Banning Coal – A Modest Proposal For U.S.-China Climate Change Cooperation

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The U.S. and China can and should reinvigorate global climate change action through a joint commitment to achieving carbon neutrality by 2045 or to accelerate carbon reductions before 2030 in the run up to the next major international climate summit (COP26) in November 2021. Such a joint pledge would restore the constructive competition on climate change and clean technologies that emerged for a brief period around the conclusion of the Paris Agreement. As the harms of climate change (e.g., fires, glacial melt, extreme storm events, drought, sea level rise) become more apparent, aggressive action from the world's two largest emitters is essential.

In November 2014, the U.S. and China issued a joint announcement on climate change with specific targets on greenhouse gas emissions trajectories and renewable energy.[1] A year later, Presidents Obama and Xi released a joint presidential statement that affirmed the countries' climate goals and elaborated on technical implementation measures, including efforts to reduce emissions in the power, industrial, transportation, and building sectors.[2] This coordination and collaboration helped to pave the way to successful consummation of the Paris Agreement.[3] The U.S. and China incorporated the key elements of these early pronouncements into their

[1] Specifically, the U.S. announced that it "intends to achieve an economy-wide target of reducing its emissions by 26%-28% below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%;" China, for its part, announced that it "intends to achieve the peaking of CO2 emissions around 2030 and to make best efforts to peak early and intends to increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030." Press Release, White House, Office of the Press Secretary, U.S.-China Joint Announcement on Climate Change (Nov. 12, 2014), https://obamawhitehouse.archives.gov/the-press-office/2014/11/11/us-china-joint-announcement-climate-change.

[2] Press Release, White House, Office of the Press Secretary, U.S.-China Joint Presidential Statement on Climate Change (Sept. 25, 2015), https://obamawhitehouse.archives.gov/the-press-office/2015/09/25/us-china-joint-presidential-statement-climate-change.

[3] Todd Stern, *Can the United States and China Reboot their Climate Cooperation?* BROOKINGS, Sept. 14, 2020, https://www.brookings.edu/articles/can-the-united-states-and-china-reboot-their-climate-cooperation/ (noting that the "nature of our cooperation was never easy.")

respective Paris pledges, known as Nationally Determined Contributions (NDCs).[4] Those heady days of cooperation seem a world away now, replaced by what some have called a relationship in "freefall" or the worst point in U.S.-China relations since 1972.[5]

While tensions remain high, Joe Biden's victory in the 2020 presidential election has put the renewal of U.S.-China climate change collaboration firmly on the table again. Under the Trump administration, the type of momentum-building environmental collaboration seen during the Obama administration came to a halt. The U.S. federal government under Trump was actively hostile to climate change regulation and attempted to rescind every major Obama-era climate change commitment. Trump's move to withdraw the U.S. from the Paris Agreement (since reversed) was perhaps the best known of these efforts.[6] The administration also aggressively sought to limit the latitude of states, like California, to pursue pro-environmental agendas.[7]

Although environmental collaborations among private actors and sub-national levels of government continued, the breakdown in U.S.-China relations and the lack of a clear direction on climate change from the two leading emitters had a devastating impact on global climate change action. The next stage of U.S.-China cooperation on climate change will require something

[4] The two countries' leaders issued another U.S.-China Joint Presidential Statement on Climate Change in March 2016 to announce the U.S. and China's signing of the Paris Agreement. Press Release, White House, Office of the Press Secretary, U.S.-China Joint Presidential Statement on Climate Change (Mar. 31, 2016), https://obamawhitehouse.archives.gov/the-press-office/2016/03/31/us-china-joint-presidential-statement-climate-change.

[5] Ezra Klein, *The Coronavirus Has Pushed US-China Relations to Their Worst Point Since Mao*, VOX (Mar. 31, 2020), https://www.vox.com/2020/3/31/21200192/coronavirus-china-donald-trump-the-ezra-klein-show.

[6] Under the rules of the UNFCCC, the U.S. withdrawal will not be effective until November 4, 2020 – the day after the 2020 U.S. presidential election.

[7] These include, among other things, an attempt to revoke California's "waiver" to set its own automobile emissions standards and a lawsuit challenging the legality of California's carbon trading markets linkage with the Canadian province of Quebec.

bolder and more ambitious if the world is to have any chance of meeting global climate change goals.

The next phase of global climate action is the effort to achieve carbon neutrality. According to the Intergovernmental Panel on Climate Change (IPCC), an ambitious move of this nature *within the next three decades* is necessary to limiting global warming to 1.5° C.[8] Although such a dramatic transformation may still seem difficult to imagine, carbon neutrality goals have in a very short span of time become a central part of climate change policy discussions. As of this writing, 127 countries, responsible for 63% of global emissions, have made some announcement about carbon neutrality.[9] The Biden administration has stated that its policy objective is to "put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050."[10] On September 22, 2020, President Xi Jinping announced that China would "aim to… achieve carbon neutrality before 2060."[11] As one commentator put it at the time of the announcement, "[i]f China is serious, it would be the single biggest piece of climate news in the last decade, in terms of actual impact on emissions and future warming."[12]

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[8] "In model pathways with no or limited overshoot of 1.5°C, global net anthropogenic CO2 emissions decline by about 45% from 2010 levels by 2030 (40–60% interquartile range), reaching net zero around 2050 (2045–2055 interquartile range). For limiting global warming to below 2°C CO2 emissions are projected to decline by about 25% by 2030 in most pathways (10–30% interquartile range) and reach net zero around 2070 (2065–2080 interquartile range)." INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, GLOBAL WARMING OF 1.5°C: HEADLINE STATEMENTS FROM THE SUMMARY FOR POLICYMAKERS (2019), https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Headline-statements.pdf.

[9] *Climate Action Tracker: Paris Agreement Turning Point*, NEW CLIMATE INSTITUTE & CLIMATE ANALYTICS (Dec. 2020) 5, https://climateactiontracker.org/documents/829/CAT_2020-12-01_Briefing_GlobalUpdate_Paris5Years_Dec2020.pdf

[10] *Executive Order on Tackling the Climate Crisis at Home and Abroad*, THE WHITE HOUSE (Jan. 27, 2021), https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/

[11] *Statement by H.E. Xi Jinping President of the People's Republic of China at the General Debate of the 75th Session of the United Nations General Assembly,* Min. of Foreign Affairs of the People's Republic of China (Sept. 22, 2020), https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1817098.shtml.

[12] Laura Millan Lombrana, et al., *China Beat the U.S. to a Carbon Neutrality Pledge*, Bloomberg Green (Sept. 22, 2020), https://www.bloomberg.com/news/articles/2020-09-22/china-beat-the-u-s-to-a-zero-carbon-emissions-climate-pledge.

The European Union (EU) is already moving forward on such a proposal, having set a goal of achieving carbon neutrality by 2050.[13] South Korea, the world's seventh largest emitter, has made a similar pledge.[14] South Africa, Japan, and Canada have made similar announcements.[15]

The momentum towards global carbon neutrality sets the stage for renewed U.S.-China climate partnership. An ambitious joint announcement by the world's two leading emitters (responsible for 45% of global emissions) to accelerate the move to carbon neutrality and to reduce emissions more aggressively before 2030 would send an important signal that climate change action is a critical priority. It could also help to bring into the fold the world's leading emitters that still have not committed to a carbon neutrality goal, such as India, Russia, and others.

Achieving a goal of this ambition in practice would be no easy lift. Rapid decarbonization on this scale would require overcoming domestic barriers – political, social, and technological – that have long stymied even more modest climate change action. The coronavirus-related economic downturn has created pressure to put aside environmental goals. And worsening U.S.-China relations render collaboration more difficult than at any point in recent memory.

Although achieving carbon neutrality will be difficult in either country, the task will almost certainly be more difficult in China. China is at an earlier stage of economic development with large swathes of the country at levels of per capita income and GDP well-below that in the

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[13] *A European Green Deal*, EUROPEAN COMM'N, https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en (last visited June 1, 2020).
[14] Josh Gabbatiss, *The Carbon Brief Profile: South Korea*, CARBONBRIEF (Apr. 6, 2020, 3:14 pm), https://www.carbonbrief.org/the-carbon-brief-profile-south-korea.
[15] *Climate Action Tracker*, *supra* note 9, at 5.

U.S. The carbon intensity of the economy is still relatively high due to heavy reliance on coal and continued economic dependence on heavy industry.

The Prospects for Chinese Carbon Neutrality

This paper will therefore attempt to shed some light on the likelihood of *China* achieving carbon neutrality within the next three to four decades. The more Chinese leaders see such a goal as in the country's self-interest, the more likely they are to agree to a new joint climate pledge with the U.S. and to be able to achieve these climate goals in practice. As a window into the feasibility of a Chinese carbon neutrality pledge, this paper will examine the likelihood of eliminating *coal* from China's energy mix. The argument here, in short, is that this seemingly dramatic transition is more feasible than commonly supposed.

The benefits of a rapid transition away from coal are increasing, even as the costs of doing so have dropped precipitously. Renewable energy technologies and battery storage are now available and rapidly declining in cost. The coal industry is increasingly uncompetitive and only sustainable through massive state subsidy. Economic opportunities in fledgling "green" industries dovetail with broader possibilities for burnishing global soft power and enhancing national security. Eliminating coal would not be the end of the story. Carbon neutrality would require finding alternatives to oil, natural gas, and other sources of greenhouse gases as well. Nonetheless, removing coal from the energy mix would be a transformative step for China.

This paper does not take the position that U.S. and Chinese pledges need be the same for successful collaboration. This paper selects a 2045 carbon neutrality pledge for the U.S. both for climate mitigation reasons (accelerated decarbonization improves our chances of achieving climate goals) and for political reasons (to help generate additional momentum in the wake of

China's 2060 announcement). As for China, its pledge could initially be somewhat less ambitious than a U.S. 2045 carbon neutrality pledge as a reflection of China's greater current carbon intensity, the sectoral mix of its economy, its stage of development, and so on. For example, a U.S. 2045 carbon neutrality pledge paired with the Chinese pledge to attain carbon neutrality by 2050 would be an acceptable start. Other interim targets, such as more aggressive targets for carbon mitigation by 2030 or a Chinese ban on unabated coal use by a date certain, will be necessary components of a plan to achieve the long-term carbon neutrality goal.[16]

For the U.S., the risks of pressing for such an agreement are low. If one is willing to see the benefits of engagement despite differences, then the risks are of the sort that have already long been debated. Engagement offers China the possibility of making material gains—growing its economy, expanding its influence and power. Engagement can burnish China's reputation at home and abroad. Specific to the climate context, engagement might accelerate Chinese inroads into clean technology industries. For partnership to work, China would need to see gains in each of these areas, but the key question is whether Chinese gains (economically or politically, for instance) come at relative U.S. expense. If partnership improves the chances of mitigating the climate crisis and also enhances American welfare, collaboration seems worth the effort.

Even without any formal collaboration, U.S. efforts to decarbonize will be dependent to a significant extent on what happens in China. The rapid deployment of renewable energy technologies (solar, wind) has been enabled by China's rapid expansion in these industries. If the U.S. is serious about confronting climate change on the time scale science says is necessary, it will inevitably need to engage with China and seek to benefit from the strengths that China has

[16] "Unabated coal use" refers to "the use of coal without any technologies to substantially reduce its CO2 emissions, such as carbon capture and storage." http://climateinitiativesplatform.org/index.php/Powering_Past_Coal_Alliance.

brought to bear on clean energy, electric vehicles, and other green technologies.[17] Formalizing this collaboration can help to accelerate the move toward effective climate change action.

Even with a formal Chinese carbon neutrality pledge, few would argue that the path to achieving that goal is likely to be simple or easy. The obstacles to carbon neutrality are well-known. The cost of climate change action is generally seen as high. Any meaningful effort at deep decarbonization will require China to eliminate fossil fuel use (absent the development of technologies that can capture carbon at scale). In significant part this will involve the elimination of coal, which currently accounts for 58% of China's total energy consumption (and 65% of electricity generation).[18] Oil and natural gas make up an additional 27.4% of China's energy mix.[19] This would require massive changes to China's energy, industry, transportation, and building sectors. Such changes would trigger concerns about energy security, economic slowdown, and job loss, putting at risk the growth and stability that have been the foundation for Chinese regime legitimacy in the reform period. From a political economy perspective, it does not help that entities at all levels of government and powerful incumbent coal, oil, and industrial actors (as well as the millions of people they employ) have deep vested interests in the status quo. Top-down implementation of state policy goals has always been a challenge in a fragmented bureaucratic system, particularly where, as here, there remain divisions among elite leaders as to the appropriate path forward. On top of all this, Chinese leaders still take seriously the notion of

[17] John Helveston & Jonas Nahm, *China's Key Role in Scaling Low-Carbon Energy Technologies*, SCIENCE, 794-796 (2019), https://science.sciencemag.org/content/366/6467/794.

[18] In China, as of 2018, China consumed 3,273 Mtoe of primary energy (129.8 quadrillion BTU). *BP Statistical Review – 2019: China's Energy Market in 2018*, BP (2019), https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-china-insights.pdf; *2018 Detailed Electricity Statistics*, CHINA ENERGY PORTAL (Dec. 21, 2019), https://chinaenergyportal.org/en/2018-detailed-electricity-statistics-update-of-dec-2019.

[19] As of 2018, oil and natural gas are 20% and 7.4% of China's energy mix, respectively. *BP Statistical Review – 2019: China's Energy Market in 2018*, *supra* note 15.

common but differentiated responsibilities and continue to take the position that developed countries must move first and support developing countries on climate action.

But the dynamics around climate action are changing. Climate change impacts are more apparent than ever, highlighting the growing costs of inaction. The costs of decarbonization are falling rapidly. Failure to act on climate change, moreover, presents significant opportunity costs to both countries in the risk of ceding green industries of the future to others and lost opportunities to improve each country's standing in the world. Moreover, China has shown a willingness to move forward more aggressively on environmental regulation (particularly, air pollution) and to work to manage the challenges of industrial dislocation, job loss, and economic transition—despite risk and uncertainty. And the global shift toward carbon neutrality goals has dramatically changed the political dynamics of climate change policy for the better.

The remainder of this paper will use the case of coal in China to illustrate how factors have shifted in favor of more aggressive climate action and conclude with discussion of the implications of a joint climate change pledge for the U.S.

Note that the core intuition here is that China is more likely to be able to achieve carbon neutrality than commonly supposed. This argument assumes that many observers have a baseline skepticism about China's capacity and political will to deliver on its environmental promises. Critics have often focused on the many examples of Chinese reality falling short of promises and stated intentions.[20] This paper takes the position, however, that even accepting significant imperfections in implementation, Chinese capabilities and political will have been underestimated. One might note further that this line of argument sits in some tension with the

[20] To head off any criticisms that this constitutes arguing against a strawman, it is also worth noting that other critics acknowledge that Chinese environmental pledges are not merely symbolic, but instead criticize China's efforts as overly authoritarian, causing overzealous (or misdirected) implementation, and insufficiently responsive to public will.

arguments of other papers in this series, which have argued that China is less capable of achieving its objectives (say in the security or trade realm) than many assume—due to fragmentation, insufficient commitment, or other reasons. These positions are not inconsistent, however, and more likely reflect differing baseline concerns and expectations about China in different subject areas.

Banning Coal in China

The continued use of coal is incompatible with global climate change goals. The IPCC estimates that coal in primary energy will have to decline by 97% of 2010 levels by 2050 to be consistent with 1.5°C pathways, absent viable carbon capture technologies.[21] The International Energy Agency (IEA) Beyond 2 Degrees Scenario estimates that coal-fired power generation would need to be eliminated by 2040.[22] Even the Pope has called for the replacement of coal "without delay."[23]

Any effort to eliminate global coal consumption must run through China.[24] China is the world's largest consumer of coal, using more coal than the rest of the world combined.[25] It is

[21] *China: Current Policy Projections*, CLIMATE ACTION TRACKER (Dec. 2, 2019), https://climateactiontracker.org/countries/china/current-policy-projections. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, GLOBAL WARMING OF 1.5°C, at 28 (2019), https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf.

[22] *Energy Technology Perspectives 2017*, INT'L ENERGY AGENCY (June 2017), https://www.iea.org/reports/energy-technology-perspectives-2017.

[23] Pope Francis, *Laudato Si [Encyclical Letter on Care for Our Common Home]*, para. 165 (2015), http://www.vatican.va/content/dam/francesco/pdf/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si_en.pdf.

[24] Studies of China's carbon pathways unsurprisingly track global assessments calling for the rapid reduction of coal consumption. *See, e.g.*, Gang He, et al., *SWITCH□China: A Systems Approach to Decarbonizing China's Power System*, 50 Envtl. SCI. & TECH. 5467 (2016); Kejun Jiang, et al., *2050 China Low Carbon Development Scenario Research, in* 2050 CHINA ENERGY AND CO2 EMISSIONS REPORT (2050CEACER ed., 2010); Kejun Jiang, et al., *China's Role in Attaining the Global 2°C Target*, 13 CLIMATE POLICY 55 (2013).

[25] 1907 MToe – China vs. 1805 MToe – World in 2018. *How Is China's Energy Footprint Changing?*, CHINAPOWER, https://chinapower.csis.org/energy-footprint (last visited June 1, 2020).

also the global leader in the production and import of coal.[26] The overwhelming majority of coal is used for electricity generation, industrial processes (such as steel, cement, and chemicals production), and commercial or residential use (heating, cooking).[27] For example, China is home to nearly half of global coal-fired electricity generation capacity—at more than 1,000 GW. This includes nearly 3,000 coal-fired units located in over 1,000 coal-fired power stations, which account for more than half of China's coal consumption.[28] China's installed capacity of coal-fired power far exceeds that in the next two closest nations (1,005 GW in China vs. 245 GW in the U.S. & 229 GW in India).[29] China is also the site of nearly half of global coal-fired generation capacity under construction or in development (205.9 GW).[30] The proliferation of these new coal power projects are a leading reason that skeptics see China as backtracking on its climate commitments. China also faces overcapacity in heavy industrial sectors (like steel and cement) that are major consumers of coal.[31] Chinese support – whether finance, construction, or development – for the expansion of coal-fired power plants and heavy industry abroad play a key role in sustaining coal use outside of China.

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[26] *13-12 Total Output of Industrial Products 2014, in* CHINA STATISTICAL YEARBOOK (2015); WORLD COAL ASSOCIATION, COAL FACTS 2015 (2015), https://www.worldcoal.org/file_validate.php?file=Coal%20Facts%202015.pdf; *Coal information 2019*, INT'L ENERGY AGENCY (Aug. 2019), https://www.iea.org/reports/coal-information-2019.

[27] *Coal 2019: Analysis and Forecasts to 2024*, INT'L ENERGY AGENCY (Dec. 2019), https://www.iea.org/reports/coal-2019; *Share of Coal Consumption in China in 2017, by Sector*, STATISTA (Nov. 2018), https://www.statista.com/statistics/978359/china-share-of-coal-consumption-by-sector.

[28] *Global Energy Monitor*, GLOBAL COAL PLANT TRACKER, https://globalenergymonitor.org/coal/global-coal-plant-tracker (last visited June 1, 2020); *Coal Plants by Country (MW)*, GLOBAL COAL PLANT TRACKER (Jan. 2020), https://docs.google.com/spreadsheets/d/1kXtAw6QvhE14_KRn5lnGoVPsHN3fDZHVMlvz_s_ch1w/edit#gid=191821593; *Coal Plants by Country (Stations)*, GLOBAL COAL PLANT TRACKER (Jan. 2020), https://docs.google.com/spreadsheets/d/1JKJJa-jwK6YpkEQKP2bcENHR2yoS40ur8baQnIXHtIU/edit#gid=0; *Coal Plants by Country (Units)*, GLOBAL COAL PLANT TRACKER (Jan. 2020), https://docs.google.com/spreadsheets/d/1W-gobEQugqTR_PP0iczJCrdaR-vYkJ0DzztSsCJXuKw/edit#gid=0.

[29] CHRISTINE SHEARER ET AL., BOOM AND BUST 2020: TRACKING THE GLOBAL COAL PLANT PIPELINE 13 (James Browning ed., 2020), https://endcoal.org/wp-content/uploads/2020/03/BoomAndBust_2020_English.pdf.

[30] *Id.* at 13.

[31] Bas J. van Ruijvena et al., *Long-term Model-based Projections of Energy Use and CO2 Emissions From the Global Steel and Cement Industries*, 112 RESOURCES, CONSERVATION & RECYCLING 15, 23 fig. 4 (2016).

Chinese demand for coal spiked dramatically between 2002 and 2013,[32] coinciding with the nation's economic boom in the years after World Trade Organization (WTO) entry. Coal demand has been relatively flat since 2013, due to regulatory reforms, economic slowdown, and secular trends in the economy. At the same time, Chinese coal consumption has not yet begun to decline in any appreciable way.

From a climate change perspective this is cause for great concern because China's absolute level of coal consumption is responsible for an extraordinary amount of greenhouse gas (GHG) emissions. Even though coal has been on the decline as a percentage of China's overall energy mix (falling from 72.5% in 2007 to 58% in 2019),[33] coal still accounts for 80.6% of China's overall GHG emissions.[34] Further, 97% of China's CO_2 emissions from the electricity and heat sector derive from coal.[35] The persistence of coal in China presents a serious challenge to any carbon neutrality goal.

Elimination of coal in China will require a halt to development of new coal-fired power plants, and the rapid retirement of the existing coal power fleet. It will demand alternatives to industrial use of coal that do not yet exist at commercially viable cost. It will require the replacement of coal-fired heating, cooking, and other uses through electrification or cleaner energy. Rapid decarbonization of the electricity sector is particularly important as climate change reforms in other sectors, such as transportation and buildings, rely to a significant extent on

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[32] *Coal Imports vs. Exports, China (People's Republic of China and Hong Kong China) 1990-2017*, INT'L ENERGY AGENCY, https://www.iea.org/data-and-statistics/?country=CHINAREG&fuel=Coal&indicator=Coal%20imports%20vs.%20exports (last visited June 1, 2020).
[33] *How Is China's Energy Footprint Changing?*, *supra* note 25.
[34] *CO2 Emissions by Energy Source, China (People's Republic of China and Hong Kong China) 1990-2017*, INT'L ENERGY AGENCY, https://www.iea.org/data-and-statistics?country=CHINAREG&fuel=CO2%20emissions&indicator=CO2%20emissions%20by%20energy%20source (last visited June 1, 2020).
[35] *Id.*

electrification. This puts a premium on the availability of carbon-free electricity, so that electrification does not become merely an exercise in shifting emissions to other sectors.

Beyond consumption, China's status as the world's leading *producer* of coal also matters for any effort to eliminate coal. China produces 47% of global coal supply.[36] Elimination of Chinese coal will reduce the demand for coal production with economic and social implications for communities, companies, governments, and workers.

Shifting Dynamics of Coal in China

These obstacles to a coal phaseout (and carbon neutrality) are daunting, but a number of dynamics in China suggest that the elimination of coal over the next three decades is more feasible than commonly supposed.

Aligned Chinese Policy Objectives

Chinese leaders have elevated the priority of environmental objectives in recent years, motivated by economic, environmental, and social concerns. Leaders have made economic transition a central policy objective. This includes reducing the contribution of heavy industry to GDP and increasing the contribution of services and advanced industries like clean energy and electric vehicles. The Xi-era push for "eco-civilization" has also resulted from a seemingly genuine desire to address the environmental degradation (including concern about the risks of climate change) that has grown by leaps and bounds in the reform period. Public dissatisfaction and protest have offered another incentive for action on the environment. Bureaucratic fragmentation, local protectionism, and other barriers remain a challenge to implementation, but the elevation of environmental protection as a policy priority has resulted in a cascade of policy

[36] *See* WORLD COAL ASSOCIATION, *supra* note 26 (reporting that total global coal production in 2014 was 8,022.5 Mt, of which China produced 3,747.5 Mt).

and lawmaking and expanded efforts to strengthen enforcement and compliance that appear to have borne fruit.

Existing Chinese Efforts to Regulate Coal

Among these efforts are plans, policies, and laws that seek to cap coal demand and improve the efficiency of coal production and use. Though China's regulatory regime does not yet call for the elimination of coal nationwide, coal use has been reduced dramatically in key regions around Beijing, Shanghai, and Guangzhou.

Early-stage environmental reforms, dating back to the 11th five-year plan (2006-10), focused on pollution reduction, energy efficiency, and carbon intensity reduction. China's international climate change pledges have set targets for carbon intensity (60-65% reduction by 2030 from 2005 levels), non-fossil energy (15% by 2020, 20% by 2030), and the peaking (but not the reduction) of emissions growth by 2030. The September 2020 announcement calls for China to peak CO2 emissions *before* 2030 and adds the new "aim" to achieve carbon neutrality by 2060.

Of existing measures, the most significant policies aimed specifically at curbing coal have been motivated by air pollution concerns. Nonetheless, many of the key policy measures have co-benefits for air pollution *and* climate change.[37] These measures give us some sense of the possibilities for achieving climate targets.

- The 2013 State Council Action Plan on the Prevention and Control of Air Pollution set a target to limit coal in China's primary energy mix to 65% by 2017 (met in 2015) through a combination of renewable energy, fuel switching to natural gas

[37] Other air pollution measures control conventional pollutants without limiting greenhouse gases. These include 2015 "ultra-low emission" rules meant to bring coal plant emissions down to levels typically emitted by natural gas plants.

("coal to gas"), electrification ("coal to electricity"), energy efficiency, and the reduction of "excessive production capacity" in heavy industrial sectors. The 2013 Action Plan also called for medium- and long-term targets for coal consumption and "negative coal consumption growth targets" in the three key air pollution regions (Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta). Sub-national jurisdictions each issue their own work plans and targets to meet the national goal.[38]

- The State Council's 2014 energy action plan called for a cap on annual coal consumption by 2020 at 4.2 billion tons and a reduction of coal in China's primary energy mix to less than 62% by that year.[39]
- China's December 2016 13th Five-Year Plan for Energy Development set China's first *mandatory* national coal target of 58% by 2020.[40] The 2018 State Council Three-Year Action Plan on Winning the Battle for Blue Skies set a 10% coal reduction target for the Beijing region; 5% for the Yangtze River Delta; and a negative growth target for the Shanxi, Shaanxi, Henan region.[41]
- China placed significant limits on new coal power plants in three industrial regions: Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Pearl River Delta. The

[38] *A Work Plan to Accelerate Coal Consumption Reduction and Clean Energy Development Between 2013 and 2017,* BEIJING MUNICIPAL PEOPLE'S GOVERNMENT (2013), https://web.archive.org/web/20150406093344/http://zhengwu.beijing.gov.cn/ghxx/qtgh/t1321733.htm.

[39] NATIONAL DEVELOPMENT AND REFORM COMMISSION, COAL FIRED POWER PLANT ENERGY SAVING AND EMISSION REDUCTION UPGRADE AND RENOVATION ACTION PLAN (2014□2020).

[40] Nengyuan Fazhan 'Shisanwu' Guihua (能源发展"十三五"规划) [13th Five Year Plan for the Development of Energy] (promulgated by Nat'l Energy Admin., Dec. 26, 2016, effective Dec. 26, 2016), Dec. 2016, at 15, https://www.ndrc.gov.cn/xxgk/zcfb/ghwb/201701/W020190905497899281430.pdf (China).

[41] Guowuyuan Guanyu Yinfa Daying Lantian Baoweizhan Sannian Xingdong Jihua (国务院关于印发打赢蓝天保卫战三年行动计划的通知) [Notice of the State Council on Issuing the Three-year Action Plan to Fight Air Pollution] (promulgated by St. Council, June 27, 2018, effective July 3, 2018), http://www.gov.cn/zhengce/content/2018-07/03/content_5303158.htm (China).

regions also closed existing coal-fired power plants, generally replacing them with gas plants. Beijing, for example, closed 5 coal-fired power plants between 2013 and 2016, reducing coal consumption by 9.2 million tons per annum.

- China's Ministry of Industry and Information Technology (MIIT) announced plans to reduce coal consumption by 80 million tons (by 2017) and 160 million tons (by 2020).[42]
- The National Development and Reform Commission's (NDRC) 2017 Energy Production and Consumption Revolution Strategy, 2016-2030 elaborated on means of meeting China's non-fossil energy and carbon intensity reduction goals.[43]
- China's National Energy Administration (NEA) released a 2019 Renewable Electricity Quota and Assessment Method aimed at meeting China's non-fossil primary energy goals.

These policies have helped to moderate coal growth. Coal consumption actually declined for three years running (by 2.9% in 2014, 3.7% in 2015, and 4.7% in 2016), before increasing again in subsequent years.

The high political priority placed on air pollution, the ramp up in enforcement, and the demonstrable results in air pollutant reductions provide support for the feasibility of achieving climate change objectives.[44] Decarbonization of energy, electrification of heating, cooking, and

[42] Chinese coal consumption in 2014 was 2.8 billion tons of coal equivalent.
[43] 能源生产和消费革命战略（2016—2030）（公开发布稿) [Energy Production and Consumption Revolution Strategy, 2016-2030], https://www.gov.cn/xinwen/2017-04/25/5230568/files/286514af354e41578c57ca38d5c4935b.pdf.
[44] Jiankun He, et al., *Synergizing Action on the Environment and Climate: Good Practice in China and Around the Globe*, U.N. ENV'T PROGRAMME (2019); Alex Wang, et al., *Coordinated Governance of Air & Climate Pollutants: Lessons from the California Experience* (July 2020).

other activities that have relied on coal, electrification of transportation, and expanded forest cover are all measures with air pollution and climate change co-benefits. These are all measures that are already being implemented in China. More aggressive climate change targets would require an acceleration of these methods, but China already has a substantial base of experience on which to build. As of this writing, few details for the implementation of China's 2060 carbon neutrality goal have been revealed.[45] In March 2021, China announced new climate and energy targets as part of its 14th Five-Year Plan, including an 18% carbon intensity reduction target and a 13.5% energy efficiency target.[46] Further details are expected to be released in subsequent plans in 2021 and 2022. The extent to which new policy pronouncements follow or go beyond the timeline seen on air pollution in the last decade or place more aggressive constraints on fossil fuel use will provide a signal as to either the seriousness of China's climate ambitions or the ability of climate proponents to realize a vision of deeper decarbonization in practice.

Favorable Renewable Energy Trends

China has become a global leader in the manufacture and adoption of renewable energy technologies, which would serve as among the primary alternatives to coal-fired power. Heavy Chinese investment and state support for such technologies have made Chinese companies among the world's largest and brought about a precipitous decline in the prices of wind, solar, and battery storage. Renewable energy is now or will soon be (depending on the location)

[45] On October 12, 2020, Chinese researchers working on behalf of the government released the first comprehensive academic study describing initial modeling and policy proposals for achieving the 2060 carbon neutrality goal. Jiankun He, 中国低碳发展战略与转型路径研究：项目成果介绍 [China Low Carbon Development Strategy and Pathway Transformation Research: Project Results], Institute of Climate Change and Sustainable Development at Tsinghua University (Oct. 2020).

[46] 中华人民共和国国民经济和社会发展第十四五年规划和 2035 年愿景目标刚要 [People's Republic of China National Economic and Social Development 14th Five-Year Plan and 2035 Long-Term Targets Outline], XINHUA (Mar. 13, 2021), http://www.gov.cn/xinwen/2021-03/13/content_5592681.htm; *Q&A: What Does China's 14th 'Five Year Plan' Mean for Climate Change?* CARBONBRIEF (Mar. 12, 2021), https://www.carbonbrief.org/qa-what-does-chinas-14th-five-year-plan-mean-for-climate-change.

cheaper than coal power, with the cost of wind, solar, and battery storage down by 35-85% since 2010.[47] One study estimated that, by 2021, "up to 1,200 gigawatts of existing coal-fired capacity" globally "would cost more to operate than new utility-scale solar PV would cost to install."[48] Another study argues that these declines in renewable energy costs mean that China's power sector could halve its 2015 carbon emissions at 6% lower cost than business-as-usual conditions, and renewable energy deployment could be accelerated such that 62% of China's electricity "could come from non-fossil sources by 2030 at a cost that is 11% lower" than business-as-usual approaches.[49] These trends highlight how quickly the alternatives to fossil fuels have become economically competitive.

The rapidly growing clean technology industries also create vested interests *in favor of* clean energy among government actors, investors, companies, and workers, though it remains to be seen if such interests can counterbalance powerful incumbent fossil fuel interests. Traditional fossil fuel interests themselves increasingly see green technologies and clean energy as promising centers of profit as well. In 2019, media reports noted, for example, that China Power – which is owned by the Chinese state-owned State Power Investment Corp. Ltd. – made more

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[47] Matt Gray, et al., *How to Waste Over Half a Trillion Dollars: the Economic Implications of Deflationary Renewable Energy for Coal Power Investments*, CARBON TRACKER (Mar. 2020), https://carbontracker.org/reports/how-to-waste-over-half-a-trillion-dollars; Josh Gabbatiss, *Solar Now 'Cheaper than Grid Electricity' in Every Chinese City, Study Finds*, CARBONBRIEF (Aug. 12, 2019), https://www.carbonbrief.org/solar-now-cheaper-than-grid-electricity-in-every-chinese-city-study-finds; Philip Gordon, *Renewables Will Be Cheaper than Coal by 2026 in China – Study*, Smart Energy Int'l (Jan. 15, 2020), https://www.smart-energy.com/renewable-energy/renewables-will-be-cheaper-than-coal-by-2026-in-china-study (finding that the average levelized cost of electricity (LCOE) for solar and wind power is already cheaper than gas-fired power in China and will be competitive with coal-fired power by 2026).

[48] RENEWABLE POWER GENERATION COSTS IN 2019, INT'L RENEWABLE ENERGY AGENCY (June 2020), https://www.irena.org/publications/2020/Jun/Renewable-Power-Costs-in-2019.

[49] He Gang, et al., *Rapid Cost Decrease of Renewables and Storage Accelerates the Decarbonization of China's Power Sector*, NATURE COMMUNICATIONS (2020), https://www.nature.com/articles/s41467-020-16184-x (also noting that '[t] he global weighted-average levelized cost of electricity (LCOE) of utility-scale solar PV, onshore wind, and battery storage has fallen by 77%, 35%, and 85% between 2010 and 2018, respectively"). More dramatic carbon reductions in the electricity sector are possible, but at higher cost than business-as-usual. *Id.* ("An 80% reduction in 2015 carbon emissions is technically feasible as early as 2030 but requires about a 21% higher cost than the business-as-usual approach").

profit from sale of 1.53 TWh of solar electricity than from the sale of nearly 17 times more (25.9 Twh) coal-fired power.[50]

Unprofitable Coal Plants

Even as the economics of renewable energy have improved, coal-fired power plants are in increasingly dire economic straits in China. Nearly 50% of coal-fired power plants in China operate at a loss.[51] In some provinces and regions with growing must-run renewable resources, coal plants have suffered large losses, leading the State-owned Supervision and Assets Commission to order the closure of 32.7 GW of coal power capacity in five northwest provinces with substantial renewable resources and the transfer and restructuring of the remaining coal plant assets among the generators in an attempt to improve profitability.[52] The average utilization rate of Chinese plants is less than 50%, a clear indication of overcapacity in the industry.[53] The economic case for sustaining these loss-making firms and for developing even more plants in this context is weak. When one includes the immense social costs of coal – harms to human health, local pollution harms, and climate change impacts – the argument for sustaining these underutilized, loss-making assets becomes even weaker.

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[50] Max Hall, *China Power Figures Show How Much Cheaper Solar is than Coal,* PV Magazine (Aug. 27, 2019), https://www.pv-magazine.com/2019/08/27/china-power-figures-show-how-much-cheaper-solar-is-than-coal.

[51] Mengjia Ren, et al., China Overinvested in Coal Power: Here's Why, VOX EU CEPR (Mar. 16, 2019) (citing X. Ji, China Reform Institute: Half of Thermal Power Companies Face Loss, Need to Increase Subsidies Imperatively" (original title: 中改院：火电企业亏损近半，需加紧输血造血), CHINAREFORM.ORG.CN (Sept. 4, 2018), http://www.chinareform.org.cn/Economy/industry/report/201809/t20180904_274989.htm.

[52] Muyu Xu & Dominique Patton, *Update 1-China to Slash Coal-Fired Power Capacity at Big Utilities by Merging Assets-Document*, Reuters (Dec. 2, 2019, 1:49 AM), https://www.reuters.com/article/china-coal-debt/update-1-china-to-slash-coal-fired-power-capacity-at-big-utilities-by-merging-assets-document-idUSL4N28C1Y9; *China Urges Top Utilities to Speed up Transfer of 40 Coal-Fired Power Plants - Document*, Reuters (May 26, 2020, 1:40 AM), https://www.reuters.com/article/uk-china-coal/china-urges-top-utilities-to-speed-up-transfer-of-40-coal-fired-power-plants-document-idUKKBN2320ZP.

[53] Olivia Kalb, *Coal-Fired Power to Drop Record 300 TWh in 2019, Down 3% on Year: Analysts*, S&P GLOBAL PLATTS (Nov. 25, 2019), https://www.spglobal.com/platts/en/market-insights/latest-news/coal/112519-coal-fired-power-to-drop-record-300-twh-in-2019-down-3-on-year-analysts.

Even so, concerns about "stranded assets" and the broader economic and social impacts of firm closure and the resultant decline in demand for coal will create strong opposition to coal plant closure. This opposition will come from governments at all levels that rely on coal revenue, the coal and coal-mining firms and their investors, and workers in the industry. These are the biggest barriers to a coal phase-out and the reasons that coal use persists despite increasingly unfavorable economic, health, and environmental dynamics.

It is worth elaborating on some of these key challenges and the arguments that these barriers can be overcome given political will.

Governments at all levels have invested in and profited from coal. The major coal mining firms and operators of coal-fired power plants are among the largest corporations in the world. Even smaller firms are dominant politico-economic actors in their localities with intertwined relations with local governments. More than 260 Chinese cities generate more than 40% of their GDP from coal-related economic activity.[54] Coal mining is concentrated in the northern central provinces of Inner Mongolia (20%), Shanxi (20%), and Shaanxi (10%), but almost every province (other than Hainan, Tibet, and the metropolitan areas of Shanghai and Tianjin) has some mining and coal-fired power generation.[55]

The relatively young age of Chinese power plants presents another challenge to coal phase-out. Most coal-fired power plants in China were built after 2002, with the majority built after 2005. The average age of coal plants in the U.S. and EU is greater than forty years, nearer to the typical planned retirement age for plants of this sort.[56] Chinese policymakers will also have to decide the extent to which investors should be compensated for the early retirement of

[54] BEN CALDECOTT ET AL., MANAGING THE POLITICAL ECONOMY FRICTIONS OF CLOSING COAL IN CHINA 27 (2017).
[55] *Id.* at 18.
[56] *Id.* at 13 n.12.

assets. The determination will affect the pace of asset retirement and the degree of resistance from those affected.

Recent analyses, however, suggest that a coal phase-out can be implemented in China without significant economic harm. A University of Maryland study proposes an algorithm for phasing out coal power by 2050-55 to meet a 2°C pathway with "little economic impact."[57] Other analyses suggest that "it would be technically and economically feasible for China to largely phase out its coal infrastructure by 2050."[58]

Existing policies support coal and protect it from market competition. In the power sector, policies such as guaranteed operation hours and administered wholesale electricity prices for coal power artificially prop up demand for coal.[59] Current proposed rules for China's national carbon trading market may lead to surplus allowances that subsidize the development of supercritical and ultra-supercritical plants, while providing no incentive for investment in renewable energy.[60] These are just a few examples of significant laws and policies that currently hinder a coal phase-out. While such legislation would require concerted effort to amend, reforms will become more likely if unfavorable economic trends in the coal industry continue to worsen.

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[57] Ryna Cui et al., A HIGH AMBITION COAL PHASEOUT IN CHINA: FEASIBLE STRATEGIES THROUGH A COMPREHENSIVE PLANT-BY-PLANT ASSESSMENT 33 (2020) ("China can achieve a 2°C compatible coal power phaseout by 2050-2055 with little economic impact. A more ambitious 1.5ºC phaseout by 2040-2045 is also feasible with a carefully designed retirement plan and a financial compensation mechanism… Compared to alternative policy design, the retirement roadmaps [in the report]… lower total stranded assets to about 241 billion yuan (~$34 billion) under 1.5°C and 65 billion yuan (~$9.3 billion) under well-below-2°C. However, the trade-off for the avoided stranded assets is that the coal plants will earn less profits during the operation period due to reduced utilization, by 451 billion yuan (~$64 billion) under 1.5°C and 357 billion yuan (~$51 billion) under well-below-2°C. Across provinces, stranded assets are highest in Shandong, Xinjiang, Inner Mongolia, Shanxi, and Henan").
[58] Friedrich Kahrl, et al., *Working Paper 007: Sunsetting Coal Power in China, Lawrence Berkeley National Lab*, ENERGY TECHS. AREA (Sept. 2019), https://eta.lbl.gov/publications/working-paper-007-sunsetting-coal.
[59] Max Depuy, *Guest Post: Why Would Anyone Finance Another Coal Power Plant in China?* CarbonBrief (Sept. 7, 2020), https://www.carbonbrief.org/guest-post-why-would-anyone-finance-another-coal-power-plant-in-china; see also Ren, et al., *China Overinvested*, *supra* note 51.
[60] *China's Emissions Trading Scheme*, INT'L ENERGY AGENCY (IEA), 12, 17 (2020), https://www.iea.org/reports/chinas-emissions-trading-scheme.

The potential for job loss associated with a coal phase-out presents another challenge. For workers and communities, a coal ban raises issues of "just transition" for displaced workers[61] and concern about the distributional consequences of coal bans. Chinese coal companies employed 3.21 million people in 2018.[62] And this does not account for ancillary jobs in coal-based communities and jobs related to power plants and other coal-based industries.

That said, the numbers of jobs at stake are substantially fewer than in previous economic transitions, such as China's late 1990s restructuring of its state-owned enterprise sector that involved the loss of 70 million jobs.[63] What's more, this is a transition that has already begun in earnest. Coal jobs have already declined by more than 2 million in the span of a few years due to automation, general economic weakness in the industry, and state efforts to reduce overcapacity (5.3 million jobs in 2013 vs. 3.21 million in 2018). China has already committed $15.3 billion (100 billion RMB) toward supporting workers who have lost their jobs. At the same time, renewable energy industries have created more than 4 million jobs in China.[64]

This is not to say a just jobs transition will be easy. But these developments suggest that a transition is more politically feasible than commonly assumed. The challenges discussed here only highlight the urgent need for stronger efforts to create new opportunities or a safety net for displaced workers. This is desirable as a matter of justice and distributional equity, but also as a way to reduce potential political opposition to a coal phase-out.

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[61] RICHARD BRIDLE ET AL., AT THE CROSSROADS: BALANCING THE FINANCIAL AND SOCIAL COSTS OF COAL TRANSITION IN CHINA 8 (Intl. Inst. for Sustainable Dev. eds., 2017) https://www.iisd.org/sites/default/files/publications/crossroads-balancing-financial-social-costs-coal-transition-china.pdf.

[62] Gang He et al., *Enabling a Rapid and Just Transition Away from Coal in China*, ONE EARTH 187-194 (2020), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7442150. .

[63] Shannon Tiezzi, *China's Coming Mass Layoffs: The Past as Prologue?* THE DIPLOMAT (Mar. 3, 2016), https://thediplomat.com/2016/03/chinas-coming-mass-layoffs-past-as-prologue.

[64] 2.2 million solar photovoltaic industry jobs, 670,000 solar water heating related jobs, and 510,000 wind power industry jobs in 2018. *Renewable Energy and Jobs – Annual Review 2019*, INT'L RENEWABLE ENERGY AGENCY, 25 (2019), https://www.irena.org/publications/2019/Jun/Renewable-Energy-and-Jobs-Annual-Review-2019.

Carbon Export

Another factor here that suggests a possible pathway toward the elimination of coal *within* China is the trend toward Chinese export of carbon emissions to other countries, such as via the Belt and Road Initiative.[65] Foreign jurisdictions can absorb the excess capacity of Chinese coal companies, power plant developers, and heavy industry. From a political economy perspective, such a pathway provides an outlet for corporate interests – an alternative profit center – that could mitigate domestic opposition to climate change regulation. Rather than attempt to block climate reforms at home, Chinese firms see foreign markets as an attractive alternative. To be clear, this export of emissions is highly problematic as a matter of climate change policy, as carbon leakage to other jurisdictions could eliminate gains made at home in China. Understanding this dynamic, however, helps us to see how the domestic political economy of coal is shifting, just as it highlights new frontiers in the battle to eliminate carbon emissions.

Enhanced Chinese Legitimacy

In a more abstract sense, China's environmental efforts—to the extent they are successful—reinforce a particular narrative of Chinese party-state legitimacy. Chinese leaders have emphasized the party-state's ability to deliver performance. This has meant delivery of economic growth and social stability, but over the last two decades this has broadened to mean the delivery of all the features of a good life. These aims are achieved through party leadership and top-down design, coupled with pragmatic, flexible administration and an iron fist where necessary. One need only look at China's COVID-19 response to see the dynamics of both the narrative and the system in action. Chinese leaders have relished the praise China received for being a "climate

[65] Jing Meng, et al., *The Rise of South-South Trade and its Effect on Global CO2 Emissions*, NATURE COMMUNICATIONS (2018), https://www.nature.com/articles/s41467-018-04337-y.

leader" in the wake of the Paris Agreement, and the country has been able to burnish this reputation even further in the wake of the Trump administration's retreat from climate change commitments.

A U.S.-China joint announcement would provide further incentive for China to accelerate its carbon neutrality pledge and to ensure that its climate commitments are implemented in full and on time. If the U.S. actively pursued a 2045 carbon neutrality pledge, it would put pressure on China to "stay in the game" to sustain progress toward a comparable pledge that was not seen as lethargic or back-sliding. Envisioning climate negotiations as a two-level game, we can also see a U.S.-China climate pledge aiding domestic actors in internal contestation over climate change policy. It is plausible that even the prospect of a Biden presidency has spurred China to enact a more aggressive climate change posture (e.g., the carbon neutrality goal) after several years of ambivalent action.

Climate Cooperation and U.S.-China Relations

What are the broader international relations implications of any joint pledge to pursue carbon neutrality? This paper has so far limited its scope to domestic aspects of eliminating coal in China. But any such cooperation would take place within the context of China's rise, its increasing engagement with the outside world, and an increasingly fraught U.S.-China relationship.

U.S.-China cooperation to eliminate fossil fuels plays into competition between American and Chinese orders in several ways.

China's Rise and the Prospect of U.S. Decline

Any such U.S.-China cooperation will play into ongoing debates over competing governance models. China's economic success and the decay of democratic governance in parts

of the world have reshaped the debate over governance legitimacy. Talk of the inexorable rise of democracy and the "end of history" have given way to a greater focus on bureaucratic performance and other aspects of governance.[66] Just as national responses to COVID-19 have fueled competing narratives about the relative merits (or not) of governance in China, the U.S. and other countries, debates over different governance models will inevitably arise in any U.S.-China cooperation on climate change.[67]

If China succeeds in an effort to eliminate coal, it will likely be through a top-down, campaign-style approach with significant state intervention. We have seen this in China's "war on air pollution," the campaign to retire "backward" industrial capacity, the coal-to-electric and gas heating policy, and Shanghai's implementation of its recycling program. Unsurprisingly, Chinese leaders have argued that China's approach is justified by the results and has been essential to Chinese modernization and prosperity. Critics, on the other hand, have seen the approach as "blunt regulation" reflecting state weakness and highlighted the shortcomings of China's "authoritarian environmentalism." If China's state-led approach is able to deliver an end to fossil fuels and a successful transition to a low carbon economy, it will be cited as evidence of the advantages of the Chinese model. The nation's success in manufacturing and developing renewable energy and other clean technologies has already become a part of the debate in this way.

Exactly how such an approach is seen by the global community and Chinese citizens alike will depend though on how the U.S. approaches its own efforts to tackle climate change

[66] *See, e.g.*, FRANCIS FUKUYAMA, POLITICAL ORDER AND POLITICAL DECAY (2014); Trang (Mae) Nguyen & Edmund Malesky, *Reopening Vietnam: How the Country's Improving Governance Helped It Weather the Covid-19 Pandemic*, BROOKINGS INST. (May 20, 2020), https://www.brookings.edu/blog/order-from-chaos/2020/05/20/reopening-vietnam-how-the-countrys-improving-governance-helped-it-weather-the-covid-19-pandemic/?preview_id=809736.

[67] Xi Jinping has been explicit about this in the COVID-19 context. "COVID-19 is a major test of the governance capacity of countries; it is also a test of the global governance system." Xi, *supra* note 11.

and transition away from fossil fuels. The Republican and Trump administration strategy on climate change was to deny and delay. As the effects of climate change become ever more apparent, however, the necessity of action will become unavoidable. As with the U.S. response to COVID-19, delayed action on climate change will inevitably lead to higher costs and a more painful transition than if careful advance preparation had been taken. U.S. inaction on climate change will only provide further fodder to those who see democracy as in decline.

U.S. inaction on climate change under Trump set the country back in preparing to benefit from global clean energy and technology trends that are already under way. Continued failure to act will cede the key climate-friendly industries of the future to China or other countries. Indeed, China is supporting investment in clean energy, electric vehicles, battery storage, and rare earth metals in significant part *because* these are industries that China has the opportunity to dominate—rapidly growing sectors that are not already controlled by incumbent players in other countries. Moreover, the risk of Chinese dominance of these industries does not go away just because some U.S. leaders say that climate change is a hoax perpetrated by the Chinese.

Effective U.S. action on climate change, on the other hand, will provide evidence that American governance can still deliver on major public policy objectives with global benefits. This is not to say that the U.S. needs to approach climate change in any particular way. U.S. climate politics are now as divided as ever. Green New Deal approaches call for much more significant state investment and intervention with attention to labor transitions and distributional equity. Republican supporters of climate change action, such as a coalition led by George Schultz, Hank Paulson, et al., emphasize the role of markets subject to a revenue-neutral carbon tax. U.S. Supreme Court cases on climate change and the environment reflect deep ideological

differences on the role of the state, the appropriate balance of powers among branches of government, and federal-state dynamics.

But if the U.S. is able to craft a political coalition willing to act on climate change in a manner consistent with (admittedly contested) American values, it will be a demonstration that the process of liberal democratic governance can still deliver performance on important matters of global concern. To not address climate change at all on the other hand would stand as abject governance failure.

If the U.S. competes successfully on a "moonshot" to achieve carbon neutrality by 2045, it will go some way toward restoring American prestige and it will offer the U.S. the economic boost that will inevitably come from leading the global energy transition. Enhanced legitimacy and greater economic power will in turn enable the U.S. to garner greater support from other countries around the world.

This is not to say that all policy instruments are created equal or would be equally effective in practice. Nonetheless, the success or failure of each country on a carbon neutrality goal would inevitably be read as evidence of policymaking and governance effectiveness and legitimacy.

Coordination Problems

The challenges of international cooperation on climate change have often been presented in the form of a "prisoner's dilemma" —an example of how coordination problems and incomplete information prevent a negotiated solution.[68] In this scenario, both parties would maximize utility via mutual coordination, but the risk of the other party defecting (e.g., claiming to act, but then failing to do so) renders inaction the most likely default position. Opponents of

[68] Vann Newkirk, *Using Game Theory to Break the Climate Gridlock*, ATLANTIC: REPORTER'S NOTEBOOK (Apr. 21, 2016, 12:09 PM), https://www.theatlantic.com/notes/2016/04/climate-change-game-theory-models/479340.

climate change action (e.g., Republicans) in the U.S. have commonly held up the lack of action in China as a reason the U.S. should not move. Chinese leaders, for their part, have argued that the U.S. has the duty to move first and to a larger extent given historical emissions. To do otherwise would be to impose unfair burdens on China's economic development.

The argument here is that changing dynamics have lowered the barriers to unilateral action —limiting potential costs and raising possible benefits. The cost of fossil fuel alternatives is declining. The benefits of climate action are growing as the extreme costs of more severe floods, wildfires, storms, and drought manifest. The economic opportunities in clean energy and other environmental industries, and the potential reputational gains from taking climate action, further enhance the benefits of unilateral moves on climate change.

If the U.S. doubles down on green technologies, does that accrue to China's benefit? Possibly, but mainly if one does not believe that U.S. companies can compete against Chinese companies and the Chinese model. U.S. companies should instead lead in these industries with support and long-term policy signals from U.S. regulators. This is the opportunity and the risk. But inaction is not risk-free either. Failing to act would mean succumbing to the harms of climate change without a fight, and also foregoing the possibility of economic and reputational gain from assertive climate change action. Inaction is no longer such a comfortable default position.

One might ask why collaboration is even necessary if unilateral action is becoming so attractive. For one, joint action can create even larger benefits for the U.S. and China, certainly in terms of avoided harms of climate change, but also in enlarging the markets for green technologies and in spurring other countries to act on climate change as well. In other words, collaboration can accelerate the realization of these benefits in both countries. Coordination

might also be necessary to mitigate concerns in each country about the strategic and security risks of reduced production and use of traditional fossil fuel energy resources. A fossil fuel non-proliferation agreement, for example, could help to reduce possible concerns about foregoing fossil fuel resources that could then be controlled by rival nations.[69]

Conclusion

Getting to carbon neutrality or even the less ambitious goal of eliminating coal will not be easy. The barriers to climate change action are by now well-known. Moreover, given the state of U.S.-China relations, any effort to work together on climate change will involve an uncertain balance between competition and collaboration.

That said, the dynamics in China are shifting in ways that make the elimination of coal more feasible than ever before. A U.S.-China joint commitment would accelerate fledgling decarbonization trends within China that have substantial global benefit. Such a commitment is not without risks to the U.S. Any Chinese agreement to such a commitment would be driven by Chinese interest in burnishing its reputation and seeking to gain a strong position in rapidly growing economic sectors not already controlled by incumbent players in other countries. But gains for China in this regard need not come at the expense of U.S. interests. If the U.S. competes successfully on a "moonshot" to achieve carbon neutrality by 2045, it will go some way toward restoring American prestige and it will offer the U.S. the economic boost that will inevitably come from leading the global energy transition and working to solve the climate change crisis.

[69] Scholars have proposed such an idea as a global multi-lateral treaty. But a bilateral non-proliferation treaty would better avoid the collective action problems present in current international climate change negotiations and focus on key players with the largest impact on fossil fuel use. Peter Newell & Andrew Simms, *Towards a Fossil Fuel Non-Proliferation Treaty*, Climate Policy (2020), https://www.tandfonline.com/doi/full/10.1080/14693062.2019.1636759.