Swimming upstream: Addressing fossil fuel supply under the UNFCCC

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Abstract: Reducing fossil fuel supply is necessary to meet the Paris Agreement goal to keep warming "well below 2°C", yet the Agreement is silent on the topic of fossil fuels. This article outlines reasons why it is important that Parties to the Agreement find ways to more explicitly address the phasing out of fossil fuel production under the UNFCCC. It describes how countries aiming to keep fossil fuel supply in line with Paris goals could articulate and report their actions within the current architecture of the Agreement. It also outlines specific mechanisms of the Paris Agreement through which issues related to the curtailment of fossil fuel supply can be addressed. Mapping out a transition away from fossil fuels – and facilitating this transition under the auspices of the UNFCCC process – can enhance the ambition and effectiveness of national and international climate mitigation efforts.

Key policy insights:

- The global commitment to limit global average temperature increases to "well below 2°C" provides a strong rationale for Parties to the Paris Agreement and the UNFCCC to pursue a phase-down in fossil fuel production, not just consumption.
- Many countries have already made commitments to address fossil fuel supply, by agreeing to phase down coal or oil exploration and production.
- Integrating these commitments into the UNFCCC process would link them to global climate goals, and ensure they form part of a broader global effort to transition away from fossil fuels.
- The Paris Agreement provides a number of new opportunities for Parties to address fossil fuel production.

Keywords: Paris Agreement; UNFCCC; fossil fuels; supply-side climate policy

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1. Introduction

There is growing acknowledgement that meeting the goal of the Paris Agreement to keep global warming 'well below 2°C' and 'pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels' will require a radical reduction in fossil fuel consumption, even under ambitious assumptions for carbon capture and storage[1] (Rockström et al., 2017; Rogelj et al., 2015). This implies that significant portions of the world's fossil fuel reserves will need to remain undeveloped (McGlade & Ekins, 2014). It also suggests that specific policies may need to be enacted to constrain fossil fuel supply, avoid locking in new high-emissions infrastructure investments, and ensure a just transition for those currently dependent on fossil fuel production for their livelihoods (Erickson, Lazarus, & Tempest, 2015, Muttit et al., 2016, Rosemberg, 2017).

And yet, even as the need to limit fossil fuel production is increasingly recognized, most climate policy still focuses on reducing the demand, not supply, of fossil fuels. Winding down global fossil fuel production will therefore likely require new domestic and international supply-side policy approaches, to complement existing demand-focused policies (Green & Denniss, 2018; Lazarus, Erickson, & Tempest, 2015). These policies could be facilitated through the central international forum for addressing anthropogenic climate change – the international regime established by the United Nations Framework Convention on Climate Change (UNFCCC).[2]

For most of the 25-year history of the UNFCCC process, the topic of fossil fuel production has been side-lined in global negotiations.[3] Indeed, the phrase 'fossil fuels' is missing from the Paris Agreement, despite the fact that that fossil fuels account for two-thirds of all global anthropogenic greenhouse gas (GHG) emissions (Blanco et al.,

2014; IEA, 2017).[4] This omission can be understood as an effort to be equally inclusive of all sources of CO_2 and other greenhouse gases, but it is also a reflection of the concerns of major fossil fuel producing nations about the impacts of mitigation measures on their economies (Chan, 2016).

However, in the run up to the UNFCCC Conference of Parties (COP 23) in November 2017, the tone of international climate discussions began to shift. The United Nations (UN) Secretary-General António Guterres called fossil fuel investments 'bets on an unsustainable future that will place savings and societies at risk' (Guterres, 2017), and the COP 23 President, Fijian Prime Minister Bainimarama, stated that the 1.5°C target 'means shifting away from fossil fuels altogether' (Bainimarama, 2017). This call was reinforced at the closing of COP 23, where the world's 47 least developed countries requested that the then-forthcoming Talanoa Dialogue on raising ambition include discussion of 'managing a phase-out of fossil fuels' (Republic of Ethiopia, 2017). While these statements reflect a growing *sentiment* that fossil fuels – including fossil fuel production – need to be addressed more directly, there is still limited *action* being taken on fossil fuel supply through the UNFCCC process.

This article explores how fossil fuel supply could be integrated into the UNFCCC process, and outlines why it could be important to do so. It describes how countries aiming to keep fossil fuel supply in line with the Paris goals could act within the current architecture of the Agreement, and how the UNFCCC process could foster such actions. Overall, this article argues for greater attention to fossil fuels – especially, to fossil fuel production – in the UNFCCC process and subsequent refinements to Paris Agreement mechanisms, and it reviews and synthesizes the options for doing so.

2. Why address fossil fuel supply through the UNFCCC process?

The international response to climate change is centred around the UN Framework

Convention adopted in 1992 (UNFCCC). Since that treaty's entry into force in 1994, negotiations have continued to strengthen the international response, resulting in the Kyoto Protocol in 1997, the Paris Agreement in 2015, and hundreds of decisions by the Conference of the Parties (COP) to the UNFCCC. This broader UNFCCC process acts as a forum for convening global conversations on how to address climate change, and coordinates and supports actions by governments and non-state actors to mitigate and adapt to the problem. If the UNFCCC process does not address fossil fuels, it becomes easier for governments, industries, and other actors to remain vague about plans to phase-down fossil-fuel production and fossil-derived carbon dioxide (CO_2). Ultimately, meeting the goals of the Paris Agreement will require a phase-down of coal, oil and natural gas, both in consumption and production.

Some countries have already recognized the need to constrain fossil fuel supply, and have taken steps in that direction. Some illustrative examples include:

- Moratoria on new oil exploration licences enacted by the governments of Belize, Costa Rica, Denmark, France, and New Zealand (Bamat, 2017; Green, G. 2018; Kane, 2014; Roy, 2018; Whitbread, 2018);
- India's tax on locally produced and imported coal at a rate of INR 400 [about USD 6] per tonne (Sinha, 2016);
- Ireland's divestment of coal, oil and gas investments from the Ireland Strategic Investment Fund (Osborne, 2017); and
- Sweden's largest national pension fund divesting from fossil fuel companies that it deems have acted in conflict with the goals of the Paris Agreement (AP7, 2016; Fouche, 2017).

These actions signal a readiness to move away from a fossil-fuelled economy by some nations. They can also have a tangible impact on CO_2 emissions, as they complement existing national climate change mitigation strategies by allowing for more CO_2 emissions abatement for a given marginal cost (Fæhn, Hagem, Lindholt, Mæland, & Rosendahl, 2017; Green & Denniss, 2018), and reduce 'lock-in' to development pathways that are dependent on fossil-fuelled energy (Erickson et al. 2015). Since fossil fuels are traded commodities and subject to price-induced market "leakage", measures to restrict fossil fuel production will be most effective if they are done in conjunction with other nations, as part of a global climate change mitigation strategy. For this reason, it is important for nations to pursue such actions as part of their commitments to the UNFCCC under the Paris Agreement.

Publicly communicating and recognizing Parties' actions on fossil fuels at the international level serves several purposes. It encourages countries to make concrete commitments, which can be used to debate whether planned actions are fair and ambitious, and to identify where there may be a need for financial, technological, and capacity-building support. Addressing fossil fuel supply through the UNFCCC process also clarifies and strengthens signals to financial markets that a critical mass of countries are committed to scaling back investment in fossil fuels (Sandalow, Benes, & Augustin, 2016). Furthermore, explicitly discussing a fossil fuel phase-down in the UNFCCC process can help to normalize the idea that transitioning away from fossil fuel extraction and supply is an indispensable part of climate policy (Green, F., 2018).

3. How could fossil fuels be addressed under the Paris Agreement?

The Paris Agreement has several elements through which the need to limit fossil fuel supply can be addressed. These include formal commitments and reporting requirements, as well as actions that could be taken by Parties, non-state actors and the

UNFCCC Secretariat in response to specific provisions. This section reviews options for addressing fossil fuels through elements of the Paris outcome.[5]

3.1. Track alignment of fossil fuel development against a 1.5-2°C warming goal

While the Paris Agreement does not explicitly call for a transition away from fossil fuels, the goal to keep warming 'well below 2°C' and pursue efforts to limit temperature rise to 1.5°C necessitates deep reductions in fossil fuel use, which implies reduced production (McGlade & Ekins, 2014; Rockström et al., 2017; Rogelj et al., 2015). This headline goal provides a measuring stick against which the transition away from fossil fuels can be monitored. This could be operationalized, for example, by mapping fossil fuel phase-down pathways in future Intergovernmental Panel on Climate Change (IPCC) reports. The UNFCCC Secretariat, Parties, and non-state observers could thereafter use IPCC scenarios to track alignment of global fossil fuel development with a 1.5 to 2°C warming goal over time.

3.2 Include targets and actions related to fossil fuel supply in Nationally Determined Contributions

Article 4 of the Paris Agreement calls for countries to communicate their commitments to reducing emissions through Nationally Determined Contributions (NDCs) every five years (UNFCCC, 2015b). There is a good deal of flexibility in the scope and contents of NDCs. At present, fossil fuel supply is not a central focus of most NDCs – which primarily focus on measures that reduce demand for fossil fuels – though some countries do communicate measures that would constrain fossil fuel development. For example, India includes discussion of its tax on extracted and imported coal. However, this is the exception rather than the norm. An examination of NDCs from the top ten fossil-fuel-producing nations (Table 1) reveals that for the most part, countries discuss

fossil fuel extraction in terms of the impacts of climate change mitigation measures on fossil-fuel-dependent economies, or future plans to make the industry more efficient.

[TABLE 1 APPROXIMATELY HERE]

Nations could embed supply-side strategies in their NDCs in various ways. Alongside their emissions reduction targets, countries could include targets for a fossil fuel production phase-down (e.g. production reduction targets). In addition, they could include commitments to constrain investment in fossil fuel supply, such as by pledging to remove subsidies to fossil fuel producers (van Asselt & Kulovesi, 2017). Alongside existing descriptions of mitigation activities, Parties could include measures such as moratoria on new fossil fuel infrastructure or taxes on fossil fuel exports. Countries could also discuss policy measures to ensure a just transition for extractive-industry workers, such as job-retraining programmes (Rosemberg, 2017).

3.3 Plan for a phase-down of fossil fuels in long-term low greenhouse gas emission development strategies

Article 4 of the Paris Agreement also calls on Parties to 'formulate and communicate long-term low greenhouse gas emission development strategies' (LTSs) (UNFCCC, 2015b; Article 4.19). The development of LTSs is not a legally binding requirement, and there are (as of yet) no terms of reference for their content. The intention is that nations develop plans for decarbonizing their economy by 2050, to provide an overarching framework for shorter-term NDCs. The process of LTS development provides an ideal opportunity for nations to plot out a managed decline in fossil fuels. Nations can incorporate trajectories for fossil fuel production and investment in their LTSs that are consistent with 1.5 or 2°C goals. This could involve identifying what types of infrastructure development are consistent with a planned phase-down of fossil fuels, as well as developing strategies for transitioning workers in the industry to new

roles in the economy.

3.4 Use the 'response measures' track to plan a transition away from fossil fuels

The Paris Agreement – like the UNFCC and Kyoto Protocol before it – acknowledges that some measures taken to reduce emissions (known as 'response measures') may have negative social and economic impacts. The Agreement therefore calls for Parties to 'take into consideration in the implementation of this Agreement the concerns of Parties with economies most affected by the impacts of response measures, particularly developing country Parties.' (UNFCCC, 2015b; Article 4.15).

Historically, the 'impacts of response measures' have been heavily promoted by oil-producing countries, who have expressed concern about the implications of a movement away from fossil fuels on their economies (Chan, 2016; Depledge, 2008). More recently, the focus of the 'response measures' track has begun to shift, as trade unions have joined deliberations, calling for consideration of the impacts on workers in extractive industries, and the need to plan a transition towards cleaner jobs (ILO, 2015; ITUC, 2015).

To help address these concerns, the UNFCCC negotiations established an Improved Forum on the 'Impact of the Implementation of Response Measures'. The Forum developed a work programme focusing on two areas: 'economic diversification and transformation' and 'just transition of the workforce, and the creation of decent work and quality jobs' (UNFCCC, 2016). The 'imperatives of a just transition' is also recognized in the preamble to the Paris Agreement (UNFCCC, 2015b).

The 'response measures' track provides a space for planning the transition away from fossil fuels. Indeed, the first UNFCCC technical report on 'just transitions' acknowledges that the Paris Agreement implies the decline of the fossil fuel industry, stating that 'climate policies will need to bring about a fundamental change in the global

energy mix in coming years and decades. The result will be further job losses in the fossil fuel sector – in coal mining, in exploration and production of oil and gas, and at fossil fuel-powered power plants' (UNFCCC, 2016, p. 31).

The open acknowledgement that meeting Paris goals will lead to a decline in jobs in the fossil fuel sector is an important first step. The next challenge is ensuring that this decline proceeds in an equitable fashion. There are several unanswered questions regarding an equitable decline in fossil fuels, such as how to prioritize any fuels that fit within the remaining carbon budget, and how to support nations transitioning away from extractive economies (Kartha, Caney, Dubash, & Muttitt, 2018). The Improved Forum seems the appropriate space within the UNFCCC process for addressing such questions.

3.5 Develop and employ an accounting framework for extraction-based emissions

The Paris Agreement calls for Parties to 'account for their [NDCs] … in accordance with guidance adopted by the [COP]' (UNFCCC, 2015b; Article 4.13). The decision accompanying the Agreement specifies that accounting should follow the 'methodologies and common metrics assessed by the [IPCC]' (UNFCCC, 2015a; Paragraph 31).

Greenhouse gas emissions are currently accounted for under the UNFCCC process using a production-based or territorial accounting framework. Under this framework, emissions from fossil fuels are counted in the nation where they are released, such as when fuels are combusted for power generation or transport. Countries report emissions in the form of national inventory reports, which are typically compiled following the guidance of the IPCC (IPCC, 2006). A territorial approach rewards actions that reduce emissions domestically, but does not recognize actions that might

reduce emissions offshore (such as restricting fossil fuel exports). Thus, the existing framework gives no credit to nations who export fossil fuels if they limit the supply. An alternative GHG accounting framework based on extraction-based emissions would help ensure that such efforts are reflected in national accounts (see Davis, Peters, & Caldeira, 2011; Erickson & Lazarus, 2013; Steininger, Lininger, Meyer, Muñoz, & Schinko, 2016 for examples of alternative frameworks).

Establishing a standardized methodology and capacity for territorial emissions accounting has been a long, iterative process. Rather than displacing this framework, an extraction-based accounting system could be established in parallel to monitor the alignment of fossil fuel supply with climate goals. As a first step, nations that are already considering restricting fossil fuel supply could begin accounting for their extraction on a voluntary basis. At the same time, the IPCC could develop standards for extraction-based accounting, and collect baseline data on existing and planned fossil fuel extraction. This would lay the foundation for more comprehensive tracking of extraction-based emissions in the future, as ambition rises to meet global climate targets.

3.6 Ensure that the 'enhanced transparency framework' retains enough flexibility to accommodate tracking a phase-down of fossil fuels

The Paris Agreement states that 'in order to build mutual trust and confidence and promote effective implementation, an enhanced framework for transparency and support' will be created (UNFCCC, 2015b; Article 13.1). At present, details of the transparency framework are still under negotiation. However, the Agreement does spell out some features. In particular, it calls for Parties to provide 'a national inventory report of anthropogenic emissions' using methods specified by the IPCC, as well as 'information necessary to track the progress made in implementing and achieving its

[NDC]' (UNFCCC, 2015b; Article 13.7). It further suggests that some developing countries will have more flexibility in light of their capacities.

Negotiations under the Ad Hoc Working Group on the Paris Agreement are developing common modalities, procedures and guidelines by the end of 2018; these form an important aspect of strengthening transparency on mitigation, adaptation, finance, technology transfer, and capacity building (Winkler, Mantlana, & Letete, 2017). The issue of accounting for actions that fall outside existing national inventories will likely be discussed during negotiations on the new transparency framework, because countries have proposed a variety of non-GHG emissions targets in their NDCs (e.g. reducing short-lived climate pollutants, or increasing renewable energy production; see Hood, Briner, & Rocha, 2014). A framework that is flexible enough to incorporate diverse targets could also accommodate tracking a phase-down of fossil fuels. As no country has yet set goals to limit fossil fuel supply in their NDC, this opportunity may be missed in the development of the new framework. It is therefore important to retain sufficient flexibility so that new, more ambitious goals (such as restricting new extraction) could be reported.

In addition to reporting, the Paris Agreement calls for information submitted under the transparency framework (i.e. national inventory reports and biennial reports on progress made towards NDCs) to 'undergo a technical expert review' as well as a 'facilitative, multilateral consideration of progress' (UNFCCC, 2015b; Article 13.11 and 13.12). One way to help mainstream national actions on fossil fuel supply restriction is for Parties to nominate experts to the UNFCCC's roster of technical reviewers who can provide knowledge and support regarding fossil fuel production, its impact on global emissions, and policies to support just and orderly transitions. Alternatively, Parties could provide appropriate training in this area for existing expert

reviewers. Parties can also ensure during negotiations that the mandate for reviewers includes explicit consideration of these measures.

3.7 Include fossil fuel production in the global stocktake

The transparency framework is expected to feed into a 'global stocktake', which will assess 'collective progress towards achieving the purpose of [the] Agreement and its long-term goals' (UNFCCC, 2015b; Article 14.1). The process of tracking alignment of national efforts with global long-term goals began with a 'facilitative dialogue' (rebranded the Talanoa Dialogue at COP 23) in 2018, and will continue with a global stocktake starting in 2023 and held every five years thereafter. As with other elements of the Agreement, the details of the global stocktake are still to be determined. For instance, beyond a few broad categories of information sources (e.g. IPCC reports; see UNFCCC, 2015a; Paragraph 99), it is not yet clear what types of information will be gathered and assessed. The ultimate form of the stocktake will dictate the types of data that Parties should ideally report under the transparency framework.

The global stocktake could include tracking measures targeted at fossil fuel extraction as one set of actions working toward a 1.5°C or 2°C target, which would help illuminate which fossil fuel reserves could be utilized in the future while still meeting the Paris Agreement goals. Models exist for this type of analysis on a global scale. For instance, McGlade and Ekins (2015) have mapped out the regional distribution of reserves that are 'un-burnable' in a 2°C warming scenario, and the IEA's annual *World Energy Outlook* estimates regional fossil fuel production under low-carbon scenarios. The five-yearly stocktakes would provide an opportunity to revisit the assumptions of models, and determine where declines in extraction are most needed to keep temperatures below targets.[6] Information for a stocktake of a fossil fuel phase-down could come directly

from Parties, through scientific assessments like the IPCC's Assessment Reports, or from non-state actors tracking national commitments.

3.8 Ensure climate finance addresses fossil fuel supply

One of the headline goals of the Paris Agreement is to make 'finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development' (UNFCCC, 2015b; Article 2.1). This goal has major implications for investment in the fossil fuel industry. At present, energy investment is heavily weighted towards fossil fuels. The IEA estimated that in 2015, over three-quarters of energy investment remained in fossil fuels, amounting to more than USD 1 trillion (IEA, 2016c). The situation is compounded by fossil fuel subsidies provided by governments around the world, which amount to hundreds of billions of dollars annually (OECD, 2017, p. 196) and which increase fossil fuel investment and production (Erickson, Down, Lazarus, & Koplow, 2017). Bringing finance flows in line with a 'pathway towards low greenhouse gas emissions' requires reforming these subsidies, and more generally, reducing investment in fossil fuel infrastructure.

There are a number of ways that investments in fossil fuel supply could be addressed within the framework of the Paris Agreement. First, Parties could agree to high-level goals that align fossil fuel financing with the 'well below 2°C' warming goal, such as a global agreement to phase-down fossil fuel subsidies (van Asselt & Kulovesi, 2017) or a commitment to exclude fossil fuel infrastructure from eligibility for climate finance (Bodnar, Ott, Thwaites, De Marez, & Kretschmer, 2017). This would mirror a similar commitment by the World Bank to phase-out financial support for oil and gas extraction (Elliot, 2017). Progress could be tracked either by the UNFCCC Standing Committee on Finance, or alternatively by non-state actors outside the UNFCCC process, and assessed in the global stocktake. Second, Parties can make individual

commitments to align their public financing with global climate goals in their NDCs. For example, thirteen countries have already committed to fossil fuel subsidy reform in their NDCs (Terton, Gass, Merrill, Wagner, & Meyer, 2015). Third, the UNFCCC Secretariat and other supporting bodies could help Parties who want to undertake finance reform access technical expertise, either through capacity building, or by holding technical expert meetings (TEMs) on reforming financial support for fossil fuels (van Asselt & Kulovesi, 2017). By taking these steps, the UNFCCC could build on the work of other forums and international organizations, such as the G20 and G7, that have committed to phasing out inefficient fossil fuel subsidies (Merrill et al., 2017), or the OECD, IEA and International Monetary Fund, which compile detailed information on countries' subsidies on an ongoing basis.

3.9 Provide financial resources for developing countries to shift away from fossil fuel extraction

The Paris Agreement stipulates that developed country Parties need to provide financial support to developing countries, recognizing that many nations have limited financial capability to mitigate and adapt to climate change (UNFCCC, 2015b; Article 9). Developed countries have agreed to mobilize USD 100 billion a year by 2020 to support developing countries, and to scale this commitment up over time.

There are several steps that could be taken to limit investment in fossil fuels, and ensure financing for developing nations remains 'consistent with a pathway towards low greenhouse gas emissions'. First, developed nations can phase-down fossil fuel infrastructure investment in developing nations. Examples abound of development funding being funnelled to fossil fuel infrastructure (notably, Japan has even claimed that several coal projects in Asia count as climate finance) (Chen, Doukas, Godinot, Schmidt, & Vollmer, 2016). This funding locks countries into a development pathway

that limits their long-term ability to transition away from fossil fuels (Erickson et al., 2015; OECD, 2017). Governments can phase-down funding for fossil fuel extraction and exploration in their own bilateral institutions – including overseas aid and export credit agencies – and work to ensure that multilateral institutions make similar commitments (Doukas & Bast, 2017).

Second, governments can redirect funding currently used to support fossil fuels to meet international climate finance goals. For instance, annual fossil fuel subsidies represent more than six times the 'financing gap' between national pledges and the USD 100 billion goal (Merrill et al., 2017). Redirecting fossil fuel subsidies towards climate financing would have the dual outcome of reducing GHG impacts created by the subsidies, and freeing up funds for low-carbon development.

Finally, funding agencies can support developing countries in accessing finance for transitions away from a fossil fuel economy. For example, 'just transition' funds could be established to assist nations who wish to retrain workers in fossil-fuel-dependent communities (Rosemberg, 2017). Expanding the scope of funded activities to include mitigation efforts focused on fossil fuel supply is necessary to help nations develop in an appropriate manner for a climate-constrained future.

3.10 Provide technical and capacity-building support for a fossil fuel phase down

It has long been recognized within the UNFCCC process that some nations lack the capacity or the public support needed to implement effective climate strategies. For this reason, the Paris Agreement calls for capacity building and public education on climate change (UNFCCC, 2015b; Articles 11 and 12), which will be coordinated through the Paris Committee on Capacity Building (PCCB). In addition, there are a wide range of global initiatives set up to help national governments achieve Paris goals, such as the

NDC Partnership and the Low Emission Development Strategies Global Partnership.

Capacity-building and education programmes are key areas where norms are spread about appropriate climate responses. As such, Parties and the UNFCCC Secretariat could help ensure that capacity-building efforts address the links between fossil fuel supply and climate goals, as well as provide tools and support for nations transitioning away from fossil fuel extraction. One way to help build a knowledge base for mitigation strategies focused on limiting fossil fuel supply would be to convene sessions devoted to supply-side policy at UNFCCC TEMs. Technical and institutional capacity could be advanced on a number of topics, including assessing the emissions implications of restricting fossil fuel supply, evaluating whether proposed fossil fuel infrastructure is consistent with climate goals, estimating fossil fuel subsidies, designing fossil fuel subsidy reform, and planning workforce transitions. Given that some of these issues only relate to a sub-set of UNFCCC Parties, it may make sense to build a dedicated network for extractive economies to engage in learning on climate change and fossil fuel supply.

3.11 Support non-state actors who are contributing to the transition away from fossil fuels

Proactive sub-national governments, businesses, and civil society organizations have long been taking steps to reduce climate change impacts. These actions were formally recognized in the Paris Agreement, where parties were called upon to ‘enhance public and private sector participation in the implementation of [NDCs]’ (UNFCCC, 2015b; Article 6.8). Non-state actors play multiple roles within the international climate regime, including raising public awareness, representing marginalized voices, lobbying, providing expert advice, implementing their own climate actions, and monitoring and enforcing Parties’ commitments (Nasiritousi, Hjerpe, & Linnér, 2016; van Asselt,

2016).

Non-state actors will undoubtedly play an important role in a managed decline of fossil fuel production. Indeed, it has been non-state actors that have pushed much of the climate action focused on limiting fossil fuel supply so far. For instance, civil society actors have led a global divestment movement, which has resulted in more than USD 5 trillion of investment being pulled from fossil fuel industries (Ayling & Gunningham, 2017). Research organizations and other non-governmental actors have also been responsible for changing the discourse on climate change mitigation to bring more attention to fossil fuels, providing critical research on 'unburnable carbon' and 'stranded assets' in a 2°C scenario (Leaton, 2011). Trade unions have also played a key role in ensuring that global negotiations consider a 'just transition' for those affected by the loss of fossil fuel jobs (ILO, 2015; ITUC, 2015).

The commitment to increase public and private sector participation also means that fossil fuel companies have an acknowledged role in meeting Paris goals (Nasiritousi, 2017). This is significant, because a significant portion of global emissions come from the combustion of fossil fuels carried out by a small group of companies (Heede, 2013). The role for the fossil fuel industry within the Paris framework remains up for debate, with some arguing that the industry has a conflict of interest in any climate agreement, and others seeing the industry as playing a critical role. This debate will likely intensify if fossil fuel production takes a more central position in the UNFCCC process.

The UNFCCC process can support non-state actors who are contributing to the transition away from fossil fuels. For example, a dedicated category for supply-side actions could be set up in the Non-state Actor Zone for Climate Action (NAZCA – the online portal for registration of non-state activities), which currently emphasizes

demand-side action (UNFCCC, 2017c). The UNFCCC process could also provide opportunities for non-state actors to contribute to monitoring and ambition-raising mechanisms (such as the global stocktake); civil society actors, for instance, could report on whether their governments' fossil fuel extraction activities align with global commitments. These actions could be promoted and coordinated by the two UNFCCC High-Level Champions, who are appointed to boost cooperation between non-state actors and governments.

4. Responsibilities for addressing fossil fuels within the UNFCCC

The previous section presented multiple ways through which a phase-down of fossil fuels could be embedded within the current mechanisms of the Paris Agreement. However, it is important to recognize that the existing structure and politics of the UNFCCC process makes some of these actions more feasible than others. There are few barriers (beyond those relating to domestic politics) to individual Parties voluntarily adopting some of the suggested approaches in Section 3, such as reporting fossil fuel production targets within their NDCs. However, actions that require new processes to be developed at the UNFCCC level, or a COP decision, will be more challenging to enact.

In the UNFCCC process, decisions are made by consensus, and new strategies are only adopted if no one objects. While some of the smaller actions outlined in Section 3 appear to be within the scope of day-to-day operations of the Secretariat (such as adding new categories to the roster of experts or NAZCA), many are significant enough that they would warrant a consensus by Parties. Consensus on provisions for a fossil fuel phase-out through a COP decision would likely difficult, if not impossible, in the current political climate. Given that an important source of economic activity would be at stake, some oil, gas and coal producing nations would in all likelihood would

block efforts to include fossil fuels within the global stocktake or to tie fossil fuel supply to overarching Agreement goals.

How then should nations who are willing to phase-down fossil fuels proceed? First, they can lead by example and ensure that their own national efforts reflect their commitment to limiting fossil fuel supply. For instance, they can include measures to address fossil fuel production in their NDCs, map a transition away from fossil fuels in their LTS, and ensure their financial support does not support the ongoing growth of the fossil fuel industry. Second, they can work with other like-minded nations to advocate for the explicit inclusion of fossil fuels into components of the Paris Agreement.

Nations may consider forming dedicated coalitions to address fossil fuel transitions (Weischer, Morgan, & Patel, 2012). Party coalitions with related interests – such as small island states, or least developed countries – have worked together throughout the evolution of the climate regime, with new coalitions emerging over time. A similar grouping could be set up for those pursuing a managed decline in fossil fuels. As an example of what such a group could achieve, Collier and Venables (2014) propose that a 'coalition of the willing' could work together to phase out coal production, the most polluting of the fossil fuels. Indeed, such a coalition began to emerge at COP 23, with twenty countries joining a new global alliance to phase out coal (UNFCCC, 2017b). To date, this Powering Past Coal alliance has emphasized phasing out coal-fired electricity, rather than extraction, however the mandate could potentially be expanded to include coal production. While there is no reason such a group would need to exist within the auspices of the UNFCCC, tying it to Paris Agreement goals would make more explicit the need for other nations to address fossil fuel supply.

5. Conclusion

This article outlined ways that the UNFCCC process can support countries transitioning

away from fossil fuels, by building recognition and reporting tools into the existing architecture of the Paris Agreement. It demonstrates that there are multiple avenues through which restrictions on fossil fuel supply could be embedded within the elements of the Paris Agreement.

The idea of directly addressing fossil fuels within the UNFCCC process is not new. Since the outset of the Framework Convention, fossil fuel dependent countries have been calling for special consideration given their unique role in the climate regime (Chan, 2016), and major fossil fuel producers, such as Saudi Arabia, have worked hard to ensure climate negotiations do not harm their economic interests (Depledge, 2008). Indeed, at COP 23 the US held a side-event touting the virtues of fossil fuels (Friedman, 2017). For those who are familiar with this history, it begs the question: why try to tackle fossil fuel supply now? Given that securing the Paris Agreement was a hard-fought battle, it might seem prudent to avoid such a politically charged issue. However, we would ask a different question: if not now, when? Current national commitments are expected to lead to a significant overshoot of agreed temperature limits (Rogelj et al., 2016), and countries will soon consider how to enhance their collective ambition. Now may be the ideal time to consider supplemental approaches to attaining that ambition.

Furthermore, in the next few years, some of the Paris Agreement's key features – including those outlined here – will need to be agreed upon, putting in place concrete pathways for mitigating climate change. The 2018 Talanoa Dialogue to discuss whether national commitments are sufficient to meet global goals will likely provide a model for the global stocktake. In addition, countries will agree on the detailed rulebook specifying information needed in NDCs, as well as the design of the enhanced transparency framework and the global stocktake. Alongside these efforts, the IPCC will be revising guidelines for national inventories of GHGs. If fossil fuel production is

left aside in all of these discussions, significant time could pass before the issue is revisited. At that point, it may be well past the period that a 'managed decline' in fossil fuels will be possible while still limiting warming to 'well below 2°C' (Muttitt et al., 2016).

While addressing the supply of fossil fuel in the UNFCCC may seem like swimming upstream, there are signs that the tide is turning, and some countries are becoming more open to addressing fossil fuel production. As outlined in Section 2, several countries have begun enacting policies that would have the effect of limiting fossil fuel supply, and coalitions of governments are working together on elements of the fossil fuel phase-out – through initiatives such as the Powering Past Coal Alliance, and the Friends of Fossil Fuel Subsidy Reform (FFFSR, 2018; UNFCCC, 2017b). Likewise, there is a greater push from civil society actors to move away from fossil fuels (Piggot, 2018). It appears a new anti-fossil fuel norm is emerging (Green, F., 2018). This shifting socio-political landscape opens up new opportunities to raise the topic of oil, coal and gas production in climate negotiations.

In this article, we have outlined multiple pathways for addressing fossil fuel supply in the UNFCCC process. We acknowledge that the present political climate makes a global commitment to phase down fossil fuel production unlikely, but not all of our suggested approaches require global agreement. A 'coalition of the willing' could work to restrict fossil fuel supply, in addition to working towards GHG emissions goals, even if some major producer nations choose not to participate. Here, we have provided possible avenues for such a coalition to reshape the international regime so that ceasing fossil fuel production features more prominently as a climate solution.

Notes:

[1] The feasibility of using large-scale carbon capture and storage (CCS) to meet climate goals has been questioned for a number of reasons, including the cost, slow uptake, social acceptability, and potential technological risks. Anderson and Peters (2016) suggest it constitutes a 'high-stakes gamble' and a 'moral hazard' to rely heavily on levels of CCS deployment that are not yet proven feasible. Kartha and Dooley (2016) echo this concern, arguing that reliance on unproven technologies could leave society 'stranded with an insufficiently transformed energy economy and a carbon debt that cannot be repaid' (p. 22).

[2] We use the term "UNFCCC process" broadly to refer to the United Nations global climate governance regime, encompassing not only the Framework Convention on Climate Change (UNFCCC), but also other major subsequent agreements. The primary emphasis of this paper is on the post-Paris Agreement era of the UNFCCC process.

[3] While fossil fuel supply has been raised in the UNFCCC process, it has not featured prominently, and discussions have focused primarily on supporting producers rather than on phasing down production. Indeed, the emphasis on fossil fuels has diminished in global climate treaties over time: the Framework Convention on Climate Change (FCCC) was explicit in calling for special consideration of Parties that are 'highly dependent on income generated from the production, processing and export, and/or on consumption of fossil fuels' (Articles 4.8 and 4.10) (UNFCCC 1992), the Kyoto Protocol included more veiled language about 'minimiz(ing) adverse effects' on Parties included in FCCC Article 4.8 (Articles 2.3 and 3.14) (UNFCCC 1997), and the Paris Agreement dropped direct reference to Article 4.8 altogether, simply referring to 'economies most affected by the impacts of response measures' (Article 4.15) (UNFCCC 2015b). Chan (2016) provides a more detailed history of fossil fuels in response measures negotiations, highlighting that the tone has shifted over time from a narrow focus by fossil fuel producers on compensation, toward a more forward-thinking approach emphasizing support for economic diversification and transitioning planning.

[4] Early drafts of the Agreement contained references to fossil fuels, and the need to decarbonize the economy, however this language did not make it into the final version. Reports from observers suggest that opposition from some oil-producing nations led to this text being dropped from the Agreement (Meyer 2015; Yeo 2015).

[5] The UNFCCC process is not the only relevant international institution that might help govern the transition away from fossil fuels. For a description of other options see van Asselt (2014).

[6] A number of factors play into the question of which fuels can be extracted, which may necessitate regional differentiation in extraction limits. Considerations include: the

emissions intensity of different fuels; production costs (McGlade & Ekins, 2015); equity concerns (Kartha et al., 2018); or potential for co-benefits from avoided extraction (such as protection of biodiversity hotspots - see Larrea & Murmis, 2016).

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Table 1. Inclusion of fossil fuel supply in NDCs for the ten largest fossil fuel producers

Country	CO_2 Emissions profile (million tonnes CO_2)		Fossil fuel extraction explicitly discussed in NDC?	Context in which fossil fuel extraction is discussed in the NDC			
	Territorial emissions (emissions from domestic consumption of fossil fuels)	**Extraction-based emissions** (emissions that will be generated downstream from extracted fuels)		**Policies limiting fossil fuel supply**	**The need for economic diversification**	**Impacts of climate change mitigation response measures on the economy**	**Other statements** (e.g. dependence on fossil fuels, or improved efficiency in fossil fuel production)
China	9135	8254	✓				Reach 30 billion cubic meters of coal-bed methane production. Enhance oil and coal-bed methane recovery.
USA	5176	5031	✓				Address methane emissions in the oil and gas sector.
Russia	1468	3415					
Saudi Arabia	507	1747	✓		Plans to diversify the economy away from heavy reliance on income generated from a single resource [oil].	Socio-economic and technological research on the impact of response measures is needed to understand impacts and increase resilience. Aim is to achieve a growth of domestic industries that exceeds the loss of revenue from oil export.	Ambitions contingent on a robust contribution from oil export revenues to the national economy. Increase natural gas production. Pilot test CO_2 enhanced oil recovery. Methane recovery.
Indonesia	437	1388					
Australia	374	1319					
India	2020	1254	✓	Cess [tax] on coal: INR 200 (USD 3.1) per tonne of coal extracted or imported.			List of illustrative mitigation technologies includes underground coal gasification.
Canada	555	1070	✓				Reduce methane emissions and improve energy efficiency in the oil and gas sector
Iran	556	871	✓			Dependence on revenues from oil production and exports have made the country vulnerable to mitigation of GHG emissions.	Availability of hydrocarbon resources have made national development rely on energy-intensive industries. These have made upward trend of GHG emissions inevitable.
Qatar	78	586	✓		Enhance the diversification of the economy away from hydrocarbons	Due to dependence on the export of oil and gas, response measures may negatively impact the strength of economy and potentially quality-of-life of residents.	Hydrocarbon extraction contributes to the economic and social growth of the state. Qatar has been exporting Liquefied Natural Gas as a clean energy.

Note: The largest fossil fuel producing nations were selected by taking the top five oil, gas, and coal producers from the 2016 BP Statistical Review of World Energy, which summarizes 2015 production data (BP, 2016). NDCs were sourced from the UNFCCC NDC registry using the most recently uploaded version on 6/6/17 (UNFCCC, 2017d), except Russia, Iran, and Qatar, which were sourced from the UNFCCC INDC database (UNFCCC, 2017a). Territorial fossil fuel CO_2 emissions were sourced from the 2016 IEA Emissions from Fuel Combustion (IEA, 2016a), using the latest year available at the time of writing (2014). Extraction-based emissions estimates were calculated using the amount of fossil fuels produced in each nation from the 2016 BP Statistical Review of World Energy (BP, 2016; 2014 data to match consumption statistics). From these fossil fuel production statistics, eventual CO_2 emissions were estimated based on standard IPCC carbon contents (IPCC, 2006; Vol 2, Table 2), adjusted to account for the average portion of each fuel left in products that are not combusted (Heede, 2013): 8.0% for oil, 1.9% for gas, and 0.016% for coal.
Statements included in this table were condensed or paraphrased for the sake of brevity.