So I'm gonna talk about COVID-19, Science, and the way forward on climate change. And this talk will be more conceptual and not so much presenting my research. Next slide, please.

So firstly, there's really no evidence that climate change caused the COVID-19 pandemic. However we should note that climate change does cause increased spread of infectious diseases and could contribute to future pandemics. So simply put, mosquitoes, ticks, and other disease vectors do better in a warming world. Floods, which are more frequent under climate change, spread waterborne diseases, or infections, I should say. And with regard to future pandemics, climate change causes migration of both human and animal populations, and this facilitates mixing of these populations which could contribute to viruses spilling over from animals to humans. Next slide, please.

However climate change and enhanced disasters will exacerbate the COVID-19 pandemic. I think that's almost guaranteed. So we could see floods in the Midwest. We almost certainly will see wildfires in California later in the season.
Almost certainly we’ll see hurricanes in the Caribbean along the Gulf Coast or along the Eastern U.S., and those will produce climate refugees who will likely be housed in shelters. And of course, during a pandemic, we don’t want people housed in shelters, that it’s closed quarters and not a good idea.

There could be destruction of healthcare system infrastructure by hurricanes, wildfires, et cetera, and we could see more overwhelming of the healthcare systems, the various healthcare systems with both disaster-related patients, in addition to COVID-19 patients.

Another example of how climate change and COVID-19 pandemic could interact is the Locust plague, which you’ve probably heard about, that’s going on in East Africa. It’s been happening for the last several months. It’s thought that very heavy rains in East Africa precipitated this locust plague, probably related to climate change. The Locust plague has been causing agricultural failures, leading to food insecurity, leading to malnourished people who have weakened immune systems who will be more susceptible to the virus.

Next slide, please.

So there are many parallels...
between the pandemic and climate change. So let me state some of those.

So first, of course, there have been long-standing warnings by scientists that have not been heeded about the risk of pandemics and about climate change. And since they’ve not been heeded, prevention and preparedness efforts have been woefully inadequate.

Secondly, for both the pandemic and climate change, they’re both disasters for public health and for the economy, and we’ll get back to the economy. Both prey on the most vulnerable, including the elderly, poor and people of color. For both, an effective response requires early action, federal government leadership, international cooperation, and unprecedented societal mobilization. So for climate change, these four responses have been extremely poor. I’d say actually somewhat better for the pandemic. We could have a discussion about that, but also a lot of failings for the pandemic as well. Next slide, please.

So both crises are urgent, but on different timescales. For the pandemic, it will probably play out over a period
months to several years. We could say it’s the worst acute public health crisis in a century. I would argue that it’s probably not the worst, at least not yet, not the worst public health crisis in a century. We have to compare it with the tobacco epidemic, obesity, HIV. So it remains to be seen where this pandemic will be situated overall, but certainly as an acute public health crisis, it’s the worst. With regard to climate change, the timescale is decades to centuries, and it’s possibly the worst public health crisis in human history, depending on what we do over the next decade or two. So both crises can be solved by science. For the pandemic, we’ve been talking a lot, of course, about physical distancing, testing, contact tracing, quarantining, PPE, ventilators, the need to develop through scientific research antiviral medications, as well as a vaccine. So I think it’s pretty clear how science needs to be used to solve the pandemic. With regard to climate change, scientists have shown that it’s real, it’s caused by humans, it’s harming public health,
and that the longer we delay, the worse it will get.

And through science, we actually know what the solution is,

which essentially is to convert from a fossil-fuel-based economy to a renewable-energy-based economy.

That’s a tall order, but as we’ll talk about, it’s doable.

Next slide, please.

So, the world economy has taken a big hit, as you all know.

It’s gonna need to be rebuilt and I would suggest that there are two paths for rebuilding the world economy.

There’s the path backwards,

in which we would double down on our fossil fuel economy,

or the path forward,

in which we would seize this unprecedented opportunity to build a renewable energy economy.

Next slide.

So first, the path backwards.

This path would pit the environment against the economy.

It’s a tried-and-true tactic that’s been used and we continue to rollback environmental regulations and suspend enforcement.

There will be stimulus infrastructure and/or infrastructure packages,

no matter what the path,

that we’d have a package that first has no environmental requirements for bailed-out industries,
like airlines, cruise ships and industrial agriculture, and that, second, resuscitates and entrenches the fossil fuel industry, which as you know, is currently kind of on its heels, and the path backwards will attempt to do that for decades to come. Next slide, please.

So then there’s the path forward. So first, I would say, and this isn’t the main part of the path forward, but I think it’s important to note, we would retain what we’ve learned during the pandemic. So that would include reducing business travel by relying more heavily on video conferencing. We’ve all or a lot of us have really taken up video conferencing in a big way and we know how to do it and it’s actually quite useful. And of course, if we reduce business travel, that reduces greenhouse gas emissions. We could see an increase in remote working, which many of us have been doing and we’ve got a taste for that. It’s not that hard to do, and that would also decrease greenhouse gas emissions. We could produce more of our own goods, such as drugs, medical equipment, and personal protective equipment in order to reduce vulnerability to globalized supply networks.
So that would reduce shipping and also greenhouse gas emissions and we can convert healthcare systems from single-use to reusable PPE. Single-use is tremendously wasteful and has a larger greenhouse gas footprint than doing reusable.

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The main element of the path forward is to heavily invest in renewable energy. The foundation of a transition to a renewable energy economy is to generate electricity with renewable energy. Once that’s done, we can electrify transportation, heating of buildings, and industry. All of that’s gonna require a huge amount of electricity. It’s important to develop energy efficiency and conservation, which could include dense well-designed livable cities that are a lot more energy efficient, developing mass transportation, which is also much more energy efficient than single-occupied automobiles, and high-speed inter-city trains to replace regional air travel. Parenthetically air travel is one of the complicated issues with regard to accomplishing zero greenhouse gas emissions
because we don’t know yet how we’re gonna fly airplanes without burning fossil fuels.

Then the final element that I’ll mention is carbon dioxide capture and storage. Unfortunately the world has dithered so long with regard to reducing greenhouse gas emissions that in addition to reducing emissions, we’re gonna have to also capture and store CO2. Now that could be done through natural mechanisms by reforestation, and also agricultural soil management, which, unfortunately, that might not be enough. And so people are trying to develop technologies to remove CO2 from the atmosphere, and then store it underground. Those technologies are not there yet, but we could invest in research on those technologies.

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Then the final part of the path forward that I see is to invest in science education and literacy. So the COVID-19 experience I think shows that people respond to clear science-based messages from trusted sources. So it hasn’t been perfect, obviously, and we haven’t seen those science-based messages from some of our leadership, but we have seen it from other leadership, a lot of the governors,
from medical leadership, such as Doctor Fauci and others,
and it’s actually been to me quite remarkable
how much adherence there has been
to the physical distancing.
Now we might see some degradation and change in that.
There’s gonna be political demagoguery
and there’s a lot of misinformation on the internet,
which we could point to a positive experience
with regards to science communication for COVID-19.
So we need to do the same thing with climate change
and we need to educate the general public, policy makers,
but I think it’s an important slide.
I’ll walk you through it.
So I’ll walk you through it.
This is looking at generation of electricity
by different types of renewable energy
and it’s comparing the cost in dollars per kilowatt hour
on the y-axis
between 2010 and 2018.
It’s important to note the kind of light tan coloring,
and that’s the fossil fuel cost range.
Now, just to go through this quickly, then, you could see that for bioenergy, geothermal, and hydro, that those are all at the lower end of the fossil fuel cost range. Then very notably for solar voltaics, between 2010 and 2018, we saw a dramatic drop in costs. We're now, in 2018, the cost is in the low range of the fossil fuel cost range. Concentrated solar power, which is another type of solar power, there's been a very dramatic drop as well, although it's actually still a bit above the fossil fuel cost range. And then for offshore wind, has gone down to the mid range for fossil fuels and onshore wind is at the lower end now in terms of the range of fossil fuels. So the point I'd like to make here is that fossil fuel advocates say renewable energy would be nice, but it’s really not feasible, it’s not cost effective, but the fact is that that’s not true, that we've reached a point technologically that it is feasible to make this transition from fossil fuels to renewable energy. There are still a few technological improvements that need to be made,
such as battery storage of energy, but it’s really there. It just requires political will and the necessary investments. Final slide, please.

So I’d like to end with this quote that, “optimism is a moral imperative,” and that’s because pessimism is a self-fulfilling prophecy. So I think we have a long road ahead with regard to climate change, but it’s important to have optimism to motivate and sustain our work. So, thank you.