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How COVID-19 Disrupted the Renewable Energy Transition – and How the World Can Get Back on Track

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In December 2019, S&P Global released an optimistic rundown of 2020 energy events. They reported that lower emissions and increased sustainability would be a major theme of 2020. A few months later, many of those events were canceled and the predictions rendered irrelevant as the coronavirus pandemic upended the world.

Like many other industries, the renewable energy sector experienced slowdowns, pauses, and even complete shutdowns throughout the years that followed. These were often due to sudden unavailability of resources or personnel, a disrupted supply chain, and time, energy and money diverted elsewhere.

Yet, the sector has shown resilience. Just two years later, 2022 was called a “record year for renewable capacity.” There are even indications that the industry may benefit from the wake-up call caused by the pandemic as a focusing event.

While the pandemic is far from over — the Johns Hopkins University COVID-19 Dashboard reported more than 12.3 million cases globally in the month of October 2022 — the world is reopening.

In this article, we look closer at the pandemic’s effect on sustainable energy sources and on global endeavors to reduce climate change. We also examine ways that worldwide recovery efforts can make up for lost time during this critical moment.

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> If the international community fails to limit global warming during this century, serious climate disruption may follow. On the one hand, technological progress has contributed to decarbonization in the global power sector, and the rise of electric vehicles holds promise in transportation. . . . On the other hand, the deep undercurrents of international politics are distinctly unfavorable to effective, coordinated climate action.
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> JOHNS HOPKINS SAIS PROFESSOR JOHANNES URPELAINEN

What Happened?

The Global Supply Chain Broke Apart

In March 2020, more than 100 countries entered full or partial lockdowns. This included nations that were key links in the sustainable energy supply chain.

China, the first to lock down, produces more than 60% of the world’s solar panels, accounts for 58% of global wind turbine nacelles production capacity, and supplies roughly 75% of the world’s lithium-ion batteries, among many other components, according to a Brookings report.

Nearly 95% of the Fortune 1000 companies reported disruptions. Clean energy projects went on hold for months or even years as procurement, refining, manufacturing, assembly, shipping, and logistics were all affected by the supply chain crisis.

By 2022, projects resumed despite lingering supply chain issues: large- and small-scale solar projects were up 33% in 2022, and wind project financing was up 16% that same year, according to BloombergNEF.

However, commodities are priced higher than at the start of the pandemic. That means it will cost more to meet our climate goals. For instance, the residential solar market in the United States saw a record 4.2 GW installed in 2021, a 30% growth over 2020. Yet, that same year also saw a record price increase of 12.7%, according to the Solar Energy Industries Association.

We need new approaches to stop materials shortages, such as focusing on recycling of the rare-earth materials found in permanent magnets or finding substitutions to balance the demand for aluminum, copper, and cobalt. Innovative thinking will be critical for weathering the ongoing crisis.

Fossil Fuels Gained Traction Again

The pandemic challenged the world’s dedication to championing renewable energy sources.

At the start of the pandemic, fossil fuel consumption dropped as people stayed home.

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- **Global CO2 emissions from fossil fuels dropped 7.8% in the first quarter of 2020.**
- **Coal demand dropped by 4.4% in April 2020.**
- **Oil markets plunged, with demand dropping by 9% at the end of 2020.**

But those dips turned back into spikes: by the end of 2020, coal usage was higher than in 2019. And in 2022, oil companies like Shell and ExxonMobil reported record profits.

These trends have since shifted somewhat: the International Energy Agency's 2022 analysis found the uptick in coal was temporary, and that solar photovoltaic (PV) and wind are growing faster than any other energy source.

But we are not out of the woods yet — in his testimony before Congress on green recovery, JHU professor Jonas Nahm called out governments that still bail out fossil fuel companies and invest in polluting technologies.

"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," Professor Nahm said.

Resources Diverted To Fighting the Coronavirus — and Recovery Spending Is Still Falling Short

The pandemic demanded an incredible outlay of resources. This often necessitated a rapid shift away from priorities that, at least superficially, did not have an immediate impact on abating the pandemic's consequences.

Countries rolled out large spending bills meant to stabilize their economies; an estimated 85% of these funds went to rescue spending, which buoyed families and businesses.

However, a team of Johns Hopkins University professors analyzed that spending and found that only 6% of stimulus spending went to emission-cutting activities. They also found that 3% of that money went to activities that could actually increase global emissions.

As countries shift from emergency spending to recovery spending, they are spending less on green recovery than in past recessions. This is a missed opportunity: "Long-term investments in infrastructure, transport electrification, building efficiency and clean-energy technologies will open up new sources of economic growth," the JHU professors write. "It is not too late to change course."

The War in Ukraine Brought Further Disruption

> The crisis created by Russia's invasion of Ukraine is breaking down administrative and bureaucratic barriers and will likely accelerate change.
>
> JIM BELLINGHAM, DIRECTOR OF THE INSTITUTE FOR ASSURED AUTONOMY AT JOHNS HOPKINS UNIVERSITY

As markets began to stabilize in the wake of the pandemic, Russia invaded Ukraine in February 2022. This has caused a humanitarian crisis, a geopolitical crisis, and also an energy crisis.

Before the war, Russia was the third largest producer of fossil fuels, had the third largest reserve of coal in the world, and held the second largest reserve of natural gas. Their natural gas supply lines served as an important transitional energy source for regions with ambitious clean energy plans like the European Union. Russia as well as Ukraine supplied raw materials used in renewables such as palladium, semi-finished steel, and nickel.

The turmoil has left the EU, in addition to countries like the U.S., Japan, and India, racing to find new energy partners. It also has encouraged them to ramp up domestic production. This may ultimately accelerate the transition to sustainable energy sources. Here are some factors driving that acceleration.

- **As fossil fuel prices skyrocket, renewable options are more price competitive**

"High fossil fuel prices serve as an opportunity in the renewable energy transition; although renewable energy prices have also significantly increased, the comparative increase in fossil fuel prices renders the renewable energy sources cost competitive," said the United Nations in a report on the global impact of war in Ukraine.

- **Fossil fuels costs are volatile, pushing the market to seek stability elsewhere**

"Renewables are by far the cheapest form of power today," said Francesco La Camera, director-general of the International Renewable Energy Agency. "Renewable power frees economies from volatile fossil fuel prices and imports, curbs energy costs, and enhances market resilience — even more so if today's energy crunch continues."

- **Russia's political actions have increased the pressure to find autonomous sources**

"Fossil fuels not only worsen the climate crisis but also give many autocratic regimes leverage and power they otherwise would not have," said EU Green Deal chief Frans Timmermans during a Dean's Speakers Series event at Johns Hopkins SAIS. "Renewables give us the freedom to choose an energy source that is clean, cheap, reliable, and ours," he said.

However, in a "Hopkins at Home" talk about the future of European energy, Professor Nahm warned that countries will not become immediately self-sufficient — instead they may find themselves in new relationships that are difficult in different ways.

It is not clear yet what exact shape the new supply chains will take or where the industry will shift. What is certain is that our highly interconnected energy network will look very different in the next decade.

What's Next? Steps for Ensuring a Stronger Clean-Energy Future

The term "carbon lock-in" describes the deep roots that fossil fuels have in our systems. This integration — and inertia — makes it harder to switch to green technologies. A focusing event or a "shock" to the existing system like the coronavirus pandemic can break the lock-in and create openings for change. There are some encouraging signs that transition is underway.

- **Global clean energy spending ramped up in 2022; worldwide clean energy investment rose 8% in 2022 to reach a total of $2.4 trillion, according to the IEA, with the biggest spenders being China, the EU, and the U.S.**
- **Industrial countries have all pledged more money over the next decade to combat climate change and promote green energy. For example, the U.S.'s 2022 Inflation Reduction Act includes $369 billion in funding for climate and clean energy provisions, while the European Green Deal includes €503 billion for clean energy over the next ten years.**
- **Energy jobs have rebounded from COVID-19. In the U.S., energy jobs grew faster than the U.S. workforce overall. More than 300,000 jobs were added in 2021 for a total of 7.8 million jobs. Worldwide, sustainable energy employment increased by 700,000 for a total of 12.7 million jobs.**

These are promising steps, but much more needs to be done to improve energy efficiency in order to reach net-zero emissions by 2050 and limit global temperature rise to 2.7°F. What are some steps to ensure that we make the most of this critical time?

Policies for Greener Recovery Spending

An analysis in *Nature* by JHU professors Jonas Nahm, Scot Miller, and Johannes Urpelainen found that initial pandemic recovery spending did not cut emissions as promised. To avoid this with future funding, they detail four ways governments can promote recovery spending that enhances livelihoods and secures a cleaner energy future.

1. Include environmental conditions in all stimulus bills.
2. Focus on recovery measures that have a direct emissions impact.
3. Position their economies to be strategic in a post-carbon world.
4. Analyze recovery spending in different countries to find the best investments for both climate and economic recovery.

"We call on all governments to combine economic and climate objectives in upcoming recovery bills — even cheap measures can be effective, such as making bailouts conditional on emissions reductions," the professors write.

"As the COVID-19 pandemic is slowing, governments that turn a blind eye to risks fail to guard their citizens' lives and livelihoods," they warn.

"Cooperate or Perish"

Greenhouse gasses don't stop at borders; the consequences of climate change do not proportionally affect the biggest polluters. Climate change is a global problem that demands international cooperation.

"This is our only hope of meeting our climate goals," said the UN secretary general during the 2022 United Nations Climate Change Conference (COP-27). "Humanity has a choice: cooperate or perish." He said that the U.S. and China especially needed to find a way to show leadership through cooperation.

Professor Urpelainen agrees: "Ending the tug-of-war between politics and markets is essential for meaningful progress in the global effort to stop climate change before it is too late to avoid irreversible damage," he said. "Without a 180-degree change in the direction of international relations, today's great techno-economic opportunity will not save us from extreme climate disruption."

Nations and private firms should not attempt to "do it all" — that is, develop, commercialize, and produce new technologies, often duplicating efforts. Instead, leaders should embrace "collaborative advantage," explains Professor Nahm. This is a shared, global division of labor where countries and firms specialize in areas where they already have an advantage and then collaborate to complete the technology chain.

Professor Nahm points out that this collaboration has already played out successfully among China, Germany, and the U.S. in the wind and solar industries. However, a tax credit in the Inflation Reduction Act that ties eclectic vehicle battery funding to U.S. manufacturing is causing pushback from the EU and reveals the challenges of balancing progress and politics.

Support Innovation and Visionary Solutions

The world has made incredible strides in how we generate, distribute and use energy. The Intergovernmental Panel on Climate Change (IPCC) points to advances in solar PV, onshore and offshore wind, and batteries as key signs of progress.

In order for these advances to continue, they must be supported by a mix of direct federal funding, market-shaping policies, and private-sector research spending.

"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," Professor Nahm said in his testimony before congress on green recovery.

"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," he said.

The power of investing in innovation is clear at Johns Hopkins University: the Ralph S. O'Connor Sustainable Energy Institute (ROSEI) opened in 2021 with a $75 million, 10-year investment drawn from both institutional and private funding. Now, researchers at ROSEI are working to:

- **Extract the carbon in CO2 and convert it to solid carbon to be used in applications ranging from farming to construction.**
- **Produce flexible colloidal quantum dot-based solar cells that can be sprayed like paint directly onto batteries to form an integrated power generating storage system.**
- **Create high-performance computer simulations that can support better wind-farm planning or demonstrate the purchase and delivery of power through an inverter-dominated power grid.**

"There are so many industries that need to be redesigned so we can lessen the carbon emissions to hit those goals, so coming up with new practices that will help with that could become an exciting career," said Chao Wang, a lead at ROSEI and an associate professor in the JHU Department of Chemical and Biomolecular Engineering. "This is an opportunity to make a big impact."

With 3.5 million clean energy jobs in the US today — and 1.1 million more projected by 2030 — a policy-centered sustainable energy degree equips you to thrive in dynamic energy markets.

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Time Is Running Out — We Need Highly Capable Energy Leaders

The renewable energy sector is returning to full strength after these difficult years. However, the world is not on track to meet its climate goals.

What does this mean for someone interested in renewable energy careers? It means there are opportunities at every level and across a multitude of sectors — and the need is immediate. Now is the time to act.

Anyone who wants to shape the transition to more sustainable energy sources must be able to operate within complicated economic, political, and environmental systems. Leaders must be as comfortable working with datasets as they are working with stakeholders.

Those who can navigate these systems will be able to shape policy, advise organizations, contribute to academic research, and ultimately help the world make up for lost time.

About the MA in Sustainable Energy (online) Program at Johns Hopkins SAIS

Provided by a top global university, the Master of Arts in Sustainable Energy (online) at Johns Hopkins School of Advanced International Studies (SAIS) was created to help professionals gain the expertise needed to answer questions about how we can become more effective in our transition to sustainable energy.

Students have the opportunity to improve their base of knowledge and their critical thinking skills, helping them rise to leadership positions in their respective fields. This program equips graduates with the interdisciplinary expertise needed to lead energy transitions that are technically sound, economically viable, and socially equitable.

Developed with input from expert faculty, industry leaders and sustainable energy employers, the program and its courses are taught by highly experienced researchers and professionals. Students in the Johns Hopkins SAIS benefit not only from the expertise and industry connections of our faculty but also from our network of 230,000+ alumni.

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