, Saudi Arabia, South Africa, the United Arab Emirates, the United Kingdom, and the United States. The profiles summarize each country's stated national climate ambitions; available information on government views, projections, and support for fossil fuel production; and emerging policies and discussions towards a managed and equitable wind-down of production.

These countries have announced GHG emission reduction targets through their NDCs and, in some cases, have set net-zero goals. However, few have assessed, at least publicly, whether their projected fossil fuel production is consistent with the goals of the Paris Agreement. This focus on emissions alone ignores their roles and responsibilities in producing the predominant source of these emissions.

Moreover, the country profiles show that most of these governments continue to provide significant policy support for fossil fuel production, through tax breaks, finance, direct infrastructure investments, exemptions from environmental requirements, and other measures. Most major oil- and gas-producing countries are planning on expanding production. For coal, some countries plan to reduce production while others still plan to continue or increase it. While some countries are beginning to discuss and enact policies towards a just and equitable transition away from fossil fuel production, these efforts have not yet affected the plans and strategies of major producing countries.

Verifiable and comparable information on fossil fuel production and support, from both governments and companies, is essential to addressing the production gap. Governments should strengthen transparency by disclosing their production plans in their climate commitments under the Paris Agreement.

While existing transparency initiatives have shed some light on fossil fuel production, the available information is incomplete, inconsistent, and scattered. Addressing the production gap requires governments to be far more transparent in their plans and projections for oil, gas, and coal production.

Governments have already committed to reporting climate-related information as part of the Paris Agreement. This reporting currently focuses on emissions goals, but governments could also include

production plans and projections in their NDCs, their long-term, low-emissions development strategies (LT-LEDS), and their progress reports on implementing and achieving their NDCs.

Governments can also mandate that investor- and stateowned fossil fuel companies disclose their spending, project plans, emissions, and climate-related financial risks in a way that is consistent across countries.

Governments have a primary role to play in closing the production gap.

In addition to strengthening measures to reduce the demand for fossil fuels, governments should also take actions to ensure a managed and equitable decline in production, such as the following:

- Acknowledge in their energy and climate plans that there is a need to wind down global fossil fuel production in line with the Paris Agreement's temperature limits. This creates impetus and accountability for policy action.
- Chart the course towards a rapid, just, and equitable wind-down of fossil fuel production as part of overall decarbonization plans. Comprehensive efforts to wean countries off the use of coal, oil, and gas should be coupled with strategies to ramp down production to ensure a less disruptive transition.
- Place restrictions on fossil fuel exploration and extraction to avoid locking in levels of fossil fuel supply that are inconsistent with climate goals.
- Phase out government support for fossil fuel production. Governments can end subsidies and other support for production, exclude fossil fuels from public finance, and direct greater support towards low-carbon development.
- Leverage international cooperation to ensure a more effective and equitable global wind-down of production. A just, equitable, and effective transition will require greater international support for countries highly dependent on fossil fuel production and with limited financial and institutional capacity. Countries with greater capacity can lead the way.

4 Introduction

For many people, the extraction, processing, and burning of coal, oil, and gas is invisible; it happens out of sight and out of mind. We turn on lights, heat water, light a stove, buy goods and rarely see the physical fuel itself, let alone the emissions caused by burning it. Further from view is where the fuel came from: the well or mine.

Governments, however, very much have fossil fuels in their sights. The production and export of fossil fuels can support or hinder local economies, aid or impede alliances between countries, and make or break the political careers of government policymakers.

This report, now in its third edition, highlights the tension between the importance that governments have traditionally attached to fossil fuels and a harmful effect of fossil fuel production and trade: global warming. We find that government plans for fossil fuel production are still far more in line with worsening climate disasters than they are with internationally agreed temperature limits.

This disconnect is the production gap, the difference between government plans for fossil fuel production and the levels consistent with globally agreed climate limits. And while the breadth of the gap is sobering, governments have the power to address it.

Fossil fuels are something governments have substantial control over. More than half of the world's fossil fuel production is directly owned by governments, including by state-owned companies. Even when governments do not directly own fossil fuels, their policies and permits still control, to a large degree, how much fossil fuel gets extracted.

This ability to steer fossil fuel supply can be an important component of meeting global temperature and emissions goals, including net-zero emissions targets. When fewer fossil fuels are produced, fewer are burned, and fewer greenhouse gas emissions are released. Therefore, by working together to constrain fossil fuel production, countries can help bend the emissions curve downwards on a path towards net zero.

Working together on emissions from fossil fuels is something nations already do, through major critical venues like the United Nations Framework Convention on Climate Change (UNFCCC), which yielded the Paris Agreement in 2015. Though nations have also cooperated on steering fossil fuel production, such as through the Organization of the Petroleum Exporting Countries (OPEC), they have not yet done so with the intent of limiting climate change.

A few countries, however, are starting to announce their intentions to ban or move away from producing fossil fuels. This collection of nations is so far composed of countries with relatively limited fossil fuel resources (such as Costa Rica and Denmark), but it could expand, while other groups and coalitions of fossil-fuel-producing nations could form or adapt their missions to focus on climate.

After all, major fossil-fuel-producing countries have reason to limit the supply of fossil fuels: tighter supply leads to higher prices and revenues for existing fossil fuel resource holders, which can boost local economies. Higher prices also can help reduce emissions.

Governments may be wary of being perceived as getting too directly involved in fossil fuel markets in a way that might increase prices for energy consumers. That is understandable, and fossil fuel prices that are too high can negatively affect the economy. However, the bigger, longer-term risk is instead prices that are too low. By enacting measures to limit greenhouse gas emissions in line with the Paris Agreement, and hence cutting fossil fuel demand, countries will already be pushing producer prices lower.

As an example of the problem of low fossil fuel prices, the International Energy Agency (IEA) recently found in its Net Zero by 2050 report that oil prices could head steadily downward

toward USD 37 per barrel by the end of this decade, as nations move to low-carbon forms of transport such as electric vehicles. To ward off volatility and keep prices from sinking even lower, the IEA foresees that even fossil-fuel-rich states may need to purposefully limit supply, so as not to threaten the financial value of their existing deposits.

In other words, working together to limit supply, in tandem with demand, could bring more certainty to the markets, adding extra force to the low-carbon transition.

Furthermore, constraining supply can help ensure that, as fossil fuel demand declines, prices do not get so low as to spur new consumption, undermining the path to net-zero emissions. Put simply, limits on supply can ensure that when increasingly stringent climate policy prevents a barrel of oil or ton of coal from being burned in one location, it is not instead burned somewhere else.

The way forward for aligning fossil fuel production with climate limits is not easy. Government efforts to limit fossil fuel production will need strong support to succeed politically. That is a challenge, in part due to the long history of fossil fuel extraction and associated social and political institutions that maintain fossil fuel dominance in many coal-, oil-, and gas-producing communities.

One source of support may be local residents. They feel the health effects of extracting fossil fuels, whether through water pollution, coal dust, or other dangerous chemicals in the air. Local residents also value biodiversity, recreation, and tourism; fossil fuel development conflicts with these priorities. And, in many areas of the world, engaged citizens are the ones who have most clearly pointed out the disconnect between fossil fuel development and climate change mitigation.

Another source of support may be the courts. National courts in some countries have issued rulings that underscore the conflict between expanding fossil fuel production and climate limits. For example, the District Court of The Hague in the Netherlands ruled that Royal Dutch Shell's production levels contribute to global warming, and that, by reducing production of fossil fuels, Shell would help reduce global carbon emissions.

Still, few national policymakers are on board with limiting fossil fuel supply in the name of climate protection. The most recent cooperative climate effort from major fossil-fuel-producing national governments, the Net-Zero Producers Forum, has thus far focused on extracting fossil fuels in less-polluting ways, not on winding down production levels in line with climate goals.

Those efforts are important, as reducing methane and other emissions at fossil fuel extraction sites is a critical step in meeting the goals of the Paris Agreement. But as we show in this report, making fossil fuel extraction less polluting is also highly insufficient. The overall levels of fossil fuel production urgently need to decrease.

Governments, with fossil fuels under their policy control, are key to closing the production gap. They can establish the norms and rules that will ensure that companies extract less fossil fuels, and only they have the broad, economy-wide interests, power, and responsibilities to protect social and economic stability during the transition. While private-sector actors, including energy companies and financial institutions, should also move away from extracting and investing in fossil fuels, their action is no substitute for the economy-wide, public-interest role and responsibility of government.

This report thus focuses on governments, and their role in widening, or closing, the production gap. It quantifies the size of the production gap, summarizes how governments support fossil fuel production, details how governments in 15 key countries deal with fossil fuel production, and highlights opportunities for strengthening the transparency necessary to help close the production gap. Finally, a concluding chapter discusses how governments can manage the decline of fossil fuel production in line with climate goals in a just and equitable way.

5 The production gap

The world's governments are planning to produce 110% more fossil fuels in 2030 than would be consistent with limiting global warming to 1.5°C, and 45% more than would be consistent with limiting warming to 2°C. The production gap grows much wider by 2040.

The size of the production gap has remained largely unchanged compared to our prior assessments.

The production gap is widest for coal: governments' production plans and projections would lead to around 240% more coal, 57% more oil, and 71% more gas in 2030 than global levels consistent with limiting warming to 1.5°C.

Governments are in aggregate planning on increasing gas production out to at least 2040. This continued, long-term expansion in gas production is inconsistent with the Paris Agreement's temperature limits.

Global coal, oil, and gas production must start declining immediately and steeply to be consistent with limiting longterm warming to 1.5°C.

If carbon dioxide removal technologies fail to develop at large scale, fossil fuel production would need to decline even more rapidly.

Since the release of the first Production Gap Report in 2019, many governments have updated their nationally determined contributions (NDCs) under the Paris Agreement and announced new, more ambitious greenhouse gas (GHG) emission reduction targets, including net-zero pledges. While this is a positive development, only a few fossil-fuel-producing countries have begun to grapple with how zeroing out global GHG emissions will affect their future coal, oil, and gas production.

This chapter quantifies the global fossil fuel production gap: the discrepancy between the global levels of fossil fuel production implied by governments' plans and projections and the levels consistent with the Paris Agreement's goals (namely, limiting warming to well below 2°C and "pursuing efforts to limit the temperature increase to 1.5°C"). It provides the first comprehensive update to the production gap estimate since the inaugural edition of this report in 2019. We first quantify the production gap, before discussing the major trends and drivers of the gap and its changes compared to our 2019 assessment. We then explore the uncertainties of the production gap, due to assumptions underlying different mitigation pathways.

5.1 The fossil fuel production gap

The calculation of the production gap relies on two major elements. The first is the pathway of global future fossil fuel production implied by the plans and projections of national governments. The second is the pathway of global fossil fuel production that would be consistent with limiting warming to 1.5°C or to 2°C.

The first element relies on our compilation of government projections for fossil fuel production, as outlined in recent and publicly available national energy outlooks and targets as of August 2021. This year, that includes outlooks from the eight major countries included in our 2019 report, as well as outlooks from seven additional countries. Altogether, these 15 countries accounted for around 75% of global fossil fuel extraction, on an energy basis, in 2020. Their combined production levels are then scaled up to a global estimate, based on these countries' projected future shares of global production. The result is our global countries' plans and projections pathway. Our updated assessment of the gap therefore reflects to the extent possible based on data availability how governments expect their fossil fuel production will be influenced by more ambitious climate mitigation targets and policies, the COVID-19 pandemic, and other factors.

The second element to the production gap is the pathway of global fossil fuel production that would be consistent with limiting warming to 1.5°C or to 2°C, based on the mitigation scenarios compiled by the Intergovernmental Panel on Climate Change (IPCC) for their Special Report on Global Warming of 1.5°C, which the IPCC refers to as SR1.5. These scenarios show how much primary energy is supplied by coal, oil, and gas under emissions pathways with varying global warming outcomes, from which we calculate the median values and interquartile ranges. We calculated the 2°C-consistent pathway as the median of scenarios that have at least a 66% probability of limiting warming to below 2°C over the entire 21st century

(meaning, no temperature overshoot), relative to the pre-industrial global average atmospheric temperature. We calculated the 1.5°C-consistent pathway as the median of scenarios with at least a 50% likelihood of limiting warming to below 1.5°C by end-of-century (meaning, with a low amount of temporary overshoot allowed before 2100). We further constrained these two sets of scenarios by how much carbon they sequester from bioenergy with carbon capture and storage (BECCS) and by afforestation; specifically, we only included scenarios in which BECCS sequesters an average of less than 5 billion tonnes of carbon dioxide per year (GtCO2/yr) and in which afforestation sequesters an average of less than 3.6 GtCO2/yr, both as assessed between 2040 and 2060. This approach follows the Climate Action Tracker's interpretation of sustainable limits for these carbon dioxide removal (CDR) practices, given their multiple feasibility and sustainability constraints, as noted by the IPCC (IPCC, 2018a, p. 19; New Climate Institute et al., 2018).

5.2 A breakdown of the "countries' plans and projections" pathway

In this section, we explore trends in major producer countries that underlie the global coal, oil, and gas countries' plans and projections (CPP) pathway, and then describe how these pathways have changed compared to our 2019 assessment.

This year's analysis of the CPP pathway comprises an evaluation of the most recent government plans and projections from the eight major fossil-fuel-producing countries we assessed in our 2019 report, as well as from seven additional countries. This year's analysis thus relies on the plans and projections of 15 major producer countries (countries added this year are denoted with an asterisk*): Australia, Brazil*, Canada, China, Germany*, India, Indonesia, Kazakhstan*, Mexico*, Norway, Russia, Saudi Arabia*, the United Arab Emirates (UAE)*, the United Kingdom (UK)*, and the United States (US). On an energy basis, these producer countries accounted for 75% of global fossil fuel production in 2020 (IEA, 2020). Within these 15 countries, 8 had government plans and projections for coal (accounting for around 90% of global production), 14 had projections for oil (70%), and 13 had projections for gas (65%).

For coal, projections under the CPP pathway in 2030-2040 have decreased slightly compared to our 2019 analysis. Still, governments' planned coal production will vastly exceed global levels consistent with limiting warming to 1.5°C — by 240% in 2030 and by 450% in 2040.

For gas, the global level of production estimated under the CPP pathway in 2030-2040 has remained largely unchanged since our 2019 analysis. Governments' planned gas production will exceed the levels consistent with limiting warming to 1.5°C by 71% in 2030 and by 150% in 2040.

Altogether, the largely unchanged outlooks for global coal, oil, and gas production under the CPP pathways in 2030 means that our estimate of the overall production gap has remained almost the same for that year. In 2040, small reductions in the levels of oil and coal under the CPP pathways translate to a very small narrowing of the overall gap (by 3%).

5.3 Implications of mitigation pathways on the production gap

As discussed in Section 2.1, one of two major elements we use to estimate the size of the production gap is the future pathways of global fossil fuel production that would be consistent with limiting warming to 1.5°C or 2°C. Our analysis relies on the set of mitigation pathways assembled by the IPCC SR1.5 (IPCC, 2018b). Each model scenario has its own estimates for how quickly coal, oil, and gas have to be phased down in order to meet the 1.5°C- and 2°C-warming limits of the Paris Agreement. We use the median values across scenarios to calculate the production gap, but this is not the only way this estimate could be made (Huppmann et al., 2018). For example, it is possible that certain groups of scenarios, or even individual scenarios on their own, are more plausible than the median values. There are also very different conceptions of how the low-carbon transition might unfold.

Accordingly, in this section, we explore how the size of the production gap might differ under the four illustrative pathways of the IPCC SR1.5 (IPCC, 2018b; Rogelj et al., 2018), as well as under IEA's recently released Net Zero by 2050 pathway (NZE) for the energy sector (IEA, 2021). Since these pathways are all designed to limit long-term warming to 1.5°C, we focus on this temperature limit in this section. Figure 2.4

shows how global fossil fuel production differs among different 1.5°C-consistent pathways, and how these six pathways compare to the countries' plans and projections pathway. We include the median pathway used to calculate the production gap, as well as the four IPCC SR1.5 illustrative pathways (termed P1, P2, P3, and P4) and the IEA NZE pathway.

IPCC chose the four illustrative pathways to demonstrate "the spectrum of CO2 emissions reduction patterns consistent with 1.5°C", which range from very rapid decreases, facilitated by efficiency and demand-side measures, to relatively slower reductions that lead to a temperature overshoot and necessitate large carbon dioxide removal (CDR) deployment later in the century (Rogelj et al., 2018, p. 99). CDR refers to various approaches to removing carbon dioxide from the air, including afforestation, reforestation, BECCS, direct air capture (DAC), enhanced weathering of minerals, and ocean fertilization (Minx et al., 2018). The two CDR methods most often included in the IPCC SR1.5 scenarios are BECCS and afforestation (Rogelj et al., 2018).

There are also other decarbonization roadmaps for limiting warming to 1.5°C beyond the model scenarios analysed and discussed here. For example, other researchers have explored pathways that do not assume continued growth in gross domestic production and do not rely on CDR technologies (Keyßer & Lenzen, 2021). Others have also pointed out that low-carbon pathways with limited CDR deployment and a faster phase out of fossil fuels will bring additional air pollution reduction and public health co-benefits (Shindell et al., 2018). Among all these models, the peak dates and decline rates in coal, oil, and gas production and use vary, depending on their assumptions. However, they all share one common outcome for meeting the temperature limits of the Paris Agreement: a global, long-term wind down of coal, oil, and gas production and use.

5.4 Conclusions

Our assessment of the most recent government plans and projections for fossil fuel production reveals that the world's governments plan on producing around 110% more fossil fuels in 2030 than would be consistent with the median 1.5°C-warming pathway, and 45% more fossil fuels than would be consistent with the median 2°C-warming pathway. The production gap has remained largely unchanged since our 2019 analysis. The gap remains proportionally largest for coal, even as governments plan small production decreases in aggregate. Meanwhile, governments plan to increase oil and gas production until at least 2040, leading to large production gaps for these fuels as well.

As shown in this chapter's analysis of modelled scenarios assembled by the IPCC, global coal, oil, and gas production (and consumption) have to start declining immediately to be consistent with limiting warming to 1.5°C. Global coal and oil also have to decline immediately to be consistent with a 2°C limit, while gas production must decline no later than 2030. However, current government plans and outlooks for fossil fuel production would take the world in the opposite direction, creating an ever-widening production gap that is vastly inconsistent with the Paris Agreement's goals.

This disconnect could be even worse than our analysis implies. As explored in this chapter, our estimate of the size of the production gap partly depends on model assumptions and conceptions of how the energy sector can be decarbonized, such as how much carbon dioxide emissions can be captured and stored or sequestered, or how much methane emissions can be reduced in the near term. If CDR technologies fail to develop at large scale, a precautionary approach would demand that fossil fuel production and use decline even more rapidly than in our median 1.5°C- and 2°C-consistent pathways. Similarly, relying on other near-term, emission-reduction strategies to compensate for the delayed availability of CDR technologies, such as minimizing methane emissions from fossil fuel extraction and distribution, is not a substitute for a sustained wind-down in fossil fuel production and use.

6 Government support and policies for fossil fuel production

Governments continue to commit more funds to fossil fuels than to clean energy through their COVID-19 recovery plans.

Since the adoption of the Paris Agreement, public finance institutions have spent at least USD 294 billion supporting fossil fuels overseas.

Major multilateral development banks (MDBs) and G20 countries have significantly decreased new international public finance for production since 2017. MDBs and G20 development finance institutions (DFIs) holding a total of over USD 2 trillion in assets have adopted policies that exclude fossil fuel production activities from future finance.

Governments have an opportunity to reduce production through their leverage in state-owned companies, which control 50% of global oil and gas production and 55% of global coal production. However, current trends instead show an increase in government support for fossil fuel production and infrastructure.

Seven of the 15 major fossil-fuel producing countries analysed in this report have made net-zero emissions pledges. At the same time, most still plan on increasing their oil and gas production until at least 2030, in contradiction with the global production declines needed to limit warming to 1.5°C or 2°C.

Governments have injected trillions of US dollars into the economy to respond to the consequences of the COVID-19 pandemic. Many governments have committed to using some of these funds to "build back better," including through public investment in low-carbon development, high-quality clean energy jobs, and a just transition for all. However, the policies, investments, and measures adopted so far have yet to match up with this "build back better" commitment.

Since the start of the pandemic, many governments have added to their long-standing support for domestic and overseas fossil fuel production through tax breaks, direct government spending, public finance, and support for state-owned enterprises (SOEs) (Geddes et al., 2020; Sanchez et al., 2021). This increase in support stands in contrast with the declines in production necessary to meet the Paris Agreement's goals, as well as with the International Energy Agency's recent report that found that "there is no need for investment in new fossil fuel supply" in a scenario that limits warming to 1.5°C.

This chapter reviews both the way in which the COVID-19 pandemic has influenced new public support for fossil fuels and the mixed trends in government institutions' efforts to shift public support away from fossil fuel production.

6.1 Plans, targets, and projections

Governments are key entities in driving future fossil fuel production. Not only do SOEs control more than half of global fossil fuel production (Beaton & Roberts, 2019; Nelson et al., 2014; NRGI, 2021), but governments also influence the decision-making of private fossil fuel companies and investors, including through their plans, targets, and projections for fossil fuel production. The future trajectory of fossil fuels is also being shaped by the unprecedented levels of COVID-19-related investment that many governments are injecting to boost their economies. The IEA and International Monetary Fund (IMF) now both project strong rebounds in oil demand and supply in coming years (IMF, 2021; IEA, 2021a).

At the same time, a growing number of countries have announced targets to achieve net-zero emissions by mid-century. As of July 2021, 53 countries and the European Union, representing more than two thirds of global GHG emissions and 93% of global GDP, have pledged net-zero emissions targets (Climate Watch, 2021; Energy & Climate Intelligence Unit, 2021). Seven of the 15 major fossil fuel producers profiled in Chapter 4 have adopted such commitments. Meeting these targets will require declines in fossil fuel production alongside reductions in consumption. Yet, most producer countries with net-zero targets still plan on increasing their oil and gas production, as do most who lack such targets. Indonesia, Norway, and the UK do project declines in the long term. But such trends are primarily a reflection of natural resource depletion (as producing fields become exhausted), rather than the result of intentionally aligning

production with a decarbonized future. All major coal-producing countries with net-zero targets also project some declines in coal production; however, among those without them, some are still projecting significant production increases this decade, notably India and Russia.

Many countries continue to view expanding fossil fuel production as a key lever for their national development, energy security, and sovereignty (Harrison & Bang, 2021).

6.2 National support mechanisms

At the national level, governments support fossil fuel production through a variety of financial, regulatory, and administrative mechanisms. In this section, we pay specific attention to financial mechanisms, including fossil fuel subsidies,17 aid to state-owned coal and oil and gas companies, and public funding commitments approved during the COVID-19 pandemic.

6.2.1 COVID-19 response and economic recovery

The scale and type of COVID-19 economic responses have varied widely across countries. Many wealthier countries have been able to rapidly fund large stimulus efforts, while many low- and middle-income countries are struggling to mobilize support at scale, burdened by high levels of debt and unfavourable conditions in international markets (Kose et al., 2021; O'Callaghan & Murdock, 2021).

Several research efforts are tracking the potential climate, social, and environmental implications of economic measures approved during the COVID-19 pandemic. While they differ in scope, sectoral coverage, and methods, their findings are broadly aligned. The Global Recovery Observatory found that as of August 2021, only 23% (USD 530 billion) of announced economic recovery spending (USD 2.35 trillion) was green spending (Global Recovery Observatory, 2021). Another assessment found that, as of July 2021, stimulus measures in 20 of 30 countries analysed are likely to have a net negative environmental impact (Vivid Economics & Finance for Biodiversity Initiative, 2021). Focusing on energy-intensive sectors, the Energy Policy Tracker found that since January 2020, G20 countries have directed 45% (USD 297 billion) of new public money commitments towards fossil-fuel-consuming and -producing activities (Energy Policy Tracker, 2021).

In late 2020, countries' proportion of expenditure toward green policies increased, though governments continue to commit more COVID-19 funds to fossil fuels than to clean energy (Dufour et al., 2021; Green Recovery Tracker, 2021; SEI et al., 2020; Vivid Economics & Finance for Biodiversity Initiative, 2021).

As part of their COVID-19 responses, governments have provided support to the production of fossil fuels through new tax incentives, guarantees, regulatory changes, and other financial support, largely without accompanying social, economic, or environmental requirements (Energy Policy Tracker, 2021). Between January 2020 and June 2021, 31 countries added over USD 55 billion in support to production of fossil fuels (Energy Policy Tracker, 2021). This may be an underestimate, given the lack of data and transparency in many countries.

6.2.2 Fossil fuel subsidies

A large number of fossil fuel production and consumption subsidies predate the COVID-19 pandemic. In 2019, fossil fuel subsides totalled approximately USD 468 billion (OECD, 2021). While lower fossil fuel prices have driven a recent decline in fossil fuel consumer subsidies, fossil fuel producer subsidies have been on the rise (OECD, 2021).

In 2019, subsidies supporting the production of fossil fuels increased by 30% compared to 2018 levels, reaching a total of USD 53 billion, according to the data collected on 50 OECD members, non-OECD G20 members, and economies in the European Union's Eastern Partnership (OECD, 2021). The surge in production subsidies among OECD countries was driven by attempts to alleviate corporate debt and promote investment in fossil fuel infrastructure — trends that the COVID-19 pandemic exacerbated in 2020 (OECD, 2021). The increase was particularly prominent in North America, due in part to Mexican government efforts to shore up its heavily indebted stateowned oil company, Pemex, and to automatic increases in long-standing US subsidies as oil prices declined and production increased (OECD, 2021).

This trend is at odds with the commitment made by G20 countries in 2009 to "rationalise and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption, while providing targeted support for the poor" (G20, 2009), and the reaffirmed G7 commitment to "eliminating

inefficient fossil fuel subsidies by 2025" (G7, 2021). The lack of progress in reforming fossil fuel subsidies is a lost opportunity, as such reforms could free up scarce public resources to build back better from the pandemic (IISD, 2021)

6.2.3 State-owned coal and oil and gas companies

Support channelled into fossil fuel production and infrastructure through state-owned enterprises (SOEs), specifically, national oil, gas, and coal companies, also plays a prominent role in the evolution of the production gap. National oil and gas companies (NOCs) are responsible for more than 50% of global oil and gas production, and national coal companies control around 55% of global coal production. NOCs account for 40% of total investment in oil and gas worldwide, making them one of the largest vehicles steering public revenues toward fossil fuel production (Manley & Heller, 2021).

6.3 Multilateral and bilateral finance

International finance plays a significant role in supporting fossil fuel production. We focus here on international public support provided by governments through bilateral export credit agencies (ECAs), development finance institutions (DFIs), and multilateral development banks (MDBs). This finance in the form of loans, grants, equity, insurance, and guarantees, is often provided at preferential below-market rates and has a significant impact on what projects get implemented by leveraging substantial additional commercial investment; international private finance has provided trillions of US dollars to fossil fuels since the adoption of the Paris Agreement (Rainforest Action Network et al., 2021). Public finance institutions (PFIs) also shape the energy landscape by signalling government priorities, providing political cover and pre-investment support (OECD, 2017; Tucker et al., 2020).

6.3.1 Scale of finance

Governments have committed to making finance flows "consistent with a pathway towards low GHG emissions and climate-resilient development" (Paris Agreement, 2015 Art. 2.1(c)). Since the adoption of the Paris Agreement, however, international PFIs have continued to support fossil fuels significantly, totalling USD 294 billion since 2016. From 2017 to 2019, international public finance for fossil fuels from major MDBs25 and G20 countries averaged USD 62 billion a year, including USD 28 billion for fossil fuel extraction, distribution, and processing (OCI, 2021).

6.3.2 Fossil fuel exclusion policies

Meanwhile, a growing number of PFIs have made commitments to limit or exclude fossil fuels from their future investments and align with the Paris Agreement goals (Bhattacharya et al., 2019; Larsen et al., 2018; Finance in Common Summit, 2020; IDFC & MDBs, 2017). At the time of writing, the European Investment Bank is the only MDB to formally exclude all unabated energy fossil fuel projects (EIB, 2019, p. 4). Most other institutions with exclusion policies have limited them to fossil fuel production.

6.4 Conclusions

As Chapter 2 shows, global coal, oil, and gas production need to decline steeply if we are to limit global warming to 1.5°C or 2°C. In contrast, many countries continue to offer significant support to new and increased fossil fuel production and are even increasing this support when it comes to subsidies and pandemic recovery packages. A significant course correction, including profound changes in technology deployment, policy adoption, and financing, is needed if the world is to get on track with an equitable, low-carbon recovery that is consistent with the Paris Agreement goals. In their efforts to "build back better," governments should shift their support away from fossil fuel production and towards preparing for a managed transition that equitably addresses the needs of people and communities. Some governments and international financial institutions have begun to take encouraging steps in this direction. These efforts need to deepen and more must follow.

7 Fossil fuel production and policies in key countries

This chapter provides an overview of the climate ambitions and fossil fuel production plans, views and policies for 15 key producer countries: Australia, Brazil, Canada, China, Germany, India, Indonesia, Mexico, Norway, Russia, Saudi Arabia, South Africa, the UAE, the UK, and the US.

These countries have announced various emission reduction targets through their nationally determined contributions (NDC) and, in several cases, have set net-zero goals. Few have assessed, at least publicly, whether their projected fossil fuel production is compatible with limiting global warming to 1.5°C or well below 2°C.

Most major oil and gas producers are planning on increasing production out to 2030 or beyond, while several major coal producers are planning on continuing or increasing production.

A few countries are beginning to discuss and enact policies towards a just and equitable transition away from fossil fuel production. However, these efforts have not yet affected the plans and strategies of major producer countries.

This chapter surveys government strategies, support, and plans and projections for fossil fuel production across 15 key countries. The first eight countries, China, the United States, Russia, Saudi Arabia, Indonesia, Australia, India, and Canada are the largest global producers of fossil fuels in terms of extraction-based CO2 emissions. The remaining seven countries represent other major producers with readily available data (United Arab Emirates, South Africa, Brazil, and Mexico), as well as those with strongly stated climate ambitions (Norway, the United Kingdom, and Germany). Altogether, these 15 countries accounted for 77% of global, extraction-based CO2 emissions in 2019.

Each of the 15 profiles in this chapter includes a summary of the country's stated national climate ambitions; available information on government views, projections, and support for fossil fuel production; and emerging policies and discussions towards a managed and equitable wind-down of production. The profiles draw on national energy plans and outlooks published by government and affiliated institutions; on studies by government, research, and intergovernmental institutions; and on other publicly available information.

These countries' plans and projections for domestic fossil fuel production underpin the global gap analysis detailed in Chapter 2. We do not provide an assessment on whether each individual country's projected level of fossil fuel production would be consistent with limiting global warming to 1.5°C or 2°C. This would require making assumptions and establishing principles for how to equitably distribute the remaining global fossil fuel extraction consistent with these temperature limits, taking into account factors including, but not limited to, countries' relative capacity to transition away from fossil fuel production, relative economic dependence on production, relative costs of production, and historical responsibility in terms of past extraction and benefits accrued (Caney, 2016; McGlade & Ekins, 2015; Muttitt & Kartha, 2020; Pye et al., 2020; SEI et al., 2020).

As one starting point for considering how to effectively and equitably align their domestic production with the Paris Agreement's goals, countries could look to global decline rates that would be consistent with these goals. As shown in Chapter 2, annual average decline rates of around 11% for coal, 4% for oil, and 3% for gas between 2020 and 2030 would be consistent with limiting warming to 1.5°C, based on the mitigation scenarios compiled by the Intergovernmental Panel on Climate Change (IPCC). In order to ensure a just and equitable wind-down, countries with greater capacity and lower dependency on fossil fuels will likely need to wind down their production faster than the global average. Meanwhile, countries with limited capacity will need financial, technological, and capacitybuilding support from the international community, as discussed in Chapter 4 of the 2020 Production Gap Report (SEI et al., 2020).

The countries profiled here have announced various emission reduction targets through their nationally determined contributions (NDCs) and, in several cases, have set net-zero goals. However, this focus on emissions alone ignores their roles and responsibilities in producing the predominant source of these

emissions, fossil fuels. Achieving net-zero emissions globally will require countries to wind down their production of coal, oil, and gas. To date, few producer countries have assessed, at least publicly, whether their projected fossil fuel production is compatible with limiting global warming to 1.5°C or well below 2°C.

In April 2021, the governments of Canada, Norway, Saudi Arabia, and the US, along with Qatar, announced a "Net-Zero Producers Forum" with goals to "form a cooperative forum that will develop pragmatic net-zero emission strategies, including methane abatement, advancing the circular carbon economy approach, development and deployment of clean-energy and carbon capture and storage technologies, diversification from reliance on hydrocarbon revenues, and other measures in line with each country's national circumstances" (U.S. Department of Energy, 2021). Further details have not emerged since this initial announcement, and the Forum has not acknowledged or addressed the need to reduce production itself.

8 The critical role of transparency in addressing the production gap

Verifiable and comparable information on fossil fuel production and support from both governments and companies is essential to addressing the production gap.

Existing transparency initiatives shed some light on fossil fuel production and its implications for meeting climate goals, but available information is incomplete, often inconsistent and scattered across various, mostly voluntary, government-driven and non-governmental efforts.

Governments should strengthen transparency by disclosing their fossil fuel production plans and projections, and how these align with climate goals. They should do this in their published national climate and energy plans, including in their nationally determined contributions (NDCs) and their long-term, low-emission development strategies under the Paris Agreement.

Governments should require that both private- and stateowned fossil fuel companies disclose their spending, project plans, emissions, and climaterelated financial risks, and do so in a consistent manner across countries.

The public disclosure of verifiable and comparable information by governments and corporations is key to addressing the fossil fuel production gap. Such information can reveal the extent to which governments are supporting fossil fuel production, and provide insights into how countries can wind down production in light of the Paris Agreement's goals.

Transparency strengthens climate and energy policymaking in several ways. It helps policymakers better understand the scope of a problem, clarifying the social, economic, and environmental consequences at stake. Openness and disclosure can also encourage more inclusive and participatory decision-making. Moreover, transparency can help hold governments, companies, and other actors accountable, driving them to modify their behaviour by facilitating market pressure, public shaming, or litigation. When countries seek to simultaneously expand fossil fuel production and achieve greenhouse gas (GHG) emissions targets, transparency can highlight the inconsistencies in these domestic policies, and draw attention to the risk of stranded assets and communities.

Transparency further matters for international climate cooperation. It can reveal whether collective climate goals are being met, help identify which actors are making progress, which ones are lagging, and which ones require support, and facilitate learning between countries (Gupta & Mason, 2014; Hale, 2008). Moreover, countries tend to be more willing to increase policy ambition when their performance is verified by other countries (Bell et al., 2012; Chayes & Chayes, 1998; Victor, 2011). In the context of the production gap, transparency entails reporting production levels, plans, and support, in addition to the emissions-focused information covered by the international climate regime under the United Nations Framework Convention on Climate Change (UNFCCC).

This chapter highlights transparency initiatives and information gaps relevant to fossil fuel production (Section 5.1), and discusses how governments, companies, and other actors can strengthen transparency around fossil fuel production (Section 5.2).

8.1 Existing transparency initiatives and information gaps

Transparency is central to many international initiatives related to fossil fuels. International organizations such as the International Energy Agency (IEA) emerged with the specific aim of improving information sharing and collective action among fossil fuel consumer countries (Van de Graaf, 2015). The growing number of transparency and data collection efforts (summarized in online Appendix C) have diverse rationales and objectives for improving fossil fuel transparency, including: reducing fossil fuel price volatility through more accessible production data (e.g. the Joint Organisations Data Initiative, or JODI); removing fossil fuel market distortions (such as through data collection on fossil fuel subsidies by various

international organizations); and improving extractive industry governance (e.g. the Extractive Industries Transparency Initiative, or EITI).

These transnational initiatives have not, historically, focused on climate change. More recently, however, non-governmental organizations (NGOs) and the private sector have launched initiatives that can help to better understand the impacts of fossil fuel production on the climate. This has included the development of frameworks to assess climate-related financial risks through the Taskforce for Climate-Related Financial Disclosures (TCFD), understand fossil fuel industry emissions through the Climate Change Reporting Framework of the International Petroleum Industry Environmental Conservation Association (IPIECA), and monitor infrastructure development through trackers such as those developed by the non-profit Global Energy Monitor.

To better understand the extent of the production gap, improved transparency about fossil fuel production is urgently needed, including the disclosure of information on:

- National plans and policies for fossil fuel production, including: production data; licensing of fossil fuel resource exploration or extraction; plans and policies for future production, including underlying economic and technological assumptions; production levels implied by climate targets; GHG emissions embedded in fossil fuel exports; plans for decommissioning existing fossil fuel infrastructure; and assessments of whether production plans are equitable in the context of global climate objectives.
- Government support for production, including: fossil fuel production subsidies; domestic and international public finance for fossil fuel infrastructure; and other non-fiscal measures to promote or expedite production (e.g. fast-track approvals and regulatory exemptions).
- Fossil fuel companies' plans and strategies, including: information on the economic viability of fossil fuel reserves under different price conditions; details on investment and production plans and strategies, including underlying assumptions; end-use emissions from the coal, oil, and gas produced; and exposure to climate-related financial risk

In addition, further information is necessary to enable a well-managed and equitable transition away from fossil fuel production, including on: laws and policies to manage future fossil fuel production; estimates of the revenues that may be needed to replace lost fossil fuel rents and royalties; and data on the scale of the economic transition at national and subnational levels, including specific data on workforce transition needs. Information is also needed on the costs and liabilities associated with decommissioning fossil fuel production sites, and on the benefits of the transition (such as cost savings and public health benefits).

8.2 Strengthening transparency

If governments strengthened transparency around their fossil fuel production, they would facilitate the assessment of whether and how production plans align with climate goals. Moreover, such transparency can benefit a country's own citizens. In this section, we outline how governments can boost transparency by: 1) publicly releasing plans and policies for fossil fuel production, 2) reporting financial and non-financial support to production, and 3) mandating the disclosure of fossil fuel companies' plans and strategies, to assess their (mis)alignment with climate goals.

8.2.1 Transparency of national plans and policies for fossil fuel production

At present, only a handful of small producer countries have spelled out a strategy for aligning domestic fossil fuel production with international climate goals in their national climate and energy plans (Jones et al., 2021). There is a need for governments to provide clearer information in these plans about current and future fossil fuel production, and how they will manage the energy transition away from fossil fuels. Ideally, comprehensive climate and energy plans would include: details on historical and planned fossil fuel production; clear targets and timelines for bringing production in line with agreed climate goals; descriptions of planned or enacted policies to wind down fossil fuel production; measures introduced to support a just transition and economic diversification; and information on international cooperation to wind down fossil fuel production.

8.2.2 Transparency of government support for fossil fuel production

Governments also can strengthen transparency around their financial support for fossil fuel production, which they provide through government finance ministries, national development banks, export credit agencies (ECAs), and other public finance institutions. Very few of these institutions publicly report project-

level information. ECAs, for example, do not provide comprehensive and fully comparable data for fossil fuel projects, nor are there universal definitions of sectors and financial support metrics (Shishlov et al., 2020). Multilateral development banks (MDBs), by contrast, are more transparent, with many providing project-level information and a joint commitment in recent years to report on how bank activities help countries meet and exceed their climate goals (E3G, 2020; MDBs, 2019).

8.2.3 Transparency of fossil fuel companies

Notwithstanding some positive steps forward, fossil fuel companies, including publicly traded companies and state-owned enterprises (SOEs), still exhibit major gaps in their transparency around their investment and production plans and, more generally, their climate-related financial risks. Governments can play a key role in improving and enhancing the transparency of fossil fuel companies.

8.3 Conclusions

Improved transparency plays an essential role in both assessing and closing the fossil fuel production gap. It can provide governmental and non-governmental stakeholders with the needed information to support improved decision-making on fossil fuel production, infrastructure development, investment, and policies, thereby strengthening the accountability of governments' actions in light of climate goals. Moreover, transparency can facilitate international cooperation by building trust and promoting compliance with international commitments.

Various government-driven and non-governmental initiatives have begun to shed light on fossil fuel production and its impacts on climate goals. However, the available information is spotty and incomplete: many producer countries and companies have yet to participate, key types of information are not reported, the data are scattered across various initiatives, and initiatives are largely voluntary or driven by civil society. The lack of available and consistent information makes it difficult to properly assess the production gap and the extent to which governments are driving this gap, as well as identify opportunities for governments to close it.

Governments and other actors can work together to boost transparency, including by:

- disclosing plans and projections for fossil fuel production and for a just transition in NDCs, LT-LEDS, and UNFCCC national reports.
- providing information on fossil fuel infrastructure at various stages of development.
- divulging information on public finance for fossil fuels by production stage and financing mechanism.
- mandating that investor-owned and state-owned fossil fuel companies disclose their spending, project plans, GHG emissions (including end-use emissions), and climate-related financial risks.
- ensuring that the decision-making processes both for fossil fuel infrastructure and for winding down production are open and transparent, and that civil society has adequate capacity to engage.
- ensuring that relevant information on fossil fuel production is not only available, but also understandable, usable, and timely.

Governments can strengthen existing transparency initiatives, or create new ones. On the international stage, countries can make better use of existing mechanisms; for instance, they can convey information on fossil fuel production through the UNFCCC, and improve subsidy reporting under the WTO and the SDGs. Multi-stakeholder initiatives such as the EITI can use their long-standing experience in the sector to strengthen transparency on the climate impacts of fossil fuel production, including by proposing uniform standards for information disclosure. New transparency initiatives may be warranted, however. Specifically, governments should consider establishing a dedicated platform for reporting and reviewing information on fossil fuel production, which would bring the dispersed information together in a harmonized and standardized manner, building on advances made by civil society organizations.

9 Closing the fossil fuel production gap

Governments have a primary role to play in closing the production gap and ensuring the transition away from fossil fuels is just and equitable.

Few countries have acknowledged the need to wind down fossil fuel production. Doing so can provide the impetus for governments to develop plans and implement policies that align their production with climate goals and commitments.

Governments can restrict fossil fuel exploration and extraction, phase out producer subsidies and public finance for fossil fuel projects, and re-direct support towards decarbonization and just transition efforts.

International cooperation can support a more effective and equitable transition away from fossil fuels.

Over 75% of global GHG emissions stem from fossil fuels (SEI et al., 2019). Meeting the agreed objectives of the Paris Agreement and achieving net-zero emissions by mid-century, thus requires dramatic and sustained reductions in fossil fuel use and extraction. Existing national energy plans and outlooks, however, take the world in the opposite direction.

Governments can do much more, as they have a primary role to play in closing the production gap and in ensuring that the transition away from fossil fuels is just and equitable. State-owned enterprises (SOEs) control more than 50% of global fossil fuel production (Chapter 3). While privately-owned fossil fuel companies also have important roles to play, and can take important steps to increase their alignment with climate objectives (Coffin, 2021; World Benchmarking Alliance, 2021), governments wield great influence: they drive private-sector exploration and extraction through their policies, permitting, and investments. The extent of COVID-19 recovery spending on fossil fuel energy since the start of the pandemic demonstrates how entrenched these industries remain.

Only a handful of countries clearly acknowledge the need to wind down fossil fuel production to achieve the objectives of the Paris Agreement. None are top producers. Such an acknowledgement is important: it can provide the impetus for developing plans for a managed wind-down of production and for implementing specific policy measures. Two policy areas for governments to pursue are:

- Placing restrictions on fossil fuel exploration and extraction to avoid locking in levels of fossil fuel supply that are inconsistent with climate goals. Examples of relevant policies include moratoria, bans, or limits on all or certain types of fossil fuel exploration and extraction (such as offshore or unconventional drilling) or infrastructure (such as oil pipelines or liquefied natural gas (LNG) terminals). Countries with higher financial and institutional capacity should lead the way with these restrictions, as they are better equipped for a rapid and sustained decline (Muttitt & Kartha, 2020; SEI et al., 2020).
- Phasing out government support and financing for fossil fuel production. As detailed in Chapter 3, governments continue to support domestic coal, oil, and gas production through fossil fuel subsidies, regulatory exemptions, aid to SOEs, and public funds, including those committed through COVID-19 recovery packages. In addition, support for overseas fossil fuel production provided through bilateral export credit agencies (ECAs), development finance institutions (DFIs), and multilateral development banks (MDBs) play a significant role in shaping the international energy landscape. Therefore, a key step towards closing the production gap is for governments to phase out their production support policies, ramp up the exclusion of fossil fuel projects from public finance institutions, and re-direct support towards decarbonization and just transition efforts.

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