



# Understanding supply-side climate policies: towards an interdisciplinary framework

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## Abstract

Once marginal in climate governance, supply-side policies which seek to restrict the production of climate warming fossil fuels are now gaining greater prominence. From national level bans and phase out policies to divestment campaigns and the creation of ‘climate clubs’ such as the Beyond Oil and Gas Alliance, an increasing number of such policies are being adopted by governments, cities and financial actors around the world. But why would states voluntarily relinquish potentially profitable reserves of fossil fuels? How can we account for the rise of supply-side policies, the form they take and the sites in which they are being adopted? What conditions and contexts are most conducive to the adoption and sustainability of ‘first mover’ bans and phase out policies? This paper seeks to build an interdisciplinary account fusing insights from diverse theoretical traditions from international political economy, political science, sociology and the literature on socio-technical transitions in order to capture the interaction of political, economic and socio-cultural drivers in national and international settings which can provide the basis of a more integrated and multi-dimensional understanding of supply-side policies. Such an account, we suggest, helps to understand the origins and evolution of supply-side policies and, more critically, the conditions which might enable the expansion of supply-side climate policies to new sites.

**Keywords** Fossil fuels · Supply-side policies · Production · Climate change · International policy · Governance

## Abbreviations

BOGA	Beyond Oil and Gas Alliance
DONG	Danish Oil and Natural Gas
EJOLT	Environmental Justice Organizations, Liabilities and Trade
IEA	International Energy Agency

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IPCC	Intergovernmental Panel on Climate Change
KIIG	Keep it in the ground
LINGO	Leave it in the ground
LDCs	Least developed countries
LNG	Liquefied natural gas
MDBs	Multilateral Development Banks
NDCs	Nationally determined contributions
PCCA	Powering Past Coal Alliance
SAFE	Stand Against Fossil Fuel Expansion
UNFCCC	United Nations Framework Convention on Climate Change

## 1 Introduction

Once marginal in climate governance, supply-side policies which seek to restrict the production of climate warming fossil fuels are now gaining traction. From national level bans on new oil and gas and coal phase out policies to divestment campaigns and the creation of ‘climate clubs’ such as the Beyond Oil and Gas Alliance, an increasing number of such policies are being adopted by governments, cities and financial actors around the world, reflecting a growing recognition that the temperature goal of the Paris Agreement cannot be achieved without enhanced efforts to leave large swathes of remaining fossil fuel reserves in the ground (SEI et al., 2021; Calverley & Anderson, 2022). But how can we account for the rise of supply-side policies, the form they take and the sites in which they are being adopted? What conditions and contexts are most conducive to the adoption and sustainability of ‘first mover’ bans and phase out policies? This paper seeks to build an interdisciplinary account fusing insights from diverse theoretical traditions to capture the interaction of political, economic and socio-cultural drivers in national and international settings which can provide a basis for understanding supply-side policies. Such an account, we suggest, helps to understand the origins and evolution of supply-side policies and, more critically, the conditions which potentially enable the extension of supply-side climate policies to new sites.

Here, we propose elements of an adaptable framework that can help to account for key supply-side policy dynamics: their origins, development and (political) sustainability, including efforts to get them adopted internationally. The framework draws on (i) critical and comparative (international) political economy to understand the location of states in the global political economy (of trade, aid, finance and energy) and how this conditions affect their scope and capacity to pursue supply-side policies often in the face of pressure to do otherwise, (ii) scholarship on socio-technical transitions to understand questions of incumbency, lock-in as well as regime destabilisation and disruption around fossil fuel use to shed light on resistance to supply-side policies and the conditions in which it can be overcome, (iii) perspectives in political science on networks, coalitions and historical institutionalism as a means to understand agents of change that can support the adoption and longevity of supply-side policies, and (iv) sociological work on energy cultures and social movements that helps to account for the socio-cultural barriers to supply-side policies as well as the role of civil society organisations in demanding supply-side measures and supporting their entrenchment. The paper draws on ongoing empirical research in first mover and emergent second mover countries to ground and explore the merits of the framework.

If the goals of the Paris agreement on climate change are to be achieved, supply-side policies are needed to keep a high proportion of remaining fossil fuels in the ground. Fossil fuels—coal, oil, and gas—are the single largest contributor to greenhouse gas emissions, accounting for more than three-quarters of emissions. Further fossil fuel production jeopardises the achievement of the long-term temperature goals of the Paris Agreement on climate change (McGlade & Ekins, 2015; Trout et al., 2022; Welsby et al., 2021); yet currently governments have plans to produce 120% more fossil fuels that would be compatible with the goals of that agreement (SEI et al., 2021) and very few include limits on production in the Nationally Determined Contributions (NDCs) (Janzwood & Harrison, 2023).

Acknowledging the need to move fossil fuel production centre stage, a growing number of countries are adopting supply-side policies. These take a number of forms that include withdrawing fossil fuel subsidies or public financing for fossil fuels, reforming taxes on fossil fuel production or exports, prohibiting the development of infrastructure supporting production, making legal claims against producers which restrict their expansion plans, undermining the legitimacy or financial viability of extraction via divestment, and limiting production by bans or moratoria on extraction (Green & Denniss, 2018; Lazarus et al., 2015). Calls for these supply-side climate policies have grown since the late 1980s, seen in early government reports, community-based resistance to fossil fuel extraction, reports by environmental organisations, and more recently, academic analysis (Asheim et al., 2019; Eriksen et al., 2018; Carter & McKenzie, 2020). Today, the evidence is unequivocal that no new fossil fuel development is possible in a world where temperatures do not exceed 1.5 degrees of warming. This is now well documented by leading energy and climate analysis, notably the IEA's *Net Zero Emissions by 2050* and the latest IPCC report (IEA 2021; IPCC 2021).

## 2 The rise of supply-side climate policies

Supply-side climate policies are spreading rapidly (for examples, see Fig. 1). Gaulin and Le Billon, drawing on a fossil fuel cuts database, found that 1302 initiatives have now been implemented between 1988 and 2017 in 106 countries across seven major types of supply-side approaches (Gaulin & Le Billon, 2020). Notable among this upward trend is the rise of bans on extraction, considered to be “potentially the most effective supply-side initiatives”, as they stem the flow of fossil fuels at their point of origin (Gaulin & Le Billon, 2020). Ecuador was the first national government to attempt to prevent oil extraction with its Yasuní-ITT Initiative (MacIntosh & Constable, 2017; Martin, 2011; Sovacool & Scarpaci, 2016). Costa Rica then implemented its moratorium on oil exploration and extraction in 2011. Then starting in 2017, a surge of countries, including France, Belize, Denmark, Ireland, New Zealand, Spain, and Germany, announced bans on oil, gas, or coal exploration or extraction. While some caution is required about the nature and durability of these commitments (Carter and McKenzie 2020), these ‘first mover’ countries are supporting the development of climate clubs in this space including the Beyond Oil and Gas Alliance (BOGA), following the precedent set by the Powering Past Coal Alliance (PCCA) which was led by states with large coal reserves (such as the UK and Canada) but which were already well advanced in the process of phasing out coal (Jewell et al. 2019). As well as bans on new extraction of oil and gas, many countries have adopted coal phase out policies including Germany, the UK, Poland and Australia (Caldecott et al., 2017; Brauers et al., 2018; Arora & Schroeder, 2022;

Economic measures	<ul style="list-style-type: none"> <li>Removing public subsidies for fossil fuel production and infrastructure</li> <li>Restricting financing for fossil fuel extraction or infrastructure (ie. ending or limiting financing by credit/development agencies and banks)</li> <li>Compensating resource owners for leaving reserves in the ground</li> <li>Divesting from companies involved in fossil fuel production (by institutions, governments, or individuals)</li> <li>Increasing taxes on fossil fuel emissions, production, or exports</li> <li>Implementing cap and trade systems on fossil fuel production or emissions</li> </ul>
Regulation and policy measures	<ul style="list-style-type: none"> <li>Limiting or prohibiting exploration, production, or transportation of fossil fuels (ie. by restricting leasing on state-owned lands or marine areas, or prohibiting the development of particular kinds of fossil fuels, or the use of particular technologies, such as fracking)</li> <li>Requiring the assessment of life-cycle emissions in the environmental impact review of new fossil fuel supply projects</li> <li>Rejecting proposals to explore for or produce fossil fuels, or rejecting fossil fuel infrastructure (ie. pipelines and export terminals)</li> <li>Requiring the accounting of full life-cycle emissions of fossil fuel development and export, from extraction and consumption</li> </ul>
Legal and direct-action measures	<ul style="list-style-type: none"> <li>Initiating court challenges to prevent fossil fuel exploration, production, or transportation</li> <li>Blockading fossil fuel projects (physically obstructing sites of fossil fuel exploration/extraction or infrastructure)</li> </ul>

Adapted from Lazarus et al. (2015), Table 1, and Gaulin and Le Billion (2020).

**Fig. 1** Examples of supply-side climate policies. Adapted from Lazarus et al. (2015), Table 1, and Gaulin and Le Billion (2020)

Campbell & Coenen, 2017; Oei et al., 2019; Dilusio et al., 2021; Egli et al., 2022). Supply-side climate policy is also slowly being reflected in United Nations Framework Convention on Climate Change (UNFCCC) negotiations as we discuss below.

Supply-side initiatives have grown rapidly during the past decade, but their adoption has been highly uneven across the world. From a global distributive justice perspective, wealthy states with large, emissions-intensive reserves and/or large historical emissions from fossil fuel production ought to lead the global fossil fuel phase out (Green & Finighan, 2012; Hoel, 2013; Jewell et al., 2019; Lenferna, 2018; Voorhar & Myllyvirta, 2013). Yet until recently national bans on oil and gas have been led primarily by rich developed states with the capacity to transition, but without significant reserves or high dependence on fossil fuel extraction. Advanced economies with major reserves of coal, oil and gas such as the UK, Germany and Spain, some of which was exported, have either largely transitioned away from them or are proposing prohibitions on further exploitation of reserves (Turnheim & Geels, 2012).

Even so, these bans have enormous symbolic power because they reinforce calls that fossil fuel extraction needs to be subject to national and international regulation and that expansion of fossil fuel frontiers is increasingly incompatible with the goals of the Paris agreement. They help to socialise the idea of production limits and moves to regionalise and multilateralise such approaches help to generate pressure on other countries to adopt supply-side measures. Some countries such as Denmark have also moved rapidly from being major investors in oil and gas to leaders in renewables, captured most clearly in the renaming of DONG (Danish Oil and Natural Gas) as Ørsted, while former major coal producers such as the UK, Spain and Germany have introduced phase out policies.

More recently, however, larger fossil fuel producers have also adopted supply-side policies. Countries such as Colombia, heavily dependent on fossil fuels to date, have

announced they will not approve any new oil or gas exploration (Taylor, 2023). This is significant because Colombia is among the top coal producers globally and heavily dependent on fossil fuels for revenue (between 40 and 50% of its exports are coal and oil). Taxes from the sector and the part state-owned oil company Ecopetrol account for about 9% of the central government's income (Rubiano, 2022). Meanwhile, in August 2023, the oil producing state of Ecuador hosted a national referendum on whether to keep the country's largest oil fields, which lie beneath Yasuní National Park, permanently in the ground and 58% of those who voted gave their support to the proposal to protect the reserve and leave the oil in the ground (CCE, 2023). These first movers are charting a new terrain in climate policy that, if spread and developed into a global governance norm, will influence major fossil fuel producers.

This governance turn towards fossil fuel supply in international policy is opening a new avenue for confronting the climate crisis, but the uneven temporal and geographical take up of supply-side policies and diversity of approaches adopted warrant explanation. It is critical then to make conceptual and practical sense of this shift in governance to understand the conditions and contexts most conducive to the adoption and political sustainability of 'first mover' bans and phase out policies to better understand the likely enabling conditions for second and third mover countries. Here, we draw together diverse strands of literature which we argue can shed useful light on key political dynamics of supply-side policies from their origins and durability to efforts to diffuse and internationalise them.

An embryonic literature has sought to correct the imbalance in the literature and policy responses that until quite recently were focussed on governing emissions reductions (on the consumption or demand side) rather than on regulating the *source* of those emissions: the supply of fossil fuels. Critical interventions include, for example, Meinshausen et al. (2009), who retrieved Hare's (1997) argument that fossil fuel reserves far outstripped a 2-degree warming limit carbon budget. In 2010, Davis et al. extended the supply-side analysis to warn against additional fossil fuel infrastructure. By 2011, Nishimura and Yasumoto argued the UNFCCC Secretariat ought to create "a single global upstream carbon market" to curtail the right to extract (Nishimura & Yasumoto, 2011). The scholarly literature on supply-side and policies to "keep it in the ground" (KIIG) intensified starting in 2015.<sup>1</sup> A growing group of researchers have now proposed supply control policy as a fundamental policy tool alongside demand-side policies to address climate change (Harstad, 2012). Some scholarship, for example, has looked to historical parallels and precedents of phase out policies that might apply to fossil fuels (Trencher et al., 2022), while others have explored cases of energy transition focussed on energy production (Feoli, 2018; Slevin, 2016) as part of the broader politics of energy (Hughes & Lipsy, 2013). A small selection of case studies has explored these explicitly in terms of supply-side policies (Bang & Lahn, 2020; McKenzie and Carter 2021; Sovacool & Scarpaci, 2016; Alarcón, 2023). There is scope to learn from policies to phase out or restrict the production of other products and hazardous substances, while recognising that the omnipresence and high politics of fossil fuels might test the transferability and relevance of some of the lessons.

<sup>1</sup> As seen in key contributions by, for example, Benedikter et al. (2016), Blondeel et al., (2020), Codato et al. (2023), Collins and Mendelevitch (2015), Eaton (2021), Erickson and Lazarus (2015), Erickson et al. (2018), Fæhn et al. (2017), Frumhoff et al. (2015), Gaulin and Le Billon (2020), Green (2018a, 2018b), Green and Denniss (2018), Harrison (2015), Lazarus and van Asselt (2018), Lazarus et al. (2015), Le Billon and Kristoffersen (2019), Lenferna (2018), Lujala et al. (2022), Newell and Simms (2020), Pellegrini and Arsel (2022), Piggot (2018), Piggot et al. (2018), Princen et al. (2015), Rempel and Gupta (2021), and Strauch et al. (2020).

As supply-side climate policies extend and move towards centre stage in international climate governance, pressing questions persist. A first set of questions is around the origins and uneven spatial, geographical and temporal nature of supply-side climate policy adoption. Which states (and other actors) adopt them and when? A second dimension is more processual: how were they adopted? Which combinations of social forces, alliances, bargains and negotiations enabled them to win support in the face of opposition and scepticism? A third relates to their sustainability and resilience over time: their longevity and therefore effectiveness (to what extent and how long they keep fossil fuels in the ground) and relatedly how far and by what means supply-side policies might be internationalised to create a supportive enabling environment for other states to adopt them? Clearly, each of these dimensions is interrelated and overlaps and takes place on a fast moving policy terrain and whose longer-term impact and significance we cannot yet know.

The factors which explain the emergence of supply-side policies in these conditions are multifaceted and operate across levels, complicating the task of generating generalisable explanations but underscoring the value and necessity of interdisciplinary approaches (Cherp et al., 2018). Here, rather than propose an all-encompassing theoretical account, we seek to showcase conceptual resources that can be adapted to particular contexts to help build the basis of a flexible, adaptable and interdisciplinary framework for explaining the different dimensions of supply-side policy. We survey contributions to understanding supply-side climate policy gleaned from four approaches, in turn foregrounding the political-economy of supply-side policies, the governance of supply-side policies, socio-cultures of supply-side policies, and the global governance of supply-side policies.

### 3 The political-economy of supply-side policies

To understand the global drivers of national supply-side policies or what might be referred to as the ‘horizontal governance’ of supply-side policies, we begin by drawing on critical and comparative (international) political economy to understand the location of states in the global political economy (of trade, aid, finance and energy) which circumscribe the degree of policy and developmental space they have to adopt supply-side policies. This enables an appreciation of the role of external influences on the adoption of supply-side policies from other states, corporate actors, financial institutions and global and regional governance institutions that play a central role in financing and building capacity for transitions and shaping energy policy frameworks. For example, levels of aid dependence determine the scope for donors and multilateral development banks (MDBs) to shape national level energy strategies—sometimes withdrawing support for fossil fuels, but often reluctant to endorse bans because of their neo-liberal paradigm (Newell & Phillips, 2016). The Group of Least Developed Countries (LDCs) navigates the complexities of pressing rich-world countries to lead ambitious climate policy that include phasing out fossil fuel production, while receiving G20 aid to expand their domestic fossil fuel production (Saha & Carter, 2022). At a private event on supply-side policies at the UN climate negotiations organised by one of the authors with delegates from G77 countries, many aid dependent countries stated that they were supportive of a new international framework to limit production but were wary of advocating for it for fear of antagonising major donors opposed to such an approach. Understanding the degree of leverage that states have to chart their own energy pathways is critical, therefore, to assessing the prospects of supply-side adoption.

Geopolitical shifts in the landscape can also dramatically shift the nature of these global pressures (Blondeel et al., 2021; Goldthau et al., 2019), underscoring the ways in which energy is central to ‘high politics’ and concerns with security (Strange, 1988). Hence, Russia’s invasion of Ukraine saw many European countries move from persuading many African countries to move away from fossil fuels to negotiating deals with them to export their gas to the region to replace lost access to Russian gas. Even at the climate COP27 summit in Egypt, while the climate talks debated language on phasing down fossil fuels, gas deals were being struck on the side lines of the negotiations. Egypt signed a memorandum of understanding with Germany to expand liquefied natural gas (LNG) export capacity by 2050, Tanzania committed to a \$40 billion LNG deal with Equinor and Shell, while Germany and the United States agreed to finance Egyptian renewables to “free up” gas for export and Italy struck gas deals with Angola, Algeria and the Republic of Congo (Levantesi & Cooke, 2022).

Investor and trade pressures are also crucial in terms of shaping calculations about energy pathways and determining the conditions and terms of market access and political economy accounts underscore the blurring of state and corporate interests in approaches to supply-side policies. Global fossil capital plays a key role in seeking to curtail or delay the adoption of supply-side policies building on a long history of attempts to delay climate action by other means (Newell & Paterson, 1998). As we write, foreign oil and gas companies, working alongside national capital in the form of the Colombian Petroleum Association, are placing immense pressure on the new Colombian government of Gustavo Petro over his declared prohibition of new oil and gas exploration, while the UK Labour Party had to backtrack on elements of its proposals to ban new oil and gas exploration in the North Sea following an orchestrated backlash by business groups and some trade unions fearful of job losses (Stacey, 2023) such as the GMB Union that said the UK needed “plans not bans” (GMB, 2023).

One means of constraining policy autonomy over supply-side policy decisions is the use of state-investor dispute mechanisms. Fossil fuel firms are invoking provisions in investment treaties, such as the Energy Charter Treaty, to legally challenge government policies aimed at phasing out fossil fuels in investor-state dispute settlement bodies. There is real concern that recent moves to bring cases by energy company RWE against the Dutch government over its coal phase out, or by TC Energy over the cancellation of the Keystone XL oil pipeline in the United States, for example, presage the use of a new weapon some corporations will use to slow the pace and ambition of climate action including through supply-side measures (Tienhaara & Newell, 2023; Tienhaara et al., 2022).

Literature within critical international political economy and development studies helps to make sense of these power dynamics, whether Gill’s notion of the ‘new constitutionalism’ to understand the increasing legal protection afforded to investors over states in legal arrangements such as the Energy Charter Treaty, his notion of ‘disciplinary neo-liberalism’ to understand the power of surveillance global bodies exercise over national developmental pathways or ideas about ‘bounded autonomy’ (Newell, 2008), ‘policy autonomy’ and ‘developmental space’ (Gallagher, 2005; Wade, 2003) to account for the ways in which the menu of policy options available to poorer countries in particular is often constrained, not just by the lobbying and preferences of states and capital, but also by trade and investment rules which delimit their freedom of manoeuvre. Conversely, despite membership of the European Union, states such as France, Ireland and Denmark have more freedom and autonomy to chart alternative energy pathways which they have exercised as first mover countries on supply-side policy. This strand of literature helps then to place the role of the state in supply-side policies in a global context.



But we still require an account of the ‘vertical governance’ of supply-side policies within and across the state: the variation, comparative differences in responses and battles *within* the state over energy policies and proposals to restrict production. Literature on the state and transitions can help to understand questions of state capacity, resourcing and autonomy from energy sector actors that might be required to adopt supply-side policies (Johnstone & Newell, 2018; Newell, 2021) as well as internal conflicts within states over energy policy, drawing on relevant literature in these areas. For example, a key terrain for battles over supply-side policies is between Ministries of Energy, Resources or Mining, often with the support of Finance Ministries resisting such measures, versus Ministries for the Environment or renewable energy advocating for them as a key means of delivering climate targets for which they are responsible. Power imbalances within government in terms of influence and resources mean the former often wield more power, while the latter have to bolster their position with support from outside government in civil society. Political economy analysis of energy policy in major economies such as South Africa and India (Baker et al., 2014; Phillips & Newell, 2013) or emerging fossil fuel powers such as Mozambique (Power & Kirshner, 2019) sheds light on the policy landscapes that supply-side policy initiatives will have to navigate. Scholarship on comparative climate policy and political economy (Hochstetler, 2021; Purdon, 2015) and historical institutionalism (Kuzemko et al., 2016; Lockwood et al., 2016), meanwhile, can help to inform analysis across first mover countries and to locate their approaches to contemporary adoption of supply-side policies within longer historical trajectories. For example, an historical institutional approach highlights differences in energy policy approaches between the UK and Germany that have both adopted supply-side policies with reference to the more liberal and *laissez-faire* approach to regulation adopted in the UK and a more interventionist approach in the case of Germany (Lockwood, 2022).

Critical theories of the state have paid attention to the peculiar role of energy in state accumulation strategies, the way in which major energy firms can claim to speak for the interests of ‘capital in general’ because of energy being a prerequisite to the economic success of all other sectors which affords them structural power (Newell & Paterson, 1998). This “carbon entanglement” (Gurría, 2013) relates in turn to the power of incumbent actors to resist and shape the adoption of supply-side policies which can be understood by drawing on work on incumbency and business and the state (Downie, 2017; Ford & Newell, 2021; Geels, 2014; Meckling, 2015) and the forms of material, institutional and discursive power than can be mobilised to resist change to the status quo (Levy & Newell, 2002), what Carroll (2021) characterizes as a powerful “regime of obstruction”. This higher-level account of the power wielded by corporate actors in obstructing supply-side policies can be enriched by analysis of the specific tactics adopted by incumbents explored in the next section, by attending to the power differentials within the state, noted above, which afford them different degrees of access and influence, as well inform the strategic analysis of social movement actors about how such approaches can be challenged in preparing the ground for supply-side policies.

Building on the analysis above of the constraints on supply-side policies, scholarship on socio-technical transitions can also shed light on questions of incumbency (Lockwood et al., 2020), ‘lock-in’ (Unruh, 2000) by fossil capital and labour (Mildenberger, 2020) and how the adoption of supply-side policies can be resisted by incumbent actors such as powerful fossil fuel companies (Newell & Paterson, 1998). But it can also help to explore the conditions in which regime destabilisation and disruption around fossil fuel use might be possible (Geels, 2014; Geels et al., 2017; Rogge & Johnstone, 2017; Rosenbloom et al., 2019) which are a pre-requisite to supply-side policy adoption and success. Much



of this literature centres on exploring the conditions in which ‘niche’ alternatives to the dominant ‘regime’ (based on fossil fuels in most countries) become possible. Strauch et al. (2020), for example, identified feedback loops between (i) politics (coalitions supporting decarbonized industries), (ii) policy (i.e. financial and research support for renewable energy deployment), and (iii) technology (where advances in technologies and falling costs thereof generate political gains and more policy support). Past a threshold, combinations of policy and political support plus technological readiness result in regime scale changes that redefine energy systems. Arguably the global community has reached or is approaching this point, as seen in, for example, the sharp growth in Electric Vehicle adoption and falling costs of renewable energy which provide considerable cost savings over continued fossil fuel-based systems (Way et al., 2022), but the political work of challenging dominant framings and articulating the case for supply-side policies requires networks and coalitions to which we turn next.

#### 4 Governing supply-side policies

Perspectives in political science on policy networks (Normann, 2017) and political coalitions (Hess, 2014, 2019) provide useful resources for understanding agency and political agents of change as well as the processual dynamics described above: how disparate actors navigate uneven ‘political opportunity structures’ and levels of institutional access to seek to advance supply-side policies (Van der Heijden 2007). Many of these conceptual tools and approaches are being applied to the study of energy transitions, though less so the study of supply-side policies. There is clearly rich potential to adapt them to understanding the dynamics of network and coalition formation and how to navigate seemingly unmalleable institutional landscapes to advance change. One way might be through ‘feedback effects’ which help to undermine opposition to new policy measures by creating benefits for potential losers from policy reforms and help, therefore, to stabilise policy coalitions over time (Lockwood, 2022) and in the case of supply-side might relate to the deals, side-payments and compromises that might have to be struck over job retraining, compensation or regional redevelopment plans to enable a ‘just transition’ away from fossil fuels and secure support for supply-side policies. Such conceptual work can be informed and enriched by analysis of more successful experiments in just transition policies to date (Harrahill & Douglas, 2019).

There are also theoretical resources that can provide important insights into the precarious politics of building and sustaining ‘winning’ coalitions for supply-side policies. Literature on ‘discourse coalitions’ has been used to explore anti-fracking discourses, for example, in Europe and the US (Metze & Dodge, 2016) and work on advocacy coalition frameworks applied to energy policy (Jenkins-Smith and Sabatier 1994; Markard et al., 2016). For example, Bradshaw et al (2022) show how the UK’s failure to exploit fracked gas and the reinstatement of its ban on fracking (despite it being overturned by former Prime Minister Liz Truss a month earlier) came about despite support for its extraction among some Conservative members of parliament and fracking companies. Campaigners in the UK were confronted with the disproportionate level of access afforded to fracking firms whose interests were championed by former CEO of the oil major BP, John Browne who was appointed by then Prime Minister David Cameron to be the “lead non-executive director” at the Cabinet Office. He was also chair of fracking company Cuadrilla at the time and pledged to do “whatever it takes” to promote shale gas. Yet activists were able

to outmanoeuvre high level commercial and political backing for fracking by mobilising supporters of the ruling party in rural constituencies opposed to fracking in their local area such that it became a liability for the government and public opposition to fracking has remained solid despite the shifts of policy position.

Given how deeply incumbent power is entrenched, political settlements in favour of supply-side policies are often vulnerable to being reversed. Change of government in supply-side first mover country Costa Rica has implications not just for its domestic supply-side policy of leaving reserves of oil in the ground, but also has knock on implications for BOGA as one of the founding members. Likewise in New Zealand, another supply-side policy first mover, the recently elected National Party has stated that it will repeal the offshore oil and gas exploration ban introduced by the Labour and Green Government in 2018. These developments point to the need to sustain coalitions of support for supply-side policies and to build broad cross-movement support for ambitious policies that are more likely to withstand changes of governments and shifting priorities using some of the means described in these literatures: deliberate feedback effects, strategic deployment of discourses and diverse alliance and coalition-building. Successful policies also need to engage with socio-cultural politics of supply-side policies to which we turn next.

## 5 Socio-cultures of supply-side policies

Finally, sociological work on energy cultures and social movements helps to account for the dynamics of stability and change in energy systems: both socio-cultural givens and inertia around energy system change, but also the scope for disruptive social movement mobilisation. This is important because calls for supply-side policy originated from broad civil society collaborations, notably the formation of the “Leave it in the Ground Coalition” (now LINGO) in 2011 as well as Environmental Justice Organizations, Liabilities and Trade (EJOLT) joining with Oilwatch to recommend a global moratorium on oil exploration and extraction in Indigenous territories and protected areas in 2013 (Temper et al., 2013) and then broadening out to the civil society-led Lofoten Declaration in 2015 which called for a ‘managed decline of fossil fuel production’.<sup>2</sup>

Civil society and social movements are now clearly one of the main drivers of supply-side policy adoption: their advocacy seeks to mobilise and magnify state-led attempts to exercise leadership and accelerate energy transitions (Piggott 2017; Princen et al., 2015). Diverse strategies undertaken by civil society groups were a primary feature in the adoption of supply-side policy in Ireland (McKenzie & Carter, 2021) as well as in Denmark, France, and the Canadian province of Québec (Norton & Carter, 2023). Domestic movements are often supported by international organisations as well as international initiatives seeking to support supply-side policy learning across states, such as the Lofoten Declaration and more recently the Fossil Fuel Non-Proliferation Treaty. They also work with cities, over 135 of which on five continents have SAFE status (taking a ‘Stand Against Fossil Fuel Expansion’) to try and generate pressure within states for the adoption and strengthening of supply-side policies.<sup>3</sup> The dynamics of these forms of transnational supply-side governance have precedents in previous endeavours studied by scholars of transnational climate governance where insights might be carried over (Bulkeley et al. 2014).

<sup>2</sup> <https://lofotendeclaration.org/>.

<sup>3</sup> <https://www.safecities.earth/>.

Social movements also help sustain supply-side policies by rallying support around contentious policies and the fragile coalitions that sometimes keep them in place (the case of getting the fracking ban reinstated in the UK mentioned above being a case in point). Socially, momentum is likely to come from resistance to new fossil fuel infrastructure by social movements and pressure groups, often working across sites and scales (Cheon & Urpelainen, 2017; Neville, 2021). In North America, Indigenous groups have played a key part in struggles, for example, over the Keystone XL and Dakota Access pipelines (Gilio-Whitaker, 2019; Indigenous Environment Network, 2021). This resistance coexists with more “insider” advocacy around specific proposals for new fossil fuel projects (Carter & McKenzie, 2020; Piggot 2018). Temper et al. (2020) find, for example, that more than a quarter of fossil fuel projects encountering social resistance have been cancelled, suspended, or delayed. Campaigns are also increasingly aimed at phasing out public finance for fossil fuels. In the UK, activists successfully secured a ban on overseas finance for fossil fuels after years of mobilising and adopting a plethora of both insider advocacy with civil servants and ‘outsider’ protest strategies. The victory was significant given that from 2016 to 2020 alone UK Government support for fossil fuels overseas amounted to at least £21 billion (McGibbon, 2021). Recent moves by the European Investment Bank to end lending for fossil fuels and commitments from the World Bank and a growing number of export credit agencies suggest that these are having an effect.

For activists, the aspiration is to create a ‘domino’ effect where funders in other governments and institutions feel pressured to fall into line, thereby internationalising supply-side policies. In the case of the UK ban, it was followed by moves on the part of US President Biden and the Scottish government to restrict fossil fuel finance (McGibbon, 2021). These strategies are informed by and form part of a long history of activism targeted at cutting the supply of finance for fossil fuels which provides a critical basis for supply-side policies. There is growing pressure from the fossil fuel divestment movement on pension funds, endowments, and sovereign wealth funds to divest from fossil fuels driven by key advocacy groups such as 350.org. By late 2021, a total of 1,485 institutions representing \$39.2 trillion in assets worldwide had begun or committed to a divestment from fossil fuels (Stand Earth, 2021). Again, thinking about the importance of supply-side discourses, the language of “stranded assets” has gone mainstream, highlighting the fact that investments in fossil fuel reserves and infrastructure could be lost because their extraction and use are incompatible with ambitious climate targets. In this framing, fossil fuel assets are at risk of becoming what the think tank Carbon Tracker calls “unburnable carbon”. Pressure is mounting on fossil fuel majors to divulge their fossil fuel assets through initiatives such as the Carbon Disclosure Project, which over 200 major buyers, with a combined purchasing power of \$5.5 trillion, have asked their suppliers to join. Scholarship on shareholder activism has been applied to climate policy (Newell, 2008) but could be fruitfully extended to support for supply-side policies. For example, ExxonMobil, long one of the most stalwart opponents of climate action, was defeated in a May 2021 shareholder vote in which Engine No. 1, an activist investment firm demanding that Exxon accelerate a transition to clean energy, succeeded in electing three nominees to the company’s board of directors. A key challenge for the adoption of supply-side policies is challenging the strong association between fossil fuels and prosperity through invoking ‘anti-fossil fuel norms’ (Green, 2018a, 2018b).

Social movements campaigning for supply-side policy are, therefore, gaining ground and becoming emboldened by successful campaigns. A “stepping stone” process is evident in a number of first mover countries to implement bans on oil and gas extraction, where successful campaigns to block one specific fossil fuel extraction project scale up and are

redirected to more challenging goals, such as divesting public funds from fossil fuels, or contesting particular forms of fossil fuel extraction such as fracking, and then to a refusal of oil and gas production broadly. Once extractive bans are in place, social movement actors turn other targets, such as ending the importation of fracked gas in France, or using fossil gas in Québec (McKenzie & Carter, 2021; Norton & Carter, 2023). Experience to date suggests it is critical to use windows of opportunity to deepen existing alliances and form new ones, including with communities both dependent on fossil fuels but suffering the effects of extraction. The conditions shaping possibilities for supply-side policy occur in a moment of intensifying climate-induced disasters as well as continued documentation of the health and environmental toll of fossil fuel production. These unpredictable exogenous experiences are escalating public awareness about the need to curtail fossil fuel production and use and public desire for ambitious policy responses, even in areas heavily dependent on extraction (Brown & Spiegel, 2017). For example, acknowledging the health, environmental, and worker safety risks of the coal sector—as well as job growth in the renewable sector—labour unions in US coal-dependent states have accepted the need to end coal extraction and focus instead on building a low-carbon economy (Dusyk et al., 2023), even if at national levels in countries such as the US, UK, Australia and South Africa they have adopted more oppositional stances as noted above.

There are also examples emerging of promising alliances that have the potential to strengthen and amplify local and national voices in global energy debates. One way in which these alliances are being built is through networks, such as the Global Gas and Oil Network of CSOs working in the sector, or specific campaigns with global representation, such as the Fossil Fuel Non-Proliferation Treaty campaign. The former involves many African CSOs, such as the Kenya-based Power Shift Africa, working alongside Northern-based NGOs such as Global Witness, Greenpeace, Oil Change International and Friends of the Earth, while the latter brings together hundreds of indigenous, labour, feminist, human rights, environment and development groups the world over (The Fossil Fuel Non-Proliferation Treaty, n.d.).

This points to the need to appreciate diverse *social and cultural understandings and engagements with supply-side policies*. Work on energy cultures (Strauss et al., 2013), petro-cultures (Daggett, 2018; Szeman, 2019) and the social acceptance of energy transition policies, which has thus far mainly focussed on particular energy infrastructures and technologies, helps to inform an understanding of these dimensions of support for, or resistance to, supply-side policies. Ironically, much of the social acceptance literature seems to focus on siting decisions for renewable energy projects (perhaps because more are coming on stream or they are situated closer to where people live) (Barry et al., 2008; Firestone & Kirk, 2019), while overlooking the lack of social acceptance of the siting and associated contamination of health and environments of fossil fuel infrastructures expressed in strong resistance from local communities and campaigns by Indigenous groups (IEN 2021; Collinson, 1996). For many Indigenous groups in particular, opposition to new fossil fuel extractivism stems not just from fears of detrimental localised or global socio-environmental impacts, but from the fact that mining the earth in that way destroys an ecology of which they are a part, while at the same representing a further erosion of spiritual and cultural rights (Gilio-Whitaker, 2019). Hence, support for supply-side policies can come from many quarters, but needs to be cognisant and respectful of the pluriversal way in which different social groups will engage with the issue.

## 6 The global governance of supply-side policies

International initiatives and institutions are also increasingly providing a supportive framework for supply-side policy (Pellegrini et al., 2021). Here, work from international relations on global governance can provide a basis for understanding potential for the diffusion and internationalisation of supply-side policy measures (Van Asselt, 2021). UNFCCC negotiations were long silent on fossil fuels as the origin of emissions causing the climate crisis. But this has begun to change over the last five years as the need to constrain production has become ever more obvious. The need to phase out fossil fuel production, reform fossil fuel subsidies, and divest from fossil fuels surfaced as key topics in the 2018 Talanoa Dialogue process to enhance climate ambition and at the Glasgow COP in 2021 where the final conference text included reference to the need to ‘phase down’ (though notably not ‘phase out’) fossil fuels. The text of the subsequent COP called for phasing down ‘unabated coal,’ but failed to include oil and gas. However, the most recent COP in Dubai represented a breakthrough: the final text of the Global Stocktake—a central element of the Paris Agreement intended to inform the next round of countries’ climate action—‘calls on’ countries to focus on ‘[t]ransitioning away from fossil fuels in energy systems, in a just, orderly and equitable manner, accelerating action in this critical decade’ to limit global warming to 1.5 °C. Meanwhile, ‘climate clubs’ such as Powering Past Coal Alliance (PPCA) (Jewell et al., 2019) and Beyond Oil and Gas Alliance (BOGA) have also emerged as clear manifestations of international supply-side coalitions (Van Asselt & Newell, 2022). Other international governance mechanisms supporting supply-side policies are also advancing, including calls for a Fossil Fuel Non-Proliferation Treaty (Newell & Simms, 2020; Newell et al., 2022) as well as a Coal Elimination Treaty (Burke & Fishel, 2020). Seen cumulatively, an international socialisation of the anti-fossil fuel norms (Green, 2018a, 2018b) is now underway that legitimises and supports state-level policy to curtail fossil fuel supply.

In terms of how international institutions can foster, support and generalise the spread of supply-side policies, scholarship on policy transfer and policy diffusion (Evans, 2004) can provide useful insights into how, when and why policies travel—often through networks or key interlocutors seeking buy-in from international actors to support their wider adoption. This is the rationale behind the work of the fossil fuel treaty initiative to secure the support of bodies like the European Parliament and the World Health Organisation which they have been successful in doing. Precisely because of the integrated nature of energy systems and fears about free-riding by countries not limiting fossil fuel extraction, regional and multi-lateral efforts aimed at ensuring a ‘fair phase out’ will be critical. Here, scholarship on the global governance of supply-side policies (Rayner, 2021) and just transitions (Newell et al., 2023) can help to understand the enabling and constraining role of global bodies reflective of their mandates, modes of operation and the degree of power they exercise over member states regarding key elements of a transition away from fossil fuels from financing and technology transfer to policy support and capacity-building.

Going back to the discussion earlier in the paper on policy and development space that derives from literatures in critical international political economy, shifts in mandate, procedure and purpose might be required of trade and investment institutions to avoid ‘kicking away the ladder’ (Chang, 2002) of supply-side policies. In other words, a more flexible and generous interpretation of provisions in trade and investment regimes might be required to allow for the adoption of bans, procurement and infant industry measures and other forms of positive discrimination through industrial policy towards alternatives to fossil fuels.

Given the market distorting effects of tax credits and fossil fuel subsidies given to fossil fuel companies at the moment, which according to the IMF stand at \$11 million a minute (Carrington, 2021), efforts to engage and mobilise these powerful institutions in efforts to de-finance fossil fuels would further help to tip the balance of power in favour of supply-side policies.

## 7 Conclusion

In this paper, we have proposed a series of conceptual resources and entry points for advancing our understanding of the political dynamics of supply-side policies: how they formed, how they develop and are sustained (and resisted) and how they might be supported by regional and global governance mechanisms drawing on a diverse range of literatures from different disciplines to make sense of these dynamics.

Our attempt to assemble and showcase relevant theoretical resources is far from exhaustive. The extent to which the concepts we have highlighted here yield valuable insights will depend of course on the ways in which they are used and combined and the empirical contexts to which they are applied. An integrated and broad framework such as this needs to be adapted and applied to the specific context in which supply-side policies emerge, get adopted and are embedded. Hence, the combination of explanations and the ways in which they are deployed will vary. But we have identified concepts and theoretical approaches that might be applied to key dimensions of supply-side policies, whilst noting that the peculiar configurations of supply-side politics in particular settings require researchers to start from the dynamics of specific contexts and their unique histories and cultures as underscored by many of the approaches we have highlighted here and to make use of explanatory approaches that appear to have traction in the case in question. In this sense, what we have provided here is less an off the shelf 'recipe' and more a 'menu' to choose from which allows different resources and concepts to be combined in ways which resonate with a particular context. Despite a growing body of research on supply-side policy, it remains an embryonic field of enquiry and an emergent field of practice. There is plentiful scope for conceptual innovation and to bring insights to bear from different fields and disciplines which have long wrestled with related issues as we have tried to demonstrate here.

Going forward, besides questions of policy transfer and how norms and policy ideas travel and are diffused, interesting questions remain about best to understand the interconnected nature of supply-side policies. Assessing and tracking impacts elsewhere (regionally and globally) of national measures requires attention to the simultaneity and interdependence of supply-side policies in often tightly integrated global energy markets. There may also be scope to move towards typologies of supply-side policy: to explore which combinations of energy system, type of capitalism/political economy, nature and organisation of the state and systems of democracy converge in ways that are most supportive of supply-side policy and adoption. Such an approach lends itself to a more comparative analysis of the politics of supply-side politics and policies across diverse national contexts and levels of governance. This will include of course further work on the global architecture of supply-side, what we have called here the horizontal governance of supply-side policies: the enabling (and constraining) global landscapes that open up and close down opportunities to address this most critical of challenges. While our focus here has been on supply-side, it is also evidently the case that sustained and intensified efforts



to reduce demand for fossil fuels are critical to shaping the economic viability and political plausibility of supply-side policies to ‘cut with both arms of the scissors’ (Green & Dennis, 2018).

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