COVID-19's long-term effects on climate change—for better or worse

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Washington D.C. Credit: dmbosstone

As a result of the lockdowns around the world to control COVID-19, huge decreases in transportation and industrial activity resulted in a drop in daily global carbon emissions of 17 percent in April. Nonetheless,

CO_2 levels in the atmosphere reached their highest monthly average ever recorded in May—417.1 parts per million. This is because the carbon dioxide humans have already emitted can remain in the atmosphere for a hundred years; some of it could last tens of thousands of years.

Beyond carbon emissions, however, COVID-19 is resulting in changes in individual behavior and social attitudes, and in responses by governments that will have impacts on the environment and on our ability to combat climate change. Many of these will make matters worse, while others could make them better. While it's unclear how these factors will balance out in the end, one thing is certain: more large-scale actions will be essential to avoid the worst impacts of climate change.

For worse

Delay of COP26

The Paris climate accord of 2015, adopted by every country, all of which pledged to take action to keep global average temperatures from rising less than 2° C beyond preindustrial levels, was set to reconvene in November this year at COP26. The countries were to announce plans to ratchet up climate actions, since the plans they submitted in 2015 could still allow global temperatures to rise by a potentially catastrophic 3°C. Now COP26 has been delayed a year. If the conference occurred this fall, countries would likely be more compelled to introduce economic recovery plans for COVID-19 that also further their climate change goals. The delay, however, could enable countries to enact stimulus plans that do not incorporate climate change strategies.

International negotiations delayed

A variety of international negotiations to protect the environment have

also been delayed. The World Conservation Congress to evaluate global conservation measures has been postponed to January 2021. The Convention on Biological Diversity, which would have established new global rules to protect wildlife and plants from climate change and other threats, has been postponed until next year. The 2020 U.N. Ocean Conference scheduled for June to plan for sustainable solutions to manage the oceans has been delayed but no new date has been set. And a meeting to finalize the High Seas Treaty to establish agreements for conservation and sustainable development for ocean biodiversity in international waters—a meeting that took years of negotiations to arrange— has been pushed to 2021. These delays could allow some countries to shift their priorities away from the environment.

Deforestation in the Amazon

Brazilian president Jair Bolsonaro has been calling for more commercial development in the Amazon rainforest, which absorbs two billion tons of CO_2 from the atmosphere a year.

Now as Brazil, hard hit by COVID-19, is focused on controlling the virus, illegal loggers and miners are taking advantage of the situation to cut down large swaths of the Amazon. Between January and April, 464 square miles of the rainforest were razed, 55 percent more area than was destroyed in the same period in 2019. The cleared area will be burned to make it suitable for cattle grazing, which could increase the chance of wildfires; wildfires burning out of control in 2019 destroyed an estimated 3,500 square miles of rainforest.

Weakening of climate policies

Some countries and private companies may delay or cancel investments in renewable energy or climate action policies if their finances have been impacted by the pandemic. For example, airlines, responsible for two to

three percent of global carbon emissions, have been hard hit financially by the cessation of travel. They are clamoring to defer impending carbon taxes for flights within Europe. And after years of negotiation, a global plan to reduce aviation emissions, set to go into effect in 2021, would compel airlines to improve their international flights' fuel economy by capping emissions at a 2020 baseline; any increase in future emissions would need to be offset by carbon reduction projects. But because a 2020 baseline would be relatively low, if air travel returns to its "normal" levels, they would be counted as growth and increase the burden on airlines; the United Nations' International Civil Aviation Organization is considering making 2019 the baseline.

Rollback of U.S. environmental measures

President Trump signed an executive order that enables federal agencies to waive environmental review for infrastructure projects such as highways and pipelines to speed the economic recovery. It weakens the National Environmental Policy Act (NEPA) that requires government agencies to conduct a review of potential environmental and public health impacts before a project is approved and enables local communities to weigh in. The executive order gives NEPA "flexibility" in emergency situations, and allows agencies to put aside normal environmental reviews and make alternative plans.

The EPA has announced that it will temporarily "exercise enforcement discretion" with regard to violations of environmental laws as a result of COVID-19. New guidelines enable companies to monitor themselves to determine if they are violating air and water quality regulations. In other words, entities unable to comply with regulations due to social distancing or shortage of workers will not be penalized. States and environmental groups are suing the EPA for abdicating its duty. Gina McCarthy, head of the EPA under the Obama administration, now president of the Natural Resources Defense Council, called it "an open license to

pollute."

One result of the EPA's action is that manufacturing or energy production facilities, coal mines, industrial waste landfills and others can delay reporting of their greenhouse gas emissions. This emissions data is necessary to help the EPA assess its existing greenhouse gas regulations and determine if additional ones are necessary.

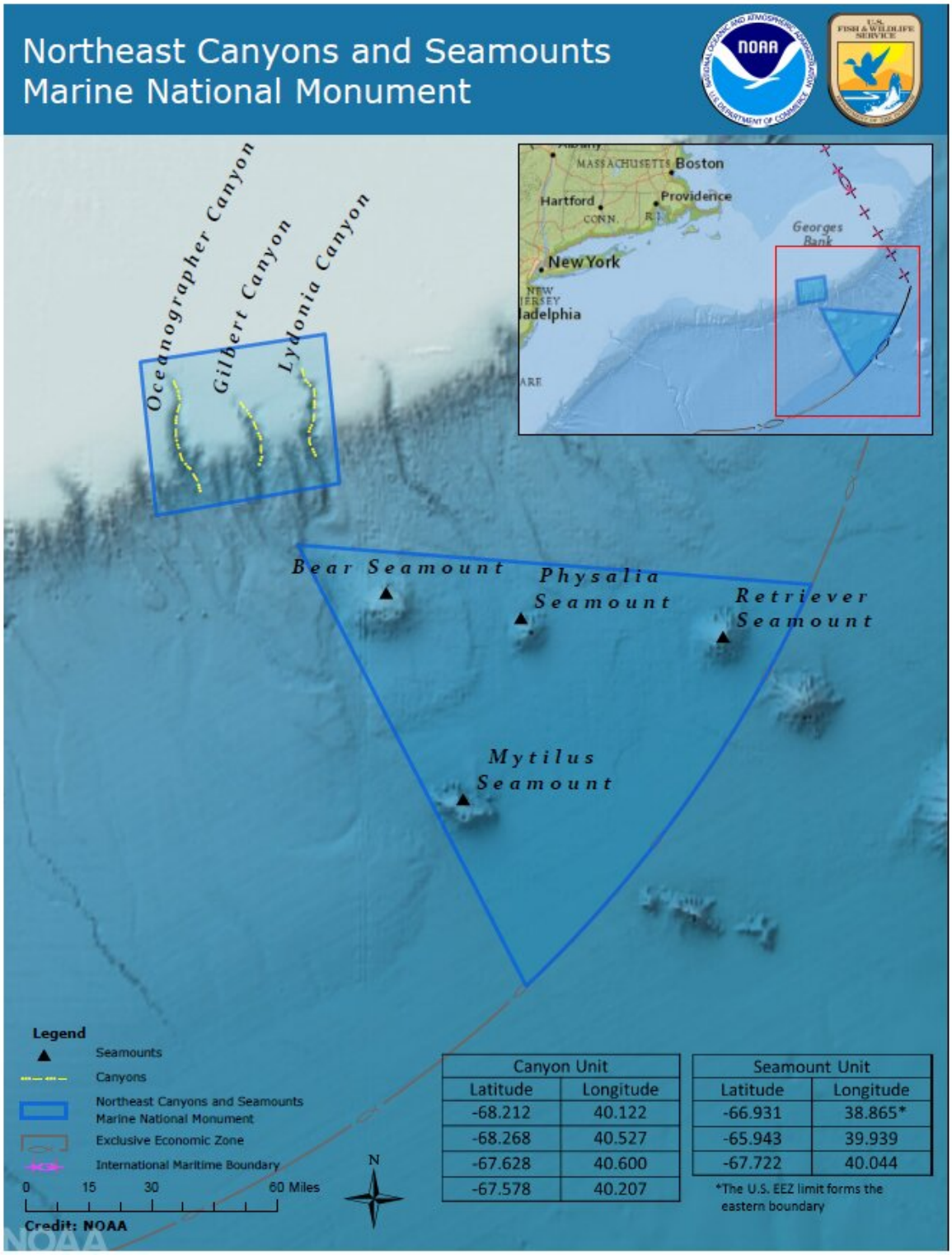
Using the pandemic as cover, President Trump is continuing his efforts to weaken environmental regulations. The EPA has proposed a new rule that would alter the cost-benefit formulas used in Clean Air Act regulations. "Co-benefits" such as improvements in public health from reducing pollution, will no longer be given as much weight in justifying regulations.

In addition, Trump signed another executive order opening up a marine conservation area off New England to commercial fishing. The Northeast Canyons and Seamounts Marine National Monument established by President Obama is a haven for endangered right whales and other vulnerable marine creatures.

The Pipeline and Hazardous Materials Safety Administration declared that it would exercise discretion in enforcing natural gas pipeline safety regulations during the pandemic. This could result in more methane (a greenhouse gas with 80 times more global warming potential than CO_2 over a 20-year span) being emitted from leaking pipelines. The EPA estimates that the natural gas pipeline system was responsible for almost 13 percent of national methane emissions in 2018.

Less money for climate resilience and renewable energy

The need for more emergency services coupled with a reduction in tax revenue has taken an economic toll on cities and states. As a result, some have had to delay and divert funding away from climate resilience projects and renewable energy. Miami, which began elevating its flood-prone roads in 2015, had only completed about 20 percent of the work when COVID-19 struck and cut tourism income. The city has lost about one quarter of its total revenue, which will make finishing the job more challenging.



Northeast Canyons and Seamounts Marine National Monument. Credit: NOAA

The Obama administration's $1 billion National Disaster Resilience Competition set aside $1 billion in funding for innovative projects that make cities and states more resilient to climate change, but the funds must be spent by fall 2022. Many projects will need an extension.

For instance, Virginia, which won $121 million to build a flood wall, raise roads and incorporate green infrastructure and pumps to curb flooding in Norfolk, has broken ground on the project, but needs more time to spend all the funds. If Congress does not extend the deadline, most of the 13 projects will not be completed.

While U.S. renewable energy generation doubled over the past 10 years, COVID-19 may undo much of this progress—600,000 jobs in renewable energy, energy efficiency, green vehicles and energy storage have been lost since March. The wind industry estimates it could lose 35,000 jobs, and the Solar Energy Industries Association predicts half its workforce will be out of work by the end of 2020. For example, sales and installations in Illinois, a once booming solar market due to its Future Energy Jobs Act enacted in 2016 to move the state to a clean energy future, have slowed due to COVID-19. Many workers have already been laid off or furloughed with more job losses expected; smaller companies may not survive.

Scientific research disrupted

Due to lockdowns and travel bans, scientists have been unable to travel to do their fieldwork, and there's a limit to how much some can accomplish with data and computers alone. Columbia University's Lamont-Doherty Earth Observatory (LDEO) closed its labs in March, affecting its researchers. Jacqueline Austermann, an LDEO earth scientist, had a National Science Foundation grant to collect coral fossil

samples in the Bahamas this spring; the samples would have helped researchers better understand historical sea levels and how climate change might affect future sea level. The project was put on hold.

Galen McKinley, a professor of Earth and Environmental Sciences at Columbia University and LDEO, studies the ocean and the carbon cycle, working mostly on the computer, running models and simulations. She depends on data collected by investigators who collect surface ocean carbon data, but many research cruises have been cancelled due to COVID-19.

McKinley explained that in some parts of the ocean, carbon uptake is only measured once every decade or so. "These sections [of ocean research] are very expensive to do. You have to have a ship out there for a couple months to accomplish it with people and equipment. If these sections get cancelled midstream, as one was in the Pacific, those data won't be taken. So we'll have a hole in our ability to observe the change in the total uptake of carbon and heat by the ocean. There will be a 10-year gap in our ability to monitor that and understand how the ocean is responding to climate change."

The cancellation of research cruises not only means a gap in the data, it also means the loss of an unprecedented opportunity. COVID-19 may result in an approximately five to eight percent reduction in average global emissions for the year, and while this is a small amount in the context of the whole system, it offers a rare opportunity to see how Earth responds to cuts on carbon emissions. "All of our observations of the Earth system have been made under a situation where atmospheric CO_2 is going up exponentially every year," said McKinley. "We don't really know what the Earth will do when we start cutting our emissions, but this is what we want and need to do under the Paris accord. That is one reason why this is a valuable opportunity to tease out any signals of what we can expect the Earth system to do in response to cutting

emissions."

McKinley and colleagues recently found that the ocean's capacity to absorb carbon dioxide from the atmosphere depends on the amount of CO_2 in the atmosphere; in other words, as CO_2 emissions decrease, the ocean's absorption of CO_2 will slow. As we cut our emissions, the ocean will eventually begin to release carbon back into the atmosphere. But we don't know whether this will happen in a few years or a few decades, and the current dip in emissions could provide some clues if researchers could go out in the field to take measurements. Understanding how the ocean circulation and carbon cycle work is key to making more accurate predictions about future conditions.

More plastic

COVID-19 has vastly increased our use of plastic: gloves and masks, plexiglass dividers in stores and offices, and disposable shopping bags.

Discarded gloves and masks are littering streets and parks, and personal protective gear is already washing up on beaches around the world. The use of plastic packaging and bags has soared because restaurants rely on take-out and delivery food. Ordering all sorts of other items online has also resulted in more packaging materials, increasing the carbon footprint of e-commerce. Some cities and states have temporarily banned reusable shopping bags, and delayed or rolled back plastic-bag bans. Most large cities are continuing with recycling, but some smaller communities such as Fayetteville, AK and Dalton, GA, have curtailed it altogether.

More cars

The CDC has recommended that people returning to work minimize contact with others, and urged companies to offer incentives to

encourage people to ride or drive alone. These guidelines are prompting more individual car use, which will cause traffic congestion and air pollution, and increase greenhouse gas emissions. Apple Maps data have detected many more requests for directions from people driving cars. The CDC advice will also increase the fear many have of taking public transportation.

According to a recent poll, about one third of Americans are considering moving out of cities to less dense areas in the wake of COVID-19. Real estate agents have reported a boom in demand from New York City residents for suburban homes in New Jersey and Connecticut. But suburban living means more driving. A 2014 report found that half the household carbon footprint of the U.S. comes from suburban living, as a result of transportation, household energy use and consumption of food and services.

For better

Green recovery in other countries

The European Commission, the executive branch of the European Union, has put forth the world's greenest stimulus plan—a 750 billion euro ($825 billion) economic recovery plan with the goal for the EU to be carbon neutral by 2050. It includes financing for renewable energy, electric vehicle charging and other emissions-friendly projects, including retrofitting old buildings and developing no-carbon fuels like hydrogen. The stimulus plan still needs to be approved by the EU's 27 member states.

"To the extent that Europe takes moves, that will make it more attractive for other countries to act," said Scott Barrett, vice dean at Columbia University's School of International and Public Affairs. "But I don't think example is enough. I think what's more powerful would be not only

their demonstration that it can be done, but a change in the economic calculus—because technology's changed, because systems are interconnected, and because when Europe did it, it actually became more economic and easier, and possibly necessary for others to do it. If they [EU] are able to lower the cost of alternative energy sources, then those actions would actually make other countries be more inclined to use those alternatives. That leverage creates a positive feedback so that when more countries do more, others want to do more."

Some countries are also using the pandemic as an opportunity to make their societies more resilient to the looming climate crisis. Germany's $145 billion stimulus plan devotes about one third of its funds to public transportation, electric vehicles and renewable energy, with no money provided for combustion engine vehicles. The government is also driving down the cost of clean energy, increasing research and development of green hydrogen, and investing in more sustainable agriculture and forest management as well as initiatives to decrease shipping and airlines emissions.

France is investing $8.8 billion to help its car industry, with the aim of becoming the main producer of electric vehicles in Europe. Its plan includes financial incentives to encourage people to exchange their old cars for lower-emissions vehicles and to buy electric cars.

South Korea has introduced a Green New Deal that would make it the first East Asian country to commit to a goal of net-zero emissions by 2050. The plan, which still needs to be signed into law, would include a carbon tax, more investment in renewable energy, training for workers displaced by the transition to clean energy, and an end to public financing of fossil fuel projects.

While the U.S.'s relief plans have so far lacked policies that help combat climate change, House Democrats have proposed a $1.5 green

infrastructure plan with much of it focused on green initiatives, resiliency, and reducing the emissions of the transportation sector. It allots $300 billion to fixing and building bridges and roads. The plan also includes funding for education, broadband, clean water and housing. The Republican-led Senate, however, is likely to oppose the plan.

A renewable energy extension

The U.S. Treasury Department has given renewable energy projects more time to take advantage of the production tax credit and the investment tax credit. Renewable energy facilities will now have five years (instead of four) to complete projects that commenced in 2016 and 2017 and still be eligible for the tax credits.

More biking and walking

To help residents trying to avoid public transportation, many cities have closed off streets for pedestrians and increased bike lanes.

Oakland, CA introduced Slow Streets, which banned cars on 74 miles of streets, encouraged slower driving, and promoted biking and walking. New York, San Francisco, Minneapolis and Seattle have followed suit. Brookline, MA, a Boston suburb, used temporary structures to widen sidewalks and increase bike lanes.

European cities have also expanded biking. Barcelona added 13 miles of city streets for biking; Berlin has 14 new miles of bike lanes and Rome is building 93 miles for biking. Paris opened almost 400 miles of bikeways as of May.

Less international travel

Transportation is responsible for 23 percent of global carbon emissions, with 11 percent of the sector's greenhouse gas emissions attributable to aviation. The enormous decrease in international air travel due to COVID-19 has reduced CO_2 and nitrogen oxide emissions as well as ozone creation and particulate matter.

As people realize they can be equally or more productive at home, remote working will likely become much more common in the future. This may mean more teleconferencing and less international business travel. International trade may also decrease as countries recognize the need to produce more goods domestically.

McKinley said that oceanography research has a particularly large carbon footprint; because collaborators are all over the world, the work entails a lot of long trips. She has been heartened by the success of COVID-19-induced virtual meetings because they actually enable more international colleagues to attend and participate.

She cited the example of a virtual meeting in May at Lamont studying the ocean carbon cycle. The working group was only 15 people, but because the meeting was virtual, they ended up with 150 people around the world listening in. Not only did the virtual meeting make for a smaller carbon footprint than an in-person meeting, "I think it really opened up the ideas to a much broader community," said McKinley. She would still want some scientific meetings be in person, however, because she feels it's important for young scientists to get to know others face-to-face. "So much of the educational experience of becoming a scientist, particularly for graduate students, is the experience of being part of a scientific community," she said.

Living more simply

Lockdowns and quarantines have compelled people to stay at home and

cook, which benefits the environment because it requires fewer resources than ordering in or eating out—processing, packaging and transporting food add to its carbon footprint. And because COVID-19 has hit people with preexisting conditions harder and meat prices rose, more people may be trying to eat less meat and instead opt for more organic, vegetarian or vegan foods. Having experienced the sight of empty shelves in grocery stores during the pandemic, they may also be inclined to waste less food. People who want to know where their food comes from may move away from processed foods, and eat more locally or grow a garden.

Living simply within our homes has encouraged many people to reexamine their pre-pandemic more materialistic and consumerist lives. Do we really need the latest fashion or the newest gadget? Consumer goods contribute to climate change throughout their life cycles: raw materials extraction, processing, logistics, retail and storage, consumer use and disposal all result in carbon emissions. Perhaps we will no longer be as susceptible to the planned obsolescence inherent in fashion and many other consumer products.

With stores, restaurants and movie theaters shuttered, people have sought relief by walking outside in parks and in nature. This experience could foster a new appreciation for nature, and more understanding about the impacts humans have on the environment. Hopefully it will translate into an impetus to protect and care for the environment.

Renewed faith in science and expertise

Our experience with COVID-19 should help people realize the importance of science and of preparing for what is to come, whether that's a pandemic or climate change, as both are phenomena that scientists have foreseen.

"Scientists have been waiting for a pandemic like this for a very long time, so for the infectious disease experts and historians who understand pathogens and interactions between humans and their environment, this is not an unusual thing," said Barrett. "I think what's been interesting has been how the public and some policy makers have been paying attention to what the infectious disease community, especially the modelers, are telling them. Also, we're now very aware of the delay between the time you act and the time you start to see results. It's pretty clear that if we had acted when we should have acted in the U.S., we would have saved a lot of people. This is a reminder that expertise matters. Nature is real. Scientists do understand how it works. We need to heed what they tell us and the warnings that they've given us."

Hope

Barrett believes that problems like COVID-19 and climate are collective problems that have to be addressed collectively. "Ultimately, we're only going to address these problems if countries work together," he said. He feels this is a real opportunity. If countries can work collaboratively to develop a vaccine and ultimately eliminate COVID-19, "I think people would say, 'Wow,' we can really do something together. Let's go back to this climate problem."

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