

The Geoeconomics of Decarbonization

Timothé Beaufils 0000-0002-2545-8064 and Philipp M. Richter 0000-0002-5581-9713

Abstract

Mitigating climate change requires global coordination. Yet, the rules-based world order fostering climate cooperation is under pressure from economic superpowers weaponizing international trade to serve their national interests. This chapter explores how these two trends - decarbonization and geoeconomic fragmentation - jointly transform one another. We argue that the two processes interact on multiple levels, forming complex feedback loops. First, geoeconomic fragmentation strengthens the case for unilateral climate policies by raising the costs of fossil-fuel dependence and legitimizing policies at the trade-and-climate nexus. Second, decarbonization reshapes national interests and geoeconomic power by redistributing rents and leverage away from fossil-fuel exporters and toward suppliers of clean technologies and critical minerals. Finally, we discuss how such reciprocal influences might feed back into prospects for future climate cooperation. We argue that while geoeconomic polarization can unlock unilateral decarbonization efforts, uncoordinated climate policies can further undermine the multilateral cooperation framework ultimately required to meet climate targets. Climate policies for a world of fragmentation should thus strike a careful balance between the acknowledgment of national interests and the preservation of multilateral principles.

Keywords Geoeconomics – Decarbonization - Trade weaponization – International cooperation – Climate cooperation – Energy security

I. Introduction

Rising greenhouse gas (GHG) concentrations in the atmosphere continue to warm the planet, damaging ecosystems and societies around the world (Calvin et al. 2023). In 2015, negotiators from virtually all countries concluded the Paris Agreement, an urgently needed global commitment to limit anthropogenic climate change and stabilize the Earth's climate system (UNFCCC 2015). A decade later, however, the situation appears bleak. Policies to implement the Paris Agreement are lagging (Schumer et al. 2025), GHG emissions remain higher than ever (Friedlingstein et al. 2026) and the consensus behind climate mitigation is weakening in several major economies (Guerin and Tubiana 2025). This trend is best illustrated by Trump's United States of America (USA) that, despite being the largest cumulative emitter, retracted its signature from the Paris Agreement and explicitly opposes any policy to limit climate change (The White House 2025; Sun and Ye 2025). At the same time, emerging signals suggest that global decarbonization might be on the verge of accelerating. Emissions appear close to peaking (Friedlingstein et al. 2026), Europe has reduced emissions by more than 35% compared to 1990 while maintaining economic growth (European Commission 2026; Zioga et al. 2024), and the costs of batteries and photovoltaic cells, electric vehicles, and heat pumps are plummeting (IEA

2025). Caught between geopolitical backlashes and spectacular technological progress, the prospects of global decarbonization thus appear uncertain.

These developments unfold in a world where the rules-based international order is itself at a crossroads. Recent years have seen a renewed emphasis on national interests. Besides the United Nations Framework Convention on Climate Change (UNFCCC), Trump's USA is withdrawing from a long list of international institutions and clearly expresses his disdain for international cooperation (The White House 2025; Galbraith 2026). The so-called "Liberation day" tariffs openly violate the most fundamental principles of the World Trade Organization (WTO) and question the seemingly universal principle of mutually beneficial exchanges (Ignatenko et al. 2025; Mackintosh and Warin 2026a). During the 2014 invasion of Crimea, Russia weaponized Europe's dependence on oil and gas to reduce international protests (Van de Graaf and Colgan 2017; Khoma and Nikolaieva 2025); trade policy, export controls, and access to critical minerals are increasingly used as instruments of power (Farrell and Newman 2019). In response, the global trade network already shows signs of alignment along geopolitical fault lines (Fajgelbaum et al. 2024; Gopinath et al. 2025). In this chapter, we use the term "geoeconomics" to describe such use of economic instruments and economic interdependencies to pursue strategic interests (Mohr and Trebesch 2025; Clayton et al. 2026a).

The world economy is fragmenting at the same time as the energy system is decarbonizing. This simultaneity creates a puzzle. Traditionally, climate policy has been understood as a problem of global cooperation, while geoeconomic fragmentation appears to make such needed cooperation more difficult. Yet, fragmentation also changes the incentives for decarbonization, and decarbonization alters the economic fundamentals from which geoeconomic power derives. A series of recent events indeed highlights that power confrontation and decarbonization are not separate dynamics. The Russian war of aggression against Ukraine and the US military intervention in Iran both triggered energy crises that resulted in rapid uptake of clean energy around the globe. The European Union's Carbon Border Adjustment Mechanism (CBAM) is accused of weaponizing the EU's central position in global supply chains for climate mitigation purposes, while China's large-scale investments in clean technologies and critical minerals are widely perceived as part of a strategy to secure future energy and industrial dominance.

This chapter draws on evidence from multiple disciplines and on the analysis of recent events to address the following question: how do geoeconomic fragmentation and decarbonization jointly transform one another?

We show that the two processes form a complex network of interactions. Fragmentation changes the incentive structure of unilateral climate policy. It can raise the strategic cost of fossil-fuel dependence, legitimize conflictual unilateral policies at the trade-and-climate nexus, and increase the value of domestic clean-energy capabilities. At the same time, decarbonization itself changes the international allocation of rents, reshapes dependencies, and creates new strategic sectors and critical inputs from which geoeconomic power derives. These interactions have important implications for the future of climate cooperation.

The public and academic debates on geoeconomic fragmentation and decarbonization have largely developed in parallel, but have increasingly begun to overlap. Recent work on

geoeconomics emphasizes how economic interdependencies can become sources of power, and how strategic sectors determine the exercise of that power (Clayton et al. 2026a, 2026b; Mohr and Trebesch 2025). Yet climate and energy are not yet a central concern of this literature, while many decarbonization scenarios produced by the climate research community still largely overlook the dynamics of geoeconomic confrontation (Blondeel et al. 2024). We argue that this matters because decarbonization changes precisely the economic relationships from which geoeconomic power derives, especially by reshaping dependencies, reallocating rents, and creating new strategic sectors. A disparate literature either frames decarbonization in the terms of geoeconomics (Meckling 2025; Weber et al. 2025; Quitzow and Zabanova 2025), or studies the role of decarbonization in geoeconomics (Adam et al. 2026; Arezki et al. 2026); but the dynamic interaction between these two trends is still largely unexplored.

This chapter is organized around the feedback between geoeconomic fragmentation and decarbonization. It proceeds in three steps. Section II focuses on the first link of the feedback and examines how geoeconomic fragmentation changes the incentives for unilateral decarbonization and the acceptability of trade-and-climate policy instruments. Section III turns to the reverse direction and analyzes how decarbonization reshapes national interests, reallocates rents, and alters the distribution and expression of geoeconomic power. Section IV closes the loop by asking how these interactions might dynamically affect the prospects for international climate cooperation. Section V concludes.

II. Economic fragmentation affects decarbonization

The atmosphere is a public good: the local effects of climate change depend on the cumulative GHG emissions from all countries, and emission reduction is costly due to the omnipresent nature of fossil fuels in the economies of the early 21st century. As such, the Earth's climate is exposed to overexploitation, which is traditionally to be answered by the collective creation of norms and rules to regulate pollution (Ostrom 1999). Practically, the global effort to mitigate climate change builds on a complex legal architecture framed by the United Nations Framework Convention on Climate Change (UNFCCC 1992). Through annual Conferences of the Parties (COPs), representatives from all nations attempt to elaborate a universal answer to the climate crisis. This process peaked so far with the signature of the 2015 Paris Agreement acknowledging the universally shared responsibility to contain climate change (Maslin et al. 2023).

Since then, the international climate mitigation has been facing headwinds and these difficulties echo a broader movement of fragilization of international cooperation, symptomatized by the multiplication of international conflicts and trade disputes (Lake et al. 2021). Arguably, such geoeconomic fragmentation stalls the progress towards a universally negotiated solution to the climate crisis (Sun and Ye 2025; Colgan and Genovese 2025). Paradoxically, it also creates new opportunities for unilateral decarbonization (Meckling 2025). First, it increases the overall costs of fossil-fuel dependence, allowing the reframing of climate policies as security policies. Second, it raises the value of unilateral climate policy amid a reduced confidence in a universal multilateral solution and leads to the emergence of policies at the trade-and-climate nexus, which can in turn generate virtuous spillovers in other countries.

II.A. Decarbonization in response to fossil trade weaponization

The first channel relates to the ambiguous role of fossil fuels for energy security.

Since the start of the First Industrial Revolution, coal, oil and gas have been powering economic and technological development around the globe. By their energy density, ease of transportation and relative availability, fossil fuels built a globally dominant position for producing energy, transporting goods, heating and cooling buildings in the modern world (Smil 2017; Pomeranz 2009). But fossil fuels are also characterized by their unequal repartition: oil and gas production are concentrated in a few countries, which therefore hold geoeconomic leverage over importing countries (Mitchell 2009; Khoma and Nikolaieva 2025; Pierre Charbonnier 2026). In a fragmented world, such resource concentration is a source of instability.

The cost of fossil import dependence

For resource-poor countries, a fossil-dependent economy creates a liability, which materializes in several ways. Generally, fuel-import dependence translates into a major economic burden due to the continuous inflow required to power the domestic economy. For instance, the EU's net imports of energy covered about 57% of its total energy needs in 2024, with heterogeneity in this energy import dependence rate, reaching higher levels in key economies such as Germany, Italy or Spain (Eurostat 2026a), representing around 15% of the EU's import value (Eurostat 2026b). Yet the real cost of fuel-import dependence reveals itself at times of crisis (Kilian 2008). Sudden spikes in global fuel prices can trigger major energy crisis in importing countries. Before Russia's invasion of Ukraine, about 45% of EU gas imports were supplied by Russia; during the 2022 energy crisis, EU's import costs rose to about EUR 400 bn - more than three times as much as in 2021 - despite a substantial drop in demand (Zeniewski et al. 2023). Given the central place of fossil fuels in the social organization, energy crises can escalate into social unrest, warranting costly policy interventions for governments (Beaufils, Eydam, et al. 2026). In general, the adoption of domestically produced energy thus provides direct economic benefits by reducing the burden of energy imports and by improving the terms of trade of fuel importing countries (Beaufils et al. 2025).

Energy security in a fragmented world

Furthermore, the emphasis on geoeconomic interests in world affairs exacerbates the cost of fossil dependence. As the norms of the multilateral order weaken, energy superpowers increasingly leverage energy dependence for achieving economic and strategic dominance. In Europe, it is now widely accepted that the energy partnerships between Russia and major European economies, best symbolized by the construction of the controversial Nordstream 2 pipelines between Russia and Germany, were part of a wider diplomatic strategy to impose the *fait accompli* regarding the 2014 invasion of Crimea (Van de Graaf and Colgan 2017; Boute 2022). In the context of the 2022 invasion of Ukraine, Russia has been heavily relying on fossil fuel exports to fund its military operations (Beaufils et al. 2025) and the EU built on energy sanctions to respond to the Russian aggression (Spiro et al. 2025). The second Trump administration also clearly frames its fossil fuel exports as a tool of geoeconomic dominance (Curran 2026; Mackintosh and Warin 2026a, 2026b): in the wake of the so-called "Liberation day" tariffs, the

US administration has been using its full geoeconomic leverage to force many countries into unfavorable trade agreements at the core of which lay massive commitments to buy American oil and gas (House 2025). In addition, the 2026 blockade of the Hormuz Strait by the Iranian regime in response to the US and Israeli aggression highlights that the weaponization of fossil fuel flows is not reserved to military hegemons. The geographic concentration of fossil fuel resources and transport chokepoints makes the global fossil-based energy system vulnerable to disruption, including by military groups using asymmetric warfare techniques. Continued dependence on fossil fuels thus entails not only economic costs, but also potentially unacceptable risks for national security.

The rise of clean technologies

In principle, any domestic energy production allows alleviating the burden of fossil import dependence, including the use of emission-intense coal energy. However, recent developments in key technologies - including photovoltaics, batteries, and grid-forming devices – are making renewable-based electricity a credible and cost-competitive alternative to fossil fuels (IPCC 2022). This makes the adoption of clean technologies in response to energy shocks an increasingly viable option for fuel importing countries, and this trend is accelerating with the fragmentation of the global economy (Meckling 2025; Weber et al. 2025; He et al. 2025). The 2022 energy crisis already led to large clean energy deployment in Europe (Boonman and Rodriguez 2025) and beyond (Emiliozzi et al. 2025; Nasir 2026). The ongoing conflict around the Strait of Hormuz is yet again catalyzing a surge of clean technology adoption, best illustrated by record sales of electric vehicles around the globe (Shah 2026).

By raising the cost of fossil-fuel dependence, geoeconomic fragmentation is thus increasing the attractiveness of clean technologies and, in turn, accelerating unilateral decarbonization.

II.B. A justification for policies at the trade-and-climate nexus

The second effect is that the weakening of international norms allows the implementation of more aggressive climate policies.

The challenge of unilateral climate policies

Unilateral climate policies are difficult to implement effectively in open economies (Jakob 2021). Supply chains often connect producers and consumers along multiple processing steps, spreading responsibility for GHG emissions across many intermediates (Beaufils, Berthet, et al. 2023). Emissions are often concentrated in upstream sectors, whose production can be outsourced at comparatively low cost (Shapiro 2021). In a globalized economy, domestic emissions reductions are partly offset by increases in emissions abroad. The risk of so-called “carbon leakage” has been a central argument for conditioning domestic climate policies on international agreements on a global carbon price or universal solidarity mechanisms (Grubb et al. 2022). In the absence of such negotiated outcome, the range of climate policies acceptable from a multilateral perspective dramatically shrinks.

Designing climate policies that avoid carbon leakage necessarily involves adding friction to international trade. Policy options range from domestic procurement rules, domestic subsidies and carbon tariffs to avoid the pressure from unregulated competitors (Jakob 2021). Such trade-and-climate policies have historically been faced with legal and diplomatic constraints. First, the rules of the World Trade Organization (WTO) generally forbid the application of a national preference in trade, although exceptions can be granted on a case by case basis for environmental reasons. Second, even when policies are designed to be compliant with the WTO regulations, climate policies with trade implications bear important diplomatic costs and often lead to tensions in international negotiations (Cosbey et al. 2019).

Making trade-and-climate policies acceptable

By weakening the rules-based world order, geoeconomic fragmentation opens the door for more aggressive policies at the trade-and-climate nexus. Recent years have seen the emergence of a number of climate policies confronting with free trade principles. The 2021 Inflation Reduction Act (IRA) in the USA is an expansionary policy that initially aimed at reconciling economic growth, economic security and climate mitigation (Mackintosh and Warin 2026b). It notably included domestic content requirements for clean technologies which, before being rolled back by the Trump administration, were intended to support the growth of a domestic clean-tech industry while avoiding carbon leakage. Similarly, the EU's Carbon Border Adjustment Mechanism (CBAM) extends the EU carbon price to emission-intense imported materials, thereby pricing emissions occurring in other jurisdictions (Beaufils, Ward, et al. 2023).

While the IRA and the EU CBAM have been designed to be defensible against trade norms, their implementation benefits from the weakening of multilateral trade rules. Not only are WTO rulings hindered by political manoeuvres, but the policies at the trade-and-climate nexus now appear relatively more acceptable in contrast with the illegal and sudden 2025 "Liberation Tariffs" imposed across the board by the Trump administration against most countries in the world. In comparison, the EU CBAM was announced in advance, is based on transparent rules and gradually implemented over the years. As illustrated by the milder-than-expected reactions to the enforcement of the EU CBAM in January 2026 (Otto 2025), such policies to foster unilateral decarbonization appear relatively more legitimate in a world crippled by sudden and arbitrary trade restrictions than in a rules-based world order.

The knock-on effects of unilateral climate policies

By allowing unilateral emission reduction while limiting carbon leakage, policies at the trade-and-climate nexus reduce the cost of unilateral climate action (Ambec et al. 2024). In addition, unilateral policies affecting emitters in other countries might create incentives to decarbonize in other countries. This is for instance the case for the EU CBAM: by making clean exporters more competitive on the EU market, it incentivizes companies to engage in emission reduction. Furthermore, exporting countries might want to introduce their own carbon pricing scheme in response to the EU CBAM to collect domestically the revenue that otherwise accrues to the EU (Beaufils, Wanner, et al. 2026). This mechanism, sometimes described as "Brussels' effect" (Bernat and Spera 2024) highlights a paradox of aggressive policies at the trade-and-climate nexus. While they apparently oppose the principle of a multilateral solution to the climate crisis,

they might contribute to overcoming the coordination problem arising in international negotiations.

In summary, the fragmentation of the global economy thus appears as an obvious challenge to the implementation of a multilateral solution to the climate crisis. Yet, the weaponization of trade dependencies also creates new justifications for decarbonization and the weakening of international trade norms widens the policy toolbox for unilateral action.

III. Decarbonization reshapes geoeconomic power balances

Conversely, understanding decarbonization through the lens of national interests provides a rich framework to understand the emerging challenges to the global economic order. The impact of the energy transition on geopolitics is widely acknowledged by social scientists (Mitchell 2009; Hughes and Lipsky 2013; Blondeel et al. 2021; Colgan and Hinthorn 2023; Gazmararian and Tingley 2026) but is still largely overlooked in the mainstream geoeconomic literature (Mohr and Trebesch 2025). For decades, oil and gas rents allowed the making of fortunes in some regions of the globe, while locking the rest of the world into a costly dependency. In the first section, we highlighted that decarbonization offers fuel importers a way to reduce costly dependence on fossil-fuel exporters. Symmetrically, for resource-rich countries, the energy transition threatens a central source of income and political power and thus becomes a source of geoeconomic tension. We discuss how decarbonization alters the existing geoeconomic power balance in three steps. First, we show how the transition to clean energy systems reshapes power balances in the global economy. Second, we highlight how decarbonization changes the expression of geoeconomics. Third, we illustrate the emerging role of decarbonization in geoeconomic confrontation by analyzing the role of energy in the geoeconomic confrontation between the USA and China.

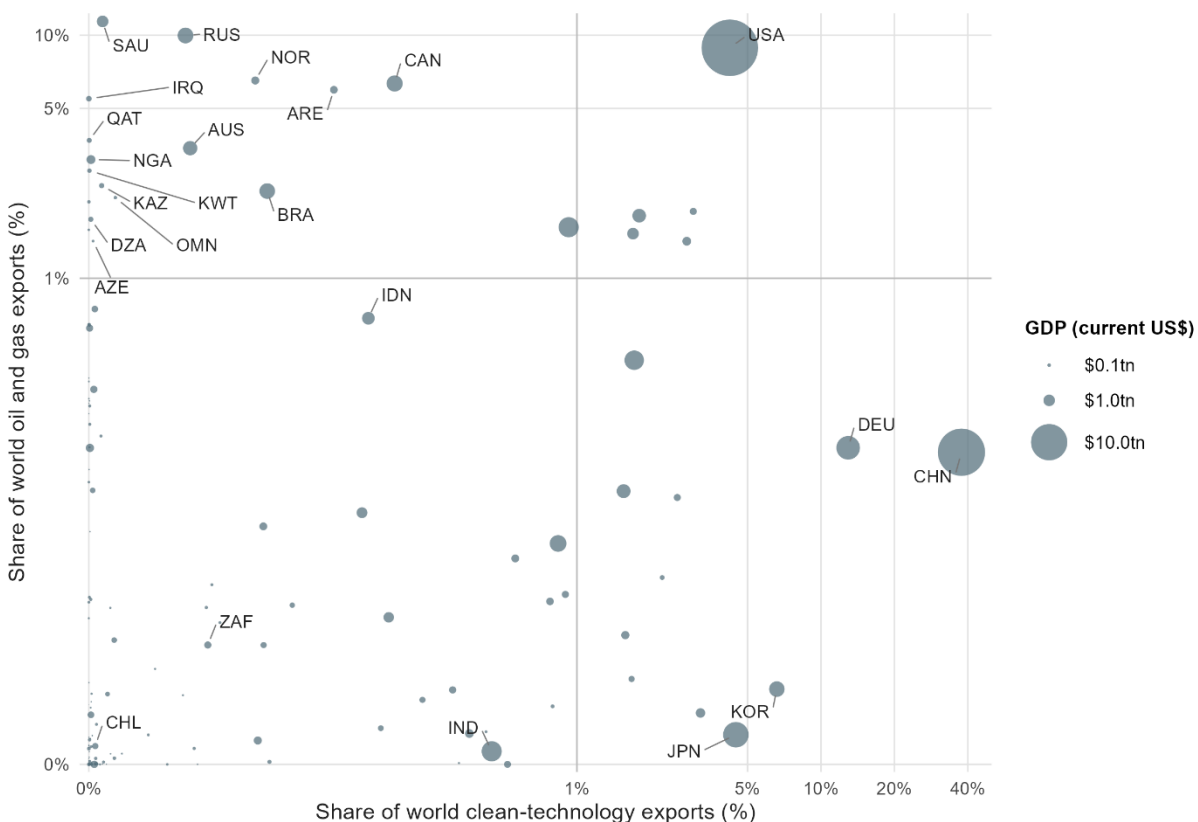
III.A. Shifting power balances in a decarbonizing world

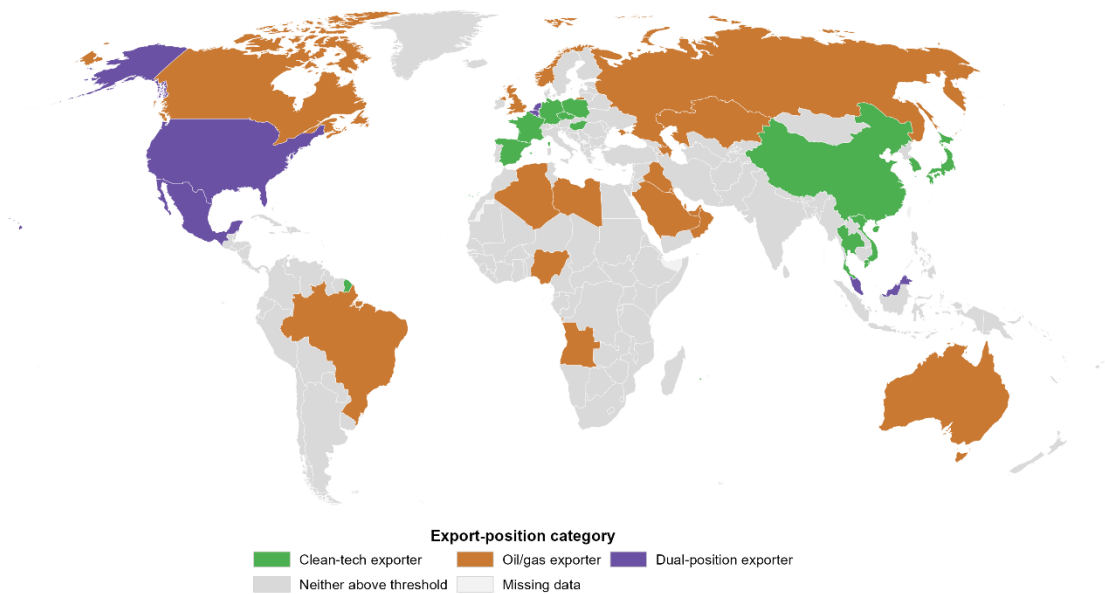
The emergence of renewable technologies as substitutes to fossil fuels draws a new geography of geoeconomic power. Fossil fuel resources – in particular oil and gas – are unevenly distributed around the globe, with the 10 largest producers of oil accounting for 73 % of the 2023 global supply (Emiliozzi et al. 2025). In the past decades, such fossil rents created immense fortunes and fuelled the rapid development of entire regions, with so-called “petrostates” basing their development on the export of fossil fuel resources (Ashford 2022). Decarbonization can yield short-term opportunities for these countries to concentrate the emission-intense industries delocalizing from the rest of the globe (Goldthau and Westphal 2019) or to reduce the share of the extracted fuel that is consumed domestically and thereby increase export quantities. Still, the prospects for a transition to a fossil-free global energy system represents a massive threat to the development model of these countries (Colgan and Hinthorn 2023).

By contrary, decarbonization stimulates the development of new supply chains for providing solar panels, wind turbines, batteries and electric vehicles. These supply chains combine complex

technologies and key mineral resources, thereby creating new channels for the expression of geoeconomic power (Clayton et al. 2026b). Figure 3 illustrates that countries' positions in clean-technology exports largely differ from their positions in oil and natural gas exports, drawing an intuition of the shifts at play in the global distribution of geoeconomic power in a decarbonized world. In Panel , the upper-left cluster captures major fossil-fuel exporters with limited clean-technology presence on the world market, while the lower-right cluster shows major clean-technology exporters with small shares in oil and gas exports. The USA stands out as being important on both export markets, with a global share in clean-technology exports of more than 4% and of oil and gas of more than 8%, on average between 2020 and 2024. The world map in Panel shows that the divide is geographic, illustrating how decarbonization may redistribute rents and thus the source of geoeconomic power across countries.

Figure 1: Export positions in fossil fuels and clean technologies





Source: Authors' calculations and illustration based on CEPII BACI HS17 (Gaulier and Zignago 2010). Caption: The upper panel plots countries' shares of world clean-technology exports against their shares of world crude oil and natural-gas exports, averaged over 2020–2024. The lower Panel illustrates countries' export-positions by categorizing based on the 1% thresholds shown in the upper panel. Countries above both thresholds are classified as dual-position exporters. Clean technologies are defined as a narrow basket covering wind-powered generating sets, lithium-ion accumulators, electric vehicles, heat pumps, and solar photovoltaic cells/modules. Oil and gas exports include crude petroleum oils, liquefied natural gas, and gaseous natural gas.

Alt Text description: The upper panel is a scatter plot showing how countries are positioned with regard to global shares of clean technology exports (x-axis) and fossil fuel exports (y-axis). The figure uses logarithmic scales on both axis and the size of the data points is proportional to the country's GDP. The big fuel exporters are mostly on the top left quadrant (Russia, Gulf countries, Canada...), with the exception of the USA in the top right quadrant, having both large fossil fuels and clean energy exports. Other rich economies are on the lower right quadrant (China, EU countries, Japan and Korea) and a lot of small economies are on the lower left quadrant, with low fossil fuels and clean energy exports.

The lower panel is a worldmap in which countries are colored according to the quadrant they belong to in the upper panel. Economies whose exports clearly bend towards fossil energy are in orange (middle east, Brazil, Canada, Russia, Australia). Clean-energy oriented exporters are in Green (EU countries, Eastern Asia). Countries with both high fossil and high clean exports are in purple (mostly the USA).

III.B. Decarbonization and the expression of geoeconomic power

The influence of decarbonization on geoeconomics is not limited to the reshuffling of resource endowments. It also changes the way geoeconomic power can be exerted. When fossil-fuel disruptions have immediate global impacts, the weaponization of clean energy builds on more subtle mechanisms and policies.

Clean technologies are capital-based

First, the energy contained in barrel of oil can only be recovered once, such that fossil-based energy systems require a continuous inflow of fossil fuels to function. On the contrary, clean energies are mostly capital-based: a single solar panel can produce energy throughout its lifetime without the need for a constant resupply. This implies that a decarbonized energy system is, in principle, less exposed to geoeconomic pressures, since trade restrictions on clean energies have less direct impacts on energy security than fossil supply disruptions (Ho et al. 2026). In the long term, recycling strategies can allow the emergence of quasi-closed supply chains, in which primary extraction would only play a marginal role, thereby limiting entry points for trade weaponization (Zhai et al. 2025).

Clean technologies build on complex supply chains

Second, a clean energy system builds on more complex supply chains than a fossil-based one. Between their extraction and their production of energy, fossil fuels only need to be refined, transported and distributed to the final consumers. Instead, clean technologies build on many intermediate inputs. Clean supply chains can thus involve the use of tens of mineral resources that all need to be extracted, processed and transported to manufacturing plants, where substantial technology is needed to produce solar panels, wind turbines and batteries (Fetzer and Lambert 2026). Such complexity paints an ambivalent picture. On the one hand, the upstream minerals required for clean energy systems are often more concentrated geographically than fossil fuels (Alfaro et al. 2026; Adam et al. 2026) and the multiplication of processing steps creates multiple entry points to weaponize clean energy interdependencies (Farrell and Newman 2019; Clayton et al. 2026b; Domínguez-lino et al. 2026). On the other hand, the relative complexity of clean technologies compared to fuel combustion allows for easier input substitution, thereby reducing the effectiveness of supply restrictions. For instance, the currently dominant battery technologies critically rely on lithium and cobalt, but this dependence can be relieved by using alternative technical solutions (Olivetti et al. 2017; Mertens et al. 2024; Alfaro et al. 2026).

Clean technologies build on endogenous technological change

Third, clean technologies are still in a rapid development phase. Not only does this imply that the current patterns of dependence on critical materials might evolve, but the clean technologies markets are still largely contested. While the specialization in fossil fuel exports was largely driven by natural resource endowments, the competitive advantages in clean technologies derive from technological factors that can be influenced by political decisions (Rodrik 2014; Acemoglu et al. 2012). This means that the geoeconomic competition for clean technologies can mobilize a broad

spectrum of policies to influence the emergence and stability of clean supply chains, such as strategic subsidies (Fischer).

III.C. Decarbonization in ongoing geoeconomic struggles

Far from being a mere conceptual possibility, the prospects for decarbonization already play a role in the mounting geoeconomic confrontation between the USA and China. While this rivalry builds on many other dimensions, these opposite views on decarbonization have important geoeconomic implications. Despite a competitive clean energy sector (see Figure 1), the USA remains one of the world's largest fossil fuel producers and the risk of losing such resource rent partly explains the rise of the contrarian discourse on climate change in the American society (Mackintosh and Warin 2026b). On the contrary, China is pushing the concept of "ecological civilization", which ultimately relies on the phasing out of fossil fuels in favour of clean energies (Hansen et al. 2018). Beyond discourses, these opposite views already have tangible impacts on the global economy.

The USA of the second Trump administration is vehemently opposing decarbonization. The energy question is central to the rhetoric of the 49th president of the USA, who repeatedly praises the benefits of the "beautiful clean coal", encourages the country to "drill baby, drill", while denouncing the "green climate scam" (Milman 2025), which translates politically into the dismantling of the public policies in favor of clean energy (Colgan and Genovese 2025; Deberdt et al. 2025). This domestic strategy mirrors an aggressive international strategy with vast geoeconomic implications (Mackintosh and Warin 2026b, 2026a). The so-called "Liberation tariffs" are used as leverage to secure future use of USA's fossil resources, as in the trade deal struck with the EU (House 2025); the pressures on Ukraine and Greenland coincide with the availability of critical minerals (Haneklaus et al. 2026) and the military intervention in Venezuela and Iran affect the exporting capabilities of key exporters of fossil fuels to China (Mellish 2026).

Conversely, the Chinese territory does not contain significant oil and gas resources. While this resource scarcity has historically been compensated by the extraction of coal, the Chinese government has been heavily investing in clean technologies in the past decades, with world-high renewable deployments that already started curbing the use of fossil fuels in China (Friedlingstein et al. 2026). This decarbonization effort is not bounded to the domestic Chinese economy. Instead, it integrates into a broader geoeconomic strategy that encompasses investments in mineral extraction across the globe and strategic subsidies in key clean technologies (Bian et al. 2024). As a result, China is now dominating most of the supply chains to produce clean technologies, from the refinement and processing of rare earths to the development and assembly of batteries, photovoltaic panels and Electric Vehicles (EVs). As illustrated by the 2025 European tariffs on Chinese EVs, this strategy is creating frictions in the global economy (Dou et al. 2026).

IV. The future of climate cooperation

The previous two sections have shown that decarbonization and geoeconomics interact on two levels. On the one hand, the weakening of the norms governing the global economy creates a powerful incentive for fuel importing countries to reduce their dependence on fossil fuels and extends the policy toolbox to abate domestic emissions. On the other hand, the emerging feasibility of a transition from a fossil-based to electrified economic system questions the organization of the global economy and redistributes economic power away from fossil fuel rich countries. We discuss here hypothetical climate cooperation scenarios that could emerge from the interaction between these two trends.

IV.A. A self-reinforcing feedback

Our first two scenarios hypothesize that the incentive for fuel importers to decarbonize and the stakes of fuel exporters in the current energy system converge in a self-reinforcing polarizing effect: as fossil superpowers see their economic domination threatened by decarbonization, they might increasingly use geoeconomic instruments to tighten their hold on the countries buying their fossil fuels. In response, trade weaponization makes the cost of critical dependence more salient for importers, thereby reinforcing the unilateral incentives to reduce reliance on fossil fuels.

Fossil Energy Dominance

The outcome of such a stand-off would largely depend on the technological maturity of clean technologies. Despite recent advances, the technologies available today still face limitations that forbid an immediate and complete replacement of fossil fuels. For instance, the stabilization of renewable-powered energy grids on very short (Smith et al. 2022) and seasonal time frames is still to be fully resolved (Jiang et al. 2023), and some sectors (aviation, petrochemistry) still lack economically viable alternatives to fossil fuels (Meng et al. 2025). If these technical issues are not overcome in due time, fuel importers will not be able to fully overcome their fuel dependence and fossil-rich countries could succeed in maintaining some level of "fossil energy dominance". A similar situation could be reached if countries lack the political will and the financial capacity to overcome the large initial investments needed to decarbonize their economies, possibly under the geoeconomic pressure of petrostates willing to preserve their export margins. Either way, a scenario where fossil superpowers succeed in maintaining "fossil energy dominance" would likely forbid any satisfactory answer to the climate crisis by locking the world in unsustainable fossil fuel consumption levels.

A Green Cold War

A more optimistic scenario assumes that the technological, political and economic hurdles to remove fossil fuels are quickly overcome. In this situation, fossil-poor countries would have a clear interest in decarbonizing their economy to reduce their exposure to fuel producers, gain a competitive edge on clean technologies and reduce the overall level of climate change. Yet, if fossil exporters still perceive themselves as losing from decarbonization, this scenario would also

yield an unsatisfactory response to the climate crisis. First, the concentration of fossil resources makes it possible for a handful of petrostates to keep the planet on an unsustainable warming trajectory if they maintain a heavy consumption of the fossil fuels domestically available. Second, fuel exporters could use sanctions, export controls, and other geoeconomic instruments to heighten the cost of decarbonization for other countries as long as these still need some fossil fuels. This would further incentivize decarbonizing countries to reduce their exposure to petrostates, potentially resulting in a "Green Cold War", a strongly polarized world economy split between decarbonized and fossil-based economies, in which climate cooperation would prove impossible.

IV.B. Defeating climate polarization

Portraying the geoeconomics of decarbonization as a zero-sum power struggle between the winners and losers of decarbonization thus leads to an impasse for climate cooperation: either the losers from decarbonization succeed in preventing decarbonization everywhere (as in the "Fossil Energy Dominance" scenario), or the decarbonizing countries would lack the leverage to coerce fossil superpowers into decarbonizing their own economy ("Green Cold War" scenario). We introduce here a "Green Détente" scenario, in which we claim that acknowledging the potential gains of decarbonization for fuel exporters paves the way to safeguard climate cooperation.

The shared gains from climate mitigation

A key hypothesis of the "Fossil Energy Dominance" and "Green Cold War" scenarios is that fuel exporters are portrayed as net losers from decarbonization. In reality, decarbonization is not a zero-sum game and fossil-rich countries also have to gain from climate cooperation. First, the damages from climate change affect all countries, such that all countries benefit from the reduction of global GHG emissions (Calvin et al. 2023). Second, the dependence of an economy on a resource rent comes with a number of negative externalities that can be mitigated by diversifying away from fossil fuels. For instance, the reliance on fossil exports reduces the overall competitiveness of an economy and often comes with societal pressures with regard to the misallocation of this rent (van der Ploeg 2011). Relatedly, fuel exporters also profit from the co-benefits of decarbonization, for instance in terms of air pollution or technological comfort (Karlsson et al. 2020). Third, a competitive advantage in fossil resources does not necessarily correlates with a competitive disadvantage in clean technologies, as illustrated by the USA in Figure 1. Moreover, some specialized skills and capital historically associated with fuel extraction and refining can be transposed in a clean energy world, for instance for the capture and storage of carbon dioxide, hydrogen-based supply chains, biofuels or geothermal energy (IEA 2023).

The road for a Green Détente

Building climate cooperation at times of geoeconomic fragmentation needs to build on the shared interests in climate mitigation. Yet, we have clearly shown that these gains are heterogeneously distributed in time and space. Our "Green Détente" scenario thus needs to strike a fine balance between the acknowledgment of national interests and the challenging of the existing power balances.

The first key aspect of the Green Détente scenario is the need for the countries most obviously benefiting from decarbonization to engage in unilateral climate policies. Although uncoordinated climate policies are in principle inferior to a globally negotiated agreement, such an agreement is hardly reachable with such heterogeneous stakes in mitigating climate change (Farrokhi and Lashkaripour 2025). This is reflected by 30 years of international climate negotiations with meagre outcomes, even when the prospects for international cooperation were better than today (Maslin et al. 2023). In a fragmented economic landscape, unilateral climate policies can only succeed if they use the toolbox of geoeconomics. The countries willing to engage in decarbonization should be able to weather the pressure from fuel exporters and the first-mover penalties using subsidies, climate tariffs and agreements to secure critical supply chains.

Yet, aggressive policies at the trade-and-climate nexus yield an existential risk for climate cooperation, as polarizing policies risk alienating fuel exporters and increase the risk of a Green Cold War (Perdana et al. 2026). Instead, in the Green Détente world, unilateral policies should always include clear mechanisms for cooperation. In this scenario, unilateral policies are not intended to hurt fuel exporting countries, but to create the conditions for decarbonization to develop despite geoeconomic pressures, and to pave the way for ever more countries to engage in decarbonization. In that regard, the concept of a self-enforcing climate club is a promising avenue (Overland and Huda 2022). The countries most willing to decarbonize would agree on a set of shared policies to enhance decarbonization, while designing a shared protective mechanism to avoid the competition from non-decarbonizing countries. Other countries could voluntarily join the club by themselves adopting the same climate policies. In particular, carefully designed CBAMs could play an important role in enabling the formation of such climate clubs (Beaufils, Wanner, et al. 2026).

V. Conclusion

Geoeconomic fragmentation and decarbonization are two defining trends of the early twenty-first century. They should not be interpreted as independent developments but as jointly transforming one another. Geoeconomic fragmentation changes the incentives and set of instruments for decarbonization; decarbonization in turn changes economic interrelations and dependencies from which geoeconomic power derives. Jointly, the two developments feed back into the prospects for future climate cooperation.

The first link runs from fragmentation to decarbonization. Paradoxically, the weakening of multilateralism may accelerate the decarbonization of the world economy. It increases the economic costs and vulnerability of fossil-fuel dependence. For fossil-fuel importing countries, ambitious decarbonization policies, which are usually perceived as too costly to be enforced domestically, can therefore become more attractive for reasons of energy security, national autonomy, and industrial strategy. At the same time, the weakening of trade norms can encourage the emergence of policies at the trade-and-climate nexus, such as CBAM.

The second, reverse link runs from decarbonization to geoeconomic power. Fossil fuels have been at the center of economic development for decades, and decarbonization threatens the

rents and political influence of countries that dominate their extraction. At the same time, green supply chains have become the site of intense competition over key technologies, critical minerals, processing steps, and comparative advantages in global markets. The systemic confrontation between the USA and China illustrates how the contest over fossil fuels and clean technology can be a contributing factor to geoeconomic polarization. Decarbonization therefore changes the structure of interdependence itself.

The resulting feedback is ambivalent. Fragmentation can make decarbonization more nationally attractive, but it can also make international cooperation more demanding. Unilateral decarbonization in fossil-fuel-importing countries can provoke fossil exporters to defend current rents and assert their geoeconomic dominance more aggressively, while competition over clean technologies and critical inputs can further deepen bloc formation. Yet this outcome is not predetermined. The same forces that make clean investment more attractive and clean-technology sectors strategically important can also support different and more pragmatic forms of global cooperation.

The key challenge is to use the current momentum for unilateral climate policy created by geoeconomic fragmentation without leading to a zero-sum game of economic domination. Climate policies in a fragmented world must acknowledge the state of tension in the global economic system, recognize the powerful role of national interests and entail defensive instruments to weather geoeconomic coercion. At the same time, they should remain framed in the norms and rules of multilateralism to align with the universal gains of climate mitigation and enhance participation. The global nature of climate change means that decarbonization cannot be determined only through the logic of strategic rivalry but ultimately requires global cooperation.

- Acemoglu, Daron, Philippe Aghion, Leonardo Bursztyn, and David Hemous. 2012. "The Environment and Directed Technical Change." *American Economic Review* 102 (1): 131–66. <https://doi.org/10.1257/aer.102.1.131>.
- Adam, Christopher, Rabah Arezki, and Frederick van der Ploeg. 2026. "The Scramble for Critical Minerals." *Oxford Review of Economic Policy* 42 (1): 1–13. <https://doi.org/10.1093/oxrep/grag010>.
- Alfaro, Laura, Harald Fadinger, Jan Schymik, and Gede Virananda. 2026. "The Rare-Earth Footprint of the Global Economy: Input-Output Evidence." *AEA Papers and Proceedings* 116 (May): 103–8. <https://doi.org/10.1257/pandp.20261068>.
- Ambec, Stefan, Federico Esposito, and Antonia Pacelli. 2024. "The Economics of Carbon Leakage Mitigation Policies." *Journal of Environmental Economics and Management* 125 (May): 102973. <https://doi.org/10.1016/j.jeem.2024.102973>.
- Arezki, Rabah, Michael L Ross, and Frederick van der Ploeg. 2026. "On the Politics and Economics of the Shift from Fossil Fuels to Critical Minerals." *Oxford Review of Economic Policy* 42 (1): 156–69. <https://doi.org/10.1093/oxrep/grag009>.
- Ashford, Emma. 2022. *Oil, the State, and War: The Foreign Policies of Petrostates*. Georgetown University Press.
- Beaufils, Timoth  , Etienne Berthet, Hauke Ward, and Leonie Wenz. 2023. "Beyond Production and Consumption: Using Throughflows to Untangle the Virtual Trade of Externalities." *Economic Systems Research* 35 (3): 376–96. <https://doi.org/10.1080/09535314.2023.2174003>.
- Beaufils, Timoth  , Killian Conyngham, Marlene de Vries, et al. 2025. *The Geopolitical Externality of Climate Policy*. Kiel {{Working Papers}} No. 2283. Kiel Institute for the World Economy (IfW Kiel). <https://doi.org/None>.
- Beaufils, Timoth  , Ulrich Eydam, Maik Heinemann, et al. 2026. "Energy Crisis Relief as Implicit Insurance: Fossil Import Dependence and Policy Design*." *EconPol Policy Brief*.
- Beaufils, Timoth  , Joschka Wanner, and Leonie Wenz. 2026. "The Potential of Carbon Border Adjustments to Foster Climate Cooperation." *Journal of the Association of Environmental and Resource Economists* 0. <https://doi.org/10.1086/742163>.
- Beaufils, Timoth  , Hauke Ward, Michael Jakob, and Leonie Wenz. 2023. "Assessing Different European Carbon Border Adjustment Mechanism Implementations and Their Impact on Trade Partners." *Communications Earth & Environment* 4 (1): 131. <https://doi.org/10.1038/s43247-023-00788-4>.
- Bernat, Micha  , and Francesco Spera. 2024. "The De Jure 'Brussels Effect': Current Legal Trends in the EU's Unilateral Regulatory Globalisation." *Studia Europejskie – Studies in European Affairs* 28 (4): 77–105. <https://doi.org/10.33067/se.4.2024.4>.

Bian, Alice, Simon Dikau, Hugh Miller, Roberta Pierfederici, Nicholas Stern, and Bob Ward. 2024. *China's Role in Accelerating the Global Energy Transition Through Green Supply Chains and Trade*. (London, UK), February.

Blondeel, Mathieu, Michael J. Bradshaw, Gavin Bridge, and Caroline Kuzemko. 2021. "The Geopolitics of Energy System Transformation: A Review." *Geography Compass* 15 (7): e12580. <https://doi.org/10.1111/gec3.12580>.

Blondeel, Mathieu, James Price, Michael Bradshaw, et al. 2024. "Global Energy Scenarios: A Geopolitical Reality Check." *Global Environmental Change* 84 (January): 102781. <https://doi.org/10.1016/j.gloenvcha.2023.102781>.

Boonman, Hettie, and Mauricio Rodriguez. 2025. "Mitigating Foreign Fossil Fuel Shocks: The Role of Renewable Energy and Industrial Electrification in The Netherlands." *Economic Modelling* 151 (October): 107138. <https://doi.org/10.1016/j.econmod.2025.107138>.

Butte, Anatole. 2022. "Weaponizing Energy: Energy, Trade, and Investment Law in the New Geopolitical Reality." *American Journal of International Law* 116 (4): 740–51. <https://doi.org/10.1017/ajil.2022.53>.

Calvin, Katherine, Dipak Dasgupta, Gerhard Krinner, et al. 2023. *IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (Eds.)]*. IPCC, Geneva, Switzerland. Edited by Paola Arias, Mercedes Bustamante, Ismail Elgizouli, et al. Intergovernmental Panel on Climate Change (IPCC). <https://doi.org/10.59327/IPCC/AR6-9789291691647>.

Clayton, Christopher, Matteo Maggiori, and Jesse Schreger. 2026a. "A Framework for Geoeconomics." *Econometrica* 94 (1): 105–36. <https://doi.org/10.3982/ECTA23206>.

Clayton, Christopher, Matteo Maggiori, and Jesse Schreger. 2026b. "Putting Economics Back into Geoeconomics." *NBER Macroeconomics Annual* 40 (January): 23–87. <https://doi.org/10.1086/738941>.

Colgan, Jeff D., and Miriam Hinthorn. 2023. "International Energy Politics in an Age of Climate Change." *Annual Review of Political Science* 26 (Volume 26, 2023): 79–96. <https://doi.org/10.1146/annurev-polisci-051421-124241>.

Colgan, Jeff, and Federica Genovese. 2025. "Global Climate Politics After the Return of President Trump." *International Organization* 79 (S1): S88–102. <https://doi.org/10.1017/S002081832510115X>.

Cosbey, Aaron, Susanne Droege, Carolyn Fischer, and Clayton Munnings. 2019. "Developing Guidance for Implementing Border Carbon Adjustments: Lessons, Cautions, and Research Needs from the Literature." *Review of Environmental Economics and Policy* 13 (1): 3–22. <https://doi.org/10.1093/reep/rey020>.

- Curran, Louise. 2026. "The Future of Global Production Networks Post Trump II: Coupling and Decoupling in a World of Trade Policy Uncertainty." *Journal of Economic Geography* 26 (2): 163–73. <https://doi.org/10.1093/jeg/lbaf062>.
- Deberdt, Raphael, Angeline Letourneau, and Philippe Le Billon. 2025. "Unleashing American Energy? Uncertainties in Energy Transition Developments Under a New Trump Administration." *Energy Research & Social Science* 126 (August): 104169. <https://doi.org/10.1016/j.erss.2025.104169>.
- Domínguez-lino, Tomás, Jonathan T. Elliott, and Allan Hsiao. 2026. *Critical Minerals, Geopolitics, and the Green Transition*. Working Paper No. 35654. Working Paper Series. National Bureau of Economic Research. <https://doi.org/10.3386/w35654>.
- Dou, Hao, Shuyan Jiang, Shiqi Shawn Ou, et al. 2026. "Distributional Impacts of EU Tariffs on Chinese Electric Vehicles Across European Markets." *Nature Energy*, July, 1–14. <https://doi.org/10.1038/s41560-026-02105-7>.
- Emiliozzi, Simone, Fabrizio Ferriani, and Andrea Gazzani. 2025. "The European Energy Crisis and the Consequences for the Global Natural Gas Market." *The Energy Journal* 46 (1): 119–45. <https://doi.org/10.1177/01956574241290640>.
- European Commission. 2026. *Progress on Climate Action*. https://climate.ec.europa.eu/eu-action/climate-strategies-targets/progress-climate-action_en.
- Eurostat. 2026a. *Energy in Europe*. <https://ec.europa.eu/eurostat/web/interactive-publications/energy-2026>.
- Eurostat. 2026b. "EU Imports of Energy Products - Latest Developments." In *Statistics Explained*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_imports_of_energy_products_-_latest_developments.
- Fajgelbaum, Pablo, Pinelopi Goldberg, Patrick Kennedy, Amit Khandelwal, and Daria Taglioni. 2024. "The US-China Trade War and Global Reallocations." *American Economic Review: Insights* 6 (2): 295–312. <https://doi.org/10.1257/aeri.20230094>.
- Farrell, Henry, and Abraham L. Newman. 2019. "Weaponized Interdependence: How Global Economic Networks Shape State Coercion." *International Security* 44 (1): 42–79. https://doi.org/10.1162/isec_a_00351.
- Farrokhi, Farid, and Ahmad Lashkaripour. 2025. "Can Trade Policy Mitigate Climate Change?" *Econometrica* 93 (5): 1561–99. <https://doi.org/10.3982/ECTA20153>.
- Fetzer, Thiemo, and Peter John Lambert. 2026. "Critical Minerals and Industrial Policy: A Network-Based Approach to Supply Chain Risk." *Oxford Review of Economic Policy* 42 (1): 193–211. <https://doi.org/10.1093/oxrep/grag017>.

- Fischer, Carolyn. *Strategic Subsidies for Green Goods*. MITP: Mitigation, Innovation and Transformation Pathways No. 234311. Fondazione Eni Enrico Mattei (FEEM). <https://doi.org/10.22004/ag.econ.234311>.
- Friedlingstein, Pierre, Michael O’Sullivan, Matthew W. Jones, et al. 2026. “Global Carbon Budget 2025.” *Earth System Science Data* 18 (5): 3211–88. <https://doi.org/10.5194/essd-18-3211-2026>.
- Galbraith, Jean. 2026. *Retreating from Internationalism*. <https://doi.org/10.59704/ebe2b1ebc0ba6ed7>.
- Gaulier, Guillaume, and Soledad Zignago. 2010. *BACI: International Trade Database at the Product-Level. The 1994-2007 Version*. Working Papers Nos. 2010-23. CEPII. <https://www.cepii.fr/CEPII/en/publications/wp/abstract.asp?NoDoc=2726>.
- Gazmararian, Alexander F., and Dustin Tingley. 2026. “The Political Economy of the Clean Energy Transition.” *Annual Review of Political Science* 29 (Volume 29, 2026): 73–99. <https://doi.org/10.1146/annurev-polisci-040924-091929>.
- Goldthau, Andreas, and Kirsten Westphal. 2019. “Why the Global Energy Transition Does Not Mean the End of the Petrostate.” *Global Policy* 10 (2): 279–83. <https://doi.org/10.1111/1758-5899.12649>.
- Gopinath, Gita, Pierre-Olivier Gourinchas, Andrea F. Presbitero, and Petia Topalova. 2025. “Changing Global Linkages: A New Cold War?” *Journal of International Economics* 153 (January): 104042. <https://doi.org/10.1016/j.jinteco.2024.104042>.
- Grubb, Michael, Nino David Jordan, Edgar Hertwich, et al. 2022. “Carbon Leakage, Consumption, and Trade.” *Annual Review of Environment and Resources* 47 (1): 753–95. <https://doi.org/10.1146/annurev-environ-120820-053625>.
- Guerin, Emmanuel, and Laurence Tubiana. 2025. “Global Climate Governance in the Age of Geoeconomics.” *CEBRI-Revista: Brazilian Journal of International Affairs*, no. 15 (October): 30–46. <https://cebri-revista.emnuvens.com.br/revista/article/view/277>.
- Haneklaus, Nils, Michaela Hrabušajová, and Matúš Mišík. 2026. “Strategic Relevance Beyond Resource Potential: Greenland and Ukraine in EU and US Critical Mineral Diversification.” *Resources Policy* 118 (July): 105950. <https://doi.org/10.1016/j.resourpol.2026.105950>.
- Hansen, Mette Halskov, Hongtao Li, and Rune Svarverud. 2018. “Ecological Civilization: Interpreting the Chinese Past, Projecting the Global Future.” *Global Environmental Change* 53 (November): 195–203. <https://doi.org/10.1016/j.gloenvcha.2018.09.014>.
- He, Zhi-Wen, Chien-Chiang Lee, and Susan Sunila Sharma. 2025. “The Impact of Geopolitical Risks on the Renewable Energy Transition.” *Energy Economics* 143 (March): 108278. <https://doi.org/10.1016/j.eneco.2025.108278>.

- Ho, Phuong, Christopher Knittel, and Adrien Concorde. 2026. "The Differential Impacts of Critical Mineral Prices and Oil Prices on the Economy." *Oxford Review of Economic Policy* 42 (1): 91–110. <https://doi.org/10.1093/oxrep/grag011>.
- House, The White. 2025. "Joint Statement on a United States-European Union Framework on an Agreement on Reciprocal, Fair, and Balanced Trade." In *The White House*.
- Hughes, Llewelyn, and Phillip Y. Lipsky. 2013. "The Politics of Energy." *Annual Review of Political Science* 16 (Volume 16, 2013): 449–69. <https://doi.org/10.1146/annurev-polisci-072211-143240>.
- IEA. 2023. *The Oil and Gas Industry in Net Zero Transitions – Analysis*. <https://www.iea.org/reports/the-oil-and-gas-industry-in-net-zero-transitions>.
- IEA. 2025. *World Energy Outlook 2025*. <https://www.iea.org/reports/world-energy-outlook-2025>.
- Ignatenko, Anna, Ahmad Lashkaripour, Luca Macedoni, and Ina Simonovska. 2025. "Making America Great Again? The Economic Impacts of Liberation Day Tariffs." *Journal of International Economics* 157 (September): 104138. <https://doi.org/10.1016/j.jinteco.2025.104138>.
- IPCC. 2022. *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Edited by P. R. Shukla, J. Skea, R. Slade, et al. Cambridge University Press. <https://doi.org/10.1017/9781009157926>.
- Jakob, Michael. 2021. "Climate Policy and International Trade – A Critical Appraisal of the Literature." *Energy Policy* 156 (September): 112399. <https://doi.org/10.1016/j.enpol.2021.112399>.
- Jiang, Haiyang, Ershun Du, Boyu He, et al. 2023. "Analysis and Modeling of Seasonal Characteristics of Renewable Energy Generation." *Renewable Energy* 219 (December): 119414. <https://doi.org/10.1016/j.renene.2023.119414>.
- Karlsson, Mikael, Eva Alfredsson, and Nils Westling. 2020. "Climate Policy Co-Benefits: A Review." *Climate Policy* 20 (3): 292–316. <https://doi.org/10.1080/14693062.2020.1724070>.
- Khoma, Nataliia, and Maiia Nikolaieva. 2025. "The Weaponization of Energy Resources: Fossil Fuels as Instruments of Geopolitical Leverage in the EU–Russia Context." *Journal of Liberty and International Affairs* 11 (2): 129–51. <https://doi.org/10.47305/jlia.2025.1865>.
- Kilian, Lutz. 2008. "The Economic Effects of Energy Price Shocks." *Journal of Economic Literature* 46 (4): 871–909. <https://doi.org/10.1257/jel.46.4.871>.
- Lake, David A., Lisa L. Martin, and Thomas Risse. 2021. "Challenges to the Liberal Order: Reflections on International Organization." *International Organization* 75 (2): 225–57. <https://doi.org/10.1017/S0020818320000636>.

- Mackintosh, Stuart P. M., and Thierry Warin. 2026a. "Competing Energy Futures: Industrial Policy, Energy Markets, and the Global Implications of Biden's IRA and Trump's 2025 Fossil-Fuel Strategy." *Energy Policy* 216 (September): 115393. <https://doi.org/10.1016/j.enpol.2026.115393>.
- Mackintosh, Stuart P. M., and Thierry Warin. 2026b. "Geeoeconomic Strategy: Bidenomics, Trump's 'One Big Beautiful Bill,' and the Global Political Economy." *Global Policy*, ahead of print, July. <https://doi.org/10.1111/1758-5899.70200>.
- Maslin, Mark A., John Lang, and Fiona Harvey. 2023. "A Short History of the Successes and Failures of the International Climate Change Negotiations." *UCL Open Environment* 5: e059. <https://doi.org/10.14324/111.444/ucloe.000059>.
- Meckling, Jonas. 2025. "The Geoeconomic Turn in Decarbonization." *Nature* 645 (8082): 869–76. <https://doi.org/10.1038/s41586-025-09416-x>.
- Mellish, Timothy I. 2026. "Neo-Imperial Coercion or Strategic Miscalculation? Trump's Interventions in Venezuela and Iran and the Geopolitical Ascendancy of China." *Journal of Global Faultlines* 13 (May): 11–25. <https://doi.org/10.13169/jglobfaul.13.1.0002>.
- Meng, Jing, Weichen Zhao, Jizhe Li, et al. 2025. "Technologies and Gaps in Deep Decarbonization of Hard-to-Abate Industrial Sectors." *Nature Reviews Clean Technology* 1 (8): 578–95. <https://doi.org/10.1038/s44359-025-00082-w>.
- Mertens, Jan, Jo Dewulf, Christian Breyer, et al. 2024. "From Emissions to Resources: Mitigating the Critical Raw Material Supply Chain Vulnerability of Renewable Energy Technologies." *Mineral Economics* 37 (3): 669–76. <https://doi.org/10.1007/s13563-024-00425-2>.
- Milman, Oliver. 2025. "From 'Global Cooling' to 'Beautiful Coal': Trump's Startling Climate Claims of 2025." *The Guardian*, December.
- Mitchell, Timothy. 2009. "Carbon Democracy." *Economy and Society* 38 (3): 399–432. <https://doi.org/10.1080/03085140903020598>.
- Mohr, Cathrin, and Christoph Trebesch. 2025. "Geeoeconomics." *Annual Review of Economics* 17 (Volume 17, 2025): 563–87. <https://doi.org/10.1146/annurev-economics-092424-111952>.
- Nasir, Zeeshan. 2026. "How Pakistan's Solar Boom Is Shielding It from Worst of Iran War Crisis." In *Al Jazeera*. <https://www.aljazeera.com/features/2026/4/7/how-pakistans-solar-boom-is-shielding-it-from-worst-of-iran-war-crisis>.
- Olivetti, Elsa A., Gerbrand Ceder, Gabrielle G. Gaustad, and Xinkai Fu. 2017. "Lithium-Ion Battery Supply Chain Considerations: Analysis of Potential Bottlenecks in Critical Metals." *Joule* 1 (2): 229–43. <https://doi.org/10.1016/j.joule.2017.08.019>.
- Ostrom, Elinor. 1999. "COPING WITH TRAGEDIES OF THE COMMONS." *Annual Review of Political Science* 2 (1): 493–535. <https://doi.org/10.1146/annurev.polisci.2.1.493>.

- Otto, Simon. 2025. "The External Impact of EU Climate Policy: Political Responses to the EU's Carbon Border Adjustment Mechanism." *International Environmental Agreements: Politics, Law and Economics* 25 (2): 177–94. <https://doi.org/10.1007/s10784-025-09667-z>.
- Overland, Indra, and Mirza Sadaqat Huda. 2022. "Climate Clubs and Carbon Border Adjustments: A Review." *Environmental Research Letters* 17 (9): 093005. <https://doi.org/10.1088/1748-9326/ac8da8>.
- Perdana, Sigit, Marc Vielle, and Ru Li. 2026. "Trade War to Cooperation: Scrutinizing China's Strategies to the EU Carbon Border Adjustment Mechanism." *Review of World Economics*, ahead of print, March. <https://doi.org/10.1007/s10290-026-00635-6>.
- Pierre Charbonnier. 2026. *War Ecology: An Environmental History of Peace*. Polity Press.
- Pomeranz, Kenneth. 2009. *The Great Divergence: China, Europe, and the Making of the Modern World Economy*. The Princeton Economic History of the Western World. Princeton University Press. <https://doi.org/10.1515/9781400823499>.
- Quitow, R., and Y. Zabanova. 2025. "Goeconomics of the Transition to Net-Zero Energy and Industrial Systems: A Framework for Analysis." *Renewable and Sustainable Energy Reviews* 214 (May): 115492. <https://doi.org/10.1016/j.rser.2025.115492>.
- Rodrik, Dani. 2014. "Green Industrial Policy." *Oxford Review of Economic Policy* 30 (3): 469–91. <https://doi.org/10.1093/oxrep/gru025>.
- Schumer, Clea, Sophie Boehm, Joel Jaeger, et al. 2025. *State of Climate Action 2025*. October. <https://www.wri.org/research/state-climate-action-2025>.
- Shah, Simone. 2026. "The Iran War Is Driving a Global Surge of Interest in Electric Vehicles." *Time*, April.
- Shapiro, Joseph S. 2021. "The Environmental Bias of Trade Policy*." *The Quarterly Journal of Economics* 136 (2): 831–86. <https://doi.org/10.1093/qje/qjaa042>.
- Smil, Vaclav. 2017. *Energy and Civilization: A History*. 2nd ed. The MIT press.
- Smith, Oliver, Oliver Cattell, Etienne Farcot, Reuben D. O'Dea, and Keith I. Hopcraft. 2022. "The Effect of Renewable Energy Incorporation on Power Grid Stability and Resilience." *Science Advances* 8 (9): eabj6734. <https://doi.org/10.1126/sciadv.abj6734>.
- Spiro, Daniel, Henrik Wachtmeister, and Johan Gars. 2025. "Assessing the Impacts of Oil Sanctions on Russia." *Energy Policy* 206 (November): 114739. <https://doi.org/10.1016/j.enpol.2025.114739>.
- Sun, Yixian, and Yitong Ye. 2025. "Global Climate Governance Remains Resilient Under Trump 2.0." *Global Public Policy and Governance* 5 (4): 353–66. <https://doi.org/10.1007/s43508-025-00131-x>.

The White House. 2025. "Putting America First In International Environmental Agreements." In *The White House*. <https://www.whitehouse.gov/presidential-actions/2025/01/putting-america-first-in-international-environmental-agreements/>.

UNFCCC. 1992. *United Nations Framework Convention on Climate Change*. Secretariat of the United Nations Framework Convention on Climate Change. <https://unfccc.int/resource/docs/convkp/conveng.pdf>.

UNFCCC. 2015. "The Paris Agreement." COP 21, November. <https://unfccc.int/documents/184656>.

Van de Graaf, Thijs, and Jeff D. Colgan. 2017. "Russian Gas Games or Well-Oiled Conflict? Energy Security and the 2014 Ukraine Crisis." *Energy Research & Social Science*, Conflict, Cooperation, and Change in the Politics of Energy Interdependence, vol. 24 (February): 59–64. <https://doi.org/10.1016/j.erss.2016.12.018>.

van der Ploeg, Frederick. 2011. "Natural Resources: Curse or Blessing?" *Journal of Economic Literature* 49 (2): 366–420. <https://www.jstor.org/stable/23071620>.

Weber, Pierre-François, Amandine Afota, Maria Grazia Attinasi, et al. 2025. "The Intersection Between Climate Transition Policies and Geoeconomic Fragmentation." *SSRN Electronic Journal*, ahead of print. <https://doi.org/10.2139/ssrn.5088766>.

Zeniewski, Peter, Gergely Molnar, and Paul Hugues. 2023. *Europe's Energy Crisis: What Factors Drove the Record Fall in Natural Gas Demand in 2022? – Analysis*. Commentary. IEA.

Zhai, Mengyu, Yufeng Wu, Shaonan Tian, et al. 2025. "A Circular Economy Approach for the Global Lithium-Ion Battery Supply Chain." *Nature* 646 (8087): 1114–21. <https://doi.org/10.1038/s41586-025-09617-4>.

Zioga, Maria, Maximilian Kotz, and Anders Levermann. 2024. "Observed Carbon Decoupling of Subnational Production Insufficient for Net-Zero Goal by 2050." *Proceedings of the National Academy of Sciences* 121 (45): e2411419121. <https://doi.org/10.1073/pnas.2411419121>.