POLICY FORUM

CLIMATE AND ENERGY

COVID-19 recovery funds dwarf clean energy investment needs

A modest fraction of current global stimulus funds can put the world on track to achieve Paris Agreement goals

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Governments around the globe are responding to the coronavirus disease 2019 (COVID-19)–related economic crisis with unprecedented economic recovery packages (*1*), which at the time of writing surpassed USD 12 trillion. Several influential voices, including the United Nations (UN) secretary-general, heads of state, companies, investors, and central banks, have called for post–COVID-19 economic recovery efforts to be used to catalyze the necessary longer-term transformation toward a more sustainable and resilient society. Here we shine a light on the opportunity for these investments to support a green recovery by inventorying and classifying the latest information on governments' fiscal stimulus plans (*1*) and comparing the size of these measures to estimates of low-carbon energy investment needs compatible with the 2015 UN Paris Agreement. We show that low-carbon investments to put the world on an ambitious track toward net zero carbon dioxide emissions by mid-century are dwarfed by currently announced COVID-19 stimulus funds. But marked differences across countries and regions at differing stages of development emphasize the role that international support and global partnership must play to create conditions that enable a global climate-positive recovery.

Current climate commitments by countries for the next decade remain woefully inadequate to meet the climate goals spelled out in the Paris Agreement (*2*). Decisive action in the coming decade would be needed to set the emissions of the most important greenhouse gas—carbon dioxide—on a path to net zero by mid-century (*3*) while ensuring that livelihoods of billions of people in developing countries continue to improve. The record decline in global greenhouse gas emissions in the first half of 2020 due to the COVID-19–related economic disruption will almost certainly rebound when economic activity picks up again and could ultimately have a negligible impact on global warming over the longer term—unless COVID-19 recovery also induces a longer-term structural change in the economy (*4*).

STIMULUS PACKAGES TO DATE

Governments have announced a variety of policy responses aimed at alleviating the consequences of the COVID-19 crisis (*1*). We focus on economic stimulus tools deployed explicitly through countries' fiscal systems, taking stock of the packages for 149 countries [see table S1 in the supplementary materials (SM)]. As of end of August 2020, our tracking framework showed aggregate fiscal stimuli amounting to USD 12.2 trillion, 80% of which comes from countries in the Organization for Economic Cooperation and Development (see the figure and fig. S1). The U.S. stimulus is the largest single package to date, constituting a quarter of all global commitments, although the European Union (EU) as a bloc accounts for even more (combining measures by national governments and the European Commission).

Our disaggregation of the packages for this analysis follows the approach of the International Monetary Fund (IMF), whose COVID-19 Policy Tracker is the source for our stimulus data (*1*). Stimulus packages are divided into two categories: "above-the-line" measures and liquidity support. The former includes additional spending and forgone or deferred revenue, whereas the latter includes instruments such as loans, guarantees, and equity injections. About 70% of stimulus can be classified as "above-the-line" measures, with 7% targeted for the health sector and 63% for other sectors. The remaining 30% is for liquidity support.

The level of specification of countries' stimulus packages varies widely, limiting understanding of the explicit targets governments will aim to achieve with their plans. Although several governments have announced their intentions to earmark portions of their packages for a "green recovery," the exact details remain largely unclear, and most governments have not yet signaled how they intend to spend their money. This uncertainty notwithstanding, the massive influx of support will be consequential in shaping the postpandemic global economy.

We demonstrate the potential impact that current stimulus could have for a low-carbon energy system transformation. Although such a transformation requires a wide array of policy measures to come to fruition, the spending and liquidity support being put forward can be a powerful catalyst for a climate-positive recovery.

INVESTMENT CONSISTENT WITH 1.5°C

Quantitative modeling studies of pathways compatible with the Paris Agreement agree that a low-carbon transformation is predicated on decarbonizing the production and use of energy (*3*, *5*, *6*), responsible for about two-thirds of economy-wide greenhouse gas emissions. To meet the Paris goals, energy supply would need to fully decarbonize by mid-century, if not before (*3*, *5*, *6*). Aggregate stimulus estimates (*1*), green recovery scenarios (*7*), or suggestions for green recovery policy packages (*8*) have been published, among a plethora of analyses related to the pandemic. We compare the magnitude of COVID-19 recovery stimulus to the levels of energy system investment required for putting the world on a path toward achieving the goals of the Paris Agreement (*5*), based on the average estimate across six energy-economy models that were included in the recent Special Report on Global Warming of 1.5°C by the Intergovernmental Panel on Climate Change (IPCC) (*3*). Although individual model estimates can differ by up to ±50%, the conclusions deriving from our analysis are nevertheless robust. Investments here refer to capital expenses for resource extraction, their conversion, power generation, transmission, and storage, together with efficiency improvements that reduce energy use in buildings, transport, and industry (see SM for details).

The crucial insight emerging from this comparison (see the figure) is the following: Low-carbon investments over the next several years to put the world on track toward net zero carbon dioxide emissions by mid-century are dwarfed by COVID-19 stimulus. Though impressive, a closer look at the numbers points to opportunities as well as challenges.

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Average annual low-carbon energy and end-use energy efficiency investment needs under a Paris-compatible pathway have been estimated at about USD 1.4 trillion per year globally over the near term between 2020 and 2024 (*3*, *5*). This yearly estimate of low-carbon energy investments amounts to some 10% of the total pledged COVID-19 stimulus to date (see the figure and figs. S3 and S4), or about half of stimulus when investments are cumulated over the 5-year 2020–2024 period. Given that stimulus is expected to be spent over the course of a few fiscal years only and governments have traditionally played a minority role in energy investment globally, the potential for the current tranche of public funding to support a green recovery over the next years is thus enormous.

The comparison between stimulus funding and low-carbon energy investment needs becomes sharper when concentrating specifically on those investments above and beyond a non–Paris-compatible trajectory, like the one society has been on up to now. About USD 1.1 trillion per year of low-carbon energy investment has been estimated for such a non-Paris path, together with an accompanying USD 1.1 trillion in fossil fuels. These amounts would ensure sufficient infrastructure and technology deployment for global energy demand to be met, yet still tilting toward a rather weak, pre-COVID climate policy environment worldwide (*3*, *5*). The additional investment needed to shift low-carbon energy investment onto a Paris-compatible pathway thus amounts to about USD 300 billion per year globally over the coming 5 years (see the figure and figs. S5 to S7), less than 3% of total pledged stimulus to date or 12% when considered over the entire 2020–2024 period. Simply put, if even a fraction of current government stimulus would be directed in a responsible manner toward a green recovery, the marginal benefits for a low-carbon future could be considerable.

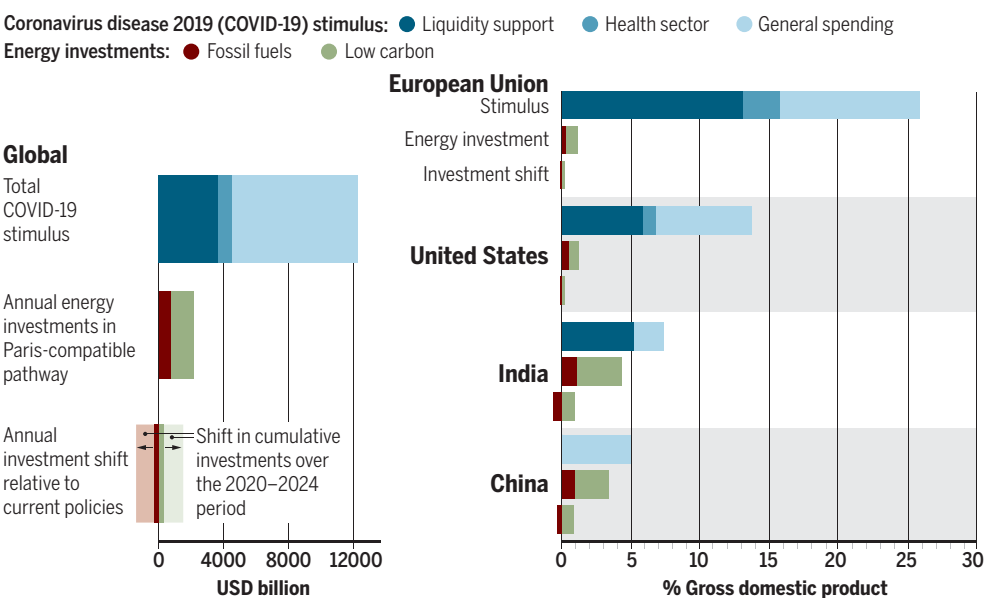
Despite the order-of-magnitude difference in these numbers, there is an important additional part to this story: Increases in low-carbon investments have to be accompanied by divestments from high-carbon fossil fuels in the range of USD 280 billion per year over the same near-term period. These divestments are distinct from the possible removal of fossil-fuel subsidies, which also range in the hundreds of billions of USD but mainly target consumption instead of production of fossil fuels (*9*). Subtracting divestments from investments indicates that the overall increase in net annual investments to achieve an ambitious low-carbon transformation in the energy sector are notably small (see fig. S3): about 20 additional billion USD per year globally. This represents a mere 0.2% of the total announced stimulus to date (compare figs. S5 and S1), or 1% over the 2020–2024 period. These numbers highlight that a climate-positive COVID-19 recovery relies as much on supporting green investments as it does on avoiding lock-in in polluting ones.

Of course, not all stimulus should be expected to go into the energy transition. Our analysis indicates that, understandably, a substantial number of shares of "above-the-line" measures are earmarked for other sectors, such as health and financial relief for individuals and households. Moreover, governments are typically responsible for only a limited share of investment in low-carbon energy across the world (*10*). What governments can do, though, is mobilize private investment by channeling stimulus into dedicated public financing mechanisms. For example, liquidity measures for development banks can help them to proactively support low-carbon investments, particularly in developing countries, and through that reduce perceived risks faced by private investors (*11*).

Today's exceptional circumstances could also give rise to low-carbon energy and efficiency investment needs or opportunities that exceed those estimated by earlier studies. For example, today's historically low interest rates support the competitiveness of green technologies. Moreover, the investment estimates relied upon here derive from welfare-optimizing scenarios using neoclassical economic theory that assess substantial, yet sustained and gradual changes in investment patterns over the long term in an otherwise stable socioeconomic context (*5*). These assumptions are in stark contrast with today's reality. Nonequilibrium economic theory might be more adequate in a crisis context and may suggest that substantially increasing green investments beyond the estimates provided here could offer further benefits for growth (*12*).

Economic stimulus and energy investments

Liquidity support includes loans, guarantees, and quasi-fiscal operations. General spending reflects measures aimed at non–health sectors of the economy and which include supporting individuals, households, and businesses, as well as forgone and deferred revenue. Energy investments are representative of average annual energy system investments over the near term (2020–2024) in a low-carbon pathway consistent with achieving the UN Paris Agreement. Annual investment shifts represent the difference in fossil fuel and low-carbon investments between current policies and a low-carbon pathway consistent with the Paris Agreement. In the absence of specific sectoral allocations, announced stimulus is classified as General spending, e.g., for China. Data and additional figures are available in the supplementary materials.



NATIONAL AND REGIONAL DIFFERENCES

Beyond the global situation, we find that when looking more regionally, total stimulus in all cases exceeds annual low-carbon energy investment needs for an ambitious Paris-compatible pathway (see figs. S8 and S9; here we look at macro regions as defined in table S2 and which are often used in energy-economy modeling). However, clear differences exist between regions and countries. The EU and United States have issued the largest stimulus packages globally, both in absolute terms and relative to

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the size of their economies. Total stimulus exceeds average annual low-carbon energy investment needs by a factor of 20 in the United States and by over 30 in the EU (see the figure and fig. S2). Even when considering the entire 2020–2024 period, total stimulus remains several times larger than low-carbon energy investment needs.

Developing economies are in a different situation. So far, the combined stimulus available to low- and lower-middle income countries amounts to only a tiny fraction (less than 4%) of total global stimulus and even including upper-middle income economies raises this share to 14% only. These numbers exclude potential international support, which to date remains negligibly small compared to the pledged domestic COVID-19 stimulus. This discrepancy will not only affect developing countries' ability to recover from the COVID-19 crisis but also the world's collective ability to achieve the Paris Agreement climate goals.

Despite recovery packages in developing countries being smaller than in developed countries [both in absolute terms and as a share of gross domestic product (GDP)], annual low-carbon energy investment needs are generally larger in these rapidly growing economies in a relative sense (see the figure and fig. S8). For example, India's total annual low-carbon energy investment needs relative to its GDP are about four times higher than those of the EU, and the country's stimulus package relative to its GDP is about a quarter the size of the EU's.

Institutionalizing international support within intergovernmental systems such as the Green Climate Fund of the United Nations Framework Convention on Climate Change or multilateral development banks could help to solidify the partnerships needed to enable a global climate-positive recovery. Furthermore, targeted financial instruments, like blended finance, have also been suggested as a means to increase low-carbon investment flows to developing countries (*11*, *13*). Blended finance uses government, multilateral, or philanthropic money to lower the risk for private investors and therewith mobilize additional private investments in developing countries. International support of only a small fraction of current COVID-19 stimulus could thus already provide a lever to catalyze a low-carbon transformation in this first half of the decade.

As developing countries are struggling with the economic fallout of the COVID-19 crisis, mobilizing additional domestic resources might seem challenging, both financially and politically. To this end, a range of measures with both near-term economic benefits and long-term climate-positive potential can prove effective (*8*).

ECONOMY-WIDE BENEFITS

In the context of a postcrisis recovery, governments will be looking for stimulus measures that can boost employment, scale rapidly, and increase societies' resilience to future shocks. Targeting a green transformation of the energy system as the proverbial engine of the economy can provide such ancillary benefits. Investment in clean energy has been identified as a driver of employment (*7, 14*); it can also spur innovation and diffusion of technologies across borders—an essential catalyst for low-carbon transformations of economies worldwide (*15*). Renewable energy investments have demonstrated a large potential for job creation and often offer a more desirable risk profile for investors (*14*). Technologies like solar photovoltaics and wind turbines are of a small, modular size that allows for a more rapid upscaling of production and much shorter project lead times.

At the same time, achieving a low-carbon transformation involves more than just investments in low-carbon energy. It requires a broad range of reinforcing policy measures, including taxation and subsidy reform, research and innovation, professional training, and education. It will also require a variety of financial instruments, from direct infrastructural investments and capital spending to liquidity support and loan guarantees for private sector investments. In the post–COVID-19 context, this means that beyond the fiscal injections that governments can supply, recovery packages should encompass incentives, policies, taxes or rebates, mandates, and other supportive regulations that facilitate the achievement of long-term climate goals.

"...a climate-positive COVID-19 recovery relies as much on supporting green investments as it does on avoiding lock-in in polluting ones."

By serving as a clear signal to investors, green recovery packages also reduce the likelihood of stranded assets. By contrast, polluting recovery packages that include unconditional oil and gas company bailouts may serve to increase the number of assets that will someday be stranded. Unless governments embed their stimulus support in a coherent long-term vision—for example, by combining support to polluting sectors with a reorientation program for their workforce—the risk for additional disruption and accompanying economic hardship in the medium term will remain high. All of these attributes make holistic green policies attractive in the context of a postcrisis recovery, and given the many ancillary society-wide benefits, governments may even choose to adopt green recovery targets beyond those presented here.

In sum, a small fraction of announced COVID-19 economic recovery packages could provide the necessary financial basis for a decided shift toward a Paris Agreement–compatible future. The dual crises of COVID-19 and climate change are global problems requiring bold government action, international cooperation, and sustainable and inclusive solutions. Though challenging politically, our findings show that these solutions are well within budget. ■

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