

Tapping the potential of NDCs and LT-LEDs to address fossil fuel production

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Abstract

The need for a managed transition away from fossil fuel production raises the question of whether and how countries are addressing this need in their national communications to the UN Framework Convention on Climate Change (UNFCCC). A previous 2019 analysis of the first round of nationally determined contributions (NDCs) and long-term, low-emissions development strategies (LT-LEDS) found that few countries discussed how they would address fossil fuel production as part of their climate mitigation activities. Here, we examine new and updated NDCs and LT-LEDS, finding a growing number of NDCs and LT-LEDS that address fossil fuel production as part of mitigation. For the first time, several countries incorporate policies and/or pathways for a managed decline of fossil fuel production. In contrast, many others foresee continued or expanded fossil fuel production, with no mention of efforts to prepare for a transition. Opportunities remain for countries to make better use of NDCs and LT-LEDS to align fossil fuel production with the Paris Agreement, including by more comprehensively reflecting on the equity implications of their plans, as well as addressing how countries plan to diversify their economies, ensure a just transition for workers, and cooperate internationally on a managed wind-down of fossil fuel supply. As COP26 approaches, this window of opportunity is still open, but it is rapidly closing.



Coal mining infrastructure in disuse, Svalbard © KATERINA SKOKANOVA / EYEEM / GETTY

1. Introduction

Countries that are dependent on fossil fuel development for economic growth are grappling with the need to align energy policy with global climate goals. Indeed, to limit warming to 1.5°C or well below 2°C, as required by the 2015 Paris Agreement, the world needs to wind down fossil fuel production (SEI et al., 2020). Instead, analysis has shown a large discrepancy between Paris Agreement goals and countries' plans for fossil fuel production, with countries aiming to produce 120% more fossil fuels by 2030 than would be consistent with a 1.5°C pathway, and 50% more than would be consistent with 2°C (SEI et al., 2020).

To ensure the world remains on track to meet global climate targets, governments are currently preparing their long-term, low emissions development strategies (LT-LEDs) and their new or updated nationally determined contributions (NDCs) ahead of COP26 in Glasgow. In previous iterations of these national climate contributions, few countries discussed how they would address fossil fuel production as part of their climate mitigation activities (Piggot et al., 2018; Verkuil et al., 2019). However, the landscape is shifting. More countries are beginning to address coal, oil and gas production as a climate policy issue (Erickson et al., 2018; Gaulin & Le Billon, 2020; SEI et al., 2020; Tudela, 2020), and the International Energy Agency recently called for all countries to end all new fossil fuel extraction in order to limit the rise in global temperatures to 1.5°C (IEA, 2021). Thus, it is an opportune time to examine NDCs and LT-LEDs to see how governments are discussing future plans for fossil fuel production, and how this aligns with the Paris Agreement goals.

This paper analyses the content of the new and updated NDCs and LT-LEDs that have so far been submitted, to understand how governments are presently discussing fossil fuel production in the context of their national communications under the UN Framework Convention on Climate Change (UNFCCC). It provides an update to earlier papers on this topic (Piggot et al., 2018; Verkuil et al., 2019), and offers a window into the energy production plans of governments worldwide in the context of climate constraints. It provides useful insights on how countries still in the process of preparing and updating their NDCs and LT-LEDs can include elements related to fossil fuel production.

1.1 Tackling fossil fuel supply under the Paris Agreement

A growing number of countries are beginning to coordinate, prepare for, and encourage a wind-down in fossil fuel production (Erickson et al., 2018; Gaulin & Le Billon, 2020; SEI et al., 2020; Tudela, 2020). Countries have various options to support this transition, including restricting fossil fuel exploration and production, eliminating production subsidies, placing limitations on finance for production projects, and planning for the just transition of fossil-fuel-dependent workers and communities (Lazarus & van Asselt, 2018). Policymakers and scholars increasingly view these measures as feasible tools that not only complement policies focused on curbing demand for fossil fuels, but also help reduce the overall cost of meeting climate goals and prevent the lock-in of high-emissions development pathways (Asheim et al., 2019; Fæhn et al., 2017; Green & Denniss, 2018). Furthermore, these “supply-side” policies carry important co-benefits for human health and biodiversity, and reduce the financial risk of “stranded assets” (Carbon Tracker Initiative & Grantham Institute, 2013; Epstein, 2017; Harfoot et al., 2018; Watts et al., 2018).

The UNFCCC has historically focused on decreasing greenhouse gas (GHG) emissions from fossil fuels and other sources, and not on metrics related to the production of fossil fuels. Nonetheless, the Paris Agreement's architecture creates various opportunities to address fossil fuel supply through the UNFCCC (Piggot et al., 2018; SEI et al., 2019). In particular, countries can incorporate actions that support a managed wind-down of fossil fuel production into their NDCs and LT-LEDs, which are complementary but distinct national climate change planning documents that represent key tools for communicating and enhancing climate ambition over time. NDCs, which Parties are required by the Paris Agreement to prepare and communicate every five years (UNFCCC 2015a, Article 4.9), generally contain a country's targets, policies and actions to reduce emissions over a five- or ten-year period; some also include information on adaptation, and means of implementation (Pauw et al., 2018).

LT-LEDS address a longer time frame, with the idea that they will inform short- and medium-term action and planning, including the formulation of NDCs (Espinosa, 2018). Unlike NDCs, there is not currently a mandate for LT-LEDS to be regularly updated; parties were invited to formulate and communicate LT-LEDS by 2020 (UNFCCC 2015b, para.35), although delays have occurred due to the Covid-19 pandemic.

NDCs and LT-LEDS offer mediums through which countries can communicate policies, measures, targets and pathways regarding fossil fuel production. NDCs provide a space to communicate policies and near-term targets for just and equitable transitions away from fossil fuel production. The LT-LEDS process, albeit limited by its more voluntary nature, provides countries with a space to plan for, and discuss, a longer-term transition away from production in order to reduce the risks of carbon lock-in, stranded assets, and stranded workforces. Given the nationally determined nature of NDCs and LT-LEDS, individual countries can pursue the inclusion of elements relating to fossil fuel production, irrespective of consensus agreement from all Parties to the UNFCCC. This approach therefore bypasses the political dynamics that have historically posed challenges for incorporating fossil fuel production into the UNFCCC regime (van Asselt, 2014). At the same time, NDCs and LT-LEDS represent an important vehicle within the UNFCCC process for normalizing a just and equitable transition away from fossil fuel production, in turn enabling the conditions for international cooperation on it (Green, 2018; Piggot et al., 2018).

1.2 Analysing the fossil fuel production content of NDCs and LT-LEDS

In 2019, we analysed 57 NDCs and 8 LT-LEDS submitted by fossil-fuel-producing nations, and examined the extent to which they addressed fossil fuel production. That analysis found that only 2 countries had included measures to constrain the production of fossil fuels in their NDCs (Verkuijl et al., 2019). Since then, 58 countries, plus the EU, have communicated new or updated NDCs (UNFCCC, n.d.), and several more fossil-fuel-producing nations have submitted a LT-LEDS (as of April 2021). The time is ripe for understanding whether and how countries are using these new and updated documents to communicate elements related to fossil fuel production, and how this differentiates from previous NDCs.

In this paper, we assess how new and updated NDCs, and LT-LEDS submitted since 2019, address fossil fuel supply. Section 2 outlines the methodology applied, and Section 3 describes the results of the analysis. Section 5 discusses the results and concludes.

We find that countries are continuing to discuss elements relating to fossil fuel production in their NDCs and LT-LEDS, and a growing number of NDCs and LT-LEDS incorporate policies and/or pathways that explicitly limit some aspect of fossil fuel production. Several NDCs and LT-LEDS have included plans to end, wind down or constrain fossil fuel production – specifically, the LT-LEDS of Denmark, EU, France and Slovakia, and the updated NDCs of Costa Rica and North Macedonia. On the other hand, many NDCs and LT-LEDS foresee continued or expanded fossil fuel production (see Appendix).

Countries are not yet using the full potential of NDCs and LT-LEDS to align fossil fuel production with the Paris Agreement. Among other options, countries could more comprehensively reflect on the equity implications of their plans, as well as address how they plan to diversify their economies, ensure a just transition for workers, and cooperate internationally regarding a managed wind-down of fossil fuel supply. As COP26 approaches, the window of opportunity for countries to address this need in their LT-LEDS and NDCs is still open, but it is rapidly closing.

2. Methods

In the 2019 assessment (Verkuijl et al., 2019), we focused on the 57 NDCs¹ and 8 LT-LEDS² from the fossil-fuel-producing countries named in the 2018 BP Statistical Review of World Energy (BP, 2018), which together accounted for 98% of global fossil fuel production. For clarity, in this paper we refer to the documents examined in the 2019 assessment as “first-round” NDCs and “older” LT-LEDS.

In this assessment, we looked at countries’ new and updated NDCs. In this round of NDC submissions, countries agreed to either update their first NDC, or submit a second NDC, depending on the time frame in their first NDC.³ We refer to these new and updated NDCs collectively as “second-round” NDCs. We also considered LT-LEDS submitted since 2019, which we refer to as “newer” LT-LEDS.

Unlike the 2019 assessment, we did not restrict the analysis to the top 57 fossil-fuel-producing countries. We instead took a broader look and examined the NDCs of all fossil-fuel-producing countries. This includes some NDCs from countries that were not included in the 2019 assessment and that have only begun fossil fuel exploration and/or production in the intervening period (Lebanon and Senegal). In addition, we searched the documents of countries that do not currently produce fossil fuels to identify any references to fossil fuel supply, where relevant. As not all updated or second NDCs have yet been communicated, this analysis is necessarily incomplete.

The documents analysed in this paper are summarized in Table 1. A total of 38 NDCs were analysed. Of those, 22 are the second-round NDC of countries whose first NDCs were examined in the 2019 assessment. A total of 11 newer LT-LEDS were examined, and the results added to those from the 8 LT-LEDS previously analysed. Together, the countries whose second-round NDCs we analysed account for approximately 36% of oil production, 38% of gas production and 22% of coal production globally. The countries whose LT-LEDS we analysed – in both the 2019 analysis and this one – account for 29%, 33% and 16% respectively (BP, 2020).

Table 1: NDCs and LT-LEDS included in analysis

Document type	Countries examined
Second-round NDCs	Angola*, Argentina*, Australia*, Bangladesh*, Bosnia and Herzegovina, Brazil*, Brunei Darussalam*, Chile, Colombia*, Costa Rica, Cuba, Ecuador*, Ethiopia, EU*, Japan*, Kenya, Democratic People’s Republic of Korea, Republic of Korea*, Lebanon, Mexico*, Mongolia*, Nepal, New Zealand*, North Macedonia, Norway*, Papua New Guinea, Peru*, Philippines, Senegal, State of Palestine, South Sudan*, Suriname, Thailand*, United Arab Emirates*, United Kingdom*, United States*, Viet Nam*, Zambia
LT-LEDS	Austria, Denmark, EU, France (updated version), Japan, Republic of Korea, Netherlands, Norway, Slovakia, South Africa, Spain

* Country included in 2019 analysis

1 Algeria, Angola, Argentina, Australia, Azerbaijan, Bahrain, Bangladesh, Bolivia, Brazil, Brunei Darussalam, Canada, Chad, China, Colombia, Republic of the Congo, Ecuador, Egypt, Equatorial Guinea, the European Union (EU), Gabon, India, Indonesia, Iran, Japan, Kazakhstan, Republic of Korea, Kuwait, Malaysia, Mexico, Mongolia, Myanmar, New Zealand, Nigeria, Norway, Oman, Pakistan, Peru, Qatar, Russian Federation, Saudi Arabia, South Africa, South Sudan, Syria, Thailand, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Ukraine, the United Arab Emirates (UAE), the United States (US), Uzbekistan, Venezuela, Viet Nam, Yemen, and Zimbabwe.

2 Canada, the Czech Republic, France, Germany, Mexico, Ukraine, the United Kingdom (UK), and the US.

3 The Adoption of the Paris Agreement (UNFCCC 2015b, para. 23-24) requests that Parties whose NDCs contain a time frame up to 2025 submit a second NDC, while those with a 2030 time frame communicate or update their NDC.

We searched the content of the 38 NDCs and 11 LT-LEDs for references to fossil fuel production or related terms, using the following search terms: “coal”, “economic diversification”, “extract”, “fossil”, “fuel”, “gas”, “hydrocarbon”, “just transition”, “lignite”, “mine/mining”, “oil”, “petroleum”, “producer”, “production”, “subsidy/ies”, and “supply”. The results were examined to verify that they concerned fossil fuel supply, and were then analysed for context. In addition, we read through all the documents to ensure no references were missed.



Entrance to closed mine © JUAN MIGUEL CERVERA MERLO / GETTY

3. Fossil fuel supply in second-round NDCs and LT-LEDs

Countries are so far discussing fossil fuel production in their second-round NDCs at a similar frequency to their first-round NDCs, and increasingly in LT-LEDs. In total, out of the 38 second-round NDCs we examined, 23 mention fossil fuel production (see Appendix), albeit with differing levels of detail and specificity. Of these, 7 belong to countries that had not included fossil fuel production in their first-round NDCs, suggesting an increased interest in addressing the subject in the UNFCCC context. So far, however, about a third of fossil-fuel-producing countries have not referenced that activity at all in their second-round NDCs – the same proportion as that identified in the 2019 assessment. However, the countries that omit a reference to fossil fuel production are not necessarily the same, and thus this proportion may change as more countries submit their second-round NDCs.

Of the 11 newer LT-LEDs examined, 8 mention fossil fuel production in some way, while 3 do not. This represents a marked increase in the proportion of LT-LEDs that reference fossil fuel production: only 4 of the 8 older LT-LEDs examined in the 2019 assessment did so. Overall, 19 fossil-fuel-producing Parties have now submitted LT-LEDs, and 12 of them mention fossil fuel production. Of these, only one – the United States – mentions fossil fuel production in its LT-LEDs but not its second-round NDC. Four mention fossil fuel production in both their LT-LEDs and second-round NDCs (EU, Japan, Mexico and Norway), although their LT-LEDs generally contain more depth on the topic.

This updated analysis found that countries are increasingly including policies, measures, targets and pathways to address fossil fuel supply in their NDCs and LT-LEDs, as seen in Figure 1. In 2019, only 2 countries included supply-side measures to manage a wind-down of fossil fuel production in their first-round NDCs (Verkuijl et al., 2019); our updated analysis found that 6 additional Parties communicated measures to constrain or disincentivize fossil fuel production for the first time in their second-round NDCs or newer LT-LEDs. Of these, 3 countries and the EU included targets and pathways for winding down fossil fuel production in their NDCs and/or newer LT-LEDs. However, 15 countries foresee continued or expanded production, through 11 second-round NDCs and 5 LT-LEDs. Of these, 6 NDCs include measures to reduce emissions from production, but lack any policies to constrain or disincentivize production itself.

Figure 1: Inclusion of fossil fuel production in NDCs and LT-LEDs. Extraction-based emissions data adapted from SEI et al. (2019).

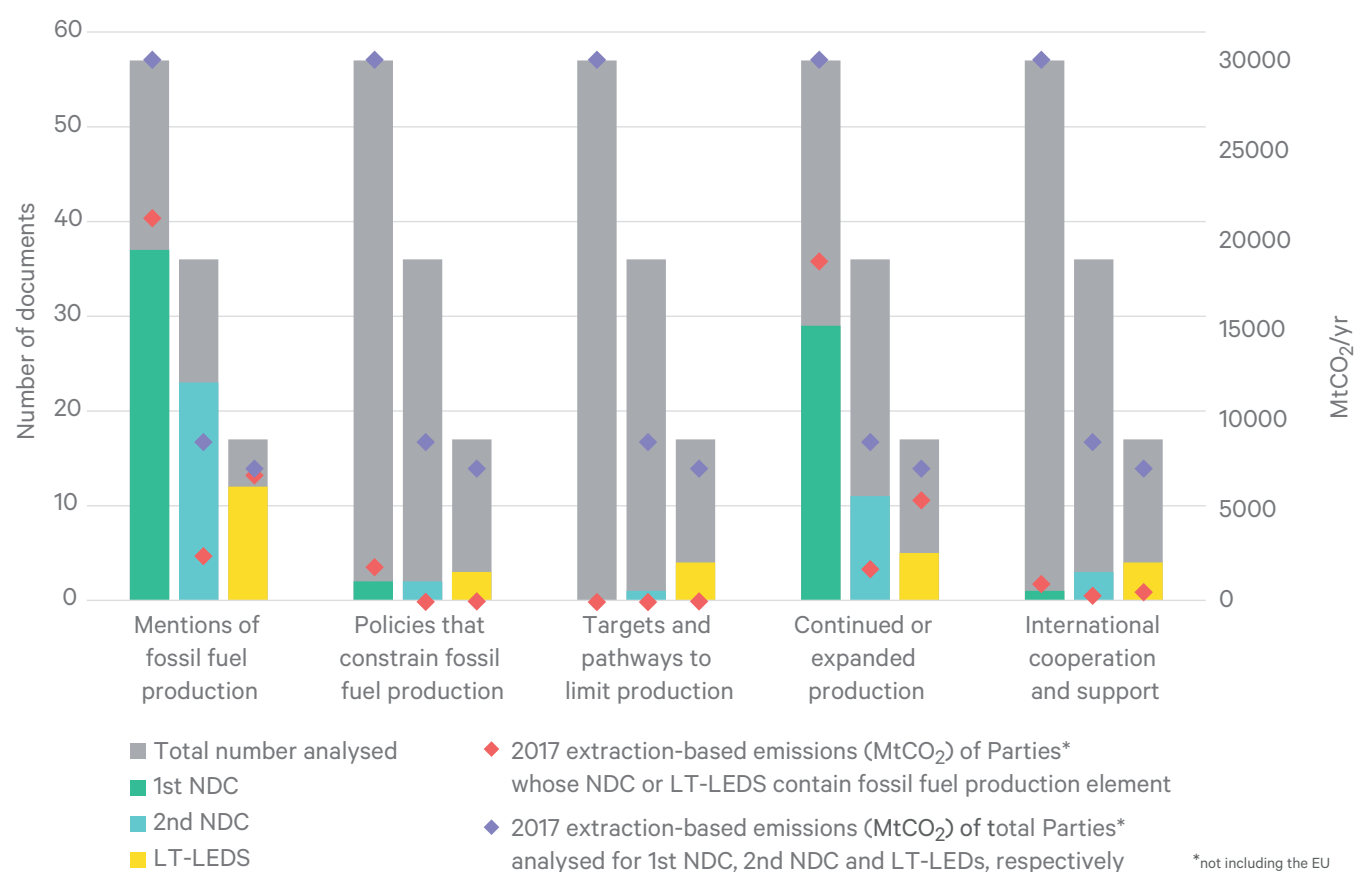


Table 2: Options for including fossil fuel production in NDCs and LT-LEDs

Type of information	NDC examples	LT-LEDs examples	Contents of examples
Information on reserves and production			
<ul style="list-style-type: none"> Current production 	 COL		Oil production in barrels per day
<ul style="list-style-type: none"> Reserves 	 KEN		Approximate volume of coal reserves
Targets and pathways to wind down fossil fuel production			
<ul style="list-style-type: none"> Commitment to reduce or phase out fossil fuel production by a target date 		 FRA	Commitment to phase out fossil fuel extraction by 2040
<ul style="list-style-type: none"> Interim targets for reducing fossil fuel production, including by fuel 	 MKD		Assumption that lignite production will be capped at an annual maximum level
<ul style="list-style-type: none"> Scenarios, modelling, and projections for phasing out fossil fuel production (LT-LEDs) 		 EU	The LT-LEDs baseline scenario assumes that most coal mining will be halted by 2050, and has various scenarios for fossil fuel production
Measures and policies to disincentivize or constrain fossil fuel production			
<ul style="list-style-type: none"> Moratorium on oil and gas exploration 	 CRI		Moratorium on exploration and exploitation of fossil fuels
<ul style="list-style-type: none"> Cancellation of exploration and exploitation licensing rounds 		 FRA	Ban on all new fossil fuel exploration
<ul style="list-style-type: none"> Non-renewal or revocation of exploitation permits 		 DNK	Cancellation of on-going licensing round and all future rounds to extract oil and gas
<ul style="list-style-type: none"> Commitment to phase out subsidies for fossil fuel production 		 FRA	Non-renewal of fossil fuel exploitation permits and the phasing-out of existing concessions on French territory beyond 2040
<ul style="list-style-type: none"> Climate tax on fossil fuel extraction 	 NGA		Plans to reform government subsidies for fossil fuel production
	 IND		"Cess" (tax) on extracted and imported coal
Mitigation and adaptation measures for the fossil fuel production sector			
<ul style="list-style-type: none"> Measures to improve energy efficiency of, and reduce emissions from, fossil fuel production 	 CAN	 CAN	Energy efficiency measures, use of electric steam generators, hydropower, and process electrification
<ul style="list-style-type: none"> Inclusion of climate change considerations in the permitting process for fossil fuel production projects 	 COL		Plans to include climate change considerations in the permitting process for projects in the fossil fuel production sector
<ul style="list-style-type: none"> Measures to reduce fugitive emissions, venting, and flaring from fossil fuel production 	 BRN		Adoption of the "as low as reasonably possible" principle to achieve zero-routine flaring
	 ARG		Measures to ensure resilient fuel production
<ul style="list-style-type: none"> Adaptation measures for fossil fuel production 	 COL		Development of a planning instrument aimed at ensuring resilient coal mining infrastructure
Transition Planning			
<ul style="list-style-type: none"> Measures to support workers and communities impacted by fossil fuel production and the shift away from it 		 USA	Just transition measures targeted at communities dependent on coal mining
<ul style="list-style-type: none"> Measures to remediate former fossil fuel production sites 			
<ul style="list-style-type: none"> Modelling, scenario planning, and road mapping a just transition over the longer term (LT-LEDs) 			
<ul style="list-style-type: none"> Policies and plans to diversify the economy away from fossil fuel production 	 SAU		Policies to diversify the economy to reduce dependence on oil revenues
<ul style="list-style-type: none"> Modelling, scenario planning, and road mapping for economic diversification over the longer term (LT-LEDs) 			
Equity in relation to fossil fuel production			
<ul style="list-style-type: none"> Quantified information on the extent of economic dependence on fossil fuel production 			
<ul style="list-style-type: none"> Information on proportion of workforce employed by fossil fuel production 	 ECU		Oil as a percentage of the country's export revenue
<ul style="list-style-type: none"> Information on national capacity needs to support a just transition away from fossil fuel production 			
<ul style="list-style-type: none"> A statement of how wind-down targets are fair and ambitious 			
International support and cooperation			
<ul style="list-style-type: none"> International support requirements to wind down (or forego development of) fossil fuel production (finance, capacity building, technology transfer) 	 KEN		International support for development objectives to enable leaving oil and coal reserves unexploited
<ul style="list-style-type: none"> Commitment to provide support to assist countries with low capacity to transition away from fossil fuel production 		 BIH	Links international support for a transition for coal mining areas to conditional emissions reduction targets
<ul style="list-style-type: none"> Membership of international fossil fuel phase-out initiatives 		 DEN	Influencing other countries to phase out coal production through the Powering Past Coal Alliance
<ul style="list-style-type: none"> Bilateral or multilateral partnerships to support economic diversification 		 EU	Support for economic diversification in the Gulf region
<ul style="list-style-type: none"> Commitment to end international finance for fossil fuel production projects 		 FRA	Ending state export guarantees for exploration and production of coal and non-conventional hydrocarbons

Within NDCs and LT-LEDs, fossil fuel production is talked about in a variety of contexts, as shown in Table 2. These include: (1) information regarding fossil fuel reserves and levels of production; (2) winding down fossil fuel production, including pathways, targets, policies and measures; (3) continued or increased production; (4) mitigation and adaptation measures for the fossil fuel production sector; (5) transition planning; (6) information related to equity considerations in fossil fuel production; and (7) international cooperation and finance. We expand on these elements in the following sub-sections, incorporating textual examples from LT-LEDs, second-round NDCs and, where relevant, first-round NDCs, in order to paint a picture of how countries have included these elements.

3.1 Background information about countries' reserves, production, and fossil fuel supply infrastructure

Crucial to realizing a just and equitable transition away from fossil fuel production is understanding the present state of affairs. Verkuil et al. (2019) found that no first-round NDCs, or LT-LEDs submitted before 13 April 2019, provided information on countries' fossil fuel reserves and current and/or projected levels of extraction. However, the picture has since changed: 5 NDCs⁴ and 4 LT-LEDs⁵ now include such background information, albeit in varying levels of detail. On the more specific end, Colombia's second-round NDC lists 2019 oil production in barrels per day, under its "national circumstances" section (Colombia, 2020, p. 9). On the less specific end, Argentina refers in its second-round NDC to its "lavish...natural energy resources, including hydrocarbons" (Argentina, 2020, p. 14).

There is significant scope for countries to increase transparency about their production plans. For example, many NDCs include background information about the country's current sources and levels of emissions, in accordance with the UNFCCC's clarity, transparency and understanding (ICTU) guidance. Countries could, similarly, include disaggregated information regarding current levels of fossil fuel production and known reserves (Byrnes, 2020; Verkuil et al., 2019). Countries could also consider including information on fossil fuel production infrastructure, such as the key facilities associated with fossil fuel production and transport. Moreover, while communicating background information on production is important for transparency purposes, countries could also consider including information on ensuring a just and equitable transition away from production.

3.2 Pathways and targets to wind down fossil fuel production

Pathways and targets are key features of most NDCs, focusing largely on reducing emissions, occasionally on increasing clean energy or reducing deforestation, and, until recently, never on reducing fossil fuel production. However, we now find that some NDCs and LT-LEDs have begun to include information on targets or pathways to restrict or wind down fossil fuel production. While Verkuil et al. (2019) found no NDCs or LT-LEDs containing such information, we find that one second-round NDC (EU) and 4 newer LT-LEDs⁶ have included pathways and/or targets:

- Denmark's LT-LEDs states that the country "has recently made a historic decision on the future of fossil extraction in the North Sea. A broad majority in the Parliament has agreed on a final phase-out date of fossil extraction in the North Sea by 2050". It calls on other countries to do the same (Denmark, 2020, p. 2).
- France's updated LT-LEDs mentions its commitment to phase out all fossil fuel extraction by 2040 (France, 2020, p. 107).

⁴ Angola, Argentina, Colombia, Kenya, and Mexico.

⁵ Denmark, France, Japan, and South Africa.

⁶ Denmark, EU, France, and Slovakia.

- The EU LT-LEDs, in the context of outlining scenarios for emissions from the energy sector, incorporates a baseline scenario which expressly envisages “the halting of most coal mining activities” in the EU by 2050, as well as various scenarios for the production of oil, coal and natural gas including “the halting of most oil extraction” in the EU by 2050 (EU, 2018b, pp. 168–169). Similarly, the second-round EU NDC states that “EU fossil fuel production and consumption will continue to decrease”, although it does not offer further detail (EU, 2020, p. 5).
- Slovakia’s LT-LEDs states that oil production in the country is “expected to end after 2020”, while natural gas production is projected to decline more slowly (Slovak Republic, 2020, pp. 31–32).

BOX 1: SETTING TARGETS FOR REDUCING FOSSIL FUEL PRODUCTION

NDCs universally contain emissions reduction targets. In light of the current mismatch between levels of fossil fuel production and Paris Agreement goals (SEI et al., 2020), countries are beginning to include targets for reducing fossil fuel production alongside those for emissions reduction.

UNFCCC guidance stipulates that countries shall include in NDCs the information necessary to facilitate clarity, transparency and understanding (ICTU) (UNFCCC 2015b Article 4.8, UNFCCC 2018). Several elements of ICTU serve as useful guidance for countries that include targets for winding down fossil fuel production, namely:

- Quantifiable information on the reference point;
 - Time frame and/or period for implementation, including start and end date, and whether it is a single-year or multi-year target;
 - Scope and coverage of the target, including sectors covered, as well as an explanation as to why any sectors are not yet included;
 - Information on the planning processes that the Party undertook to prepare its NDC, and how the economic and social consequences of response measures have been considered in developing the NDC;
 - Assumptions and methodological approaches;
 - How the Party considers that its NDC is fair and ambitious in the light of its national circumstances;
 - How the NDC contributes towards achieving the objective of the Convention.
-

LT-LEDs often contain scenario planning and modelling to reduce emissions across various sectors, as well as emissions reduction targets that fall outside the time horizon of NDCs. Such content can be complemented by longer-term targets for aligning fossil fuel production with the Paris Agreement, as well as scenarios, models and pathways for doing so (Piggot et al., 2018; Verkuil et al., 2019). Parties could include quantitative models and/or qualitative roadmaps for a managed transition away from fossil fuel production. As part of this, LT-LEDs can model the longer-term effects of short-term supply-side measures. Likewise, LT-LEDs can consider what types of fossil fuel infrastructure developments, if any, are consistent with Paris goals (Piggot et al., 2018).

3.3 Measures and policies to disincentivize or constrain fossil fuel production

Specific measures and policies that disincentivize or constrain fossil fuel production can lend credibility to the emissions reduction aspirations of NDCs and LT-LEDs by helping to align energy and climate goals. We draw from the 2019 analysis, as well as the present analysis, to illustrate this. In the first round of NDCs, only one country, India, included a measure disincentivizing fossil fuel production. Its NDC highlighted its “cess” (tax) on coal, which applied to both extracted and imported coal and indicated that the revenues raised through the policy would be used to fund clean energy projects and Ganges river rejuvenation (India, 2016, pp. 7, 27, 37; Sinha, 2016).⁷ In addition, one country communicated plans to reform government subsidies for fossil fuel extraction and delivery: the NDC of Nigeria mentioned policies to address government incentivization of fossil fuel production, in addition to consumption (Nigeria, 2017, p. 15), although it did not contain specific details.

In second-round NDCs and newer LT-LEDs, five more countries communicate policy measures to constrain fossil fuel production.⁸ Some of these are measures that have already been implemented, while others are planned for the future. Denmark’s LT-LEDs, expanding on its plans to phase out fossil fuel extraction by 2050, states that the government has cancelled the country’s eighth licensing round and all future rounds to extract oil and gas (Denmark, 2020, p. 4). Similarly, France’s updated LT-LEDs, in a section containing a strategy for carbon-free energy production by 2050, includes the country’s 2018 ban on all new fossil fuel exploration in France, the non-renewal of fossil fuel exploitation permits on French territory beyond 2040, and the phasing out of existing concessions by the same date, as well as “the national ongoing termination of coal mining activities since 2004” (France, 2020, pp. 106–107). Costa Rica’s second-round NDC announces that the government will pass its moratorium on exploration and exploitation of fossil fuels, which was enacted by executive decree, through legislation (Costa Rica, 2020, p. 25).

Countries have also included fossil fuel production measures in the course of explaining assumptions that underpin plans. Slovakia’s LT-LEDs records the closure of one coal mine in 2015 and another in 2017 – as well as the country’s commitment to cease the production of electricity from domestic coal by the end of 2023 – in the context of outlining assumptions used to project future fugitive emissions from fossil fuel production, transport and distribution (Slovak Republic, 2020, p. 30). The document explains that these measures mean that coal mining is expected to “decrease more rapidly” after 2023. The second-round NDC of North Macedonia, in constructing its baseline scenario, assumes that lignite production will be capped at an annual maximum level (Republic of North Macedonia, 2021, p. 16).

3.4 Continued or increased production of fossil fuels

Despite the need to globally decline fossil fuel production and to end new investment in fossil fuel extraction to limit the rise in global temperatures to 1.5°C (IEA, 2021; SEI et al., 2020), our analysis found that 7 countries explicitly mention plans or projections for continued or expanded fossil fuel production. This is in contrast to the 5 countries, plus the EU, that express targets, projections or measures for winding down fossil fuel production through 3 second-round NDCs and 4 newer LT-LEDs.

Specifically, 6 second-round NDCs⁹ (16% of those examined) and one LT-LEDs (Japan) (9% of those examined) refer to continued or increased production. This is a smaller proportion than in the 2019 analysis, where 13 first-round NDCs¹⁰ (22%) and one older LT-LEDs (US) (12.5%) did

7 India has since replaced the cess with a Goods and Services Tax Compensation Cess, which is no longer linked to funding clean projects (Gerasimchuk et al., 2018).

8 The updated NDCs of Costa Rica and North Macedonia, and the LT-LEDs of Denmark, France, and Slovakia.

9 Angola, Argentina, Lebanon, Papua New Guinea, Senegal, and UAE.

10 Algeria, Bangladesh, Bolivia, China, Gabon, Pakistan, Qatar, Saudi Arabia, Syria, Turkey, Turkmenistan, UAE, and Zimbabwe.

the same. One country referred to continued or increased production in both its first-round and second-round NDC (UAE), while 2 countries referred to continued or increased production in their second-round but not first-round NDCs (Angola and Argentina).

On coal production, for instance, Bangladesh's first-round NDC lists under its mitigation objectives the development of coal mines and coal-fired power stations to maximize coal output (The People's Republic of Bangladesh, 2015, p. 5), though its second-round NDC is silent on coal production. Similarly, in their first-round NDCs, Bolivia writes of "boosting the oil and mining sectors" (The Plurinational State of Bolivia, 2016, p. 5) and Pakistan anticipates that "all domestic sources of energy, including coal" will be "fully harnessed" (Pakistan, 2016, p. 10).

Our analysis also found plans for continued or increased oil and gas production. Japan's LT-LEDS states that the country will "proceed with...development of domestic resources, especially in natural gas and methane hydrate reserves" offshore. Papua New Guinea's second-round NDC heavily implies that oil and gas production will expand (Papua New Guinea, 2020, p. 11). The first-round NDC of China and the second-round NDC of Mongolia refer to plans to continue or expand coal-bed methane production (Mongolia, 2020, p. 2,5; The People's Republic of China, 2016, p. 7).

Several NDCs communicate plans to continue or increase the production of natural gas. Saudi Arabia's first-round NDC, for example, states that it will encourage investments in natural gas exploration and production "to significantly increase its contribution to the national energy mix" (Saudi Arabia, 2015, p. 3). At times, increased gas production is framed as a mitigation strategy. For instance, Argentina's second-round NDC states that by 2030, the country will "carry out an energy transition", using natural gas as a "transition fuel" in the medium term, which it says would require higher production of natural gas in absolute terms (Argentina, 2020, pp. 7, 20, 37). Similarly, Qatar's first-round NDC states that it "has been contributing indirectly" to mitigation efforts "by exporting Liquefied Natural Gas as a clean energy" (Qatar, 2015, p. 2). Increased gas production is also described as a cost-reduction measure: Japan's LT-LEDS, for instance, notes that the country is "procuring natural gas at a high price compared to international standards" in stating its plans to exploit its offshore reserves (Japan, 2019, p. 33). These countries do not express any corresponding policies to prepare for a transition or a wind-down of coal or oil production.

Among the second-round NDCs are 2 belonging to countries that only recently began fossil fuel exploration and/or production, and expect production to ramp up significantly in the years to come. Lebanon's second-round NDC, in the context of stating assumptions for how reference indicators, baselines and reference levels are constructed, notes that offshore exploration for oil and gas started in 2020, and says production and development could potentially begin around 2028 (Lebanon, 2021, p. 21). Similarly, Senegal's second-round NDC notes that oil and gas production will begin in 2022 and predicts "exponential growth" in emissions from the energy sector, implying burgeoning levels of production (Republique du Senegal, 2020, pp. 3, 24).

All NDCs and LT-LEDS that refer to carbon capture, utilisation and storage (CCUS) in the context of fossil fuel production envisage that the captured carbon would be used for enhanced oil recovery. This includes 3 first-round NDCs (China, Saudi Arabia, and UAE) as well as the second-round NDC of the UAE, and the LT-LEDS of the United States (United States of America, 2016b, pp. 13, 52, 89). Saudi Arabia's first-round NDC states that the country will operate an enhanced oil recovery demonstration project to "assess the viability" of CO₂ sequestration in oil reservoirs (Saudi Arabia, 2015, p. 3). The UAE's first-round NDC highlights its development of the region's "first commercial-scale network" for capturing emissions at a steel manufacturing plant and transporting them to oil fields for use in enhanced oil recovery (UAE, 2015, p. 2). The UAE's second-round NDC reports on the progress of that facility, highlighting figures regarding its current capacity to capture, transport and inject CO₂ (UAE, 2020, p. 5). China's first-round NDC proposes to "strengthen research and development [...] to promote the technologies of utilizing carbon dioxide to enhance oil recovery" (The People's Republic of China, 2016, p. 13).

3.5 Mitigation and adaptation measures for the fossil fuel production sector

The production of fossil fuels is a major source of global GHGs, especially methane. While aggregate global fossil fuel production needs to decrease dramatically, remaining production operations need to occur with as few emissions as possible. In the first-round NDCs, the majority of references to fossil fuel production were about cleaning up production processes, with 21 of the 57 NDCs¹¹ and 4 of the 8 LT-LEDS¹² including plans and policies to improve the efficiency or reduce the GHG emissions of fossil fuel production (Verkuijl et al., 2019). For 12 of those 21 NDCs and 2 of the 4 LT-LEDS, this was the only time the document mentioned fossil fuel production.

The picture appears to be somewhat changing with the second-round NDCs and the more recent LT-LEDS. Six of the 38 second-round NDCs¹³ and 2 of the 11 newer LT-LEDS include references to reducing production-related emissions. All but one (Mongolia's NDC) also consider fossil fuel production in (sometimes several) other contexts – a much higher proportion than in the first round, although none include measures to constrain or disincentivize production itself.

In some cases, NDCs and LT-LEDS note that reducing production would reduce emissions from extraction. For instance, the EU's LT-LEDS, in exploring drivers for methane emissions reduction in the energy sector, concludes that “the faster [the transition away from fossil fuel extraction], the faster the emissions will decrease” (EU, 2018b, p. 174). Similarly, Denmark's LT-LEDS discusses ways to reduce emissions from the exploration and production of oil and gas in the North Sea. Specifically, the document states that while electrification of the production process and increased efficiency have the “technical potential” to reduce such emissions, this would entail “large costs” for both the state and the energy companies and electrifying the entire production process would be impossible (Denmark, 2020, p. 90).

Broadly speaking, measures listed in NDCs and LT-LEDS that discuss reducing emissions from production include: reducing emissions from venting and flaring of methane; improving the efficiency of heaters; maximizing the recovery of condensates; electrifying the oil extraction process; shifting the transportation of coal for export from automobile to rail; and constructing new extraction infrastructure using “best available technologies”. This is similarly reflected in both the first- and second-round NDCs. For instance, the second-round NDC of Brunei Darussalam states its intention to significantly reduce fugitive emissions and achieve “zero-routine flaring” by adopting the “As Low As Reasonably Possible (ALARP) principle” and carrying out a number of rejuvenation projects for oil and gas production facilities (Brunei Darussalam, 2020, p. 10). Canada's first-round NDC highlights that the country is developing regulations to reduce methane emissions from the oil and gas sector by 40% to 45% by 2025, and will support the sector to improve its energy efficiency and invest in new technologies to reduce emissions (Canada, 2017, p. 3). In its LT-LEDS, Canada further expands on the reduction of emissions from the oil sands sector, including through the use of electric steam generators; hydropower; energy efficiency measures; carbon capture, utilisation and storage (CCUS); fuel-switching; and the electrification of processes including heat (Canada, 2016, pp. 6, 48–49). With the creation of the Net-Zero Producers Forum in 2021 (US Department of Energy, 2021), newer CCUS concepts, such as blue hydrogen, may be included in more NDCs and LT-LEDS.

As climate change intensifies, fossil fuel production facilities face increasing risks, including sea level rise and extreme weather (Katopodis & Sfetsos, 2019). In this context, countries increasingly mention fossil fuel production in their NDCs in the context of adaptation. The adaptation sections of 4 second-round NDCs expressly include adaptation measures in respect to fossil

11 Algeria, Azerbaijan, Bahrain, Brunei Darussalam, Canada, China, Republic of the Congo, Ecuador, Egypt, the EU, Gabon, Iran, Kuwait, Mexico, Nigeria, Oman, Qatar, Saudi Arabia, the United Arab Emirates, the US, Uzbekistan, Venezuela, Viet Nam, and Zimbabwe.

12 Canada, Mexico, Ukraine, and the US.

13 Brunei Darussalam, Colombia, Ecuador, Mexico, Mongolia, and the United Arab Emirates. Of this list, Colombia and Mongolia did not refer to fossil fuel production in this context in their previous NDCs.

fuel production¹⁴; none of these incorporate measures to wind down fossil fuel production in their mitigation components. These measures are largely framed in terms of ensuring access to energy through resilient infrastructure. For instance, Argentina's second-round NDC states that the country will develop "measures to ensure energy supply and access through the adoption of resilient and sustainable infrastructure (for example...fuel production...)" (Argentina, 2020, p. 61). Colombia's second-round NDC commits to developing by 2025 a planning instrument for the coal mining sector with climate change guidelines aimed at ensuring "resilient infrastructure", "energy security" and "comprehensive operating conditions under new operational and environmental demand scenarios". The NDC also commits to guaranteeing the competitiveness of the industry in the face of "the possible impacts of the changing climate" (Colombia, 2020, p. 16). Ecuador's second-round NDC announces its intention to develop studies of vulnerability and climate risk specific to mining and oil production (República del Ecuador, 2019, p. 30). Viet Nam's second-round NDC notes the negative projected impacts of sea level rise and rising temperatures on production (The Socialist Republic of Viet Nam, 2020, p. 15). The countries that have included cleaner production and/or adapted production in their NDCs could consider, in their next iteration of NDCs, incorporating measures for a transition away from fossil fuel production.

3.6 Transition planning

It is increasingly recognized that winding down fossil fuel production requires a managed transition to ensure just outcomes. A "just transition" includes supporting workers and communities, including through creating good low-carbon jobs, providing training and education, promoting community development, and ensuring social protection (Green & Gambhir, 2019; ILO, 2015; ITUC, 2017; Just Transition Centre and The B Team, 2018; UNCTAD, 2018; Solidarity and Just Transition Silesia Declaration, 2018). A transition away from fossil fuel production also needs to be attentive to the communities that have borne the negative impacts of production, as well as ensure that adequate measures are in place to clean up former production sites and restore a healthy environment for communities in fossil fuel production "sacrifice zones" (Healy et al., 2019).

In total, 6 of the 19 LT-LEDS¹⁵ submitted to date and one second-round NDC (Bosnia and Herzegovina) mention fossil supply in the context of a just transition. Of those, 2 also mentioned pathways, targets, or measures to wind down fossil fuel production. The EU's LT-LEDS contains a mapping of regions by their share of employment in fossil fuel extraction and mining, in particular naming North East Scotland, Silesia in Poland and Sud-Vest Oltenia in Romania as regions with high shares of employment in fossil fuel extraction and support services. It cautions that regions that depend on fossil fuel production will face challenges, and social and regional disparities in the EU could increase. It also notes that, overall, mining and extraction account for only a small share of total employment in the EU. The LT-LEDS highlights, nonetheless, the need for the shift away from fossil fuels to be "managed well, ensuring a fair and socially acceptable transition for all in the spirit of inclusiveness and solidarity" while taking social implications into account "from the outset". The EU LT-LEDS cites ongoing regional initiatives as a step in this direction (EU, 2018a, pp. 19–20, 2018b, pp. 226–232). The US's LT-LEDS stresses the importance of "ensuring a just transition for Americans whose livelihoods are connected to fossil fuel production and use", referencing existing measures targeted to coal mining communities (United States of America, 2016a, p. 6). However, neither of the US's first- or second-round NDCs mention just transition in the context of fossil fuel production.

Closely related yet distinct, many countries are increasingly recognizing that economic diversification is needed for an effective shift to a low-carbon economy, and are undertaking action to do so (Al-Sarhi, 2018; Oei et al., 2020; Ulrichsen, 2016). It is thus not surprising that many NDCs and LT-LEDS refer to fossil fuel production in the context of the need for economic diversification and/or the impact of climate change response measures.

¹⁴ Argentina, Colombia, Ecuador, and Viet Nam.

¹⁵ Canada, Denmark, EU, Germany, Norway, and the US.

Six of the first-round NDCs (Bahrain, Chad, Republic of the Congo, Iran, Qatar, and Saudi Arabia) and 2 second-round NDCs (Brunei Darussalam and UAE) – but no LT-LEDs – mention fossil fuel production in the context of the need for economic diversification. However, none of these NDCs identify concrete plans. Saudi Arabia, for instance, mentions policies to diversify the economy to reduce dependence on oil revenues; it states its aim to increase the economic share of other sectors, such as manufacturing, energy derivatives, mining, tourism, and information technology (Saudi Arabia, 2015). Brunei Darussalam states that it is identifying “growth areas” to promote the development of non-energy sectors (Brunei Darussalam, 2020, p. 4), while the United Arab Emirates states that it is “steadily pursuing its agenda of economic diversification” (UAE, 2020, p. 2). Countries could consider including specific policies and measures to promote economic diversification, and indeed doing so is already envisaged by the ICTU guidelines, which include mitigation co-benefits resulting from Parties’ economic diversification plans.

Furthermore, 5 first-round NDCs¹⁶ – 4 of which also discuss the need for economic diversification – mention fossil fuel production in the context of climate change “response measures”. For instance, Algeria states that its national economy is “highly dependent on petroleum export revenues...[which] makes Algeria vulnerable to climate change adverse effects, as well as to the negative impacts of response measures” (Algeria, 2015, p. 8).

Two of the newer LT-LEDs contain similar substantive concerns, framed in the context of “risk”. Norway’s LT-LEDs states that fulfilment of the Paris Agreement, and/or major technological advances, “may result in lower demand for energy based on fossil sources and may thus reduce the value of the remaining oil and gas on the Norwegian continental shelf”. According to Norway, this is a “transition risk” (Norway, 2020, pp. 12, 14). Also relevant in this regard is the discussion in South Africa’s LT-LEDs of the importance of coal to the country’s export revenue; the LT-LEDs notes the increasing volatility of coal prices and markets “due in part to global decarbonisation efforts”, implying this is a source of risk for the country. It highlights that “tax revenue must be decoupled from volumes of fossil fuel sales and exports in order to ensure that financial sustainability of the state does not become a brake” to needed changes (South Africa, 2020, p. 46). Underlying these references are concerns about so-called “stranded assets” (Carbon Tracker Initiative & Grantham Institute, 2013; UNU-INRA, 2019).

3.7 Equity in relation to fossil fuel production

In addition to explaining domestic policies and plans, countries typically also include details in NDCs and LT-LEDs about how their contributions are equitable in a global context. An analysis of the global equity implications of winding down fossil fuel production has identified two factors as important: the extent of the country’s dependence on fossil fuel production, and the country’s capacity to direct economic, technical, institutional and governance-related resources towards a just transition in order to avert and manage potential disruption and absorb the costs (Muttitt & Kartha, 2020). Dependence may take the form of reliance on the fossil fuel sector for employment, dependence on fossil fuel rents for funding public services, or reliance on fossil fuel export revenues for foreign exchange. Capacity, though multi-dimensional, tends to be correlated with a country’s income.

Transparency about both dependence and capacity in NDCs and LT-LEDs can assist with transition planning – as discussed in the previous section – as well as enable a robust assessment of: (1) whether countries’ approaches to fossil fuel supply are fair and ambitious, and (2) the level and type of support countries require for transitioning away from fossil fuel production.

¹⁶ Algeria, Iran, Kuwait, Qatar, and Saudi Arabia.

Nine of the first-round NDCs¹⁷ and 2 of the older LT-LEDs¹⁸ refer to the degree of the country's economic dependence on the oil and gas sector, while 9 of the second-round NDCs¹⁹ and 4 of the newer LT-LEDs²⁰ do so. Many of these focus on a high level of national dependence on fossil fuel production. For example, Kuwait's first-round NDC notes that the country relies mainly on oil as its "single source of income" (Kuwait, 2015, p. 2). Less explicitly but in the same vein, Norway's LT-LEDs highlights the coming "challenge" of "adjusting to a situation where [the country] is more similar to Western economies that do not have oil and gas resources", including lower tax revenues and lower returns on capital for companies (Norway, 2020, p. 12). While Kuwait and Norway do not give precise figures in terms of proportion of GDP or export revenue derived from fossil fuel exports, others do. For instance, Ecuador's second-round NDC specifies that oil comprises 44% of the country's exports, presumably by value (República del Ecuador, 2019, p. 7), and Senegal's second-round NDC states that oil is responsible for 34% of the country's export revenue (Republique du Senegal, 2020, p. 24). In terms of GDP, Suriname's second-round NDC estimates the combined proportion derived from oil and gold at 30% (The Republic of Suriname, 2019, p. 5), while South Sudan's second-round NDC puts the percentage of the country's GDP contributed by oil exports at 98% (Republic of South Sudan, 2021, p. 2).

3.8 International support and cooperation

While some countries should take the lead in the transition away from fossil fuel production, others will need support to transition on a timescale consistent with the Paris goals (Muttitt & Kartha, 2020; SEI et al., 2020). NDCs and LT-LEDs are increasingly highlighting the need for international cooperation and support to enable a just and equitable managed decline of fossil fuel production. While this element was included in only one of the first-round NDCs (Iran) and none of the older LT-LEDs, 4 newer LT-LEDs²¹ and 3 second-round NDCs²² reference international cooperation and/or climate finance in the context of fossil fuel production.

Some LT-LEDs highlight commitments to participate in international alliances on phasing out fossil fuels, measures to end public export financing of fossil fuel production, and bilateral initiatives. Denmark's LT-LEDs states that it will "influence other countries...to phase out coal production" through initiatives such as the Powering Past Coal Alliance²³. It also states that it will cease public export financing of thermal coal extraction, and "intensify climate diplomatic pressure for a global phasing out of coal" (Denmark, 2020, p. 140). Similarly, France's updated LT-LEDs highlights the country's decision to end state export guarantees for exploration and production of coal and non-conventional hydrocarbons, and sets scenarios for ending export guarantees for exploration and development of new oil and gas fields (France, 2020, pp. 55, 59). The EU's LT-LEDs draws attention to the European Commission's support for Gulf countries to diversify their economies, through initiatives with the Gulf Cooperation Council, the EU-Gulf Cooperation Council Clean Technology Network, and the EU-GCC Dialogue on Economic Diversification (EU, 2018b, p. 270). In terms of participation in international initiatives, South Africa's LT-LEDs says that it will "consider participating" in a G20 fossil fuel subsidy peer review "to facilitate the sharing of experience and mutual learning...as the next step in identifying inefficient fossil subsidies", which it notes "encourage the extraction and overconsumption of fossil fuels" (South Africa, 2020, pp. 41–42).

Some NDCs identify support needed to avoid commitment to fossil fuel production, or to support transitions away from it. For example, in its second-round NDC, Kenya points out that it has significant, unexploited oil and coal reserves and notes that the country "is faced with choosing

¹⁷ Algeria, Chad, Iran, Kuwait, Peru, South Sudan, Trinidad and Tobago, the United Arab Emirates (UAE), and Yemen.

¹⁸ Canada and Mexico.

¹⁹ Brunei Darussalam, Colombia, Ecuador, Papua New Guinea, Peru, Senegal, South Sudan, Suriname, and UAE.

²⁰ France, Japan, Norway, and South Africa.

²¹ Denmark, France (updated version), EU, and South Africa.

²² Bosnia and Herzegovina, Colombia, and Kenya.

²³ Notably, the Powering Past Coal Alliance to date has largely focused on phasing out coal-fired power plants. Advocating for a phase-out of coal production under the umbrella of the Powering Past Coal Alliance would be a novel development.

between the exploitation of her fossil fuel resources to realise her development objectives and foregoing their exploitation for environmental reasons". The NDC calls for "significant international support" to "forego all the benefits of exploiting the fossil fuel resources" (Republic of Kenya, 2020, p. 6). The second-round NDC of Bosnia and Herzegovina links its conditional 2030 and 2050 emissions reduction targets with international support for a "fair transition" for its coal mining areas, in the form of capacity building, training, technology transfer, and finance (Bosnia and Herzegovina, 2021, pp. 4, 7–8, 11).

Countries with high capacity could incorporate into their NDCs commitments to support low-capacity countries in their transition away from fossil fuel production, whether through international finance or other means. NDCs could also include commitments regarding other forms of support, such as capacity building or technology transfer. LT-LEDs could map out longer-term possibilities for international support.

Countries could also include information about other forms of international cooperation, as well as measures regarding international finance. This could include participation in international initiatives on winding down fossil fuels (for example, Denmark's LT-LEDs mentions its participation in the Powering Past Coal Alliance), and phasing down international finance for fossil fuel production and associated infrastructure, including in overseas aid and export credit agencies. There is considerable scope in NDCs and LT-LEDs to enhance this element.

3.9 Incidental references

For completeness, we note that some NDCs and LT-LEDs include references to fossil fuel production in incidental contexts, such as defining the coverage of the NDC, establishing baseline levels of emissions from the energy sector, and identifying assumptions underpinning scenarios.²⁴ For instance, Zambia's second-round NDC specifies that the country has broadened the scope of sectors covered in its mitigation contribution by including coal production (Zambia, 2020, p. 5). The LT-LEDs of Norway and France both include historical data on GHG emissions for the fossil fuel extraction sector (France, 2020, p. 104; Norway, 2020, p. 3).

This analysis does not include policies from countries that have enacted supply-side measures but not yet included them in their NDCs and LT-LEDs. These include, among others, measures to restrict the leasing of state-owned lands and waters for fossil fuel development, cease public financing of fossil fuel production, limit the development of specific infrastructure, and divest public funds from fossil fuel holdings (for a more comprehensive list of measures see Lazarus and van Asselt (2018)).



Oil pumps © ANTONIOSOLANO / GETTY

²⁴ See e.g. the second-round NDCs of Colombia, Japan, Mexico, Norway, and Zambia, and the LT-LEDs of France, Norway, and Slovakia. See also the first-round NDCs of Colombia, the EU, and Syria.

Conclusion

To what extent do NDCs and LT-LEDS reflect the rapid decline in fossil fuel production required to meet Paris goals? The picture is mixed. On the one hand, countries continue to include information and commitments related to fossil fuel supply, increasingly with targets and measures to wind down production. This can be understood in the context of the growing realization that tackling climate change will require a managed decline of fossil fuel production. Countries that have enacted supply-side measures still have an opportunity to include them in their NDCs and LT-LEDS, if they have not yet done so.

On the other hand, the examination of these documents reveals that many countries are still planning to continue or expand their fossil fuel production, even while concurrently planning to reduce their greenhouse gas emissions. While communication of measures to wind down or constrain production has, so far, significantly increased since the first round of NDCs – with 5 countries plus the EU communicating such measures for the first time in their second-round NDCs – it still represents a minority of instances where fossil fuel production is mentioned. Countries that currently indicate in their NDCs or LT-LEDS a continued or increased level of fossil fuel production could reconsider these plans in light of the need for a just and equitable transition away from fossil fuel production. In addition, although the documents show an increasing concern for transition planning, there is also substantial potential for countries to further flesh out plans for economic diversification and just transition, and to reflect on equity considerations. Moreover, about one-third of fossil-fuel-producing countries do not refer to fossil fuel supply at all in their NDCs, a proportion that has remained roughly constant across the first and second rounds of NDCs. However, this is only a provisional conclusion due to the number of countries yet to submit their second-round NDCs.

There is considerable scope for countries to continue to expand and deepen their consideration of fossil fuel production in their communications to the UN climate change regime. NDCs and LT-LEDS, as the key international documents for countries to communicate and enhance their climate ambition, have significant potential to be used by countries to communicate plans to ensure a just and equitable transition away from fossil fuel production. This paper identifies how countries have included such information, namely through: information on reserves and production; targets and pathways to wind down fossil fuel production; measures and policies to disincentivize or constrain fossil fuel production; mitigation and adaptation measures for the fossil fuel production sector; transition planning; equity in relation to fossil fuel production; and international support and cooperation. Many countries are already including some of these elements in their NDCs and LT-LEDS, and others may find these elements helpful for preparing and updating their NDCs and LT-LEDS.

COP26 is approaching fast. Many Parties have yet to communicate a new or updated NDC, or submit an LT-LEDS, and the window for doing so is rapidly closing. The time remaining offers an opportunity for countries to more fully take advantage of the potential of these documents to communicate supply-side ambition. Transparency around fossil fuel production and on plans to wind it down is crucial to limit warming to 1.5°C or well below 2°C.

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Appendix

Supply-side elements in countries' first-round NDCs (adapted from Verkuil et al 2019)

Country	Information on reserves and/or production	Pathways/targets to align production with Paris goals	Policy measures to restrict production	Continued or increased production	Interventions to reduce production-related emissions	Just transition and economic diversification	Level of economic dependence on production	Response measures, transition risk, or stranded assets	Adaptation of production	International cooperation and support	Incidental
Algeria											
Angola											
Argentina											
Australia											
Azerbaijan											
Bahrain											
Bangladesh											
Bolivia											
Brazil											
Brunei Darussalam											
Canada											
Chad											
China											
Colombia											
Republic of the Congo											
Ecuador											
Egypt											
Equatorial Guinea											
European Union											
Gabon											
India											
Indonesia											
Iran											
Japan											
Kazakhstan											
Republic of Korea											
Kuwait											
Malaysia											
Mexico											
Mongolia											
Myanmar											
New Zealand											
Nigeria											
Norway											
Oman											
Pakistan											
Peru											
Qatar											
Russian Federation											
Saudi Arabia											
South Africa											
South Sudan											
Sudan											
Syria											
Thailand											
Trinidad and Tobago											
Tunisia											
Turkey											
Turkmenistan											
Ukraine											
United Arab Emirates											
United States											
Uzbekistan											
Venezuela											
Viet Nam											
Yemen											
Zimbabwe											
Total	0	0	2	13	21	6	9	5	0	0	0

Supply-side elements in countries' second-round NDCs

Country	Information on reserves and/or production	Pathways/targets to align production with Paris goals	Policy measures to restrict production	Continued or increased production	Interventions to reduce production-related emissions	Just transition and economic diversification	Level of economic dependence on production	Response measures, transition risk, or stranded assets	Adaptation of production	International cooperation and support	Incidental
Angola											
Argentina											
Australia											
Bangladesh											
Bosnia and Herzegovina											
Brazil											
Brunei Darussalam											
Chile											
Colombia											
Costa Rica											
Cuba											
Ecuador											
Ethiopia											
European Union											
Japan											
Kenya											
Democratic People's Republic of Korea											
Republic of Korea											
Lebanon											
Mexico											
Mongolia											
Nepal											
New Zealand											
North Macedonia											
Norway											
Palestine											
Papua New Guinea											
Peru											
Philippines											
Senegal											
South Sudan											
Suriname											
Thailand											
United Arab Emirates											
United Kingdom											
United States											
Viet Nam											
Zambia											
Total	5	1	2	6	6	3	9	0	4	3	5

Supply-side elements in countries' LT-LEDs

Country	Information on reserves and/or production	Pathways/targets to align production with Paris goals	Policy measures to restrict production	Continued or increased production	Interventions to reduce production-related emissions	Just transition and economic diversification	Level of economic dependence on production	Response measures, transition risk, or stranded assets	Adaptation of production	International cooperation and support	Incidental
Austria											
Canada											
Czech Republic											
Denmark											
European Union											
France											
France (updated)											
Germany											
Japan											
Republic of Korea											
Mexico											
Netherlands											
Norway											
Slovakia											
South Africa											
Spain											
Ukraine											
United Kingdom											
United States											
Total	4	4	3	2	6	6	6	2	0	3	3

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