A Green Economic Recovery: Global Trends and Lessons for the United States

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The economic recession caused by efforts to contain the global Covid-19 pandemic has, in the short-term, led to a drop of global greenhouse gas emissions. Yet three factors caution against optimism that the economic recession could trigger substantial shifts toward long-term decarbonization. First, emissions reductions during the current economic recession have been small and are unlikely to have a lasting impact on efforts to reduce greenhouse gas emissions. Past recessions have been followed by rapid increases in emissions that have offset much of the downturn and the 2020 recession has begun to follow a similar pattern. Second, while economic stimulus spending in the recovery offers an opportunity to invest in long-term climate policies that also create jobs and deploy capital in the economy, G20 economies have thus far spent far less on programs with environmental co-benefits than in the aftermath of the 2009 recession. Third, the Covid-19 pandemic has further strained economic and political relationships with China, a key producer of technologies urgently needed to reduce greenhouse gas emissions in the global economy. This is detrimental to short-term efforts to address the global climate crisis.

The United States is uniquely equipped to be at the global frontier of clean energy technology innovation. America's clean energy industries, however, have suffered losses as a result of trade barriers to Chinese technologies. Such trade barriers, which have not brought manufacturing back to the United States, also threaten to damage the kind of innovation in which the United States should take a leading role. The United States should use the economic recovery as an opportunity to improve domestic competitiveness, including in segments of clean energy supply chains that are currently not well supported in the U.S. economy. The creation of domestic institutions to finance clean energy manufacturing and demonstration projects, renewed investments in vocational training and technical colleges, and a stable regulatory framework to support domestic markets for clean energy technologies would improve U.S. competitiveness in clean energy sectors. Rapid acceleration of investments in research and development are required to defend America's lead in energy technology innovation.

Economic Recessions and Climate Change

The economic recession caused by efforts to contain the global COVID-19 pandemic has, at least in the short-term, led to a considerable drop of global greenhouse gas emissions. In China, greenhouse gas emissions fell by more than 25 percent in January, as satellite data show reduced activity in coal power plants, manufacturing operations, and the transportation sector. [1] By April, global greenhouse gas emissions had decreased by 17 percent year-over-year.[2] Yet not only are such short-term emissions reductions tied to unstainable economic shutdowns, past recessions have been followed by rapid increases in carbon emissions that have offset much of the reductions of the downturn. After the 2008/2009 global financial crisis, for instance, greenhouse gas emissions from fossil-fuel combustion and the global cement industry increased by nearly 6 percent to record levels in 2010. Similar rebounds in emissions occurred after the 1970s oil crises, the U.S. savings and loan crisis in the late 1980s, the collapse of the Soviet Union in the 1980s, and following the Asian Financial Crisis in the late 1990s. In each case, emissions reductions caused by the economic recession were offset by rapidly increasing emissions in the immediate aftermath, further accelerating the accumulation of greenhouse gases in the atmosphere.[3] Thus far, the 2020 recession has shown little indication of long-term structural changes in emissions patterns.

Two facts in particular are cause for concern. First, overall emissions reductions as a result of economic lockdowns have been negligible, even if substantial in the short-term. The economic lockdowns enacted during the pandemic will likely yield the largest ever annual fall in greenhouse gas emissions. In the United States, for instance, demand for jet fuel and gasoline temporarily dropped by approximately 50 percent and 30 percent, respectively.[4] Nonetheless, overall emissions for 2020 are estimated to only yield a five percent emissions reductions year-over-year. Since climate change is driven by cumulative concentrations of greenhouse gases in the atmosphere, short-term emissions reductions have little impact on long-term climate patterns unless they are followed by structural changes in the economy. A five percent reduction of global emissions in 2020 would put the world on track to reach greenhouse gas concentrations of 414.1 parts per million in the atmosphere at the end of this year, compared to projected concentrations of 414.2 parts per million in the absence of the current crisis.[5]

Second, confirming the precedents of past economic crises, emissions have quickly begun to rebound wherever economies have indeed reopened. In China, greenhouse gas emissions surpassed 2019 levels by May as restrictions on the economy were lifted.[6] In June, global emissions were a mere 5 percent below 2019 levels. The transportation sector saw the fastest rate of emissions increases between April and June, but industrial activity and growing power demand also approached pre-pandemic levels.[7] The economic recession itself has caused only short-term emissions reductions. They will likely be followed by an increase in global emissions that will offset temporary declines as the global economy recovers. The recession has not relieved pressure to urgently decarbonize the global economy if the worst consequences of climate change are to be avoided.

Global Lessons for a Green Recovery

Government stimulus spending offers an opportunity for decarbonization through long-term investments in infrastructure, transportation electrification, building efficiency, and clean energy technologies that can reduce emissions and help sustainably shift the global economy away from fossil fuels. During the 2009 recession, governments in G20 economies responded by including climate objectives in their stimulus packages. Fifteen percent of G20 stimulus spending focused on reducing emissions reductions while supporting economic recovery. In the United States, approximately 12 percent of stimulus funds pursued such objectives.[8] It is important to note that these figures only

include large stimulus packages. As a percentage of overall recovery spending in 2009, numbers are likely significantly smaller.

Ongoing research conducted at Johns Hopkins University with support from the Johns Hopkins Alliance for a Healthier World and the Initiative for Sustainable Energy Policy suggests that green recovery efforts in G20 economies fall short of those undertaken in 2009.[9] Focusing on fiscal stimulus policies since the beginning of the Covid-19 pandemic (excluding loans, loan guarantees, and monetary policy), our preliminary data suggest that seven percent of stimulus spending through August 2020 targets a green recovery. According to our analysis, approximately the same amount of global stimulus funds aim to support fossil fuel sectors, suggesting that G20 economies have not yet used the recession to shift the global economy on a more sustainable path. Research conducted by other organizations supports our preliminary findings.[10]

While our findings are preliminary, they suggest that the majority of green recovery efforts are currently taking place in Europe. The European Union has announced plans to use its stimulus efforts to pursue the dual goal of meeting stringent climate targets and increasing competitiveness in critical industries of the future. France, Germany, and the United Kingdom have also accelerated efforts to combine economic and environmental objectives in the recovery through support for renewable energy, hydrogen, and electric vehicles, among others. In Asia, South Korea has included a "Green New Deal" in its recovery plans, which has both set more ambitious targets for decarbonization and increased funding for clean energy sectors and vehicle electrification. China, meanwhile, has accelerated a long-planned "New Infrastructure Initiative," with the goal of spending USD 2.5 trillion on seven major industries, most notably 5G, electric vehicles, and ultra-high voltage transmission. To date, stimulus bills in South Korea contain 30 percent green stimulus spending, followed by China and the European Union with 18 percent. Efforts to fund a green recovery in Germany and the United Kingdom amount to 9 and 8 percent of stimulus spending, respectively. At the same time, we estimate that Russia and India are on track to spend more than 80 percent of their stimulus funds on fossil fuel sectors. China's support for activities likely to increase carbon emissions currently exceeds 40 percent of stimulus spending.

Green recovery efforts, where they exist, have fallen into three distinct categories. First, governments have used stimulus packages to accelerate investments in infrastructure, support clean energy industries, fund research and development, and set up green financing institutions. Priorities under such direct spending initiatives have varied. For instance, the European Union, Germany, France, and South Korea have announced plans to invest in research and development of hydrogen technologies. Producing hydrogen from renewable sources is part of long-term plans to reduce emissions in heavy industrial sectors. In the short-term, governments have focused on the expansion of electric vehicle charging networks, support for the establishment of a European battery industry, and upgrades to electric grids to accommodate the growing share of renewable energy. Common to such efforts has been the goal to improve national competitiveness in key clean energy industries and improve national capabilities in the development, production, and deployment of clean energy technologies.

Second, green recovery plans have funded incentives to accelerate a clean energy transition. Such incentives include subsidies for electric vehicles as well as rebates and tax credits for building retrofits and energy efficiency. Many such programs are similar to measures adopted in the United States in the American Recovery and Reinvestment Act in 2009. Germany, for instance, has raised its incentives for electric vehicle purchases to EUR 9,000 (USD 10,000), while also reforming vehicle taxes to reward energy efficient cars. In the United Kingdom, homeowners will be reimbursed two-thirds of energy efficient building retrofits and low-income households will be reimbursed fully.

Third, governments have made financial support for private sector firms conditional on emissions reductions. In return for a EUR 7 billion (USD 8.3 billion) bailout, Air France will have to reduce domestic flights by 40 percent to encourage use of France's high-speed rail system. The Dutch government has attached similar conditions—including a requirement to reduce per-passenger emissions by 30 percent—to support for KLM, the other half of the Air France-KLM group. While details about the enforcement of such conditions remain to be resolved, they suggest experimentation with new types of climate conditionalities that could more generally make state support for the private sector dependent on environmental goals.[11]

Although there is the possibility that stimulus packages to the current date have primarily focused on economic rescue during the lockdown period and will focus on a green recovery in subsequent rounds, two concerning trends are notable in our data. First, the vast majority of spending has been on climate-neutral activities unconcerned with forging structural change in national economies toward a more sustainable path. Second, many economies that have invested substantial sums in climate-related recovery packages have also compensated fossil fuel sectors, again offering little indication that the current recession is yielding a global shift toward decarbonization. Efforts to combine climate and economic objectives in the recovery fall short of the 2009 financial crisis, even though global emissions have substantially increased since then.[12]

Climate Change and China

The United States and China jointly account for 40 percent of global greenhouse gas emissions.[13] This fact alone puts these two nations at the center of any meaningful attempt to curb emissions to the levels required to prevent catastrophic climate change. Yet the U.S.-China relationship is deteriorating at an unprecedented pace. Well before the Covid-19 pandemic, voices across the political spectrum in Washington began advocating for greater economic separation from China. Although opinions differed on what exactly such measures should entail, a bipartisan consensus emerged that China was refusing to align with Western political norms and economic practices and warranted a firm U.S. response. The pandemic accelerated such tendencies, not only highlighting the vulnerability of the world's supply chains to external shocks but also strengthening calls for national self-sufficiency in China, the United States, and elsewhere.[14]

Continuing down the path toward political antagonism and economic decoupling would make it extremely difficult, if not impossible, to solve the climate crisis. U.S. collaboration with China is fundamental to any effort to avoid the worst consequences of climate change. That is because of the combination of two realities: the existing strength of China in producing the green technologies required for decarbonization, and the limited time remaining to reduce global carbon emissions. In the short-term, clean energy technologies made in China will have to be a central element of climate strategies in the United States and elsewhere.

China is a world leader in the mass production of the technologies most needed to address the climate crisis by decarbonizing the electricity and transportation sectors. These low-carbon energy technologies include wind turbines, solar panels, electric vehicles, and batteries, which are crucial for electric cars and on-grid storage. Since joining the World Trade Organization in 2001, China has massively increased its global share of solar photovoltaic production, leaping from less than 1 percent to more than 60 percent of the world's solar panels. China is now the world's largest producer of electric cars. It makes over one-third of global wind turbines, and a much larger share of components for wind turbine installations around the world. China is now home to over two-thirds of the world's production capacity for lithium ion batteries needed for electric vehicles and storage.[15]

In large part because of China's unprecedented investment in manufacturing in green technology sectors, the cost of clean energy technologies has fallen sharply. Since 2009, global prices for wind turbines and solar panels have decreased by 69 percent and 88 percent, respectively, making these technologies competitive with conventional sources of energy in many parts of the world.[16] Wind and solar become especially competitive when they are deployed in conjunction with battery storage, where China's massive investments in new manufacturing capacity have also generated rapid cost declines. The development of these capabilities in manufacturing innovation relied on two features of China's domestic economy that supported investments in both innovation and manufacturing: central government incentives for R&D and local government support for manufacturing. To date, no other economy has been willing and able to devote a similar level of resources in the expansion of manufacturing capacity and manufacturing R&D in clean energy industries.[17]

Meeting the goals of the Paris Climate Agreement will require net-zero emissions by 2050 and substantial reductions before then. In this timeframe, it is unrealistic to expect any other economy will be able to replicate, let alone surpass, China's infrastructure for the production of clean energy technologies. To avoid the worst consequences of climate change, the world needs to cut global emissions by 50 percent by 2030, a feat unimaginable without clean energy technologies that are currently produced in China.[18] For Americans who seek to take bold action to arrest global warming, the most efficient way to do so is to collaborate with Chinese researchers and firms that are successfully mass producing low carbon energy technologies, including in the transportation and power sector which make up more than 50 percent of U.S. emissions. Economic walls between the countries make further production harder and slower for each. U.S. renewable energy startups could benefit from working with Chinese partners to commercialize their technologies instead of competing with Chinese firms that have access to an institutional infrastructure highly supportive of mass production.

The world already possesses many of the technologies needed to begin making significant progress toward decarbonization. Collaboration was central to the development of contemporary renewable energy sectors, including collaboration between U.S. innovators and Chinese producers with skills in rapid scale-up and cost reduction.[19] Recent cost reductions of solar and wind power mean that such progress is becoming ever more affordable. But trade wars and widespread talk of decoupling have begun to undermine the relationships needed to quickly and efficiently bring new technologies to market and deploy them at the scale required. The U.S. solar industry, dependent on imported solar technologies, vehemently opposed trade barriers.[20] Further tariffs would raise prices for Chinese solar panels, increase installation costs, and reduce jobs among U.S. solar installers—the main source of employment in the U.S. solar sector. If pursued further, such decoupling would thwart progress on decarbonization, making it highly unlikely that global warming could be contained to acceptable levels.

A green economic recovery is an opportunity to invest in domestic clean energy industries and reduce reliance on China in the long-term. However, in the limited timeframe remaining to rapidly reduce global emissions, reducing emissions must also entail the use of clean energy technologies that are currently manufactured in China.

Opportunities for the United States

Historically, the United States has been the largest investor in clean energy research and development and continues to lead in many areas critical for fixing the climate crisis. U.S. companies are at the forefront of developing next-generation technologies that could make decarbonization cheaper and more efficient, including next-generation solar technologies, advanced battery chemistries, new building materials, smart grid technologies, and software to manage complex energy systems.[21] Overall spending on a green recovery among G20 economies currently falls short of green stimulus

spending in the 2009 recession. The lack of green recovery spending in the United States in the current economic recovery is particularly concerning. The United States risks losing its leadership position, particularly as other economies, including the European Union, have made strengths in clean energy sectors a priority. From offshore wind turbines to hydrogen and battery technologies, Europe has combined economic and climate objectives in its recovery plans. China, too, is closing the gap in research and development expenditure, including in clean energy technologies.[22] In both Europe and China, climate policy is taking on an economic imperative, as governments seek to expand market shares for domestic firms in growing markets for clean energy technologies.[23] This is true even as green recovery efforts currently fall short of what is needed to avoid catastrophic climate change.

Addressing grand challenges like climate change will require fundamental advances in technology, where the United States is uniquely equipped to be at the global frontier. In United States, this means continuing to support the core strengths of U.S. firms and universities—the invention of new technologies—through investments in basic and applied research. Particularly on climate-related technologies, the United States should rapidly accelerate its research and development investments to defend its technological lead.[24] The technologies that emerge from these efforts must eventually be scaled and deployed, and for now, working with Chinese manufacturers can accelerate this process. Instead of competing with Chinese firms that have access to an institutional infrastructure supportive of mass production, U.S. renewable energy startups might benefit from working with Chinese partners.[25]

In the long-term, the current recession offers an opportunity to improve conditions for segments of clean energy supply chains that are currently not well-supported domestically. This mean investing in domestic manufacturing capabilities as part of a national strategy for technological innovation. The creation of an infrastructure bank that could finance domestic manufacturing projects that the U.S. financial system has been unwilling to fund, renewed investments in vocational training and technical colleges, and a stable regulatory framework to support domestic markets for clean energy technologies are needed to improve national competitiveness in clean energy technology sectors. Even then, it is unlikely that entire value chains for complex energy technologies would lie entirely within national boundaries. European recovery strategies offer instructive lessons on how stimulus spending can improve national competitiveness in clean energy industries, while maintaining open trade relationships with China.

In the short-term, the United States should not lose sight of the substantial economic benefits from investments in clean energy industries, even if a share of these technologies is, for now, manufactured abroad. Investments in clean energy infrastructure, upgrades to the grid, sustainable transit solutions, renewable energy installations—including offshore wind—and energy efficient building retrofits create local jobs in construction, installation and maintenance, and related service industries, regardless of where these products are manufactured. Green recovery spending would support the creation of such jobs in the near-term and rapidly deploy capital in the economy.[26] Even aggressive investments in clean energy sectors through economic stimulus packages will need to be complemented by stable regulatory measures to create domestic markets for clean technologies and reduce greenhouse gas emissions to levels required to avoid the worst consequences of climate change.[27] Within recovery bills, attaching climate conditions to corporate bailouts is one way to shift corporate behavior without incurring additional costs, such as France and the Netherlands are currently attempting in the aviation sector. Combining financial incentives with changes in the tax code, as Germany is doing in the auto sector to accelerate the deployment of electric vehicles, is another way to combine regulatory policies with stimulus spending. Nonetheless, long-term regulatory measures will need to follow green recovery investments to reach global climate goals.

If the economic recession in the aftermath of the Covid-19 pandemic in principle offers an opportunity to shift the global economy on a more sustainable path, there is little evidence that governments are sufficiently doing so. At best, the recession has caused short-term emissions reductions and led to some investment in clean energy industries to stimulate economic recovery. But governments have also bailed out fossil fuel companies and invested in polluting technologies—including coal power—that threaten to lock in greenhouse gas emissions for generations. At worst, the pandemic has fueled a pushback against globalization that is likely to complicate efforts to decarbonize, challenging both diplomatic relations and global supply chains most needed to collectively shift away from fossil fuels.[28] The vast majority of stimulus funds are currently spent on climate-neutral activities. Spending on decarbonization is offset by compensation for fossil fuel industries. Given the limited time remaining to reduce greenhouse gas emissions and avoid the worst consequences of climate change, these patterns signal a missed opportunity to shift the global economy to a more sustainable path.

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