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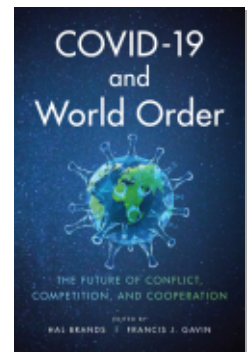
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PART III / Transnational Issues:
Technology, Climate, and Food

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Global Climate and Energy Policy after the COVID-19 Pandemic

The Tug-of-War between Markets and Politics

Johannes Urpelainen

Before the COVID-19 pandemic of 2020, international climate diplomacy had settled into a regular yet disturbing routine. Every year, governments gathered to negotiate their climate commitments. Progress was haphazard and frustratingly slow, while economic growth and rising living standards contributed to the relentless growth of greenhouse gas emissions.

The pandemic changed everything. For the first time since the end of the Cold War, global greenhouse gas emissions decreased rapidly. In April 2020, they had fallen by 17% from their 2019 levels, with almost half of the reduction from transportation. Researchers estimate that this reduction would translate into a 4%–7% decrease for the entire year, depending on how quickly the world economy rebounds.¹

Yet even this decrease, brought about by a massive economic shock, was barely in line with the emissions reductions needed to meet the goal of limiting global warming to 2 degrees Celsius by 2100. Climate scientists have shown that to achieve a 66% chance of limiting global warming to 2 degrees Celsius, net greenhouse gas emissions—subtracting carbon sequestered in oceans, forests, and so on—must reach zero by around 2070. To realize this goal, the emissions reductions driven by the COVID-19 pandemic would have to be repeated consistently over five decades.

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It is unlikely that such reductions would be driven by lockdowns and travel bans. A deeper change in the way people and firms create value will be necessary.

The stakes are high. If the international community fails to limit global warming during this century, serious climate disruption may follow. Massive wildfires, widespread flooding, and scorching heatwaves are among the dangerous climate impacts that we are already seeing. If climate change continues, these impacts will become more extreme over time. Islands and coastal areas, from Tuvalu to Bangladesh to Miami, will succumb to rising seas. Extreme weather events, such as droughts and floods, will ruin livelihoods. The resulting scarcity of food and water will trigger migration on a massive scale. These problems could be exacerbated by domestic unrest and international conflict.

After the pandemic, the outlook for dealing with climate disruption will be as unpredictable as ever. On the one hand, technological progress has contributed to decarbonization in the global power sector, and the rise of electric vehicles holds promise in transportation. If everything goes well in these sectors, the world could undergo a transition to an energy system that increasingly relies on electricity produced from low-carbon sources, such as wind and solar power. Low-cost batteries would store the energy generated when the wind blows and the sun shines, and electricity would replace gasoline, diesel, and natural gas for a wide range of purposes.

On the other hand, the deep undercurrents of international politics are distinctly unfavorable to effective, coordinated climate action. The rise of global right-wing populism and authoritarianism has brought to power leaders who have little interest in mitigating climate change and who disdain multilateral cooperation and globalization. COVID-19 has given rise to new geopolitical conflicts, as China and the United States compete for global influence and blame each other for the pandemic. In spite of the good news about clean technology, rapid climate action will be costly for the economy, at least in the short run. These costs are but a fraction of the global benefits of protecting our atmosphere, but major emitters must come to an agreement about burden sharing and then take costly action.

Ending the tug-of-war between politics and markets is essential for meaningful progress in the global effort to stop climate change before it is too late to avoid irreversible damage. Without a 180-degree change in the direction of international relations, today's great techno-economic opportunity will not save us from extreme climate disruption. Yet, there is still hope. When faced with a major crisis, governments and societies have time and again risen to the challenge.² From the world wars that roiled the twentieth century to the 1973 oil crisis that shook global en-

ergy markets, governments have shown remarkable resilience and boldness in doing things differently when the status quo was simply no longer an option.

Global Energy Markets: A Turbulent Future

Fossil fuels are both the lifeblood of the world economy and the primary driver of the climate crisis. Before the COVID-19 pandemic, approximately 80% of the world's final energy across all sectors came from fossil fuels (oil, gas, and coal). Oil continued to dominate the transportation sector, and coal continued to play an important role in the electricity sector, while the use of natural gas expanded in heating, industry, and electricity generation. Despite sharp decreases in the cost of renewable electricity generation, the share of fossil fuels in global energy consumption had not actually decreased at all. Fossil fuels accounted for slightly more than 80% of global energy consumption in 1971 and slightly less than 80% in 1989.

COVID-19 had an enormous impact on the global market for fossil fuels. Because the pandemic brought the world economy to a standstill, demand for energy decreased rapidly. Flights were cancelled, and people stopped going to the office. Bars and restaurants closed, and major events were called off. The economic shock also reduced manufacturing activity: global energy demand fell by 3.8% during the first three months of 2020. Based on this, the International Energy Agency (IEA), which closely monitors global energy markets, forecasts a 6% decrease in energy demand in 2020.³

Furthermore, according to the IEA, "the Covid-19 pandemic has set in motion the largest drop in global energy investment in history, with spending expected to plunge in every major sector this year—from fossil fuels to renewables and efficiency."⁴ Global energy investment in 2020 is projected at slightly more than \$1,500 billion. This total is \$400 billion below that of 2019, with oil and gas accounting for 60% of the decline.

Oil markets have been particularly badly hit. While a barrel of oil in the European Brent oil market cost \$56 in February 2020, the price fell to \$32 in March, and in April it collapsed to \$18. Given that the transportation sector was hit very hard by lockdowns and reduced travel, this is no surprise. Global oil supply had reached high levels before the COVID-19 crisis, and the sudden collapse in demand resulted in a glut. According to the IEA, oil demand in April 2020 was 29 million barrels per day (29%) lower than in April 2019.⁵ For the year 2020, the year-on-year decrease would be 9.3 million barrels per day (9%).

The effect of the pandemic on natural gas and coal markets was less pronounced yet substantial. Natural gas demand is forecast to decrease by 5% in 2020, after

ten years of uninterrupted, rapid growth.⁶ Because natural gas is mostly used in power generation, industry, and heating, this reduction reflects a slowdown in economic activity. In the coming years, demand for natural gas is expected to grow especially outside the member countries of the Organisation for Economic Cooperation and Development (OECD) and for use outside the power sector.

The pandemic accelerated coal's difficulties. Demand for the most polluting of the fossil fuels is anticipated to decrease by 8% in 2020.⁷ This is a much more significant decrease than for natural gas. Because power generation is the most important end use for coal, the slowdown in economic activity has been a major setback for the ailing industry. As demand for electricity dropped, coal suffered more than natural gas or renewables. While conventional economic analysis shows that low energy prices encourage consumption of fossil fuels, this temporary effect is less important than the destructive impacts of the COVID-19 pandemic on the fossil fuel industry. It is entirely possible that global oil consumption has peaked. The coal industry, which was struggling already before the pandemic, continues to lose money as cleaner fuels, notably renewables and natural gas, replace coal in the global power sector.

All these changes bode well for climate mitigation. Although the temporary energy demand reduction from the COVID-19 pandemic is not itself significant for mitigating climate change, the financial difficulties of the fossil fuel industry are significant. Even before the pandemic, fossil fuel producers faced a highly uncertain future. Oil producers worried about electric vehicles. Natural gas faced growing competition from renewable energy in the power sector. Coal could no longer compete with renewable energy and natural gas, and governments were slowly recognizing the need to impose stringent environmental regulations on coal-fired power generation. The pandemic hurt the fossil fuel industry, accelerating the global energy transition toward low-carbon alternatives.

This acceleration is essential because of the inertia in the energy system. Beginning with the invention of the steam engine, industrialized and, subsequently, emerging countries have spent centuries investing in infrastructure for fossil fuels. These investments have created a "carbon lock-in," a socio-technical system that favors the fossil fuels and leaves little room for alternatives.⁸ Power plants, transmission lines, pipelines, tankers, coal mines, and oil fields are all elements of this system. If COVID-19 can weaken the once mighty fossil fuel industry and create opportunities for alternatives, then our chances of limiting global warming are significantly improved.

At the same time, the pandemic also revealed the impossibility of halting climate change without dramatic improvements in clean technology. As noted above, the global economic turmoil brought about by COVID-19 reduced global greenhouse gas emissions by 17% in early 2020. Even though the world economy came close to collapsing, the reduction in emissions was roughly in line with what we need to achieve *annually* to limit global warming to well below 2 degrees Celsius by 2100. Simply reducing energy demand is not sufficient. Climate mitigation requires deep structural changes in the production and consumption of energy.

No one can tell with any degree of certainty whether, and how quickly, the demand for fossil fuels will rebound. If the world economy continues to struggle, the demand for fossil fuels will likely remain subdued. But even if the world economy recovers, it is possible that behavioral and organizational changes will suppress the growth in demand for fossil fuels. Oil, in particular, is facing heavy pressure. The pandemic forced organizations to allow their employees to work from home, and a major shift toward flexible working arrangements could reduce oil consumption in transportation. Similarly, lingering fears about infection might reduce air travel for both business and leisure.

On the other hand, a recovery is also possible. COVID-19 has suppressed demand for travel and many other economic commodities. If the structural changes seen in commuting, business travel, and tourism prove to be temporary, emissions could quickly rebound. One might imagine, for example, the travel industry advertising the attractiveness of long-range tourism after people spent months upon months in their homes. Similarly, widespread awareness about contagious diseases could drive people away from public transit and toward increased car ownership and use.

In the long run, a combination of renewable energy and electric vehicles could reduce emissions, regardless of how the pandemic plays out. Even if people around the world decide to purchase cars on a large scale and drive them over long distances, emissions need not increase. Electric vehicles, powered by affordable solar and wind power, would allow enhanced mobility. Because electric vehicles have batteries, they offer a natural end use for intermittent solar and wind power. Repeating this success in trucking and aviation will be more difficult.

All told, the post-pandemic era offers an enormous opportunity for rebuilding a resilient and sustainable world economy, but doing so will require decisive action. The bad news is that the outlook for such decisive action is bleak.

International Climate Policy: Will We Always Have Paris?

The primary engine and achievement of pre-pandemic climate policy was the Paris Agreement. In December 2015, the international community negotiated this flagship treaty in Paris at a United Nations summit. Unlike its predecessor, the widely criticized Kyoto Protocol of 1997, the Paris Agreement was built on countries designing and submitting their National Determined Contributions (NDCs). The Paris Agreement did not impose negotiated emission targets but instead let each country formally announce their climate action plans. These plans would then be collectively reviewed over time, with the goal of encouraging governments to ratchet up their climate action plans under peer review and public scrutiny.

Success in ratcheting up is necessary for the Paris Agreement to mitigate climate change. Today's NDCs are not ambitious enough to avoid rapid global warming. According to the Climate Action Tracker, a nonprofit that monitors the Paris pledges, the current NDCs would lead to a global warming of 2.3–3.5 degrees Celsius by 2100.⁹ This is only slightly below where current policies would lead us, with a range of 2.3–4.1 degrees Celsius. Unless governments significantly increase their ambition levels, take rapid action, and meet their targets, the international effort to halt climate disruption can be considered a failure.

The Paris Agreement was the result of decades of negotiations. The 1997 Kyoto Protocol imposed emissions reductions exclusively on industrialized countries, with the presumption that the developing world was not yet ready to act on climate change, both because of resource constraints and because of low baseline emissions. While this idea was reasonable in 1997, a decade later it seemed anachronistic, as China's stupendous economic expansion began to dominate global emissions trends.

In 2007, governments convened in Bali, Indonesia, to develop an action plan for a globally binding treaty. They then tried to negotiate it in 2009 in Copenhagen, Denmark, but the talks failed and the outcome, the Copenhagen Accord, simply listed the voluntary efforts that different countries would agree to undertake. It took the international community another six years to regroup, so that the 2015 Paris Agreement would show a new direction for global climate cooperation.

The Paris Agreement was built on the notion that national sovereignty is an inviolable foundation of international law. Earlier, global cooperation on climate change had produced underwhelming results because major emitters simply refused to commit to deep emissions reductions. The Kyoto Protocol did not impose specific requirements on any developing countries, including China and India. The

United States decided not to ratify the agreement, and Canada left in 2011. Recognizing the impossibility of a legally binding global treaty, negotiators switched gears and lowered their expectations. The goal was no longer to have countries meet top-down targets to limit global warming but to enable countries to set their own targets and increase the stringency of these targets over time.

In practice, the Paris Agreement is a fair-weather agreement. It is easy for governments to announce ambitious NDCs when they are already reducing carbon emissions and their economies are prospering. But if emissions are growing rapidly or if the economy is in recession, commitments that could be costly or difficult to meet pose a significant reputational risk for the negotiators. In 2017, only two years after the Paris negotiations, a group of scholars noted that industrialized countries, which were supposed to lead climate mitigation efforts, were not on track with their commitments.¹⁰ In the United States, President Donald J. Trump was not following the previous administration's plans to decarbonize the power sector with the Environmental Protection Agency's Clean Power Plan. In the European Union, the Emissions Trading Scheme reduced electricity usage and industrial emissions, but progress in the other 55% of European emissions has been lackluster.

President Trump's abrupt withdrawal from the Paris Agreement in June 2017 illustrates these challenges.¹¹ The 2015 Paris negotiations were significantly boosted by the November 2014 bilateral agreement on climate change cooperation between China and the United States. Combine that with a high level of enthusiasm among the EU countries and India's newfound passion for renewable energy, and the Paris talks started from a position of strength. But when Trump succeeded Barack Obama as president, the United States was out. Developing countries, for example, were furious when they realized that the \$100 billion a year that the industrialized countries had promised by 2020 to finance climate mitigation and adaptation would not be available.

The pandemic has also demonstrated that fair-weather agreements struggle when the storm comes. The immediate effect of the COVID-19 pandemic was the postponement of the 2020 United Nations Climate Change Conference to 2021. But it also reduced attention to climate change, as people, businesses, and governments focused on the more urgent problems of a global public health crisis and an economic recession. If 2019 was the year of climate change, then 2020 was the year of the pandemic, with little attention devoted to climate change. Nonetheless, because the Paris Agreement is built on the primacy of domestic climate policy, it provides a suitable framework for amplifying the impact of national and

even subnational climate initiatives. Under the Paris Agreement, major emitters can lead with domestic action and encourage others to match their ambition.

To salvage climate cooperation under the Paris Agreement, major powers must agree on a common green stimulus strategy. When the pandemic triggered a global recession, private sector investment in the energy sector decreased rapidly. Under these circumstances, public finance must play a critical role not only in economic recovery but also in moving the world toward a low-carbon economy. Moreover, historically low interest rates (negative interest rates in some cases) offer a unique opportunity for massive public investment in clean technology. If a critical mass of major emitters were to embrace a common green stimulus, other countries would have strong incentives to follow. A coordinated green stimulus backed by the world's largest economies would create new opportunities for clean technology. Governments would seek to exploit these opportunities both as a strategy for economic recovery and to bolster their reputations.

In a virtuous cycle, a massive green stimulus strategy will enable governments to extend the accidental emissions reductions caused by the pandemic recession. The COVID-19 emission reductions are not a good model for climate cooperation, but they do buy governments some time. A successful green stimulus strategy would first avoid a rapid rebound and then launch a wave of emissions reductions in key sectors, from energy to transportation. Furthermore, a successful green stimulus would also contribute to economic growth, as governments are rightly concerned about their debt burden even in a climate of generally low interest rates.

Over time, a green stimulus could trigger a complete restructuring of the world economy. We already have most of the technology required for a low-carbon economy. Renewable energy could provide most of our electricity. Energy for transportation, industry, and buildings could increasingly be produced with the help of wind and solar power. In these areas, green stimulus should focus on aggressive deployment of clean technology and building political coalitions that lobby and vote for continued investments in low-carbon industry.

In those areas where technology is not yet ready, such as steel production or aviation, green stimulus packages should promote innovation. Because energy technologies tend to crawl from the laboratory to market, generous support for innovation is essential. Major emitters could invest in everything from laboratory research to public-private partnerships and international demonstration projects.

The problem with this strategy lies in the difficulty of international cooperation. For the Paris Agreement to limit global warming to well below 2 degrees Celsius by 2100, major emitters from China and India to Russia and the United

States must devise and implement astonishingly ambitious climate policies over decades.

Discord in the Era of Climate Disruption

Cooperation on climate change has always been a near-impossible challenge. Each country's government is not only concerned about the costs of climate mitigation but also understands that other countries reap many of the gains.¹² While US emissions reductions are necessary to save Bangladesh from destructive sea-level rise, Americans will reap few direct gains from this achievement. Moreover, emissions reductions can be costly, and many of the costs will be incurred by vested interests such as fossil fuel producers and heavy industry.¹³

In recent years, the Paris Agreement's pragmatism and rapid technological progress gave new hope to climate advocates. Between 2014 and 2016, the trajectory of global emissions reached a plateau, largely thanks to China's increased investment in clean energy and the decline of coal use in the OECD countries.¹⁴ This plateau augured a bright future, as the Paris Agreement drove countries toward ever more ambitious emissions reductions in the tailwinds of a clean technology revolution.

But this hope has not yet translated into deep emissions reductions. Before COVID-19, the total effect of the NDCs fell far short of what is needed to achieve the Paris Agreement's goal. In 2017–2019, global emissions again resumed a rising trajectory. In the absence of the pandemic, emissions might have continued to increase in 2020 despite the growing competitiveness of renewables and the growing use of electric vehicles. Simply put, adding renewable electricity generation capacity and electric vehicles is not enough without substantial progress in other sectors of the global energy system.

Worse, already before the pandemic, the megatrends of international affairs pointed in a disturbing direction. Donald Trump's surprise election as president of the United States revealed an important change in politics, as people grew frustrated with the liberal, multilateral elites and voted for outsiders who challenged conventional ideas with populism. Great Britain's exit from the European Union, China's turn toward authoritarian centralization, India's Hindu nationalism, and Brazil's return to right-wing authoritarianism suggest that this change is global in nature and not limited to American politics.

This era of populist nationalism is not fertile ground for multilateral cooperation. Dealing with a "wicked" problem such as climate change is a complex social challenge that requires trust in science, effective bargaining over burden sharing,

commitment to international rules over long periods of time, and rapid adaptation to change.¹⁵ Today's populist leaders despise scientists, favor aggressive unilateralism over multilateral cooperation, break rules when it is convenient, and fail to adapt to new realities. President Trump's "America First" campaign and his failure to react to the COVID-19 pandemic in a timely manner illustrate these tendencies, and climate change is a far more complicated problem than the coronavirus pandemic.

COVID-19 made everything worse in global politics. The novel coronavirus began to spread in the Chinese city of Wuhan, and President Trump did not miss a beat in seizing the opportunity to blame the public health crisis on China. Instead of a global effort to contain the coronavirus, led by the World Health Organization, governments played the blame game and focused on protecting their own interests. This behavior contributed to a more general decrease in international cooperation, as governments increasingly distrusted each other and saw international affairs as a zero-sum game.

This deterioration of cooperation can already be seen in climate change. After COVID-19, China's role in international climate cooperation has become increasingly complicated. China's relationship with the United States has continued to deteriorate as President Trump blames China for the pandemic. At the same time, the precipitous decline in international trade has yet again led China to seek energy security in coal, the most polluting of all fossil fuels. The growth of nationalism and calls for national self-reliance have also made governments around the world worry about their dependence on China, which could reduce imports of Chinese clean technology.

The global community therefore faces a vexing dilemma. On the one hand, time is running out. The destructive effects of climate change are increasingly clear, with wildfires raging in California and rural populations in India leaving areas that are no longer suitable for agriculture. Every year that goes by without decisive action by the majority of significant emitters makes achieving any meaningful and timely emissions reductions increasingly unlikely. While there is no specific deadline for climate action, the global community cannot lose much more time, or climate change will cause massive and irreversible destruction.

On the other hand, cooperation is more challenging than at any time since the end of the Cold War. Cooperation on climate change was difficult enough in the 1990s and early 2000s; it will be much more difficult in the competitive, zero-sum world order that is currently emerging. Major emitters will be reluctant to trust each other in the spirit of reciprocity when they are competing for global influence

and trying to undercut other nations in the realms of national security and economic diplomacy.

Conclusion

International climate policy is at a crossroads. Both paths eventually lead to a low-carbon world economy, but only one of them will avoid dangerous climate disruption.

In the continued tug-of-war between markets and politics, the global energy system will eventually reduce its dependence on carbon fuels. However, the transition will be far too slow to avoid serious climate disruption. While governments scramble to respond to the COVID-19 pandemic and talk about green stimulus, their responses are too fragmented and unambitious to bend the emissions curve. Markets continue to deliver less expensive clean technology, but without government support, progress will be slow. At the time of this writing, this outcome appears likely. When major emitters finally realize that they must act, their historical emissions will have already committed us to a far less hospitable global climate. If global cooperation on climate change were to accelerate a decade after the COVID-19 pandemic, climate disruption would be all but unavoidable. Governments would have to invest in more exotic and uncertain solutions, such as geo-engineering, which aspires to offset global warming through innovative techniques like ocean fertilization or reflecting sunlight back into space, or negative emissions, which remove carbon dioxide from the atmosphere. These techniques might or might not provide some relief. Adaptation to climate change—sea walls, resilient infrastructure, drought-resistant crops, and so on—will be necessary in any case, but without an effective mitigation effort, adaptive measures will be both expensive and difficult.

But if the tug-of-war ends now, rapid progress is possible. If the COVID-19 pandemic were to bring major emitters together to rebuild a sustainable and resilient world economy, government action could significantly accelerate progress in the development and deployment of clean technology. Substantial, coordinated investments in clean technology would usher in an era of low-carbon development, with fossil fuels rapidly losing ground. Public finance would catalyze private investment. This would produce a much better global outcome, but moving in that direction is not possible without a 180-degree change in the way major emitters approach global cooperation. As long as these countries continue to be ruled by authoritarian or proto-authoritarian leaders who hold international law in contempt, this outcome is unlikely.

In the long run, the COVID-19 pandemic will affect both markets and politics. The impact on markets will be through behavioral change, such as people working from home or rejecting public transit, and favors the survival of the fittest in an economic recession. These behavioral changes could accelerate or halt progress in clean technology innovation and deployment, but they will not fundamentally break our dependence on fossil fuels. Wealthy people will continue to use large amounts of fossil fuels to support their lifestyles, and their less affluent counterparts will aspire to increase their energy consumption.

The impact on politics is more complex and more profound. Governments respond to crises, but the nature of the response is difficult to predict. It could be destructive, with governments opting for nationalism and isolation. It could be constructive, as governments recognize the impossibility of progress without a much higher level of international cooperation. The past centuries have shown that governments can and will do the right thing, but only after they have no other choice.

Of the two impacts, on markets and politics, the latter is more important. Behavioral changes will have at best marginal effects on greenhouse gas emissions. Political changes, however, could change the direction of international climate policy and give governments one last chance to avoid climate disruption, after four decades of inaction. The odds are not in civilization's favor, but failure is not yet a foregone conclusion.

NOTES

1. Corinne Le Quéré et al., "Temporary Reduction in Daily Global CO₂ Emissions during the COVID-19 Forced Confinement," *Nature Climate Change* 10 (2020): 647–53, <https://www.nature.com/articles/s41558-020-0797-x>.

2. Michaël Aklin and Johannes Urpelainen, *Renewables: The Politics of a Global Energy Transition* (Cambridge, MA: MIT Press, 2018).

3. International Energy Agency, *World Energy Investment 2020* (Paris: International Energy Agency, 2020).

4. International Energy Agency, "The Covid-19 Crisis Is Causing the Biggest Fall in Global Energy Investment in History," May 27, 2020, <https://www.iea.org/news/the-covid-19-crisis-is-causing-the-biggest-fall-in-global-energy-investment-in-history>.

5. International Energy Agency, *Oil Market Report April 2020* (Paris: International Energy Agency, 2020).

6. International Energy Agency, *World Energy Investment 2020*.

7. International Energy Agency, *World Energy Investment 2020*.

8. Gregory C. Unruh, "Understanding Carbon Lock-In," *Energy Policy* 28, no. 4 (2000): 817–30.

9. Climate Action Tracker, <https://climateactiontracker.org/> (accessed June 17, 2020).
10. David G. Victor, Keigo Akimoto, Yoichi Kaya, Mitsutsune Yamaguchi, Danny Cullenward, and Cameron Hepburn, "Prove Paris Was More Than Paper Promises," *Nature* 548, no. 7665 (2017): 25.
11. Johannes Urpelainen and Thijs Van de Graaf, "United States Non-Cooperation and the Paris Agreement," *Climate Policy* 18, no. 7 (2018): 839–51.
12. Scott Barrett, "Self-Enforcing International Environmental Agreements," *Oxford Economic Papers* 46, Supplement (October 1994): 878–94.
13. Llewelyn Hughes and Johannes Urpelainen, "Interests, Institutions, and Climate Policy: Explaining the Choice of Policy Instruments for the Energy Sector," *Environmental Science and Policy* 54 (December 2015): 52–63.
14. Thomas Spencer, Michel Colombier, Oliver Sartor, Amit Garg, Vineet Tiwari, Jesse Burton, Tara Caetano, Fergus Green, Fei Teng, and John Wiseman, "The 1.5 C Target and Coal Sector Transition: At the Limits of Societal Feasibility," *Climate Policy* 18, no. 3 (2018): 335–51.
15. Kelly Levin, Benjamin Cashore, Steven Bernstein, and Graeme Auld, "Overcoming the Tragedy of Super Wicked Problems: Constraining Our Future Selves to Ameliorate Global Climate Change," *Policy Sciences* 45, no. 2 (May 2012): 123–52.