*The Fight to Take Back*

*Our Planet*

# THE NEW CLIMATE WAR

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CHAPTER 5

# Put a Price on It. *Or Not.*

The stock market is roaring and planet Earth is wailing.
—Steven Magee

As my friend Bill McKibben likes to point out, the fossil fuel industry has been granted the greatest market subsidy ever: the privilege to dump its waste products into the atmosphere at no charge.[1] That's an unfair advantage over climate-friendly renewable energy in the playing field that is the global energy marketplace. We need mechanisms that force polluters to pay for the climate damage done by their product—fossil fuels—tilting the advantage to those forms of energy that aren't destroying our planetary home.

Such mechanisms can take the form of tradable emissions permits, also known as *cap and trade*. In this policy, government allocates or sells a limited number of permits to pollute, and the polluters can buy and sell these permits. This strategy limits pollution by providing economic incentives for polluters to reduce emissions. Another policy is a *carbon tax*, wherein a tax is levied at the point of sale on the carbon content of fuels or any other product yielding greenhouse emissions. Additionally, *carbon credits* can be granted for activities that take carbon out of the atmosphere and bury or store it, thus offsetting carbon emissions.

Fossil fuel interests and right-wing anti-regulation plutocrats have fought tooth and nail against any legislation aimed at pricing carbon emissions, for this would diminish their profits. In 2009, they torpedoed a carbon-pricing bill in the United States and similar legislation in Australia and elsewhere. Moreover, a coalition of petrostate actors, including Russia

and Saudi Arabia, joined in the United States by the Trump administration, has also conspired to block carbon-pricing initiatives. Ironically, some environmental progressives are now providing them an unintentional assist.

## DISOWNING THEIR OWN

As you may recall, former *Republican* president George H.W. Bush signed a cap-and-trade amendment to the Clean Air Act in 1990 that required coal-fired power plants to scrub sulfur emissions before they exited smokestacks. Between 1990 and 2004, sulfur emissions from coal-fired plants fell 36 percent, even as power output increased by 25 percent. The roughly nine-million-ton cap on sulfur emissions was reached in 2007 and fell to about five million tons in 2010. Lakes, streams, and forests in the Northeast—including the western Adirondacks where my family and I often vacation in the summer—recovered. It was a true environmental success story. You might think Republicans would want to own it—and build on this legacy by tackling the climate crisis using the very same market approach.[2] Instead, the GOP disowned its own brainchild.

Presumably expecting some buy-in from moderate Republicans, a cap-and-trade bill sponsored by Democratic congressmen Henry Waxman of California and Edward Markey of Massachusetts (then in the House) was proposed in 2009 to regulate carbon emissions. It passed, but largely on a party-line vote. Opposition from fossil fuel interests and their front groups—which attempted to brand it "cap and tax"—was perhaps predictable.[3] But there was also opposition from some in the environmental community, who argued that the problem was that it *wasn't* a tax. They favored an explicit carbon tax over a system of tradable emission permits.[4]

Nobel Prize–winning economist and progressive *New York Times* columnist Paul Krugman argued that while either a carbon tax or a cap-and-trade policy could achieve the needed reductions in carbon emissions, "in practice, cap and trade has some major advantages, especially for achieving effective international cooperation." He thought the House bill was likely the best compromise possible given the prevailing politics: "After all the years of denial, after all the years of inaction, we finally have a chance to do something major about climate change. Waxman-Markey is imperfect, it's

disappointing in some respects, but it's action we can take now. And the planet won't wait."[5]

Further confusing the politics of the matter was the fact that some Republicans actually supported a carbon tax. But with a catch—it had to be "revenue neutral," which is to say, it couldn't increase the overall taxation on the American people, so other taxes, such as income taxes, would have to decrease. South Carolina congressman Bob Inglis and Jeff Flake of Arizona—both fiscally conservative Republicans—made the case for such a vehicle as an alternative to cap and trade.[6]

Fossil fuel interests and their abettors now faced a grave threat. A climate bill was one house of our bicameral legislative branch away from being the law of the land and even some Republicans supported a price on carbon. The inactivists kicked into high gear. First, the Koch brothers used their tremendous wealth and influence to wage a massive disinformation campaign to defeat the climate bill.[7] They had shills such as Myron Ebell of the Koch-funded Competitive Enterprise Institute misrepresent the cap-and-trade bill as a "tax" bill that would hurt our economy and everyday citizens. Even the *New York Times* was hoodwinked into promoting that interpretation. Describing him as "a strong advocate of the acid rain cap-and-trade program," *Times* reporter John M. Broder quoted C. Boyden Gray, who had been White House counsel during the first Bush administration, saying that "opponents were largely correct in labeling the Waxman-Markey plan a tax."[8] The *Times* failed to note that Gray had worked with the Koch brothers as a member of the board of directors for Citizens for a Sound Economy, a conservative think tank the Kochs had founded in 1984. Citizens for a Sound Economy would lead to Freedomworks and Americans for Prosperity.[9]

Americans for Prosperity was in fact a Koch brothers front group. The Kochs employed it as a vehicle for sponsoring a "hot-air" bus tour around the country promoting climate-change denial and fear-messaging about how regulating carbon emissions would supposedly destroy the economy.[10] They even constructed an Astroturf movement that became known as the "Tea Party" to create the illusion of widespread grassroots opposition to the climate bill, marshaling a rabble of disaffected citizens resentful of a changing fiscal, racial, and social landscape that seemed to have left them

behind.[11]

Meanwhile, the Kochs served notice to any Republican legislators who might think about supporting climate legislation by making an example of Congressman Bob Inglis (R-SC), who, as noted earlier, had supported a carbon tax bill. Christopher Leonard, author of *Kochland*, described what happened during Inglis's reelection bid in 2010: "Koch Industries stopped funding his campaign, donated heavily to a primary opponent named Trey Gowdy and helped organize teams of Tea Party activists who traveled to town hall meetings to protest against Mr. Inglis. Some of the town hall meetings devolved into angry affairs, where Mr. Inglis couldn't make himself heard above the shouting. Mr. Inglis lost re-election, and his defeat sent a message to other Republicans: Koch's orthodoxy on climate rules could not be violated."[12]

The Kochs' efforts were successful. Democrats were unable to achieve filibuster-proof support (that is, a minimum of sixty votes) in the Senate, and the bill never went forward to President Obama's desk. Even with both houses of Congress under their control and a president in favor of climate action, Democrats were unable to pass a climate bill. While one might blame them for fecklessness, there is little doubt that cap and trade, as Broder at the *Times* put it, "ran into gale-force opposition from the oil industry [and] conservative groups that portrayed it as an economy-killing tax."[13] Tens of millions of dollars from the Koch brothers and dark-money spending aimed at sinking the bill didn't help matters. Nor did a beleaguered president who had already expended considerable political capital fighting a war with the right over health-care reform. And thus ended, with little fanfare, what had once seemed a promising prospect, finally, for a climate bill in the United States.[14] (A noteworthy postscript: Bob Inglis, who in full disclosure is a personal friend, now leads an organization aimed at bringing Republicans on board with climate action. He travels around to speak to conservative audiences about free-market approaches to pricing carbon, and in 2015 he received the JFK Profile in Courage Award.[15])

Similar episodes played out in the other major industrial nations. Australia provides perhaps the most striking example.[16] In some sense, what transpired down under was even more disillusioning than what had

occurred in the United States: The Aussies *did* have a national price on carbon, and they lost it. In 2011, after a long, drawn-out battle that dated back several governments, Julia Gillard, prime minister of the ruling labor government, passed an emissions trading scheme, or ETS (another name for a cap-and-trade system). Drawing from the very same textbook that inactivists used to sink the US cap-and-trade bill, Australia's center-right opposition party (the "Liberals"—who are actually *conservatives*) misrepresented the measure as a "carbon tax" that would hurt individuals. This was particularly problematic for Gillard, who had made a campaign promise not to pass a carbon tax but had not ruled out an emissions trading measure.[17]

The usual suspects—Koch-funded front groups combining forces with coal interests and the Murdoch media (which dominate the Australian media landscape)—went to work, savaging Gillard and the Labor Party.[18] The attacks, as described by the *New York Times*, "coalesced around the promise and the tax." The ETS was portrayed "as a burden that would hurt businesses and cost households, instead of one that would cut pollution and ensure a more secure future for our children." There was only the smallest grain of truth to that claim. In principle, some of the cost to polluters of a cap-and-trade policy can be passed on to consumers. But in practice, these costs would have been minimal.[19]

Foreshadowing the attacks on AOC and the Green New Deal that were detailed in the previous chapter, Gillard's critics made not-so-subtle misogynistic appeals to voters in accomplishing their objectives. The *Times* noted that "the heat, anger and vitriol directed at her as a leader—and as Australia's first woman to be prime minister… grew strangely nasty."[20]

Liberal Party fossil-fuel advocate and climate-change denier Tony Abbott won the subsequent general election and was eventually able to revoke the ETS. Today the conservative Liberal National Party (LNP), a coalition of the Liberal Party and the National Party, remains in power, with a like-minded prime minister in Scott Morrison who has coddled coal, played a destructive role in international climate negotiations, and downplayed the impacts of climate change even as Australians have suffered through devastating and unprecedented heat, drought, and bushfire outbreaks. It is worth noting that, as in the United States, not all of

Australia's conservative politicians were on the wrong side of the climate issue. Former Liberal prime minister Malcolm Turnbull was attacked by the Murdoch press and ousted from office in 2018 in large part because of his support of carbon pricing. He now plays a similar role in Australia to that played by Inglis in the United States, seeking to convince conservatives to come back into the climate tent.[21]

It is instructive, in light of the timeline of these attacks on climate policy, to reconsider the role played by the manufactured "Climategate" controversy. You may recall how that pseudo-scandal played out in late November 2009, just in time to have a detrimental impact on the all-important Copenhagen Summit that December. But we know that it was several months in the making, which means that the plan was likely hatched around the time the Waxman-Markey bill passed the US House of Representatives (late June 2009). The pseudo-scandal dominated conservative media and even some mainstream outlets, including CNN, well into 2010, as the US Senate was taking up the ill-fated cap-and-trade bill. Pretty darned good timing by the inactivists!

In 2009, the Labor Party was in power in Australia, with Kevin Rudd as prime minister. Rudd had attempted to pass a cap-and-trade measure, slated to take effect in July 2010. But an odd coalition of the opposition Liberals (led by Tony Abbott at the time) and the Greens opposed him. According to *The Guardian*, "the Liberal opposition argued that [consideration of the ETS] should all be put off until after the Copenhagen climate conference scheduled for the end of 2009, a tactic that helped to delay the day of reckoning within the Liberal party room."[22] The tactic accomplished more than that. It also postponed consideration of any climate pricing measure until after the "Climategate" pseudo-scandal had broken. With nothing more to go on, I still wonder if Liberal Party insiders were somehow privy to knowledge the rest of us didn't have.

Rudd had anticipated a more favorable political environment for climate action following the Copenhagen Summit. But that was not to be. The proceedings became mired in disputes between developing nations (including China) and the developed world. And the political atmosphere had been poisoned by the climate inactivists' full-on assault, including the ammunition that trumped-up Climategate rhetoric provided.

As we have seen, two petrostates—Russia and Saudi Arabia—are known to have played an important role in the spread of Climategate propaganda. Indeed, Saudi Arabia attempted to sabotage the entire Copenhagen Summit based on the false Climategate claims. This bloc of climate-denying petrostates has since welcomed two additional members: the United States under Trump, and oil-soaked Kuwait. This "coalition of the unwilling" attempted to thwart the findings of the UN Intergovernmental Panel on Climate Change during the December 2018 UN Climate Change Conference in Poland. The IPCC report concluded that rapid and immediate reductions in global carbon emissions were necessary to avert catastrophic planetary warming. The four countries were the only member nations that refused to support a motion to "embrace" the findings of the new report (instead they agreed only to "note" the report's findings—a far weaker measure that is much easier for policymakers to ignore). The delegate for St. Kitts and Nevis—a West Indian island nation threatened by sea-level rise and increasingly dangerous hurricanes—told the UN plenary that it was "ludicrous" for this minority of countries to hold up the critical proceedings over two words.[23]

Based on recent behavior, the coalition of the unwilling now includes Brazil under Jair Bolsinaro and Australia under Scott Morrison. Russia, by far, though, remains the most active member of the coalition of inactivist states. As we have already seen, it was implicated in efforts to influence recent US elections in a manner that was disadvantageous for climate policy. It also appears to have interfered in recent elections in the United Kingdom, working with the climate-change-denying UK Independence Party (UKIP), for example, to pass "Brexit" (the withdrawal of the United Kingdom from the European Union). Brexit is expected to erode the power of the European Union—including its influence on climate policy.[24]

Russia is also believed to have played a role in instigating the 2018 "Yellow Vest" revolts in France that sabotaged governmental efforts to introduce a carbon tax there.[25] In that movement, Russian trolls helped incite protests and rioting in the streets using messaging that played upon class conflict and perceived economic injustice. Ironically, although most of the protesters actually supported action on climate, they opposed a proposed fuel tax, which they were led to believe would be financed by the working

class and poor to the benefit of multinational corporations.[26]

Russia has also tampered in Canadian politics. Russian bot farms have been used, for example, in an effort to convince environmental progressives in Canada that Prime Minister Justin Trudeau, who supported carbon pricing, was in fact against taking meaningful action on climate.[27] Trudeau's environment minister, Catherine McKenna, who was responsible for implementing Canada's new carbon tax program, has been subject to an onslaught of Russia-style troll- and bot-based social media attacks since taking office in 2015. Many are tinged with misogyny, dismissing her as a "climate Barbie," and ridden with slurs like "bitch," "c—t," "slut," and "twat."[28] Going into the 2019 Canadian federal election, Russian Twitter trolls attempted to stoke anger against the Trudeau government by focusing on issues such as immigration, employment, the economy, and, of course, climate policy.[29]

What might Russia and other petrostate bad actors be trying to accomplish through these sorts of activities? For one thing, a few early carbon-pricing political disasters in countries like France and Canada might cause other governments considering climate policy to get cold feet, much as the failure in the 1970s and 1980s of many of the efforts to pass bottle bills in individual states in America sank any chance of a national bottle bill. So the theory might be to nip any promising new efforts at carbon pricing in the bud before they have a chance to succeed. And to make a price on carbon toxic, all they have to do is associate it with social unrest, disruption, and economic pain.

We can see how these efforts have paid off for the inactivists when it comes to recent climate policy efforts in the United States. Consider the defeat of a climate tax initiative by voters in Washington state in November 2016. Sure, there was massive opposition and a flood of advertising from fossil fuel interests. But ironically, those opposing the initiative got an assist from environmental organizations such as the Sierra Club, which argued that the carbon tax would violate principles of social justice. This leads to our next discussion: the ironic alienation of environmental progressives from pricing carbon.[30]

## PIPELINES, NOT PRICING

From a market vantage point, the fossil fuels we burn are a consequence of both supply and demand. And so there are two basic, complementary approaches to regulating fossil fuels: control *supply* and/or control *demand*. Pricing carbon (or, alternatively, incentives for renewables) reflects an effort to diminish demand, while fossil fuel divestment campaigns and opposition to pipelines, offshore oil drilling, or mountain-top-removal coal mining constitute efforts to diminish supply. Leading climate advocates like Bill McKibben and Senator Bernie Sanders of Vermont at least originally endorsed both approaches.[31]

Despite the natural duality between demand-side and supply-side measures, there is also an asymmetry—at least when it comes to political organizing. It's easy to motivate activists to protest a pipeline or mountain-top removal. Or to attend demonstrations at college campuses demanding that administrators divest of fossil fuel holdings. These events are visual, involve conflict, bring out A-list celebrities, and generate front-page headlines and graphic photos. Think the Dakota Access Pipeline demonstrations at the Standing Rock Indian Reservation, or Darryl Hannah and James Hansen being arrested protesting Massey Energy's coal processing plant in West Virginia.[32] Or Harvard and Yale student protesters joining forces to disrupt the 2019 Harvard/Yale football game, demanding that both institutions divest of fossil fuel holdings.[33]

Carbon pricing, by comparison, seems wonkish and abstract, and it's hard to capture it in a front-page image or on a television screen. Moreover, while both carbon pricing and pipeline protests reflect efforts to influence the underlying market economics of fossil fuel use, carbon pricing is more readily *seen* as buying into market economics. As a result, carbon pricing has been vulnerable not just to attacks from the right but also to attacks from the left. We've seen how conservatives have been led to oppose carbon pricing—by fear messaging that warns of infringements to personal liberty and heavy-handed governmental mandates. But progressives have also been led to oppose carbon pricing—for them, it has been portrayed as an ostensible mechanism of neoliberal economics that discounts social justice.

One argument that seems to have resonated with the environmental left

is that a price on carbon amounts to a regressive tax that selectively hurts low-income workers. This was the claim that was used to foment the Yellow Vest uprising.[34] It is telling that Donald Trump, in his role as patsy for the fossil fuel interests that write his energy and environmental policies, insisted that the Yellow Vest violence was proof that people oppose environmental protection (as noted earlier, it showed nothing of the sort).[35]

In reality, whether a carbon tax is progressive or regressive depends on how it is designed. A fee-and-dividend method, for example, returns any revenue raised back to the people. Such a plan could be designed to be progressive, returning revenue to the poor and those most impacted through an appropriately constructed dividend.

In fact, the carbon-pricing schemes that have been successfully instituted have been *progressive* in nature. With the ETS scheme implemented by Australian prime minister Julia Gillard, the government compensated low-income earners, who ended up *benefiting* financially. Under Canada's carbon tax-and-rebate system, most households actually save money.[36] No less than Pope Francis, a champion of social justice and a true advocate for the poor and downtrodden, has called carbon pricing "essential" for tackling the climate-change "emergency."[37]

Another argument is that carbon pricing would represent a sort of political zero-sum game for climate action, with any carbon tax coming at the expense of losing legal avenues for holding polluters accountable. More specifically, some in the climate movement believe that passage of a carbon tax would shield fossil fuel companies from legal liability for their actions. This simply isn't true.

Much as the tobacco industry was finally held liable for its efforts to hide the dangers of its products from the public, so, too, are there efforts today to use the legal system to bring polluters to justice for hiding the dangers of their product—fossil fuels—to the entire planet.[38] A number of lawsuits against fossil fuel companies are currently working their way through the legal system.[39] Two states have launched fraud investigations targeting ExxonMobil (one went to trial in 2019 and failed). Nine cities and counties, including New York and San Francisco, have used the courts to seek compensation from fossil fuel companies for the climate damages they have caused. Perhaps best known, however, is *Juliana v. U.S.*, brought by

twenty-one children who sued the federal government for violating their right to a safe climate. The suit was thrown out but is currently under appeal.[40]

The belief that a carbon tax would somehow end legal liability on the part of fossil fuel interests is premised on mistaking what fossil fuel interests might *want* for what they're actually going to *get*. Some climate activists have breathlessly warned that climate pricing legislation is a "fossil-fuel-funded Trojan Horse" that would amount to "letting oil, gas, and coal companies off the hook" by "exempting fossil fuels companies from… lawsuits."[41] While fossil fuel companies have lobbied for a bill that would do just that, none of the climate bills that have been introduced in Congress have proposed to absolve fossil fuel companies of liability.[42] It is simply a fallacy to equate carbon pricing with releasing fossil fuel interests from legal liability.

Another argument frequently made by progressive critics is that a carbon tax cannot achieve the needed emissions reductions. But that depends on the magnitude of the tax.[43] Consider, for example, what transpired in Australia between 2012 and 2014, when Gillard imposed a modest price on carbon through the ETS that ended up costing polluters about $23 per metric ton of emitted $CO_2$. Emissions in the electricity sector dropped more than 9 percent during the first six months of implementation. And what happened when the Abbott government repealed the ETS in 2014? Emissions recorded their single greatest annual gain (more than 10 percent).[44] Of course, a carbon tax is just one tool in the climate action toolbox and must be combined with other demand-side and supply-side measures in any comprehensive climate plan.

Nonetheless, because of objections from some on the environmental left, the version of AOC's Green New Deal endorsed by leading environmental organizations advocates *against* a price on carbon. A letter signed by 626 groups, including Greenpeace and 350.org, was delivered to every member of Congress in early 2019 laying out support for a Green New Deal, while stating that the groups "will vigorously oppose any legislation that… promotes corporate schemes that place profits over community burdens and benefits, *including market-based mechanisms… such as carbon and emissions trading and offsets*" (emphasis added).[45] There are other recent

cases in which environmental progressives and green groups have opposed carbon-pricing efforts. As we learned earlier, for example, the Sierra Club helped defeat a 2016 climate tax initiative in Washington because its leaders felt it didn't satisfy principles of social justice.[46]

Then there's the Carbon Pollution Reduction Scheme (CPRS) that former Australian Labor prime minister Kevin Rudd proposed back in 2009. Rudd's government had negotiated a package with climate-policy-friendly Liberal leader Malcolm Turnbull that could pass Parliament. Turnbull, however, was replaced as Liberal leader by fossil fuel flack Tony Abbott. On Abbott's first full day as Liberal leader, the members of Parliament (MPs) for the *Green Party*—yes, the party whose very name bespeaks ostensible prioritization of environmental preservation—voted with Abbot *against* the CPRS, purportedly because its members wanted *more ambitious* reduction targets. This fateful decision by the greens, as Mark Butler explained in *The Guardian,* "allowed Abbott to begin to build the momentum that has hamstrung long-term climate action for almost a decade." According to Butler, "had the CPRS passed the parliament in 2009, an emissions trading scheme would likely have been operating for some years before Abbott was able to become prime minister. And it's likely that Abbott would not have been able to build a platform to tear down such a large reform after that time."[47]

Prominent spokespeople within the scientific community, too, sometimes fan the flames of progressive opposition to carbon pricing. Consider the words of Australian environmental scientist Will Steffen, executive director of the Australian National University Climate Change Institute and lead author of a controversial "Hothouse Earth" commentary in the *Proceedings of the National Academy of Sciences*.[48] Asked what could be done to prevent a Hothouse Earth scenario, Steffen said the "obvious thing we have to do is to get greenhouse gas emissions down as fast as we can.… *You have got to get away from the so-called neoliberal economics*… [and shift to something] more like wartime footing [to decarbonize society] at very fast rates" (emphasis added).[49] While Steffen is no doubt an expert in environmental science, his statements about economics and policy here are ill informed. If we are to achieve rapid decarbonization of our economy, carbon pricing (which one suspects he is

lumping in with "neoliberal economics") is essential—it's the main lever arm we have available to us in a market economy.[50]

Among the most market-economics-averse of proponents of a Green New Deal is social activist Naomi Klein, who has long argued that modern-day capitalism—which is to say, neoliberal market economics—is fundamentally at odds with basic human rights and environmental sustainability. According to Adam Tooze, in his article "How Climate Change Has Supercharged the Left" in *Foreign Policy* magazine, "the denunciation of neoliberalism in Naomi Klein's *This Changes Everything* gave a manifesto to the new green left."[51]

I published a commentary in *Nature* that recommended Klein's latest book on the GND but questioned her critique of market mechanisms, pointing out that—as we've already seen—there is no reason that carbon pricing has to be either regressive or inadequate.[52] Her followers immediately took to social media to expressly denounce me. I can understand that some of her supporters might have been disappointed that I had some points of disagreement with her and didn't endorse her precise vision of the Green New Deal. But we are on the same side. And I didn't expect the vitriolic personal attacks of the sort I'm used to getting from the climate-denying right coming instead from the left.

One reader dismissed my commentary as "mansplaining trash from myopic white bros who do not speak for those on the front lines." Now, I'll humbly submit that I *do* know a thing or two about being on the front lines. For two decades I've been in the cross hairs of the attack machine funded by the fossil fuel industry, and I have devoted my professional life to study and activism relating to climate change.[53] Eric Holthaus jumped in to express his disapproval as well, tweeting "Ladies, does he… leverage his platform to write op-eds in prominent magazines disparaging the Green New Deal? He's not your climate hero, he's a gatekeeper."[54] These responses—from both strangers and people who are ostensibly on the same side of the issue as I am, seemed to exemplify once again the divisive way that race, gender, and callout culture are being used to divide the climate movement.[55]

The takeaway message from this particular episode, however, is that there is a fairly aggressive effort underway by some on the environmental

left to turn support for the GND *in its current form* (including *opposition to carbon pricing*) into a purity test. Even questioning it can lead to massive, mob-like online assaults and ugly accusations that somehow become framed in identity politics and tinged with issues of race, gender, and ageism. We have already seen that the inactivists seize upon such internal conflict and amplify it to sow dissent and divide the climate community. They are surely doing that here. Fortunately, as we've seen, there are also many committed climate advocates who recognize this threat and are willing to push back against needlessly divisive rhetoric. That will remain critical if we are to find some degree of common ground, as a society, when it comes to climate action—including carbon pricing. That leads us to our next topic.

## PRICING AIN'T PARTISAN

Despite the divisiveness that has arisen around the role of carbon pricing, there is nothing intrinsically divisive or partisan about it. As we have seen, market mechanisms for dealing with pollution actually have their origins in the Republican Party. Carbon pricing is supported by all former Republican chairs of the president's Council of Economic Advisers. But carbon pricing is also widely supported by Democrats. Nine of the ten leading candidates for the Democratic presidential nomination supported it as of July 2019. The one exception as well as one subsequent major "flip" are rather interesting, and we will discuss them later.[56]

It is only relatively recently, as efforts to implement carbon pricing have actually started to move forward—that we've seen support for carbon pricing start to erode on *both* sides of the political spectrum. That's convenient for fossil fuel interests, whose spokespeople might publicly claim, for public relations purposes, that their companies and organizations support carbon pricing, but behind the scenes still fund groups working to undermine it.[57]

It's hardly surprising that Donald Trump, who has outsourced his policymaking to polluting interests, is dismissive of carbon pricing, which he has derided as "protectionism."[58] But the fact that some environmental *progressives* have grown apprehensive of carbon pricing has almost

certainly influenced recent decisions by other climate-friendly politicians to steer clear of it. Consider New York governor Andrew Cuomo. Cuomo has been a leader in many respects when it comes to climate action. He has supported supply-side measures to restrict fossil fuel extraction, becoming only the second governor to ban natural gas drilling via hydraulic fracturing (fracking).[59] And he has promoted at least *one* type of demand-side measure, namely, governmental incentives for renewable energy (the topic of the next chapter). What he has proposed for New York is that it require 70 percent of the state's electric power supply to come from renewable energy sources by 2030 and mandating that it be free of carbon emissions by 2040. But Cuomo has not endorsed a price on carbon—as yet.[60]

Others have nonetheless called upon him to do so. Richard Dewey is the president and CEO of the New York Independent System Operator (NYISO), a not-for-profit corporation responsible for operating New York State's bulk electricity grid, administering its competitive wholesale electricity markets, conducting comprehensive long-term planning for its electric power system, and advancing the technological infrastructure of its electric system.[61] Dewey has insisted that Cuomo cannot achieve these goals without imposing a price on carbon: "These goals are really going to come fast," he has stated, adding that carbon pricing "is a necessary element in meeting them."[62]

The conclusion that we need carbon pricing is also supported by the International Monetary Fund (IMF), hardly a left-leaning organization. The IMF exists to "secure financial stability, facilitate international trade," and "promote high employment and sustainable economic growth."[63] It has estimated that there is an effective global average price of roughly $2 per metric ton, given the various carbon-pricing systems that are in place around the world. It has warned, however, that the world needs an average price of $75 per metric ton if we are to meet the Paris Agreement goal of keeping warming below 2°C (3.6°F). (An even higher price would be needed to keep warming below 1.5°C [2.7°F]—a level of warming increasingly considered to constitute dangerous climate change.[64])

These are examples of objective, moderate, nonpartisan institutions, with no particular axe to grind, that have called for carbon pricing. There are both Democrats and Republicans who support carbon pricing. Why is it

proving so difficult to find political common ground here? Part of the answer, of course, is that fossil fuel interests, and the forces of inaction doing their bidding, have worked hard to poison the well (look no further than Donald Trump's threats to retaliate against the European Union over its proposed carbon tax[65]). But frankly, progressive scientists and thought leaders have at times made it easy for them, helping to create a political economy that is toxic for bipartisan compromise.

Let me relate an episode involving David Mastio, the deputy editorial page editor of *USA Today* and a self-avowed "libertarian conservative." In June 2019, I coauthored an op-ed about the dangers of the new climate "deflection campaign" discussed in this book.[66] I was sure the *New York Times* would publish it, but it did not. I was sure the *Washington Post* would then publish it. It didn't. I then went to *USA Today*. David not only embraced the piece and offered to publish it, but encouraged me to keep *USA Today* in mind for any future op-eds. He's precisely the sort of conservative we need on board.

Well, I was crestfallen to read a controversial statement David made some months later when he tweeted this: "Why I remain skeptical of the climate change consensus. If this was a real emergency, the scientists would be in favor of mobilizing the power of capitalism, not government control."[67] I wondered what could have set him off? Clicking through, I saw that it was a tweet paraphrasing a letter signed by eleven thousand scientists: "11,000 scientists have declared we are in a climate emergency. Among other things, *we need to move away from capitalism*…"[68] I've intentionally eliminated the rest of the tweet (you can find it in the endnotes) because I want you to read only as far as David would have had to read before becoming suspicious that the declaration of a climate emergency is just a tool—at least to some—for overthrowing capitalism. The "watermelon" fears, revisited.

A parochiality has emerged among environmental progressives that is unhelpful to the process of building consensus for climate action. Here's an example. In January 2020, George P. Shultz, secretary of state under President Ronald Reagan, and Ted Halstead, chairman and chief executive of the nonpartisan Climate Leadership Council, coauthored an op-ed in the *Washington Post* titled "The Winning Conservative Climate Solution."[69] In

it, they advocated for a revenue-neutral carbon tax, or, more specifically, a fee-and-dividend system, similar to what is advocated by the nonpartisan Citizens Climate Lobby. In such a system, a fee is charged to carbon polluters, and the revenue is distributed, through a dividend, to the people (for example, in the form of quarterly checks sent by the government to individuals).

Now consider the response to the op-ed by David Roberts, a writer for *Vox*. Roberts tweeted, "I'll never get used to the bizarre convention of calling a policy that the GOP has repeatedly rejected & the vast bulk of conservatives oppose… a 'conservative solution.'" He went on to add, "The conservatives who are actually attracted to this policy are conservative centrists & conservative Democrats. This is an intra-left dispute in which one side is fraudulently claiming to be able to count on the right's support."[70]

Roberts often has keen insights into climate politics. But here, he is misguided. He fails to distinguish between traditional conservatives—that includes Reagan conservatives, like George Shultz, who, as we have seen, not only supported but actually *gave us* market-based approaches to reducing pollutants—and the current-day Republican Party, which has indeed been cowed into complicity with the Koch brothers, the Murdoch media, and the fossil fuel industry.

These old-school conservatives—George Shultz, Hank Paulson, Bob Inglis, Arnold Schwarzenegger, or, in the United Kingdom, former prime minister David Cameron—not only support climate action, but are passionate about it. Nevertheless, they are apprehensive about what they perceive to be heavy-handed governmental regulatory approaches, including the GND in its current form. As Shultz and Halstead put it, "the climate problem is real, the Green New Deal is bad."[71] According to Schwarzenegger, who as governor of California led efforts to cut back carbon emissions, and has roundly criticized Donald Trump's efforts to roll back environmental protections, the Green New Deal is "a slogan" and "marketing tool" that is "well intentioned" but "bogus."[72] Cameron has implored his fellow conservatives not to abandon the matter: "Don't leave the issues of climate and the future of the planet… These are natural conservative issues, don't leave this to the left or you'll get an anti-business,

anti-enterprise, anti-technology response."[73]

We are unlikely to see a climate bill resembling the current version of the GND pass both houses of Congress in the United States. There will need to be some degree of bipartisan compromise, which means bringing along moderate conservatives. Rather than alienating them through partisan rhetoric, we need to create space for them and welcome them into the fold. There *is* a legitimate wedge to be formed, and it's between moderate conservatives, who are on board with climate action, and the recalcitrant deniers, delayers, and deflectors.

Nobody said it would be easy to pass climate legislation with the fossil fuel interests and the Koch brothers doing their best to enforce Republican Party purity. But fissures are starting to form, particularly as a result of generational shifts that favor action. Republican pollster Frank Luntz found that Republican voters under the age of forty favor a fee-and-dividend carbon-pricing policy by a whopping six-to-one margin.[74] The same generational trends that led to a tipping-point-like response on marriage equality during the Obama years will soon reach a tipping point on climate, too. But we don't have a decade to wait, and the most viable path forward toward comprehensive climate legislation in the United States involves market mechanisms, including carbon pricing. It would be sadly ironic—and indeed tragic—if progressives, rather than conservatives, became the greatest obstacle to climate progress by refusing to engage in compromise, cooperation, and consensus building.

Ironically, not only is there in an increasing tendency among progressives to oppose seeking a middle ground when it comes to climate policy, but we've arrived in a "bizarro" world where the climate-change talking points employed on the political left are sometimes virtually indistinguishable from those on the political right. Adam Tooze reported in *Foreign Policy* what transpired at a conference of the UK Labour Party in September 2019: "The general secretary of the GMB trade union, Tim Roache, warned that a crash program of decarbonization would require the 'confiscation of petrol cars,' 'state rationing of meat,' and 'limiting families to one flight for every five years.' He concluded: 'It will put entire industries and the jobs they produced in peril.'"[75] Other labor leaders have an arguably more enlightened view of carbon pricing. In March 2020,

James Slevin, president of the Utility Workers Union of America, coauthored an op-ed with Senator Sheldon Whitehouse (D-RI) articulating the case for carbon pricing. They advocated measures to ensure that the revenue raised is rebated to consumers and used to help individuals and communities—particularly coal workers and their families—with support for health plans, pensions, and educational opportunities.[76]

Or consider Kevin Anderson, a climate scientist in the United Kingdom who has criticized the mainstream climate research community for understating the degree of the threat posed by climate change and overstating the progress that has been made. In critiquing a report by the Committee on Climate Change (an independent committee created to advise the UK government on matters of climate mitigation) on what measures are required to meet commitments under the Paris Agreement, Anderson stated that "it is designed to fit with the current political and economic status quo." Then he went further, accusing the entire climate research community of complicity: "The overall framing is firmly set in a politically-dogmatic stone with academia and *much of the climate community running scared of questioning this for fear of loss of funding*, prestige, etc." (emphasis added).[77] That charge is virtually indistinguishable from the shopworn accusation by climate-change deniers that climate scientists invented the climate crisis to bring in loads of grant money.[78]

Indeed, the prevailing politics of climate change today sometimes resemble the metaphorical snake biting its tail, with some on the left end of the spectrum promoting the positions on climate typically found on the right. Consider this characterization of Democratic presidential candidate Tulsi Gabbard by Brian Boyle in the *Los Angeles Times*: "Gabbard is a tricky candidate to pin down. Her domestic policy positions graft rather cleanly with Bernie Sanders' and Elizabeth Warren's progressive platforms —in fact, she was one of Sanders' fiercest supporters in 2016."[79] Sounds "left" doesn't it? But Boyle goes on to point out that Gabbard has taken curiously pro-Russian positions on any host of issues, and indeed, her candidacy was promoted by Russian bot armies. Is it a coincidence that she also happens to be the one Democratic candidate who went on record during the primaries to oppose a price on carbon—a position that aligned suspiciously with Putin's Russia and the Trump administration?[80] This

contradiction speaks to the breakdown in our conventional descriptions of "right" and "left" in the current geopolitical environment.

An even more extreme example of the blurring of the political boundaries is the British Internet magazine *Spiked*, which purports to reflect the views of the Marxist far left. *Spiked* frequently engages in what it sees as "pushback against the protected hysteria of modern environmentalism," including rejection of climate science (for example, dismissing IPCC reports as "often over-the-top" and "scare mongering").[81] The magazine also promotes caricatures of the climate movement. It insists, for example, that climate advocates claim "that we have 12 years to save the planet."[82] This is a bastardization of the scientifically backed estimate that we only have around twelve years to bring carbon emissions down (by a factor of two) if we are to avert a dangerous 1.5°C (2.7°F) warming.[83] *Spiked* also promoted Brexit, which, as we know, will help derail EU climate pricing efforts. It was a confusing mix of positions for a far-left magazine, but it all became clear thanks to the work of British columnist George Monbiot. In an exposé for *The Guardian*, Monbiot revealed that among the funders of *Spiked* is in fact the foundation of fossil fuel billionaire (and apparently secret Marxist) Charles Koch.[84] Far right posing as the far left? Can you say *Manchurian Candidate*—backward? If there's a lesson in all of this, it's that inactivists are working hard to generate conflict within the climate movement, literally infiltrating the environmental "left" in an effort to turn climate identity politics on their head. They'll seemingly stop at nothing in their efforts to block climate progress and carbon pricing. Forewarned is forearmed.

## ACCELERATING THE TRANSITION

Climate action requires a fundamental transition in our global economy and massive new infrastructure, but there is no reason to think we can't accomplish it—and accomplish it rapidly—with the right market incentives. Those incentives, as we've seen, must involve both supply-side and demand-side measures.

Supply-side measures take the form of blocking pipeline construction, banning fracking, stopping mountain-top-removal coal mining, divesting in

fossil fuel companies, and putting a halt to most new fossil fuel infrastructure. These actions obviously lend themselves to activism, protests, and media-ready conflict and publicity. But they *can* also have a material impact. Consider, for example, the Keystone XL Pipeline, which promised to deliver huge amounts of the dirtiest, most carbon-intensive petroleum from the Canadian tar sands to the open market. It's a scenario that climate scientist James Hansen exclaimed would be "game over for the climate."[85] In response to massive protests and pressure from environmental organizations, former president Obama ultimately blocked the construction of the pipeline in 2015, arguing that it would "undercut" his administration's "global leadership" in "taking serious action to fight climate change."[86] Combined with the clean power plan and tighter fuel-efficiency standards imposed by his administration, blocking Keystone XL gave Obama a strong hand in negotiating a bilateral climate agreement with China in 2015 that would, in turn, lay the groundwork for the monumental Paris Agreement later that year.[87]

But, just as personal action is no substitute for systemic change, supply-side efforts are no substitute for demand-side approaches. Both are necessary. Demand-side measures attempt to level the playing field, so that climate-friendly energy, transportation, and agricultural practices outcompete fossil fuels in the marketplace. Carbon pricing is one of the most powerful tools we have to do that. Taking it off the table would constitute unilateral disarmament in the climate wars.

That is literally what happened in Australia. A successful carbon-pricing program that both progressives and conservatives initially supported was nixed by a climate-change-denying, fossil-fuel-flacking prime minister in Tony Abbott. Fatefully, Australia, in the record hot, dry, bushfire-plagued summer of 2019/2020, morphed into a dystopian hellscape resembling a scene from the 1979 Australian film *Mad Max*. Once a shining example of climate leadership in the industrial world, Australia has now become a poster child for the cost of climate inaction. Yet it is not too late for Australians to reclaim leadership by voting in a government that promises to act on climate in the next election.

Nor is it too late in the United States. As I write, the fate of carbon-pricing remains uncertain. The election of Donald Trump in 2016 was a

major setback. A Biden presidency would put carbon pricing back on the table. Still there are signs, as we've seen, that some on the political left are also hostile to this policy. During the 2020 Democratic primaries, for instance, Bernie Sanders flipped on the issue of carbon pricing sometime between July 2019, when he supported it (albeit with qualifications), and November 2019, when, in response to direct questioning by the *Washington Post*, he indicated he no longer favored such policies. A cynic might imagine that this concession reflected an effort to wrest carbon-pricing-averse Green New Deal supporters from his chief primary campaign challenger, Elizabeth Warren. The great irony is that, as a result of this flip-flop, *both* major party candidates for the 2020 presidency could have ended up opposed to this important mechanism for climate action.[88]

Of course, a truly comprehensive strategy for leveling the playing field involves more than simply forcing corporate polluters to pay for the damage they're causing. That's the stick. But we need the carrot, too. That means incentives for energy providers to replace fossil fuels with cleaner, safer, carbon-free energy (and, conversely, eliminating the perverse existing subsidies that are provided to fossil fuel energy producers). The inactivists, naturally, as detailed in the next chapter, have opposed these measures, too.

CHAPTER 6

# Sinking the Competition

> We are like tenant farmers, chopping down the fence around our house for fuel, when we should be using nature's inexhaustible sources of energy—sun, wind, and tide.
>
> —THOMAS EDISON

WE SAW IN THE PREVIOUS CHAPTER THAT CARBON PRICING IS A means of leveling the playing field in the energy market, so that those sources of energy that are not warming the planet (i.e., renewable energy) can compete fairly against those that are (i.e., fossil fuels). A complementary approach is to introduce explicit incentives for renewable energy (and eliminate those for fossil fuels). Here again, the inactivists have put their thumbs on the scale by promoting programs that favor fossil fuel energy while sabotaging those that incentivize renewables, and engaging in propaganda campaigns to discredit renewable energy as a viable alternative to fossil fuels.

## SELECTIVE SUBSIDIES

The fossil fuel industry loves subsidies and incentives. When *they* receive them. According to the International Monetary Fund, the industry receives about half a trillion dollars globally in explicit subsidies, such as in the form of assistance to the poor for the purchase of fossil-fuel-generated electricity, tax breaks for capital investment, and public financing of fossil fuel infrastructure. It's a lot of money. But when *implicit* subsidies are included —that is to say, the health costs and damage born by citizens for the associated environmental pollution, including the damage done by climate

change—the estimate rises to a whopping $5 trillion.[1] These perks didn't arise by accident—the industry used its immense wealth and influence to obtain them. In the 2015–2016 election cycle alone, fossil fuel companies spent $354 million in campaign contributions and lobbying.[2]

Fossil fuel interests have also done everything possible to *block* subsidies and incentives for their competition—renewable energy—and they've had a lot of success doing so. That has led to a perverse incentive structure in the energy marketplace through which we are artificially boosting the very energy sources that are hurting the planet, while devaluing those that can save it. Industry front groups like the American Legislative Exchange Council (ALEC) and the Heartland Institute have been particularly active in sabotaging efforts at the national and state levels to promote renewable energy.

The watchdog group SourceWatch describes ALEC as a "corporate bill mill" through which "corporations hand state legislators their wish lists to benefit their bottom line."[3] In recent years, fossil fuel corporations such as ExxonMobil, Shell, and BP have pulled out of ALEC, concerned about increased public scrutiny of their funding activities. But the privately held fossil fuel giant Koch Industries has remained steadfast in its funding of the group.[4] In one year alone, ALEC helped push through seventy bills in thirty-seven states designed to disadvantage clean energy. ALEC has proposed legislation that would undermine state policies mandating that a fraction of the energy produced come from renewable sources (so-called Renewable Portfolio Standards).[5] One bill sponsored by Wyoming Republicans in 2020 was a caricature of these efforts. It would have required utilities to provide 100 percent of electricity from coal, oil, and natural gas by 2022. It failed.[6]

ALEC has also promoted legislation that penalizes those who choose to install solar panels on their homes. This would be accomplished by placing a surtax on homeowners with solar panels who attempt to sell power they don't need back to electric utilities.[7] Such efforts, ironically, managed to earn the Koch brothers—apparently against intrusive state interference only until their bottom line is threatened—the ire of members of the Tea Party they helped create.


The Koch-funded Heartland Institute has been engaged in similar attacks on renewable energy.[8] Beginning in 2012, it sponsored ALEC's Electricity Freedom Act, model legislation aimed at repealing state renewable energy standard programs. Fortunately, these efforts have largely failed at the state level—with only Ohio halting its program, and only for one year (2014). These efforts have failed at the national level as well. Heartland has also tried to block state-level programs incentivizing solar energy.[9]

The goal of these efforts is to undermine the decarbonization of the power sector. But no assault on renewable energy would be complete without an attack on electric vehicles (EVs), for they are the path to decarbonizing the transportation sector as well. If you get your electricity from renewables and charge your car off an outlet in the garage, you're no longer driving off fossil fuels. That's a threat to the oil industry, which profits off the sale of gasoline, and to Koch Industries, which profits off the refining and distribution of oil and gasoline. Recognizing the threat to their bottom line, agents of the Koch brothers met with oil-refining and marketing companies in 2015 to pitch a "multi-million-dollar assault on

EVs."[10]

Central to the plan was one of their bought-and-sold politicians, Republican senator John Barrasso of Wyoming, who was the third-highest recipient of Koch brothers dollars during the 2018 election cycle.[11] Barrasso, as chair of the Senate Environment and Public Works Committee, introduced the Fairness for Every Driver Act in 2019. It would not only end federal tax credits for EVs, but in addition would create an annual "highway user fee" for all "alternative fuel vehicles." It might not surprise you to learn that Barrasso, in his efforts to sell this bill to voters, used talking points that were taken directly from Koch brothers propaganda (for example, that the tax credit "disproportionately subsidizes wealthy buyers," and that "hard-working Wyoming taxpayers shouldn't have to subsidize wealthy California luxury-car buyers"). He and his fellow Republican proponents also used talking points manufactured by the Koch-funded Manhattan Institute (for example, the bogus claim that ending the electric vehicle tax credit would save roughly $20 billion in taxpayer funds over the next decade). These arguments have been characterized as resting on "every conceivable kind of error: data dredging, wishful thinking, truculent, and dogmatism."[12]

Tesla may be the greatest threat of all to the fossil fuel industry. Not only do Teslas compete with the sleekest of conventional automobiles performance-wise, but Elon Musk and his company have also literally redefined what an electric automobile can be. In North Carolina, American-made Teslas were outselling high-performance conventional vehicles, including foreign brands like BMWs, Mercedes, and Audis. The company's success was a triumph of American innovation, industry, and free markets! So the Republican state senate stepped in and tried to pass a bill that would prohibit the sale of Teslas.[13] (While the bill failed, Tesla sales were nonetheless banned in one major city, Charlotte.[14]) Soon thereafter, Republican governor Chris Christie tried to do the same thing in New Jersey.[15] Other red states—Texas, Utah, West Virginia, and Arizona—followed suit.[16] So much for "free-market" Republicans!

Meanwhile, the conservative media, doing the bidding of fossil fuel interests, have promoted mythologies designed to undermine public support for renewable energy. Solyndra was a California manufacturer of thin-film

solar cells that used unusual, innovative technology. Plummeting silicon prices, however, led to the company being unable to compete with conventional solar panels, and it went bankrupt in September 2011.[17] The company defaulted on a $535 million loan it had received from the US Department of Energy under President Barack Obama's 2009 economic stimulus package. The vast majority (98 percent) of the funds provided under the federal program went to companies that have *not* defaulted on their loans; in fact, the Department of Energy projects a profit of more than $5 billion over the next two decades, with twenty of the program's thirty enterprises operating and generating revenue.[18]

The overall success of the program notwithstanding, inactivists have sought to make Solyndra the poster child for the supposed failings of renewable energy. They also used Solyndra scandal-mongering to attack Obama's proposed budget in 2015. Presumably what they *really* didn't like about the budget was that it would repeal nearly $50 billion in tax breaks for the oil, natural gas, and coal industries.[19] So in a masterful display of propagandistic jujitsu, Fox News and the *Daily Caller* (a Koch brothers front group masquerading as a media outlet), among others, sought to use Solyndra to tie the Obama budget to an ostensibly failed renewable energy agenda.[20] Despite what they claimed, Solyndra had not received the clean energy tax credits included in the president's 2015 budget. The budget didn't even increase funding for the largely successful loan guarantee program that had supported Solyndra in 2009.[21] But facts be damned when there's an opportunity to simultaneously both smear renewables and protect fossil fuel subsidies.

## CROCODILE TEARS

Another line of attack by the inactivists is to cry crocodile tears over the purported threat posed by renewable energy. It's once again the classic tactic of dividing the environmental community, in this case by convincing them that renewables—which actually promise environmentally safe and reliable energy—are instead somehow a threat to our health and the environment.

So we get myths and distortions that seek to create a false dilemma for

the environmentally minded, namely, that decarbonizing our economy will somehow come at the expense of environmental peril. None is more prominent than the supposed threat wind turbines pose to birds. Robert Bryce of the aforementioned Koch-funded Manhattan Institute has been out in front promoting this myth, both on the editorial pages of the *Wall Street Journal* and in ultra-right-wing venues like the *National Review*.[22] Do we really think that Bryce cares a feather about the birds whose supposed turbine-driven demise he laments? More birds are killed every year by housecats. Why aren't Bryce and the Murdoch media crusading to rein in our felines? Might they—and other fossil fuel water carriers advancing the "wind is a threat to birds" myth—be crying crocodile tears?

When it comes to the welfare of our feathered friends, I put more trust in the Audubon Society, whose *actual* mission is to "protect birds and the places they need, today and tomorrow." The Audubon Society has stated that climate change is a far greater threat than wind turbines. According to an Audubon Society report, hundreds of bird species in the United States—including our national symbol, the bald eagle—are at "serious risk" due to climate change, with the ranges for some species predicted to be diminished by 95 percent by 2080. Bird catch by wind turbines can be minimized by siting wind farms away from bird migration routes. Accordingly, Audubon supports "properly sited wind power as a renewable energy source that helps reduce the threat posed to birds and people by climate change."[23]

The inactivists have even managed to invent an imaginary health affliction in their efforts to scare people away from wind power—"wind turbine syndrome." Anti-wind advocates have claimed that a whole array of afflictions, including lung cancer, skin cancer, hemorrhoids, and both the gain and loss of weight, are somehow caused by proximity to wind farms. It is just one example of how Sagan's worst fears about "pseudo-science" have come to pass.[24] With absolutely no scientific evidence behind the phenomenon, the fact that some honest actual individuals have claimed to suffer from the imaginary syndrome is a classic example of a "communicated disease"—that is to say, people who might be experiencing any number of maladies and happen to live near a wind farm hear others talk about the putative syndrome and, looking for someone or something to blame, embrace this pseudoscientific but seemingly plausible explanation.[25]

It should come as no surprise that Koch-affiliated groups, fossil fuel interests, and the Murdoch media empire have sought to spread the myth of "wind turbine syndrome" far and wide.[26] Consider the utterings of Fox Business network's Eric Bolling: "Turbines are popping up all across America, as the demand for the usage of wind energy is increasing. But at what cost? Residents close to them have reported everything from headaches to vertigo to UFO crashes."[27] Yes, you read that right: "UFO crashes," too! The anti-wind brigade even managed to recruit President Donald Trump to the cause. Among his long list of ridiculous claims about wind turbines, he suggested they "cause cancer."[28]

Trump, in fact, used a fundraising address on April 2, 2019, to promote fears that allowing wind farms in communities causes financial damage, warning Americans, "If you have a windmill anywhere near your house, congratulations, your house just went down 75 percent in value."[29] Actual studies have found no evidence for the claim that wind turbines affect property values.[30]

Crocodile tears have also been shed over the supposed environmental impact of solar energy. That isn't to say that solar farms and solar panels have no environmental footprint—there are valid issues regarding land use and habitat loss, water use, and the potential release of hazardous materials in manufacturing.[31] But that footprint is tiny compared to the environmental impact of coal, natural gas, and petroleum. And that's not even considering the damages from climate change!

Enter the so-called Breakthrough Institute (BTI), a group originally linked to fossil fuel interests that has more recently been called a "nuclear [industry] front group."[32] Public ethics expert Clive Hamilton has accused BTI of "misrepresenting data on the energy savings of investment in energy efficiency, [criticizing] almost every proposed measure to reduce America's greenhouse gas emissions [and allying] with anti-climate science organizations."[33] Thomas Gerke, writing for *Clean Technica*, noted BTI's propensity for articles "discrediting renewable energy on the one hand and on the other preaching about nuclear energy as the solution for the global energy crisis of the 21st century."[34]

BTI cofounder Michael Shellenberger promotes the myth that solar energy poses a major threat to the environment. In May 2018 he penned a

column for *Forbes* soaked with plaintive tears over the supposed toxicity of chemicals in solar photovoltaic cells.[35] Curiously unmentioned in his piece is the fact that (1) solar panel manufacturers in the United States must follow laws to ensure that workers are not harmed by exposure to toxic chemicals, and that chemical waste products are disposed of properly, and (2) manufacturers have a strong financial incentive to ensure that valuable and rare materials are recycled rather than disposed of.[36]

Just months later, Shellenberger followed up with another *Forbes* piece in which he asserted, presumably in all seriousness, that "nuclear is the safest source of electricity," that "low levels of radiation are harmless," and that "nuclear waste is the best kind of waste."[37] You see, nuclear = safe, solar = dangerous. Black = white. Up = down. Welcome to the bizarro world of soft denial.

Fox News has regularly subjected its viewers and readers to anti-solar propaganda warning of the dire environmental threats posed by solar energy. It has given us headlines like "Solar Energy Plants in Tortoises' Desert Habitat Pit Green Against Green."[38] It's an inactivist two-fer, combining feigned environmental concern with environmentalism wedge creation, all in one headline! Other examples include "Environmental Concerns Threaten Solar Power Expansion in California Desert," "Massive East Coast Solar Project Generates Fury from Neighbors," and my favorite: "World's Largest Solar Plant Scorching Birds in Nevada Desert."[39] It's touching to behold once again Rupert Murdoch's deep and abiding empathy for our avian cousins. Which makes total sense when you realize that birds are the modern descendants of dinosaurs.

Oddly, though, I don't recall seeing any Fox News headlines like "Mountain-Top-Removal Coal Mining Kills Off Fish and Amphibians," or "Deep Oil Drilling Destroys the Gulf of Mexico," or "Our Dependence on Fossil Fuels Is Scorching the Planet." Fox News and conservative media display curiously selective outrage over impacts on people and the environment where renewable energy, rather than fossil fuels, is concerned.

Some of the solar scare tactics used by the right-wing media border on the comical. Just as wind turbines supposedly cause cancer, solar panels will apparently cause you to freeze to death in cold climates. Or so claimed Fox News host Jesse Watters as he attempted to discredit the Green New

Deal and its architect Alexandria Ocasio-Cortez: “They have this new green deal or whatever. Ok, where they want to eliminate all oil and gas in 10 years. If you’re in the polar vortex, how are you going to stay warm with solar panels?”[40]

Of course, the fine art of scaring the public about renewables isn’t confined to the United States. Australian prime minister Scott Morrison, known, among other things, for having brandished a lump of coal on the floor of Parliament as a testament to his idea of “clean energy,” has also demonstrated some facility in this department. In April 2019, Morrison launched an attack on the Labor Party’s proposed target that EVs constitute 50 percent of all new car sales by 2030. Admonishing Labor leader Bill Shorten, he said that pro-EV policies would “end the weekend” for Australians. Morrison warned, “You’ve got Australians who love being out there in their four-wheel drives. [Shorten] wants to say see you later to the SUV when it comes to the choices of Australians.” Ironically, Morrison’s own government (the Liberal-National coalition) had proposed policies that were only slightly less bullish on electric vehicles, setting a goal that 25 percent of all new car sales by 2030 be EVs. Noting the irony, Shorten responded that Morrison and the coalition government were “so addicted to scare campaigns, they’re even scaring you with their own policies.”[41]

## “LET THEM BURN COAL”

If the inactivists have shed a few crocodile tears when it comes to the supposed threat posed by renewable energy to our health and the environment, they’ve cried a whole river when it comes to their supposed concern for the plight of the poor. They’ve appealed to the logical fallacy known as “you can’t chew gum and walk at the same time,” or, to be more specific, the idea that promoting renewable energy over ostensibly cheaper fossil fuel energy will somehow divert essential resources from efforts to fight third-world poverty. Welcome to the contrived concept of “energy poverty.”

The energy-poverty conceit rests on the flawed premise that lack of access to energy (rather than to, say, food, water, health care, and so on) poses the primary threat to people in the developing world, and, moreover,

that fossil fuels are the only viable way to provide that energy. In other words, if you are concerned about the disadvantaged of the world, you should be promoting fossil fuels. It's a truly brilliant, if cynical and manipulative, strategy by fossil-fuel-promoting inactivists to recruit political progressives and moderates to their cause.

Among the promoters of the concept is the aforementioned BTI, whose mission, as stated on its website, is "[to make] clean energy cheap through technology innovation to deal with both global warming and energy poverty."[42] Also among the ranks of energy-poverty adherents are Microsoft CEO Bill Gates and former ExxonMobil CEO Rex Tillerson. Tillerson once posed, without any apparent sense of irony, the question, "What good is it to save the planet if humanity suffers?"[43]

Indisputably the most enthusiastic of energy-poverty crusaders, however, is Bjorn Lomborg. A self-styled "skeptical environmentalist," Lomborg is neither—skepticism, remember, involves good-faith scrutiny of tenuous-seeming claims, not indiscriminate rejection of well-established science. The charismatic Lomborg brandishes a Greenpeace T-shirt to prove his environmental bona fides.

Dig a bit deeper, however, and a rather different story emerges. Lomborg's Copenhagen Consensus Center has been funded by the Randolph Foundation, whose main trustee, Heather Higgins, is also the president of the Koch-funded International Women's Forum.[44] The center is in fact a virtual entity, with an official address at a Lowell, Massachusetts, parcel service. The conservative Abbott government in Australia attempted to provide it with a permanent home, offering $4 million in taxpayer funds to the University of Western Australia if it would provide a home for the center. The university ultimately walked away from the offer.[45]

Lomborg frequently pens commentaries in leading newspapers, including the *Wall Street Journal*, the *New York Times*, and *USA Today*, downplaying the impacts of climate change, criticizing renewable energy, and promoting fossil fuels. With a smile and a professed concern for the environment and the poor, he scolds those who would misguidedly wean us off fossil fuels and promote clean energy.[46]

For someone with such professed sympathy for the plight of the developing world, Lomborg displays a remarkable dismissiveness toward

those most vulnerable to the devastating impacts of climate change. In one op-ed he warned that "a 20-foot rise in sea levels… would inundate about 16,000 square miles of coastline, where more than 400 million people currently live." An alarming fact. But Lomborg couldn't quit while he was ahead. He continued: "That's a lot of people, to be sure, but hardly all of mankind. In fact, it amounts to less than 6% of the world's population—which is to say that 94% of the population would not be inundated."[47]

Conservatives apparently now study Lomborg's talking points. This type of "big picture" thinking cropped up again in the middle of the coronavirus crisis of early 2020. Take, for example, right-wing Wisconsin senator Ron Johnson's message to his constituents over the Trump administration's failure to take meaningful actions in the early stages of the pandemic. "Right now, all people are hearing about are the deaths," Johnson complained. "Sure the deaths are horrific," he conceded, but "the flip side of this is the vast majority of people who get coronavirus do survive." He cheerily added that, in the end, the coronavirus would kill "no more than 3.4 percent of our population."[48] What's a few hundred million people among friends, after all, Bjorn/Ron?

When it comes to the plight of the poor, I must confess that my own bias is to take Pope Francis more seriously than Bjorn Lomborg. And the pope has rejected the energy-poverty myth, pointing out that distributed, renewable energy in the form of solar power and hydropower is far more practical than fossil fuel use in most of the developing world.[49] Even the fossil-fuel-friendly *Wall Street Journal* has acknowledged as much, noting that "renewable energy could offer a… solution for remote areas, because it is created and consumed in the same region and doesn't require massive power plants and hundreds of kilometers of power lines."[50] If you've lost the *Wall Street Journal*, Bjorn, well…

There is an even deeper problem, of course, with the premise that climate action detracts from the concerns of the poor. As Pope Francis emphasized in his papal encyclical on the environment, climate change *aggravates* other societal challenges—food, water and land scarcity, health, and national and international security. The US Department of Defense agrees.[51] The irony of the energy-poverty myth is that climate-change impacts will actually place far more people in poverty than are in poverty

today. In a scenario of climate collapse, there *is* no economy. Don't take my word for it, though. A World Bank study from 2015 concluded that climate change could "thrust 100 million into deep poverty by 2030." Even Fox News reported it.[52]

## IT'S THE JOBS, STUPID!

Another tactic the inactivists use is to scare people into thinking that climate action and renewable energy will take away their jobs. A group connected to the Koch Foundation that calls itself Power the Future has sought to blame Tom Steyer—a climate activist and philanthropist, and perhaps not coincidentally, from the standpoint of being an eligible boogeyman, a Jewish billionaire—for the steady, decades-long decline of the coal industry and the demise of coal communities across America. The organization has even attempted to brand collapsing coal towns as "Steyervilles." Their "proof" is the fact that Steyer's philanthropic spending has increased as coal jobs have decreased—not exactly the sort of iron-clad argument that would pass muster in the peer-reviewed literature, or the pages of a reputable newspaper, or even a fortune-cookie fortune.[53]

Yes, coal jobs are disappearing. And there are now far more jobs in the burgeoning renewable energy industry (hundreds of thousands in solar alone) than there are in the dying coal industry (which currently has less than fifty thousand coal-mining jobs).[54] But these job losses have more to do with increased mechanization and automation of coal mining and competition from cheaper fossil fuels (namely, natural gas) than they do with competition from renewable energy, let alone climate activism itself.

Despite job retraining programs and other efforts to help those displaced by the demise of coal, there are inevitably those—especially older workers—who will encounter difficulty finding subsequent employment. Labor leaders representing the energy sector, such as James Slevin, president of the Utility Workers Union of America, have thus argued that climate policies must include measures to help coal workers and their families by providing financial support for their health plans, pensions, and educational opportunities.[55]

Technological transitions are never easy, and there are always winners

and losers. But it is no more appropriate to blame the renewable energy industry for lost coal jobs than it is to blame the fossil fuel industry for destroying the whaling industry, which provided much of the lamp oil that was replaced by kerosene and then coal-powered electrical lighting.

## ET TU, MICHAEL MOORE?

File this one under the category of "with friends like this…" None other than liberal icon Michael Moore has now joined the ranks of the renewable energy bashers. Working with director Jeff Gibbs, his longtime collaborator on left-of-center polemics like the anti-NRA *Bowling for Columbine* and the anti-Bush, anti–Iraq War film *Fahrenheit 9/11*, Moore, in his 2020 film *Planet of the Humans* (*POTH*), has promoted a full-on assault on renewable energy. Though Gibbs directed the documentary, Moore put the full weight of his celebrity into the project, doing the talk-show circuit and flacking the film like next month's rent depended on it.[56]

*POTH* had no sooner been screened at film festivals when the negative reviews started to come in.[57] The film, in fact, proved to be so toxic that Moore couldn't get a major distributor to adopt the film. Nor would Netflix or any other major streaming platform show it. So he ended up posting it for free on YouTube on Earth Day 2020, as if his intention were to launch a hand grenade that would produce maximum collateral damage to action on climate.[58]

The fatal flaws in the film, enumerated in excruciating detail by a number of energy and climate experts, comprise a laundry list of deceptive facts and bad-faith arguments.[59] They include: (1) the misleading use of data, photographs, and interviews that are a decade old to dramatically overstate the limitations of renewable energy and understate the efficiency and capacity of current-day renewable energy sources and storage technology; (2) complaints that a still largely fossil-fuel-driven electricity grid is used in the construction of solar panels and wind turbines, without noting that the life-cycle carbon emissions are tiny compared to either coal or gas, and that decarbonization of the grid is precisely what the renewable energy transition is about; and (3) grossly inflated estimates of the carbon footprint of biofuels and biomass (which is tiny compared to that of fossil

fuels), while failing to note that biomass accounts for only 2 percent of domestic electricity generation (though Moore and Gibbs spend about 50 percent of the film complaining about it).[60]

The film, disappointingly, promotes the sorts of myths about renewable energy that one expects to hear on Fox News rather than in a Michael Moore–produced film. For example, it decries electric vehicles as not being green because they're fueled off the grid, which is still driven substantially by fossil fuel energy. But this argument neglects the fact that a fundamental component of any meaningful green energy transition is the electrification of transport in concert with the *decarbonization of the electric grid*.[61] To focus on the former without acknowledging the latter is to entirely miss the point, unintentionally or otherwise.

We are treated once again to the now familiar crocodile tears over the ostensible horrible environmental impacts of renewable energy—the large tracts of land required for solar and wind farms, the reliance on mining for metals used in solar panels, and so on. It's odd that Michael Moore seems far more concerned by fields dotted with wind turbines and solar panels than by his newfound concern about climate change. Shortly after the release of the film, he tweeted that "the public knows we're losing the climate battle, thanks to profit & greed & leaders who led us wrong."[62] First of all, we're not "losing the climate battle." As we will see later, substantial progress is now being made. And while profit and greed are certainly part of the problem, so, too, are misguided attacks on renewable energy and the false prophets who bear them. Which brings us back to Michael Moore and Jeff Gibbs.

They are shocked, for example, to learn that the United States gets some of its renewable energy from the burning of biomass (mostly, organic refuse). But in what stands out as a blatant untruth in an already a gratuitously error-ridden film, they claim that power generation from biomass exceeds that of solar and wind. The actual numbers indicate just the opposite, with biomass providing only 1.4 percent and solar and wind providing 9.1 percent of total power generation.[63] Adding insult to injury, they repeat the outrageously misleading claim that "biomass releases 50 percent more carbon dioxide than coal and more than three times as much as natural gas." The erroneous claim is the by-product of the very same bad

math we encountered in an earlier chapter with the 2014 film *Cowspiracy*.

*Cowspiracy*, as readers may recall, falsely asserted that livestock are responsible for 51 percent of carbon emissions. This figure is based on bad accounting coupled with poor scientific understanding. The scriptwriters appear to have been unaware of the simple fact that the carbon produced by cows when they exhale (in the form of carbon dioxide, through what we call "respiration") comes from consumed plant matter that had extracted the carbon from the atmosphere in the first place (through the process of "photosynthesis"). When cows, or any animals—including us—exhale, we're not adding net carbon dioxide to the atmosphere, we're simply helping circulate the carbon through the atmosphere/biosphere system.[64] The actual contribution of livestock to carbon emissions comes from entirely different processes: fermentation, manure management, feed production, and energy consumption. Cows do also belch *methane*, which is itself a potent greenhouse gas, but its lifetime in the atmosphere is much shorter than that of $CO_2$. The true net contribution to carbon emissions from livestock (15 percent), curiously enough, corresponds to a simple reversal of the two digits in the number (51 percent) cited in *Cowspiracy*.

Moore and Gibbs make essentially the same error in *POTH*, failing to inform their audience that the carbon dioxide produced by burning biomass (with the exception of old-growth forests) is carbon dioxide that recently came from the atmosphere anyway. Biomass is therefore largely "carbon neutral"—far from perfect when we are trying to reduce the amount of carbon in the atmosphere, but still better than releasing $CO_2$ from the Carboniferous era, as we do when we burn coal or gas. Burning biomass itself doesn't increase carbon dioxide levels in the atmosphere. There are, of course, some carbon emissions associated with processing and transportation, and that's simply a result of the fact that much of our basic infrastructure still relies upon a fossil-fuel-energy economy—a fact that is less true every day as a *result* of the renewable energy revolution! But the carbon emissions are tiny—about ten grams of carbon pollution per kilowatt-hour. For comparison, natural gas yields about five hundred grams and coal nine hundred grams per kilowatt-hour! Much as animal rights activists have overstated the role of meat-eating in climate change to advance their (admittedly worthy) agenda of decreasing meat consumption,

so, too, have some forest preservation activists overstated their (admittedly worthy) goal of stopping deforestation.[65]

It's important to get the facts right. The wood chips used in biomass are generally a by-product of already-existing forestry practices, not the result of cutting down trees for fuel as some imply. And biomass is a broad category. While we certainly shouldn't be turning forests into wood chips for burning, it does make sense to burn some forms of organic waste, which can provide a near carbon-neutral source of energy, while we transition to cleaner renewable energy.

*POTH* reinforces so many of the tropes we've encountered that it almost serves as a poster child for the new climate war. One challenge we face in this new war on climate action is, as we saw in the previous chapter, the wedge that has emerged within the climate movement itself when it comes to market-driven climate solutions. Moore and Gibbs attempt to pry that wedge wide open. The fact that wind and solar energy are increasingly profitable is somehow an indication, to them, that they're "bad." In the words of the editorial board of the *Las Vegas Review-Journal*, Moore seems "particularly aghast to discover that… any transition to green energy will require massive investment from evil industrialists and capitalists who might turn a profit. Who knew?"[66]

So heroes become villains—and villains, ironically, become heroes. Climate champion Bill McKibben is vilified for having once, long ago, supported the limited use of biomass energy.[67] Al Gore is attacked for supposedly being "more focused on cashing in than saving the planet."[68] (Couldn't a similar argument be made about Michael Moore and his $50 million net worth?[69]) Moore and Gibbs were apparently "shocked to find a company owned by Charles and David Koch receiving solar tax credits." Now, there are *many* reasons to dislike the Koch brothers—but the fact that they invested in solar energy is not one of them. Only in the Trumpian era of gaslighting could a progressive filmmaker produce a polemic premised on the absurd notion that ultra-right-wing plutocrats are secretly behind the effort to end our dependence on fossil fuels. And get progressives to actually fall for it.

Then there is defeatism and despair-mongering (a topic we'll explore in detail in Chapter 8). As *The Guardian* put it, "most chillingly of all, Gibbs

at one stage of the film appears to suggest that there is no cure for any of this, that, just as humans are mortal, so the species itself is staring its own mortality in the face."[70] Writing for *Films for Action*, an award-winning longtime environmental filmmaker, Neal Livingston, had an even harsher critique: "SHAME on these filmmakers for making a film like this, full of misinformation and disinformation, to intentionally depress audiences, and make them think there are no alternatives.… Let me make it absolutely clear that the new documentary, *Planet of the Humans*, by Jeff Gibbs—with executive producer Michael Moore, is inaccurate, misleading and designed to depress you into doing nothing."[71] Doomism and the loss of hope can lead people down the very same path of inaction as outright denial. And Michael Moore plays right into it.

Then there is the classic deflection of the sort we've encountered before. Technically, Moore and Gibbs do advance one "solution." Rather than focusing on the systemic source of the problem—our reliance on fossil fuels, they deflect attention toward individual behavior, which, as we have seen, is a classic new-climate-war tactic. The twist here is that it's all about the behavior of *others*. Environmental author Ketan Joshi remarks that Moore "ends up at population control—a cruel, evil and racist ideology that you can see coming right from the start of the film."[72] Brian Kahn, writing in *Earther*, noted, "Over the course of the movie, [Gibbs] interviews a cast of mostly white experts who are mostly men to make that case.… There's a reason that Breitbart and other conservative voices aligned with climate denial and fossil fuel companies have taken a shine to the film. It's because it ignores the solution of holding power to account and sounds like a racist dog whistle."[73] It is worth noting, by the way, that people in the developing world, where the main population growth is taking place, have a tiny carbon footprint in comparison with those in the industrial world. The world's richest 10 percent produce half of global carbon emissions.[74] The problem isn't so much "too many people" as it is "too many people who burn a lot of carbon." As environmental sociologist Grant Samms put it, Moore and Gibbs spend the entire film oscillating between "ecological nihilism and ecological fascism."[75]

Conservative foundations and media outlets, on the other hand, loved Moore's film. And it wasn't just Breitbart News that was "full of gratitude

and admiration that they should have made this bold, brave documentary."[76] Fossil-fuel-funded groups like the Competitive Enterprise Institute and the Heartland Institute (and their payed attack-dog Anthony Watts) lapped it up.[77] CEI encouraged people to "Hurry, see *Planet of the Humans* before it's banned," while the Heartland Institute promoted the film in a podcast series.[78] Watts advertised it as an "Earth Day Epic," linking to it directly on his blog.[79] Industry-funded denier-for-hire Steve Milloy insisted that "EU politicians should be forced to watch Michael Moore's *Planet of the Humans*… with their eyes clamped open if necessary."[80] Other fossil-fuel-industry shills, including Marc Morano of the Committee for a Constructive Tomorrow (CFACT), promoted the film and attacked its critics on Twitter, which also became a predictable venue for manufactured outrage by right-wing trollbots.[81] And yes, even the Koch brothers got in on some of the action. An anti-renewables Koch brothers front group known as the American Energy Alliance spent thousands of dollars promoting the film.[82]

We are left, in the end, to wonder why Michael Moore ever produced this film. Politics can make for strange bedfellows. Moore was a huge supporter of Bernie Sanders during his campaign for president. Sanders made his support for the Green New Deal a centerpiece of his platform, and the GND, at its core, supports renewable energy. But Moore has also been a supporter of Julian Assange for years.[83] The WikiLeaks leader has collaborated closely with Russia in its efforts to attack climate science and undermine action on climate. Moreover, Moore has been a longtime advocate for blue-collar workers and the unionization movement, beginning with his breakout 1989 film *Roger and Me*, which denounced General Motors' crackdown on union workers. It is hardly unprecedented for the labor left to find itself in conflict with the environmental left. Recall from Chapter 5 that the general secretary of the GMB trade union, Tim Roache, warned that climate action would lead to the "confiscation of petrol cars," "state rationing of meat," and "limiting families to one flight for every five years," placing "entire industries and the jobs they produced in peril."[84]

Does Moore see decarbonization of our economy as a threat to workers? Had Moore struck a secret deal with the fossil fuel industry? Or had he simply lost his mind? Had the Trump presidency somehow caused him to "flip"? Or did Moore simply care more about being provocative than about

being right? With his most successful films now more than a decade behind him and his relevance increasingly in question, was he simply looking for a dramatic way to attach himself to the defining issue of the day? Once a polemicist, after all, always a polemicist.

Maybe this is simply a manifestation of what environmental journalist Emily Atkin has referred to as the phenomenon of "first-time climate dudes."[85] It's the tendency for members of a particular, privileged demographic group (primarily middle-aged, almost exclusively white men) to think they can just swoop in, surf the Internet, interview a few hand-selected "experts," and solve the great problems that others have spent decades unable to crack. It is almost inevitable that the product, in the end, is a hot mess, consisting of fatally bad takes and misguided framing couched in deeply condescending mansplaining. On climate change, we've seen it with Bill Gates, *FiveThirtyEight*'s Nate Silver, and now with Michael Moore.[86]

The fact is that we may never know the motives behind this ill-premised, intellectually dishonest stunt by Michael Moore and Jeff Gibbs. What we *do* know is that their misguided polemic furthers the agenda of fossil fuel interests and their tactic of denial, delay, distraction, and deflection by buying into misleading and false narratives about renewable energy. It appears they will go down in history as having ironically sided with wealthy, powerful polluters, rather than "the people" they purport to care about, in the defining battle of our time.

## "YOU'RE NOT GONNA HAVE IT!"

Finally, when all other arguments fail, we're left with "Well—it just won't work. You can't do it!" Inactivists in fact twist themselves into veritable pretzels to explain why there's no way we can possibly power our economy with renewable energy. There are fundamental obstacles, they say. Intermittency! Insufficient batteries!

Yes, the wind isn't always blowing, and the sun isn't always shining. And batteries don't have infinite storage capacity. But these challenges are, if you will forgive the pun, overblown. Smart grid technology that adaptively combines various renewable energy sources can overcome these

limitations—not in the future, but right now. Utility-scale "big battery" systems like those produced now by Tesla are outperforming and outcompeting fossil fuel generators in providing grid stability to blackout-prone regions like South Australia.[87]

Peer-reviewed research demonstrates authoritatively that even without any technological innovation—that is, using current renewable energy and energy-storage technology—we could meet up to 80 percent of global energy demand by 2030 and 100 percent by 2050. This would be accomplished through increased energy efficiency, electrification of all energy sectors, and decarbonization of the grid through a mix of generation sources, including residential rooftop solar and solar plants, onshore and offshore wind farms, wave energy, geothermal energy, and hydroelectric and tidal energy. The precise mix of technologies would depend on the location, season, and time of day.[88] Sorry, Bill Gates, but we don't "need a miracle."[89] The solution is already here. We just need to deploy it rapidly and at a massive scale. It all comes down to political will and economic incentives.

A renewable energy transition would create millions of new jobs, stabilize energy prices in the absence of fuel costs, reduce power disruption, and increase access to energy by decentralizing power generation.[90] But that's not what we hear from Koch-funded groups like the Heartland Institute. Instead we get supposed experts like coal-industry shill and climate-change denier David Wojick penning pieces with titles like "Providing 100 Percent Energy from Renewable Sources Is Impossible."[91] In dismissing the viability of a renewable energy transition, Wojick engages in a classic game of denial bingo, harping on the ostensible fatal problems of "intermittency" (largely already solved, as discussed earlier), "scalability" (that's simply a matter of government incentives—the very incentives that Wojick's bosses, the Kochs, have worked so hard to game in favor of the fossil fuel industry and against renewable energy), and "expense" (he grossly overestimates battery storage costs; ignores that there are multiple storage options aside from batteries, like pumped-storage hydroelectric power; and pretends that places like Colorado have no sun).

Wojick ends by offering us some revisionist history, dismissing as "false claims" the dramatic success stories that have been told of towns and

municipalities that have already transitioned to 100 percent renewable energy. Pay no attention to Greensburg, Kansas—the town that was leveled by an EF5 tornado and rebuilt 100 percent renewable by its conservative Republican mayor.[92] Really, it doesn't exist! Fake news! The critics have gone beyond denial of climate change to denial of reality itself.

Speaking of denial of reality, let's again talk about Fox News and its take on solar energy in the United States. In a 2013 segment attacking the Obama administration's support for renewable energy, Fox News host Gretchen Carlson questioned Fox business reporter Shibani Joshi on why solar power was so much more successful in Germany than in the United States. "What was Germany doing correct?" Carlson asked. "Are they just a smaller country, and that made it more feasible?" Carl Sagan surely rolled over in his grave after hearing the response: "They're a smaller country," Joshi said, "*and they've got lots of sun. Right? They've got a lot more sun than we do*" (emphasis added). Perhaps sensing she had just said something absurd, Joshi doubled down in an effort to explain herself. "The problem is it's a cloudy day and it's raining, *you're not gonna have it*" (emphasis added). Conceding that California actually gets just a bit of sunlight now and then, she elaborated, "Here on the East Coast, it's just not going to work."[93]

Of course, it's only in the mythological universe of Fox News where the East Coast of the United States gets less sun than Germany. As Media Matters pointed out in its response to the segment, estimates from the US Department of Energy National Renewable Energy Laboratory (NREL) show that nearly the entire continental United States gets more sun on average than even the most sun-laden regions of Germany.[94] In fact, as one NREL scientist pointed out, "Germany's solar resource is akin to Alaska's." (Alaska receives by far the least average sunlight of any US state.[95]) But, returning to Carlson's original question: What's the real reason that German's solar industry is doing so much better than the solar industry in the United States? Simple: It doesn't have Fox News, the rest of the Murdoch media, the Koch brothers, and fossil fuel interests all joining forces to destroy it.

## FALSE SOLUTIONS

We have seen that there is a dual attack underway by inactivists in the form of efforts to both block carbon pricing and blunt or at least slow the renewable energy transition now underway. Fight back. When you encounter myths about the supposed environmental threat of wind turbines and solar panels, push back against them. Correct the misinformation. If you have friends or family or colleagues who have been taken in by the crocodile tears, hand them a handkerchief and explain to them they've been had. When someone cites "energy poverty" or "lost jobs" as arguments against renewable energy, point out that the opposite is true: the safest and healthiest path to economic development in the third world is access to clean, decentralized, renewable energy, and the greatest opportunity for job growth in the energy industry comes with renewables, not fossil fuels.

But also be prepared for the next line of attack: There is yearning now among the public for a meaningful climate solution. If it's not renewable energy, it must be something else. So inactivists seek to fill that void with reassuring, plausible-sounding alternative "solutions" that do not pose a threat to the fossil fuel juggernaut. And they have done so by introducing a new, seemingly empowering lexicon: "geoengineering," "clean coal," "bridge fuels," "adaptation," "resilience." Welcome to our next chapter—the *non-solution solution*.

CHAPTER 7

# The Non-Solution Solution

> It is a wholesome and necessary thing for us to turn again to the earth and in the contemplation of her beauties to know the sense of wonder and humility.
>
> —Rachel Carson

> When I am working on a problem, I never think about beauty but when I have finished, if the solution is not beautiful, I know it is wrong.
>
> —R. Buckminster Fuller

The inactivists have sought to hijack actual climate progress by promoting "solutions" (natural gas, carbon capture, geoengineering) that aren't real solutions at all. Part of their strategy is using soothing words and terms—"bridge fuels," "clean coal," "adaptation," "resilience"—that convey the illusion of action but, in context, are empty promises. This gambit provides plausible deniability: inactivists can claim to have offered *solutions*. Just not good ones. They are delay tactics intended to forestall meaningful action while the fossil fuel industry continues to make windfall profits—what noted climate advocate Alex Steffen has referred to as "predatory delay."[1] It is essential that we recognize and expose these efforts for the sham they are, for the clock is ticking. We cannot afford any further delay when it comes to the climate crisis.

## A BRIDGE TO NOWHERE

Let me sell you a bridge to a fossil-fuel-free future. Beware of a bait-and-switch, however, for it is actually a bridge to nowhere. It's called natural gas, a naturally occurring gas composed primarily of methane—the same methane that, as we learned earlier, is belched by cows, contributing to greenhouse gas emissions. This particular source of methane isn't biogenic, however. It is a fossil fuel formed from ancient organic matter—plants and animals that died and were buried beneath Earth's surface millions of years ago. They eventually made it down deep into Earth's crust, where, subjected to great pressure and heating, they eventually turned into an admixture of hydrocarbon molecules residing in either the solid, liquid, or gaseous state (coal, oil, or natural gas, respectively). Like other hydrocarbons, natural gas is energy rich, and it is readily burned for heating, cooking, or electricity generation. Or it can be cooled into a liquid (liquefied natural gas, or LNG) that can be used as a fuel for transportation.

Natural gas reservoirs can be found in sedimentary basins around the world, from Saudi Arabia to Venezuela to the Gulf of Mexico, from Montana and the Dakotas to the Marcellus Shale spanning the Appalachian Basin. That includes my home state of Pennsylvania, where the discovery of extensive natural gas deposits has led to an explosion in natural gas drilling over the past decade and a half. Pennsylvania is now responsible for more than 20 percent of all the natural gas produced in the United States.

The fracking boom has generated billions of dollars in revenue for the state. It has also generated a heated debate, forgive the pun, about the role Pennsylvania should be playing in expanding fossil fuel extraction at a time when we are increasingly dealing with the negative impacts of climate change (and that's not even accounting for the other serious potential environmental threats from natural gas extraction, including the impact of fracking chemicals on the safety of water supplies).[2]

The debate is playing out over an increasingly large stage. Australia's natural gas boom is threatening its agreed-upon carbon emissions targets.[3] Indeed, before the devastating bushfires of the summer of 2019/2020 had even ended, Australia's conservative, pro-fossil-fuel prime minister, Scott Morrison, had eagerly announced a $2 billion plan to boost the domestic natural gas industry.[4] The tragic irony was apparently lost on him.

The Trump administration, meanwhile, heavily promoted natural gas in

the United States, attempting to improve its image by rebranding it as "freedom gas."[5] The implication that it will somehow help spread freedom evokes propaganda campaigns from days of yore. The tobacco industry used the phrase "Torches of Freedom" in the early twentieth century in an effort to encourage women to smoke, convincing them it was a source of empowerment during the first wave of feminism in the United States.[6]

Natural gas has often been characterized as a bridge fuel, a way to slowly wean us off more carbon-intensive fuels like coal and gently nudge us toward a renewable energy future. The rationale is that, nominally, natural gas produces about as half as much carbon dioxide as coal for each watt of power generated. Indeed, the "coal to gas switch," as it's called, is partly responsible for the flattening of global carbon emissions as natural gas displaces more carbon-intensive coal. In the United States, for example, it has been tied to a 16 percent decrease in carbon emissions from the power sector during the 2007–2014 period.[7]

What is unique about natural gas among fossil fuels, however, is that it is not only a fossil fuel. It's also a greenhouse gas. In fact, methane is nearly one hundred times more potent as a greenhouse gas than carbon dioxide on a twenty-year time frame.[8] That means it can cause warming not only when we burn it for energy, and it releases carbon dioxide, but when the methane itself escapes into the atmosphere. The process of hydraulic fracturing, or fracking, that is used to break up the bedrock to get at natural gas deposits inevitably allows some of the methane to escape directly into the atmosphere (what's known as "fugitive methane").

The Obama administration sought to limit fugitive methane emissions by requiring natural gas interests to curb methane releases from drilling operations, pipelines, and storage facilities. The Trump administration disbanded these regulations, claiming it would save industry millions of dollars.[9]

The rest of us pay the price. Research from 2020 has demonstrated that the spike in atmospheric methane levels in recent decades is coming from natural gas extraction (as opposed to farming and livestock, or natural sources such as peat bogs and melting permafrost).[10] Moreover, the rise in methane is responsible for as much as 25 percent of the warming during this period.[11] Connecting the dots, it is reasonable to say that fugitive methane

emissions from fracking are contributing substantially to warming—enough that they may well offset, at least in the near term, the nominal decrease in carbon dioxide emissions from the coal-to-gas switch.

There are other problems with the bridge-fuel framing. Perhaps the most obvious is that we don't have decades to get this right. If we are to avert warming beyond the 1.5°C (2.7°F) danger limit, we've got *one decade* to decrease global carbon emissions by a factor of two.[12] That's a very short bridge. And increased use of natural gas for power generation is likely to crowd out investment in a true, zero-carbon solution in the power sector: renewable energy. Ultimately, the predicament with natural gas is that the solution to a problem created by fossil fuels cannot be a fossil fuel.

## UNCLEAN COAL

Why not just gather the carbon dioxide released from coal burning at a coal-fired power plant before it makes it to the atmosphere? Then contain it, burying it somewhere beneath Earth's surface (or below the ocean floor)? There's a name for that—it's called carbon capture and sequestration, or CCS, and it's already being implemented.

As I first drafted the paragraph above, the TV was on in the background. Playing was an ExxonMobil commercial promoting CCS. The advertisement conjured an enticing vision of technology overcoming our problems: coal power without carbon pollution—at last, the promise of "clean coal"! Problem solved, right? Not quite. There are in reality a number of fundamental problems with the feasibility, cost, and reliability of CCS.

With CCS, typically, the carbon dioxide released during the burning of coal is scrubbed from emissions and captured, compressed, and liquefied. It is then pumped deep into the Earth, several kilometers beneath the surface, where it is reacted with porous igneous rocks to form limestone. This approach mimics the geological processes that bury carbon dioxide on geological time scales and provides a potential means of long-term geological sequestration of carbon dioxide.

The first full-scale proof of concept for CCS was built in Illinois. Called FutureGen, it was designed to provide data about efficiency, residual

emissions, and other matters that would enable scientists to evaluate CCS performance. If CCS were to be deployed commercially at a larger scale in the future, that data would be vital. The project was funded by an alliance of the US Department of Energy and coal producers, users, and distributors. It was ultimately canceled in 2015 as a result of difficulties acquiring public funds.[13] Other CCS projects followed, however, including the large-footprint Petra Nova project in Texas.

Despite its failure, FutureGen did provide some useful insights into the viability of CCS. The scientists involved in the project estimated that they could bury roughly 1.3 million tons of carbon dioxide annually, equivalent to roughly 90 percent of the carbon emitted by the plant's coal burning.[14] But the FutureGen site was chosen in part for its favorability, as it is located above geological formations that are suited to carbon sequestration. This might not be true for many existing coal-burning sites.

The Global CCS Institute reports that there are today fifty-one CCS facilities globally in some stage of development that plan to capture nearly 100 million tons of carbon dioxide per year. (Nineteen facilities are currently in operation, and another thirty-two are either under construction or in development.) Of these, eight are in the United States.[15]

CCS might sound like a foolproof way to mitigate coal-based greenhouse emissions, but there are real questions about its scalability. It simply isn't feasible to bury the *billions* of tons per year of carbon pollution currently produced by coal burning. Many coal-fired power plants are not located at CCS-favorable sites. Moreover, given unforeseen factors, such as earthquakes and seismic activity, or groundwater flow, the efficacy of CCS in any particular location could be compromised. Carelessly sequestered carbon could easily end up becoming mobilized and belched back into the atmosphere.

Economically there is a problem as well. Coal is currently not competitive with other forms of energy in the marketplace. It is, as we have already seen, a dying industry. Requiring that coal plants capture and sequester their carbon will only make it more expensive and hasten the collapse of the industry. Unless, of course, government (that is, taxpayers like you and me) pays for it. In that case, we would be subsidizing dirty energy that still carries climate risk, rather than the cheaper, clean energy

that can mitigate it, a true perversion of the economic incentive structure.

Finally, there is the more fundamental limitation that CCS is not even carbon neutral in the best of circumstances. Even if the 90 percent rate of sequestration estimated by FutureGen scientists is correct, and representative more generally of CCS, that would mean that 10 percent of the carbon dioxide would still escape to the atmosphere. CCS-equipped coal-fired power plants would continue to emit tens of millions of tons of carbon dioxide every year. Moreover, most of the carbon dioxide that is captured in CCS is placed into tapped oil wells for enhanced oil recovery. The oil that is recovered, when burned, yields several times as much carbon dioxide as was sequestered in the first place by CCS. So much for carbon-friendliness!

Despite all the talk these days about "clean coal technology," such technology—in the sense of coal-based energy that is free of polluting greenhouse gases—does not yet exist. Until data from experimental sites have been collected and studied, a process that would take years, it will be unclear how much carbon dioxide is actually being sequestered by CCS. It could be decades before the efficacy of true long-term carbon burial could be established. Yet, we have seen that even a decade of additional business-as-usual greenhouse gas emissions could commit us to catastrophic climate change. As Michael Barnard, chief strategist for TFIE Strategy, Inc., a think tank focused on clean energy solutions, aptly put it, "we're in a hole that we've created by shoveling carbon out of the ground and into the sky. The first thing to do is stop shoveling. All CCS does is take teaspoons out of massive scoops of carbon and puts them back in the hole."[16]

CCS is attractive to fossil fuel companies, as it provides them with a license to continue extracting and selling fossil fuels. It is anathema to climate activists, however, because its claim to carbon neutrality is dubious. CCS, unsurprisingly, has been at the very center of the policy debate surrounding the Green New Deal.

Readers may recall from Chapter 5 a letter signed by leading environmental organizations proposing a particular version of AOC's Green New Deal warning that the groups "will vigorously oppose any legislation that… promotes corporate schemes that place profits over community burdens and benefits, *including market-based mechanisms… such as*

*carbon and emissions trading and offsets*."[17] What was obscured by those ellipses was the additional inclusion in the blacklist of "carbon capture and storage" (as well as "nuclear power" and "waste-to-energy and biomass energy"). Such overly restrictive language appears to have kept a number of prominent mainstream environmental organizations, including the Sierra Club, the Audubon Society, and the Environmental Defense Fund from signing the letter.[18]

One prominent group that *did* sign the letter, however, was the Sunrise Movement, the youth-led activist group that came to prominence in late 2018. It was in the news in particular over its efforts to pressure House Majority Leader Nancy Pelosi (D-CA) into creating a committee to draft a Green New Deal. Sunrise demanded that any potential plan must fund "massive investment in the drawdown and capture of greenhouse gases," which would seem to conflict with the restrictive language about carbon capture in the letter they had signed. But Sunrise now omits "capture," speaking only of the "drawdown of greenhouse gases," which would seem to indicate support for natural drawdown via reforestation and regenerative agriculture, but, by omission, not CCS.[19]

James Temple, senior editor for energy at the centrist *MIT Technology Review*, took issue with the environmentalists' letter in a piece he penned titled "Let's Keep the Green New Deal Grounded in Science." Temple argued that the sort of "rapid and aggressive action" the letter claims is necessary to avert the dangerous warming of 1.5°C (2.7°F) is likely incompatible with policies that take key options like carbon capture off the table.[20]

What has emerged here is a battle between climate progressives and climate moderates on the role of industry and market-driven mechanisms. And while my assessment of the science and economics leads me to side with climate moderates on the merit of climate pricing, for reasons outlined previously, I tend to side with the progressives on the dubious merit of CCS schemes for all the reasons discussed above (with the possible exception of currently difficult-to-decarbonize sectors like cement production).

## GEOENGINEERING, OR "WHAT COULD POSSIBLY GO WRONG?"

So, if "clean coal" and natural gas "bridge fuels" aren't the solution, is there some other way we can engineer our way out of the climate crisis? Perhaps we should consider *geoengineering*—schemes that employ global-scale technological intervention with the planet in the hope of offsetting the warming effects of carbon pollution.

Many of these proposed schemes sound like they're taken right out of science fiction. And as with science fiction films, bad things tend to happen when we start tampering with Mother Nature. We might not get a planet run by apes, giant fire-breathing dinosaurs, or institutionalized cannibalism, but we could get worse droughts, more rapid ice-sheet melt, or any number of unpleasant surprises. When it comes to a system we don't understand perfectly, the principle of unintended consequences reigns supreme. If we screw up this planet with botched geoengineering attempts, there is no "do over." And, as they say, "there is no planet B."

Consider, for example, proposals to shoot reflective particulates—sulfate aerosols—into the stable upper part of the atmosphere known as the stratosphere, where they would reside for years. This human-produced effect would mimic the way volcanic eruptions cool the planet. An explosive tropical volcanic eruption can put enough reflective sulfate particles into the stratosphere to cool the planet for a while. (The Mount Pinatubo eruption of 1991 in the Philippines, for example, cooled the planet by 0.6°C [1°F] for about fifteen months.)[21]

This scheme has the *advantage* of being feasible. It would use custom-designed cannons to fire substantial amounts of sulfate aerosols into the stratosphere, easily as much as was released during the Pinatubo eruption. Doing the math, all it would take is a Pinatubo-size injection of particles every few years to offset the current warming effect of carbon emissions. It would also be relatively cheap to do (compared to other means of mitigation).[22]

The scheme has the distinct *disadvantage*, however, of potential major adverse climate side effects. First of all, we would get a very different climate from the one we're used to. The spatial pattern of the geoengineering-induced cooling isn't the mirror image of the pattern of greenhouse gas warming. That's because the physics is different. In the former case, we're reducing the incident sunlight, while in the latter case,

we're blocking the escape of heat energy from Earth's surface. Those effects have very different spatial patterns. On average, the globe may not warm under the sulfate aerosol plan, but some regions would cool while others warmed. Indeed, some regions would likely end up warming even faster than they would have without the geoengineering. We could conceivably end up, for example, accelerating the destabilization of the West Antarctic or Greenland ice sheet and speeding up global sea-level rise. Climate model simulations indicate that the continents would potentially get drier, worsening droughts.[23]

There are other potentially nasty environmental side effects as well. It was, after all, the production of sulfur dioxide and the resulting sulfate aerosols in the lower atmosphere from coal-fired power plants that gave us the acid rain problem in the 1960s and 1970s, prior to passage of the clean air acts. The sulfate particles from geoengineering would be higher up—in the stratosphere—but they would ultimately still make it down to the surface, where they would acidify rivers and lakes. And then there's the "ozone hole." Though it has mostly recovered, there are enough ozone-depleting chemicals still in the stratosphere that, with the extra kick they would get from the injected sulfate aerosols, we would likely see continued destruction of the protective ozone layer.

As with any "cover-up" approach to climate change that doesn't deal with the root cause of the problem (continued carbon emissions), carbon dioxide would continue to build up in both the atmosphere and the ocean. The problem of ocean acidification, sometimes called "global warming's evil twin," would continue to get worse, further threatening the world's coral reefs and calcareous sea life such as shellfish and mollusks and wreaking havoc on ocean food chains.

Sulfate aerosol geoengineering is a Faustian bargain: it would require us to continue to inject sulfate aerosols into the stratosphere while carbon dioxide continued to accumulate in the atmosphere. Were there a major war, a plague, an asteroid collision, or anything else that might interfere with the regular required schedule of sulfate injections, the cooling effect would disappear within a few years. We would experience decades' worth of greenhouse warming in a matter of years, giving new meaning to the concept of "abrupt climate change."

One of the cruelest ironies of all with this prospective technofix is that it would likely render *less* viable one of the most important and safest of climate solutions: solar power. The sulfate aerosols would reduce the amount of sunlight reaching Earth's surface that is available to produce solar energy, making the already tough challenge of weaning ourselves off the fossil fuels at the root of the climate-change problem even more difficult.

Another widely discussed geoengineering scheme is ocean iron fertilization. Over much of the world's oceans, iron is the primary limiting nutrient for algae, or phytoplankton, which take up carbon dioxide when they photosynthesize. It is therefore possible to generate phytoplankton blooms by sprinkling iron dust into the ocean, which in turn metabolizes carbon dioxide. When the phytoplankton die, they tend to sink to the ocean bottom, burying their carbon with them.

One of the advantages of ocean iron fertilization is that it is solving the problem at its source, taking carbon out of the atmosphere. That means it also prevents the worsening of ocean acidification. It's an example of what is termed "negative emissions technology"—it actually takes carbon *out of* the atmosphere. The idea is appealing enough that a number of companies tried to commercialize the scheme more than a decade ago. One company even sold carbon credits, promising to bury a ton of carbon dioxide for only $5, a bargain for any organization or company seeking to lower its carbon footprint.

Subsequent experiments, however, showed that the scheme doesn't really work. Iron fertilization leads to more vigorous cycling of carbon in the upper ocean, but no apparent increase in deep carbon burial, which means no permanent removal of atmospheric carbon. To make matters worse, studies showed that it could actually favor harmful "red tide" algae blooms that create oceanic dead zones. Lacking evidence of efficacy, and with growing concern about unintended consequences, support for iron fertilization geoengineering has dissipated.[24]

Sticking with this theme, though, might there be other negative emissions technology that could be implemented safely and cost effectively? Trees do it, after all. They take carbon out of the atmosphere as they photosynthesize, and they store it in their trunks, branches, and leaves.

Then they bury carbon in the ground, in their roots, and in the leaf and branch litter that falls and gets deposited onto the forest floor and buried in the soil.

Perhaps we can learn from the trees. Maybe even improve upon them. Trees, after all, don't do a perfect carbon burial job. Like us, they respire—putting carbon dioxide back into the atmosphere. And when they die and decompose, some of their carbon escapes back to the atmosphere. It's part of the long-term balance of the terrestrial carbon cycle.

We might try to make a more perfect (from a climate standpoint) "tree"—a tree that takes carbon out of the air more efficiently than regular trees and doesn't give any of it back to the atmosphere. Rather than dying and decomposing, synthetic trees (with "leaves" treated with sodium carbonate) could turn the carbon they extract from the atmosphere into baking soda, which can be buried for the long term. Such a scheme has not only been suggested by scientists, but its viability has already been demonstrated through proof-of-concept trials. It is calculated that an array of ten million synthetic trees around the world could take up a significant chunk, perhaps as much as 10 percent, of our current carbon emissions.[25] But this so-called direct air capture would be difficult and expensive to do, perhaps costing more than $500 per ton of carbon removed. A related approach that has been suggested recently, which involves atmospheric $CO_2$ removal through the artificial enhancement of weathering by rocks, might be less expensive—somewhere in the range of $50 to $200 per ton of carbon. But its proponents concede that it could remove, at the very most, only about two billion tons of carbon dioxide per year, a veritable drop in the bucket compared with current carbon emissions.[26]

These limitations mean that at present, it is far easier and cheaper to prevent the buildup of carbon dioxide in the atmosphere in the first place, by limiting fossil fuel burning. But the cost of this direct air capture could be brought down substantially with additional research and through the economies of scale of mass production. And if, after doing everything possible to reduce our carbon emissions, we still find ourselves headed toward catastrophic warming, we might need a stopgap solution.

Of all of the geoengineering schemes, direct air capture seems the safest and most efficacious. Unlike CCS, which continues our reliance on fossil

fuels, this form of carbon burial could, along with natural reforestation (discussed later), be an important component of broader efforts to "draw down" carbon from the atmosphere, a strategy that arguably belongs in any comprehensive climate abatement program. But since we're only talking about 10 percent, at most, of current carbon emissions, it is obvious this cannot be a primary strategy for mitigation.

People have suggested many other schemes, from putting reflective mirrors in space to seeding low clouds over the oceans. All of them are fraught with political and ethical complications. For one, who gets to set the global thermostat? For low-lying island nations, current carbon dioxide levels are already too high—their people are already threatened with the loss of their land and their rich cultural heritages by the several feet of sea-level rise that is likely baked in. While the industrial world debates whether we can still avoid dangerous warming of 1.5 or 2°C (2.7 or 3.6°F), dangerous warming is already here for many. Some might want to set the thermostat at a lower temperature than others. Who gets to make the decision?

One could easily imagine a whole new form of global conflict wherein rogue states employ geoengineering to control the climate in a way that is optimal for themselves. A climate model simulation might show, for example, that sulfate aerosol injection could relieve the drought that plagues a particular nation. Yet, it would do so at the expense of causing a drought elsewhere. The perpetual conflict in the Middle East has arguably always been fundamentally about access to scarce freshwater resources.[27] Would geoengineering provide yet another weapon to fuel this ongoing battle?

A fundamental problem with geoengineering is that it presents what is known as a moral hazard, namely, a scenario in which one party (e.g., the fossil fuel industry) promotes actions that are risky for another party (e.g., the rest of us), but seemingly advantageous to itself. Geoengineering provides a potential crutch for beneficiaries of our continued dependence on fossil fuels. Why threaten our economy with draconian regulations on carbon when we have a cheap alternative? The two main problems with that argument are that (1) climate change poses a far greater threat to our economy than decarbonization, and (2) geoengineering is hardly cheap—it comes with great potential harm.

But despite the caveats, disadvantages, and risks, geoengineering has proven to be appealing to fossil fuel interests and those advocating for them.[28] They can have their cake and eat it too, claiming to support a putative climate "solution," but one that poses no threat to the fossil fuel business model. A 2019 report on geoengineering by the Center for International Environmental Law (CIEL) explains how "the most heavily promoted strategies for carbon dioxide removal and solar radiation modification depend on the continued production and combustion of carbon-intensive fuels for their viability." CIEL noted that "the hypothetical promise of future geoengineering is already being used by major fossil fuel producers to justify the continued production and use of oil, gas, and coal for decades to come."[29]

Geoengineering also appeals to free-market conservatives, as it plays to the notion that market-driven technological innovation can solve any problem without governmental intervention or regulation. A price on carbon, or incentives for renewable energy? Too difficult and risky! Engaging in a massive, uncontrolled experiment in a desperate effort to somehow offset the effects of global warming? Perfect!

It is thoroughly unsurprising, for example, that someone with as much skin in the carbon game as Rex Tillerson, former CEO of the world's largest fossil fuel company, ExxonMobil, has argued that climate change is "just an engineering problem."[30] Nor is it surprising that some of the now familiar inactivist players, such as Bjorn Lomborg and the Breakthrough Institute, have promoted geoengineering as a primary means of climate mitigation.[31]

Perhaps more eye-opening, though, is the fact that business magnates like former Microsoft CEO Bill Gates have embraced the concept. Writing in *Fortune*, journalist Marc Gunther reported that "Gates has been convinced that the risk of global warming is worse than most people think. He can see that the world's governments have failed to curb the emissions caused by burning coal, oil, and natural gas.… So the Microsoft billionaire and philanthropist has stepped into the breach to become the world's leading funder of research into geoengineering—deliberate, large-scale interventions in the earth's climate system intended to prevent climate change and its repercussions."

Gates gave millions of dollars to two climate scientists, David Keith of

Harvard University and Ken Caldeira of Stanford University, to perform research and engage in experimentation with geoengineering. That includes relatively safe direct air capture but also potentially harmful stratospheric sulfate aerosol injection.[32] Perhaps relevant, in their *Guardian* commentary "The Fossil Fuel Industry's Invisible Colonization of Academia," Benjamin Franta and Geoffrey Supran singled out these two centers of geoengineering research—Stanford and Harvard—as exemplars of how "corporate capture of academic research by the fossil fuel industry is an elephant in the room and a threat to tackling climate change."[33]

Harvard's Keith has "done as much as any single researcher to push the touchy topic of geoengineering toward the scientific mainstream," according to James Temple of *Technology Review*.[34] Keith is affiliated with the Breakthrough Institute and a signatory of the "Ecomodernist Manifesto," a techno-optimist, pseudo-environmentalist polemic that *Guardian* columnist George Monbiot characterized as "generalisations,… ignorance of history,… unexplored prejudices… an astonishing lack of depth," and a "worldview that is, paradoxically, nothing if not old-fashioned."[35] Keith helps lead a for-profit venture financed by Bill Gates to implement geoengineering and is currently planning to do real-world experimentation testing the viability of sulfate aerosol stratospheric injection.[36]

Keith spearheaded a 2019 study of the ostensible impact of sulfate aerosol geoengineering on the global climate, which included a modeling experiment to simulate the effects.[37] He took to Twitter to promote his team's findings, claiming he and coauthors had demonstrated that "no region is made worse off" by solar geoengineering. Other leading climate scientists contested that claim. Chris Colose, a climate researcher at the NASA Goddard Institute for Space Studies, pointed out that the modeling experiment is a bit of a bait-and-switch: "They don't actually put aerosols in the atmosphere. They turn down the Sun to mimic geoengineering. You might think that is relatively unimportant… [but] controlling the Sun is effectively a perfect knob. We know almost precisely how a reduction in solar flux will project onto the energy balance of a planet. Aerosol-climate interactions are much more complex." Colose went on to point out the numerous other ways in which the modeling experiment they had done was

a gross idealization of actual real-world implementation of their geoengineering scheme, emphasizing a number of the well-established flaws and caveats that we encountered earlier in our discussion of sulfate aerosol geoengineering.[38]

Ken Caldeira, the other of the two Gates-funded geoengineering scientists (who has now left his position at Stanford to work directly for Bill Gates), later weighed in, asserting, "The evidence is that solar geoengineering would be expected to reduce climate damage."[39] Again, many leading climate scientists begged to differ. Climate researcher Daniel Swain from the University of California at Los Angeles weighed in that he finds it "strange" that the regional details of climate model simulations are "taken pretty literally" in these idealized geoengineering experiments, "but are subject to huge caveats otherwise," adding that while there's "lots of evidence" that sulfate aerosol geoengineering would indeed reduce the global average temperature, "that's not all that matters!"[40] Jon Foley, executive director of Project Drawdown, added that relying on such idealized experiments is "a big gamble, especially when models have a hard time" reproducing detailed temperature patterns.[41] Matthew Huber, a leading climate researcher at Purdue University, expressed two concerns: whether humans could properly administer the highly structured geoengineering protocol required, and whether the models are reliable enough to capture some of the potential surprises that might be in store.[42]

One gets the distinct feeling that scientists like Keith and Caldeira suffer from some degree of hubris when it comes to leaping from the results of their highly idealized modeling experiments to sweeping conclusions about the real world. One also gets the feeling that their attitude toward real-world geoengineering potentially crosses the line from dispassionate inquiry to advocacy. As a scientist, that's okay as long as you're up front about it. I've argued as much in the *New York Times*.[43] But both of them seem uncomfortable acknowledging that they're engaged in advocacy. I can speak to this directly. Keith and Caldeira each responded rather defensively to a tweet of mine in which I stated that many "geoengineering *advocates*… see geoengineering as an excuse for continued business-as-usual burning of fossil fuels" (emphasis added).[44] At the time, I was bemused by the fact that they thought the tweet was directed at them (it wasn't), and I wondered

aloud whether they *do* indeed consider themselves to be "geoengineering advocates." Each equivocated, drawing a distinction between advocacy for research and advocacy for implementation.[45] I would argue that their words and actions blur any such distinctions.

Finally, let's discuss the role here of climate *doomism*, a topic we will explore in depth in the next chapter. Geoengineering advocates have increasingly found common cause with climate-change doomsayers—those who believe that the situation is now so dire that truly desperate action is required, or that we're beyond the point where any effective action is possible.

Such misguided framing was beautifully captured in a December 2019 *Washington Post* op-ed, "Climate Politics Is a Dead End. So the World Could Turn to This Desperate Final Gambit."[46] In it the author, Francisco Toro, a Venezuelan political commentator, promotes a bleak climate policy outlook, articulating the view of some climate activists "that only a drastic push toward net-zero carbon emissions can save the world. But… the politics to achieve this don't exist." As an example he cites "the events of the past decade, including the failure of the climate conference in Madrid [COP25 in 2019]."

Toro then uses this defeatist narrative to justify the implementation of potentially dangerous geoengineering schemes ("Yes, a geoengineered future may be scary. But unchecked climate change is absolutely terrifying. And attempts to prevent it aren't working"). No inactivist polemic would be complete without deflection and a free pass for polluting interests ("Climate activists typically blame the failure to cut emissions on greedy corporations and crooked politicians.… The regrettable reality is that people around the world demand cheap energy"). He misleadingly invokes the "Yellow Vest" protests as evidence that people will "punish leaders who threaten their access to it."

This commentary exemplifies how climate doomism is being exploited to support dangerous technofixes that might be favored by polluters but could leave us worse off. It demonstrates the deep hypocrisy of polluting interests and the inactivists doing their bidding, who first sabotage climate negotiations like those in Madrid, and then proclaim that the *failure* of those negotiations is grounds for their proposed "solution" (geoengineering

technofixes).[47]

The fundamental problem with geoengineering, in the end, is that tinkering with a complex system we don't fully understand entails monumental risk. Geoengineering expert Alan Robock of Rutgers University believes that geoengineering is too risky to ever try. "Should we trust the only planet known to have intelligent life to this complicated technical system?" Robock wondered. "We don't know what we don't know."[48] The CIEL report discussed earlier notes "the stark contrast between the… narrative that geoengineering is a morally necessary adjunct to dramatic climate action" and the reality that geoengineering is "simply a way of avoiding or reducing the need for true systemic change, even as converging science and technologies demonstrate that shift is both urgently needed and increasingly feasible." It highlights, furthermore, "the growing incoherence of advocating for reliance on speculative and risky geoengineering technologies in the face of mounting evidence that addressing the climate crisis is less about technology than about political will."[49]

## GREENING THE PLANET

We've seen that one type of geoengineering that has been proposed—direct air capture—mimics what trees do naturally by capturing carbon through photosynthesis, storing it in their trunks and limbs, and burying it in their roots and branches and leaf litter. So why not just engage in the massive planting of trees—that is, large-scale reforestation of the vast regions of the planet that have been deforested (or *afforestation*—foresting regions that were previously something else). Such efforts could be supplemented by land use and agricultural practices that sequester additional carbon in soils.

What is appealing about this particular negative emissions option is that it's a "no regrets" path forward. After all, by planting trees we can get better-functioning ecosystems; maintain and even increase biodiversity; improve the quality of our soils, air, and water; and better insulate ourselves from the damaging impacts of climate change. Could efforts to "green the planet" make a major dent in our carbon emissions? Or mitigate them altogether? It's certainly proven to be convenient for some, who, to deflect

attention away from the subject of what polluters should be doing, present "tree planting" as the solution and treat it as evidence of bold action on climate. Hence Donald Trump's "politically safe new climate plan" (promoted originally by some of his Republican congressional colleagues) of supporting efforts to plant hundreds of millions of new trees.[50] Is there actually merit to the suggestion?

Let's take a look at the prospects for reforestation and afforestation. One study claimed that an additional 0.9 billion hectares of the planet's surface is available for this purpose. That translates to billions of new trees that collectively could capture just over 200 billion tons of carbon over the next couple of decades.[51] That's a rate of carbon sequestration of roughly 11 billion tons of carbon dioxide per year. Other scientists have questioned the assumptions of the study and argued for much lower levels of potential carbon sequestration. In fact, the most recent IPCC report (2019) estimated that roughly only 60 billion tons of carbon dioxide could be sequestered through reforestation by the end of the century, which translates to less than 1 billion tons of carbon dioxide per year.[52] Nonetheless, let us, for the sake of argument, accept the much higher 11 billion number.

Regenerative agriculture based on recycling farm waste and using composted materials from other sources, combined with land use practices that enhance soil carbon sequestration, could potentially bury somewhere in the range of 3.5 to 11 billion tons of carbon dioxide emissions per year. Let us once again take the very optimistic upper limit of 11 billion tons per year.

Adding together these contributions gives us 22 billion tons of carbon dioxide per year. That sounds like quite a bit, but we are currently generating the equivalent of roughly 55 billion tons per year of carbon dioxide through fossil fuel burning and other human activities.[53] That means that even if we accepted estimates from the very upper limits of the uncertainty range, the combined effect of reforestation and agriculture and land use practices would at most only slow the buildup of carbon dioxide in the atmosphere by a factor of 44 percent. In other words, atmospheric carbon dioxide levels would continue to rise, just at a rate that is roughly half as fast.

That estimate, of course, is overly optimistic. We cannot ignore the

massive demands on available land of 7.7 billion (and growing) people competing for space for settlement, agriculture, and livestock. When real-world economic constraints are taken into account, the actual land area available for reforestation may be only about 30 percent of the technically available land area assumed in the recent study.[54]

Climate change itself, furthermore, is likely to diminish the ability of forests to sequester carbon. The bushfires in the summer of 2019/2020 doubled Australia's total carbon emissions in the year that followed and were likely to cause a 1 to 2 percent increase in global carbon dioxide concentrations.[55] And Australia is not the only place that is burning. Wildfires taking place from the Amazon to the Arctic are releasing billions of tons of carbon dioxide a year.[56] A study reported in 2020 in the journal *Nature* demonstrated that the peak carbon uptake by tropical forests occurred during the 1990s and has declined ever since as a result of logging, farming, and the effects of climate change. The authors found that the Amazon could go from a sink (a net absorber of carbon) to a source (a net producer of carbon) within the next decade, which is decades ahead of schedule based on former climate model predictions.[57]

Such findings underscore one of the potential pitfalls of relying upon reforestation as a primary means of climate mitigation (or, for that matter, as the basis for carbon offsets or credits). Any carbon that is sequestered could easily be lost, perhaps in rapid bursts, because of forest burning. Ironically, the problem becomes worse as the planet continues to warm and conditions become more conducive to massive forest burning.

Moreover, as with geoengineering, there are potential unintended consequences. The coauthor of a recent government report on forest carbon burial told the BBC that "we would be crazy to undertake the massive scale of planting being considered if we did not also consider the wider effects upon the environment including impacts on wildlife, benefits in terms of reducing flood risks and effects on water quality, improvements to recreation and so on." The report noted that careless tree planting, ironically, could actually lead to increased carbon emissions. As the BBC noted, "carpeting upland pastures with trees would reduce the UK's ability to produce meat—which may lead to increasing imports from places that produce beef by felling rainforests."[58]

Finally, no discussion of natural carbon drawdown is complete without addressing proposals for using biomass for energy followed by the capture and sequestration of any carbon dioxide produced. This is known as "bioenergy with carbon capture and storage," or BECCS. The IPCC has emphasized this technology in its scenarios for stabilizing carbon dioxide concentrations that assume zero total effective emissions within a matter of decades. The IPCC does this by relying upon the presumption that BECCS can actually yield negative carbon emissions, which would offset some residual fossil fuel burning and other carbon-generating practices to achieve the needed zero net emissions.

How could this work? Readers may recall from the previous chapter Michael Moore's false claim, in his film *Planet of the Humans*, that "biomass releases 50 percent more carbon dioxide than coal and more than three times as much as natural gas." In reality, biofuels (neglecting the fossil fuel energy that might be used in processing and transportation) are carbon neutral, having taken as much carbon dioxide out of the atmosphere when they were plant matter as they release when they're burned. They are therefore far more carbon-friendly than fossil fuels, yielding energy with little or no carbon pollution. In fact, they can—in a sense—be made even *more carbon-friendly than renewables*, providing energy and drawing down carbon from the atmosphere *at the same time*.

This might seem like it violates some law of physics, but it doesn't. The idea is that you burn the biofuels to get energy as you would coal or natural gas. The process, as we have explained, is carbon neutral to start. Now, if you capture the carbon dioxide and bury it, then you're doing even better than carbon neutrality—you're actually drawing down carbon that came from the atmosphere and capturing and burying it. Of course, all of the concerns we encountered previously with carbon sequestration in the context of coal or natural gas apply here as well—namely, you have to be able to bury it efficiently, safely, and effectively permanently, and that's not easy to do. Moreover, as we already saw with CCS, capture is unlikely to be complete, so some of the carbon does make it back into the atmosphere.

As alluded to earlier, negative emissions technologies—and particularly BECCS—are assumed in the various IPCC emissions scenarios or "pathways," including those that allow us to stay below critical warming thresholds such as 1.5 or 2.0°C (2.7 or 3.6°F). Given the fact that BECCS

has not yet been demonstrated to be commercially viable at the scale assumed in these scenarios, the IPCC could rightly be criticized for, in essence, "kicking the can down the road"—putting forth scenarios that allow substantial near-term carbon emissions and still avert dangerous planetary warming only by assuming massive negative emissions in future decades using currently unproven technology. What if that technology does not emerge? The "Faustian bargain" again rears its head.[59]

## THE NUCLEAR OPTION

All reasonable options should be on the table as we debate how to rapidly decarbonize our economy while continuing to meet society's demand for energy. There is no easy solution, and there are important and worthy debates to be had in the policy arena as to how we accomplish this challenging task.

There is a good-faith argument to be made, for example, that nuclear energy should be part of the solution, and I have colleagues whom I deeply respect who are bullish on the role it might play as part of a comprehensive plan to tackle climate change. I myself remain skeptical that nuclear energy should play a central role in the required clean, green energy transition. Let me explain why.

There are a number of major obstacles, first of all, to safe, plentiful nuclear power. There is the risk of nuclear proliferation, and the danger that fissile materials and weapons-applicable technology could make it into the hands of hostile nations with militaristic intentions or terrorists. There is the challenge of safe long-term disposal of radioactive waste. And there are some profound examples of the acute environmental and human threat posed by nuclear power, most recently highlighted, for example, by the Fukushima Daiichi nuclear disaster north of Tokyo in March 2011.

Hitting closer to home—for me, literally—was the historic Three Mile Island nuclear disaster of March 1979. It took place in my home state of Pennsylvania on a long, narrow island in the Susquehanna River near Harrisburg, less than a hundred miles southeast of the Happy Valley, in which I currently reside. I'm reminded of the incident—a partial meltdown that led to the release of harmful radiation—every time I fly into the

Harrisburg Airport over the plant's eerily iconic cooling towers. (The plant is now closed but not yet decommissioned.)

No means of energy production is without environmental risk, but nuclear power carries with it unique dangers. As noted by Robert Jay Lifton and Naomi Oreskes in a 2019 *Boston Globe* op-ed, improvements in design cannot eliminate the possibility of deadly meltdowns.[60] Nuclear power plants will always be vulnerable to natural hazards such as earthquakes, volcanoes, or tsunamis (like the one that triggered the Fukushima meltdown), or technical failure and human errors (like the ones responsible for Three Mile Island).

Climate change itself, ironically, increases the risk. As Lifton and Oreskes pointed out, extreme droughts have led to reactors being shut down as the surrounding waters become too warm to provide the cooling necessary to convey heat from the reactor core to the steam turbines and remove surplus heat from the steam circuit.[61] Some of my own research has shown that climate change is leading to less reliable flow for the very river —the Susquehanna—that supplied the Three Mile Island nuclear plant with needed cooling water.[62] A similar threat looms for many other active plants.

Some have argued in favor of a role for small modular reactors (SMRs), which, as the name implies, are considerably smaller than the massive reactors in Fukushima or Three Mile Island. They also require less up-front capital, and arguably they allow for better security of nuclear materials. Energy experts, however, have raised serious concerns about SMRs, including "locating sites for multiple reactors, finding water to cool these reactors, and the higher cost of electricity generation."[63] SMRs, in short, are not an obvious nuclear power "magic bullet."

Still others argue that the answer is so-called "next generation" or "generation IV" nuclear power plants, such as molten-salt reactors that automatically cool down when they get too hot, or very-high-temperature reactors (VHTR), which could be coupled to a neighboring hydrogen production facility for significantly reduced cost.[64] But as University of California, Berkeley, energy expert Dan Kammen noted, it "could easily take the advanced nuclear projects 30 years to get through regulatory review, fix the unexpected problems that crop up… and prove that they can compete." In the meantime, we could see a breakthrough in other

technologies, such as electric storage and fusion. Kammen added that while "ultimately on a planet with 10 billion people, some amount of large, convenient, affordable, safe baseload power—like we get from nuclear fission, or fusion—would be just hugely beneficial," there are "other competitors in view on the straight solar side that 10 years ago sounded like science fiction—space-based solar, transparent solar films on every window. That world works, too."[65]

Some would argue that our energy choices amount to balancing different risks. True, nuclear energy has risks, they acknowledge, but they are worth it in the balance. They would say that though nuclear accidents are acute, they are rare. And while the damage can be fatal and long-lasting, it is regionally localized. Compare that to the risks posed by climate change, which are pervasive, global, and slowly but steadily growing. If we are forced into a choice between one risk or the other, a reasonable argument could be made that there's a significant role to be played by nuclear energy. The problem with this argument is that it buys into the fallacy that nuclear power is necessary for us to decarbonize our economy. Although it may well make sense to continue with the operation of *existing* nuclear power plants until they are retired (after twenty to forty years, their typical lifetime), given that the embodied carbon emissions associated with their construction is a "sunken" carbon cost, it makes little sense to build new ones.

As we have already seen, electrification of the various energy sectors in conjunction with decarbonization of the grid can already be achieved using renewables such as residential rooftop solar and solar plants, onshore and offshore wind farms, wave energy, geothermal energy, and hydroelectric and tidal energy. Researchers have shown how these existing renewable energy technologies could be scaled up to meet 80 percent of global energy demand by 2030 and 100 percent by 2050. To those who argue that nuclear is a cheaper option, the numbers indicate otherwise. As Lifton and Oreskes noted, the average nuclear power generating cost is about $100 per megawatt-hour, compared with $50 for solar and $30 to $40 for onshore wind. Renewable energy costs are now competitive with fossil fuels—even with the incentives that are currently skewed against them—and much lower than for nuclear.[66]

So if the math and logic don't obviously favor a nuclear solution, why do advocates fight so fiercely for it? For some, no doubt, it's a matter of principle. As I mentioned earlier, I have colleagues whom I respect deeply who are convinced that nuclear energy is critical to solving the climate crisis.[67] But for many, alas, it appears to be all about ideology and political tribalism. "Hippie punching"—establishing one's conservative bona fides by opposing perceived leftist environmentalists—has become de rigueur, as a common target for attack serves to unite conservatives in the climate arena. Consider, for example, the attacks on global-warming icon and conservative punching bag Al Gore. My friend Bob Inglis, a former Republican congressman from South Carolina, has said, "In my first six years in Congress from 1993 to 1999, I had said that climate change was hooey. I hadn't looked into the science. All I knew was that Al Gore was for it, and therefore I was against it."[68]

Support for nuclear energy has become a shibboleth for conservatives in the climate policy arena. It's easy to understand why. It was the left, after all, that protested nuclear power in the 1970s. While I was growing up in Massachusetts, and protests of the Seabrook nuclear plant were taking place in nearby New Hampshire, it was all granola-crunching tree-huggers, scruffy college students and aging flowerchildren.

"The enemy of my enemy is my friend" might not be a very satisfying explanation for the unusual amount of support for nuclear energy among conservatives, but it's difficult otherwise to explain it. Solar *should be* the preferred solution for conservatives: it can be deployed locally, and if installed privately it can help liberate users from dependency on overly regulated centralized utilities. Meanwhile, nuclear power plants require huge up-front capital investments and are not viable without governmental subsides, so they are hardly the free-market solution conservatives purport to favor.[69] Bob Inglis is of course famous as a conservative climate crusader. He is all about free-market solutions to the climate crisis. He also happens to have a nuanced view of the role of nuclear energy as a climate solution: "It used to be convenient for us as conservatives to blame enviros for why we're not building nuclear power plants," he told a reporter, "but if we update our rhetoric to the actual facts, what we find is it's more a question of economics."[70]

Inglis is the exception to the rule. Conservatives (and "conservative liberals" such as CNN commentator Fareed Zakaria) love big fixes like nuclear energy and geoengineering.[71] What do these "solutions" have in common? They divert resources and attention away from the more obvious solution—renewable energy. Indeed, a cynic might wonder whether some who staunchly advocate for these options are more interested in dampening enthusiasm for a renewable energy revolution than in actually solving the climate problem. The Breakthrough Institute promotes both nuclear energy and geoengineering. So do the "ecomodernists."[72] Former Democratic presidential candidate Andrew Yang promoted nuclear energy and geoengineering as well, as he sought, during his campaign, to thread the needle of maintaining credibility on climate while courting conservative Democrats.[73]

## "ADAPTATION" AND "RESILIENCE"

The last refuge of the false solutionists is the language of "adaptation" and "resilience." That is not to say that both aren't important—they are. We have no choice but to adapt to those climate-change impacts that are now inevitable, and we need to establish greater resilience in the face of the heightened climate risk that already exists. The Global Commission on Adaptation, for example, has recommended pursuing five key areas of climate-change adaptation over the next decade: early warning systems, climate-resilient infrastructure, altered agricultural practices, protection of coastal mangrove ecosystems, and more resilient water resource management.[74]

But much as exclusive focus on individual action has been used in a deflection campaign to undermine systemic change, exclusive focus on adaptation and resilience has become a favored tactic of inactivists. It's another way of sounding like one is taking proactive steps to address the climate crisis while enabling business-as-usual burning of fossil fuels and the continued profits that go with it.

We see this language in the messaging of Republicans who are still trying to navigate a course between flat-out denial and indefinite delay. Consider Republican senator Marco Rubio of Florida, the state arguably

most on the frontlines of climate-change impacts. In August 2018, he wrote an opinion piece in *USA Today* citing innovation and adaptation as the key to combating climate change.[75] In it, he insisted that the impacts of sea-level rise could be managed through restoration of the Everglades. Costly projects aimed at slowing the encroachment by the ocean of Florida's coastline might buy some of the wealthier communities some time, but, as a colleague and I responded in a commentary, without the ability to move to higher ground, coastal populations will become increasingly vulnerable to frequent flooding and toxic floodwaters, and coastal tourism and industry will suffer.[76]

There is no way to engineer our way out of sea-level rise. If we continue to emit carbon, warm the oceans, and melt the ice sheets, the oceans will ultimately prevail in this battle between humans and nature.

In early 2019, after Democrats had taken back the House of Representatives, there was both good news and bad news when it came to the Republican stance on climate. The good news was that Republicans were no longer contesting the basic scientific evidence—they'd finally, it seems, given hard denial a rest. The bad news was that they were still promoting inaction, only this time dressed up in the language of "innovation," "conservation," and "adaptation."[77]

The Republican approach to climate change resembled a person trying to fix a leak in his ceiling with buckets, towels, and mops, but no mention of repair or a handyman. As the *Washington Post*'s Steven Mufson reported in early 2020, "the GOP is still hammering out details, but some critics say the new Republican approach to climate change looks a lot like the old one. In addition to [proposals to plant] trees, senior Republicans are said to be considering tax breaks for research, curbs on plastic waste and big federally funded infrastructure projects in the name of *adaptation* or *resilience*. The already well-worn buzzword '*innovation*' will be their rallying cry, and natural gas, despite its carbon emissions, will be embraced" (emphasis added).[78] What's missing here? Any discussion of carbon emissions, fossil fuels, or renewable energy.

A week later, Republicans on the House Energy and Commerce Committee, Greg Walden of Oregon, Fred Upton of Michigan, and John Shimkus of Illinois, wrote an op-ed in which they acknowledged that

"climate change is real," adding that they "are focused on solutions."[79] Their commentary predictably emphasized the belief that "America's approach for tackling climate change should be built upon the principles of *innovation*, *conservation*, and *adaptation*" (emphasis added). They promoted the usual conservative favorites of carbon capture and nuclear power. And where they mentioned renewable energy, they emphasized research and innovation with regard to clean energy technologies, batteries, and storage. There was no discussion about actual *deployment* of renewable energy or market mechanisms—such as incentives for renewables or a price on carbon—that might level the playing field and enable the rapid transition away from fossil fuels necessary to avoid a crisis.

This phenomenon is not unique to the United States. In Australia, with the massive shift in public sentiment that took place in the aftermath of the historic bushfires of summer 2019/2020, there was a grudging acceptance by conservatives of the climate threat.[80] Former deputy prime minister and National Party leader Barnaby Joyce, who had previously gone to great lengths to deny climate change, conceded in a *60 Minutes* special on the Australian bushfires (in which we were both co-panelists) not only that "the climate is changing," but that the bushfires were a consequence of climate change.[81] Even climate-change-denying columnist Andrew Bolt of the Murdoch-owned *Herald Sun* has now admitted the reality of human-caused climate change.[82]

Unfortunately, in spite of this grudging acceptance of the problem, there is no will in the current Australian government to do anything about it other than promoting "adaptation" and "resilience."[83] Such framing has been front and center in the messaging of Australia's fossil-fuel-industry-coddling prime minister, Scott Morrison. When it comes to the record heat and drought that Australia has experienced, the collapse of major river systems (such as the Murray-Darling) that provide critical freshwater resources, the death spiral of the Great Barrier Reef, catastrophic flooding events, and unprecedented, widespread, intense, fast-spreading bushfires, the solution, Morrison seems to think, is simply to "build… resilience for the future."[84] That policy was satirically summarized as "get fucken used to it" in a mock governmental public service announcement produced by Juice Media of Melbourne that went viral in early February 2020.[85]

It's important once again to recognize that resilience does play a role. There is no doubt that the communities, individuals, and brave firefighters who battled the devastating Australian bushfires displayed remarkable resilience, courage, and fortitude, not only in fighting the fires but in dealing with the resulting death, loss, and destruction. But the political discourse of "resilience" does them—and indeed, everyone else—a disservice. In emphasizing "adaptation" and "resilience," Morrison was engaged in a rhetorical, rather than substantive, response, both to the immediate crisis of the bushfires and to the longer-term underlying crisis of human-caused climate change. The community-wide anger that resulted was therefore understandable.

The Morrison government had neglected a previous request by fire chiefs that would have funded a fleet of water-bombing aircraft—precisely the sort of equipment needed in the face of worsening firestorms.[86] When it came to action, all the Morrison government could muster were hasty, reactive announcements of government funding initiatives to deal with the bushfire crisis after it was already underway.[87]

Those actions amounted to political spin aimed at distracting the public from the serious conversation that is needed, not only about the underlying cause of the unprecedented extreme weather disasters, but about the need to decarbonize our economies. For Australia, dangerous climate change has arguably *already* arrived at roughly 1°C (1.8°F) of warming, and dramatic reductions in carbon emissions are necessary to avoid double that much warming. Yet, in the wake of the epic bushfires, Morrison announced a $2 billion plan to promote natural gas while his coalition partners were busy advocating for new coal-fired power stations. They also wanted to open new export-oriented coal basins.[88]

In the rhetoric that fossil-fuel-promoting politicians typically use in the aftermath of climate-change-fueled disasters, we encounter another form of deflection. Talk of reducing carbon emissions, blocking new fossil fuel infrastructure, and embracing renewable energy remain off limits. Instead, those defending the fossil fuel hegemony display a softer form of denial. Don't worry about mitigation and decarbonization, we'll just adapt to the "new normal." Perhaps we'll evolve to develop gills and fins. And fireproof skin. The onslaught of damaging extreme weather events in Australia and

around the rest of the world reminds us that there are limits to adaptation and resilience in a rapidly warming world. There is no amount of resilience or adaptation that will be adequate if we fail to get off fossil fuels.

## REAL CLIMATE SOLUTIONS …

A viable path forward on climate, as we have seen, involves a combination of energy efficiency, electrification, and decarbonization of the grid through an array of complementary renewable energy sources. The problem is that fossil fuel interests lose out in that scenario, and so they have used their immense wealth and influence to stymie any efforts to move in that direction. These interests, and those advocating for them, have attempted to deflect attention from these real climate solutions, promoting in their place ostensible alternatives. Their favored options include supposedly climate-friendly forms of fossil fuel burning, uncontrolled planetary-scale manipulation of the climate, and reliance on technologies such as massive reforestation and nuclear power whose viability as true climate solutions is dubious. Their other favored option is to engage in hollow rhetoric about "adaptation" and "resilience" that neglects the fundamental source of the problem—the burning of fossil fuels.

There are false prophets who promote these non-solutions. They come with progressive-sounding names, like the Breakthrough Institute or the "ecomodernists." But don't be fooled—what they're peddling is business-as-usual dressed up as progress. And don't fall for their crocodile tears over "divisiveness" whenever someone attempts to call out bad-faith efforts to promote false solutions and deflect attention from real ones.

Consider the plaintive lament by ecomodernist Breakthrough Institute affiliate Matthew Nisbet, who wrote that "those specializing in the dark arts of social media 'engagement' have used these platforms to hack our brains, training our focus on conservatives and the evildoings of the fossil fuel industry while the end times loom."[89] Nisbet asks us to accept an alternative reality in which social media, rather than having been exploited by denialists and inactivists, has somehow been gamed *against* them by some shadowy band of environmental activist "dark arts" practitioners. This outrageous claim is perhaps unsurprising coming from Nisbet, given that he

authored a heavily criticized, un-peer-reviewed report some years ago that others have characterized as employing highly questionable accounting to level the rather absurd claim that green groups have outspent fossil fuel interests in the climate propaganda wars.[90]

But what about Nisbet's claim that climate activists might be governed by the fear that "end times loom"? Here he's at least partly right, but for the wrong reason. The false prophets have been successful, at least in part, in convincing some climate activists that desperate measures—like geoengineering—might be called for. Desperate times, after all, call for desperate measures, and there is a growing contingent within the climate movement that buys into a narrative of doom-and-gloom and desperation, a narrative that can, ironically, lead them down the very path of inaction that inactivists have laid out for them. It is the final front in the new climate war, a front that we explore in the next chapter.

CHAPTER 8

# The Truth Is Bad Enough

> The only thing we have to fear is… fear itself—nameless, unreasoning, unjustified terror which paralyzes needed efforts to convert retreat into advance.
>
> —Franklin Delano Roosevelt

> The word "catastrophe" is not permitted as long as there is danger of catastrophe turning to doom.
>
> —Christa Wolf

An objective assessment of the scientific evidence is adequate to motivate immediate and concerted action on climate. There is no need to overstate it. Exaggeration of the climate threat by purveyors of doom—we'll call them "doomists"—is unhelpful at best. Indeed, doomism today arguably poses a greater threat to climate action than outright denial. For if catastrophic warming of the planet were truly inevitable and there were no agency on our part in averting it, why should we do anything? Doomism potentially leads us down the same path of inaction as outright denial of the threat. Exaggerated claims and hyperbole, moreover, play into efforts by deniers and delayers to discredit the science, posing further obstacles to action.

## DANGER IS HERE

There is no one well-defined threshold that defines dangerous human

interference with our climate. There is no cliff that we fall off at 1.5°C (2.7°F) warming or 2°C (3.6°F) warming. A far better analogy is that we're walking out onto a minefield, and the farther we go, the greater the risk. Conversely, the sooner we cease our forward lurch, the better off we are.

Dangerous climate change has in fact already arrived for many: for Puerto Rico, which was devastated by an unprecedented Category 5 hurricane with Maria in September 2017; for low-lying island nations like Tuvalu and coastal cities like Miami and Venice, which are already facing inundation by rising seas; for the Amazon, which has seen massive forest burning and climate-change-induced drought; for the Arctic, too, which has seen unprecedented wildfires in recent years; and for California, which has experienced unprecedented death and destruction from wildfires that now occur year-round. And those are just a few examples. The United States, Canada, Europe, and Japan have collectively witnessed unusually persistent, damaging weather extremes in recent years. Africa has been subject to drought, floods, and plagues of locusts. Australia has witnessed virtually every possible form of weather and climate disaster in recent years. And the list goes on.

We often hear that climate change is a "threat multiplier" when it comes to conflict, national security, and defense, for it heightens the competition that already exists over critical resources—food, water, space. But that framing applies equally to other domains, including human health. As I was writing this paragraph in the isolation of my sabbatical residence in Sydney in mid-March 2020, overlooking a serene Pacific Ocean that took my mind off the ever-worsening coronavirus (COVID-19) pandemic rapidly spreading outside the confines of my apartment, I couldn't help but think about the lessons the crisis might offer us. Our infrastructure is already burdened by climate-related challenges. Australia hadn't yet recovered from the catastrophic weather disasters of the 2019/2020 austral summer. Along comes yet another assault on its basic societal infrastructure. Soon any capacity to cope and adapt is exceeded. I was forced to cut my sabbatical short and head back to the States. Things were even worse there.

So yes, it's fair to say that dangerous climate change has already arrived and it's simply a matter, at this point, of how bad we're willing to let it get. While climate-change deniers, delayers, and deflectors love to point to scientific uncertainty as justification for inaction, uncertainty is not our

friend here. It is cause to take even more concerted action. We already know that projections historically have been too optimistic about the rates of ice-sheet collapse and sea-level rise.[1] They also appear to be underestimating the incidence and severity of extreme weather events.[2] The consequences of doing nothing grow by the day. The time to act is now.

Recognizing that dangerous climate change is here already is, in an odd way, empowering. For there is no "danger" target to worry about missing. It is too late to prevent harmful impacts—they're already here. *But how much* additional danger we encounter is largely up to us. There is agency in the actions we take. The latest science tells us that, to a good approximation, how much the surface of the planet warms is a function of how much carbon we've burned up until that point. It is our decision-making henceforth that will determine how much additional warming and climate change we get (with some important exceptions we'll discuss later).

It is for this reason that a "carbon budget" is a meaningful notion. We can only burn a finite amount of carbon to avoid 1.5°C warming. And if we exceed that budget, which seems quite possible at this point, there is still a budget for avoiding 2°C warming. Every bit of additional carbon we burn makes things worse. But conversely, every bit of carbon we *avoid* burning prevents additional damage. There is both urgency and agency.

There is a role for voicing concern. It is important to recognize the risks of unmitigated climate change, including the potential for unpleasant surprises. We must consider worst-case scenarios when assessing our vulnerability, particularly given the fact that we have historically underestimated the rate and magnitude of key climate-change impacts. It is appropriate to criticize those who downplay the threat.

But there is *also* a danger in overstating the threat in a way that presents the problem as unsolvable, feeding into a sense of doom, inevitability, and hopelessness. Some seem to think that people need to be shocked and frightened to get them to engage with climate change. But research shows that the most motivating emotions are worry, interest, and hope.[3] Importantly, fear does not motivate, and appealing to it is often counterproductive, as it tends to distance people from the problem, leading them to disengage from, doubt, or even dismiss it.

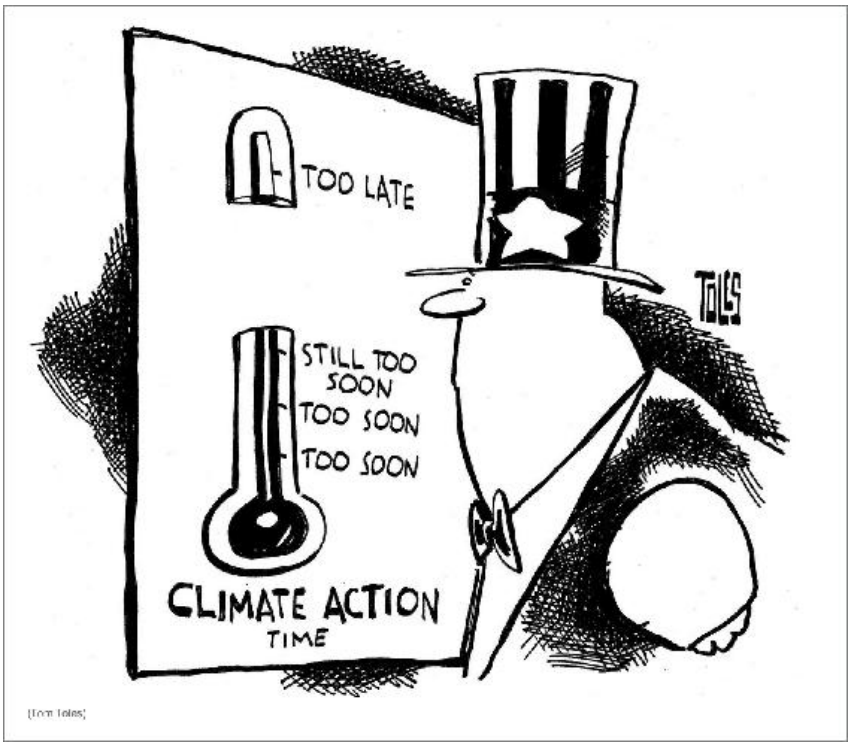
Max Boycoff of the University of Colorado is a recognized leader in the

study of climate messaging. He has argued that "if there isn't some semblance of hope or ways people can change the current state of affairs, people feel less motivated to try to address the problems." Boycoff has a T-shirt (inspired by the work of climate communication expert Ed Maibach of George Mason University) that reads: "It's real; it's us; experts agree; it's bad; there's hope."[4] Note once again the carefully calibrated balance of urgency ("it's bad") and agency ("there's hope").

## DOOMISM

On one hand, inactivists—as we have seen—attempt to downplay the threat of climate change, or even argue that it will be "good for us." Consider Bjorn Lomborg, who, as you'll recall, glibly writes off the displacement of nearly half a billion people by sea-level rise as "less than 6% of the world's population."[5] Or consider the pleadings of Trump's former EPA administrator (and Koch brothers lackey) Scott Pruitt, who infamously claimed that climate change would help "humans flourish."[6] And there's tone-deaf Murdoch media minion Andrew Bolt, who, in the wake of the devastating climate-change-fueled Australian bushfires of the summer of 2019/2020, insisted on the front page of the Melbourne *Herald Sun* that "warming is good for us."[7]

But if the inactivists tend to *understate* the threat from climate change, there is a segment of the climate activist community that not only *overstates* it, but displays a distinct appetite for all-out doomism—portraying climate change not just as a threat that requires urgent response, but as an essentially lost cause, a hopeless fight. From the standpoint of climate action, that's problematic on several levels.[8] First, it provides a useful wedge for inactivists to employ as they attempt to divide climate advocates by raising the very emotional question of whether it is too late to act.




Doomism is a form of "crypto-denialism," or, if you like, "climate nihilism." The boundary between what constitutes denialism and what constitutes nihilism is fuzzy. As clean-tech author Ketan Joshi put it, "Doomism is the new denialism. Doomism is the new fossil fuel profit protectionism. Helplessness is the new message."[9] So it has been stoked by inactivists, primarily because it breeds disengagement.

This is hardly the first time it's been used in that way. In his 2011 book *Winston's War*, British historian Max Hastings made a compelling case that doomist framing was employed rather effectively by isolationists opposed to US involvement in World War II.[10] Hastings described how those opposing US involvement in the war transitioned rapidly from the argument that "our involvement isn't necessary" to the argument that "it's too late for our involvement to make a difference." The parallels with climate inactivism are compelling, and indeed, rather chilling. And the metaphor is worth extending, because it is arguable that what is needed to combat the climate crisis is in fact a World War II–like mobilization effort.

Climate doomism can be paralyzing. As one observer noted, "[climate] doomism has been used as a tool to turn people off action and to pervert election results."[11] That makes it a potentially useful tool for polluting

interests looking to forestall or delay action. With many on the political right already opposed to meaningful climate action for ideological and tribal reasons, doomism provides a means for co-opting those on the left. It's a brilliant strategy for building a truly *bipartisan* coalition for inaction.

It is easy to understand why climate advocates have become somewhat disillusioned. In the space of a few years, we saw the United States go from playing a leading role in international climate negotiations to being the sole nation to renege on its commitment to the 2015 Paris Agreement. It is in this environment that doomism has flourished. Indeed, a September 2019 CBS News poll found that 26 percent of those who don't feel climate change should be addressed cite the belief that there is "nothing we can do about it," a larger percentage than those citing the belief that "it's not happening."[12] Doomism, it seems, now trumps denialism as a cause for inaction.

Doomist thinking has become widespread today even among ostensible environmental advocates. Consider in this vein the words of Morgan Phillips, codirector of The Glacier Trust, a not-for-profit organization that aims "to help communities at altitude adapt to and mitigate climate change."[13] Responding on Facebook to my June 2019 *USA Today* op-ed on the importance of systemic climate solutions, Phillips wrote, "You can't save the climate.… [T]he political, cultural and technological change required is impossible now.… We're very likely in the midst of a mass extinction event.… [I]t looks to me to be far too late to avoid runaway warming now."[14]

There is *no* scientific support whatsoever for such a claim. The state-of-the-art climate model simulations used, for example, in the IPCC's Fifth Assessment Report (2014) provide no support at all for a runaway warming scenario at even 4° or 5°C (7.2° or 9°F), let alone 3°C (5.4°F), which is where current policies (i.e., "business-as-usual") are now likely taking us as we slowly begin to decarbonize the economy.[15] As for "mass extinction," the most comprehensive study to date, published in April 2020 in the premier journal *Nature*, found that less than 2 percent of species assemblages will undergo collapse (what the authors call "abrupt ecological disruption") from climate change if we keep planetary warming below 2°C (3.6°F). The number rises to 15 percent if warming reaches 4°C. That is

certainly very troubling, but it doesn't constitute a "mass extinction" event of the sort that is evident in the geological record.[16]

Now look where these false prophecies of doom lead Phillips. He continued: "There isn't a bottomless pit of resources available to spend on responses… to climate and ecological breakdown. Trade offs [*sic*] need to be made, we have to ask whether we want to spend billions on spurious 'green tech' silver bullets, or billions on disaster risk reduction in the global south." To summarize his argument: (1) there's nothing we can do to prevent catastrophic, "runaway" climate change, and (2) efforts to act will somehow siphon away critical resources from helping people adapt to the inevitable coming apocalypse. So doomism literally undermines his support for climate mitigation.

The flames of doomism are being fanned by polluting interests who don't want to see us change. We must fight back every bit as fiercely as we fight outright climate-change denial. Unsurprisingly, trolls and bots are being used to promote doom and inevitability. Doomist messaging has become omnipresent in my own Twitter feed. Let's consider a couple of particularly salient examples.

Canadian prime minister Justin Trudeau and his administration, as we have seen, have been targeted by trollbots over their implementation of carbon pricing. In response to a fairly anodyne tweet by Trudeau about Canadian governmental priorities, a Twitter user quoted a previous statement by me that "meeting our Paris obligations alone doesn't get us to where we need to be…"[17] An account named "DarleneLily," with a 66 percent Bot Sentinel trollbot score, replied, "*There's no way you can control the planets temperature*. You can't stop other countries from polluting and using up their own natural resources. Truth the world is overpopulated. And *you can't stop the Supreme deity. The world is ending*" (emphasis added).[18] It's perfectly disabling doomist messaging.

A link I posted to my June 2019 *USA Today* op-ed touting the importance of systemic solutions and the dangers of only emphasizing individual behavior triggered doomist troll-like responses.[19] One Twitter user tweeted, "All-out war on climate change made sense only as long as it was winnable. *Once you accept that we've lost it, other kinds of action take on greater meaning*…" (emphasis added).[20] A few days later, the same

person tweeted, "Carbon tax caused yellow vest protests in France. Who can afford to buy a new electric car. #MagicalThinking Too little, too late!"[21] Note the combination of doomist thinking with an effort to undermine agency—the Twitter user both discredited the role of electrification of transportation and invoked the "Yellow Vest" canard that inactivists so often employ to throw damp water on carbon pricing. That's some pretty sophisticated and savvy inactivist messaging.

Doomist social-media messaging is in fact often combined with "both-siderism": that is, there is no hope because both major parties in the United States are equally bad on climate (readers will recall that Russia used this trope to suppress enthusiasm for Democratic candidate Hillary Clinton in the 2016 election). In response to my tweet of a link to Paul Krugman's *New York Times* op-ed titled "The Party That Ruined the Planet: Republican Climate Denial Is Even Scarier Than Trumpism," one user tweeted back, "Obama was literally bragging this year about oil exports at an all time [*sic*] high after his presidency. This is absurd. *Climate denial is absolutely bipartisan*. Frankly, *establishment Democrats are worse because they say it's real and still pursue policies that will kill us all*" (emphasis added).[22] There are countless other examples in my Twitter feed from the past few years of doomist messaging being used to suppress climate activism.

## MESSENGERS OF DOOM

The problem can be as simple as the headline that is chosen by an editor. Consider, for example, the recent *Nature* study cited earlier showing that ecosystem collapse can be avoided by limiting warming to 2°C. On Twitter, the Pulitzer Prize–winning *Inside Climate News* instead said, "A new study warns that climate change will soon lead to massive ecosystem collapse as key species go extinct."[23] Note how agency, unintentionally perhaps, is stolen by not properly contextualizing the claim—namely, by not acknowledging that such a scenario can be avoided through concerted action. I coyly suggested a rewrite of their tag line: "Comprehensive new *Nature* Study Shows that Massive Ecosystem Collapse Can be Averted if Warming is Limited to 2C—Which is Still Possible."[24] The award-winning editor Bruce Boyes of the Australian *KM Magazine* concurred, explaining

that "the reporting can spin science findings into the negative, with headlines that disengage rather than engage."[25] Another observer commented, "Turn away from climate doom and catastrophism, and suddenly a better future seems very possible."[26]

*The New Yorker* might as well be the member newsletter of America's liberal elite. Get a featured article there and you achieve the equivalent, with the progressive intelligentsia, of appearing on the cover of *Rolling Stone*. That's where Jonathan Franzen—known largely as a fiction writer—found himself in September 2019 with one of the most breathtakingly doomist diatribes that has ever graced a magazine's pages. In an article titled "What If We Stopped Pretending? The Climate Apocalypse Is Coming. To Prepare for It, We Need to Admit That We Can't Prevent It," Franzen gave inactivists one of the greatest gifts they've received in years.[27]

The reviews were decidedly negative. Ula Chrobak of *Popular Science* summarized Franzen's thesis thusly: "He's claiming that those advocating for climate action are practically delusional, and that renewable energy projects and high speed trains are futile efforts to stop a planet 'spinning out of control.'"[28] *Climate Nexus* executive director Jeff Nesbit explained that "this sort of 'climate doomism' is as much a trap as 'personal sacrifice' is. Both are clever narrative plots by forces opposed to any real action on climate."[29] Science journalist John Upton opined, "It's hard to imagine major outlets publishing essays declaring efforts to reduce poverty hopeless. Or telling cancer patients to just give up. Yet this Climate Doomist trope flourishes—penned, best I can tell, exclusively by older, comfy white men."[30] End Climate Silence founder Genevieve Guenther, too, was decidedly unimpressed: "This piece is completely incoherent: the apocalypse cannot be stopped due to 'human nature' (so says the white man) but we can endure it.… Jonathan Franzen has no particular authority on climate, and the NYer shouldn't run trash." And Project Drawdown executive director Jon Foley described the article as "a shallow, poorly researched, self-indulgent piece. Probably one of the worst climate pieces I've ever read outside the denier's camp."[31]

The fundamental problem with the article is that it attempts to build a case for doom on a flimsy foundation of distorted science. I can speak to

this directly, because I was contacted by the *New Yorker*'s fact-checkers to evaluate a passage in an earlier draft of the article. The passage read, "To project the rise in the global mean temperature, scientists rely on complicated atmospheric modeling. They take a host of variables and run them through supercomputers to generate, say, ten thousand different simulations for the coming century, in order to make a 'best' prediction of the rise in temperature. What then gets reported in the media isn't the likeliest rise in temperature. It's the lowest temperature that shows up in ninety-three percent of all scenarios. When a scientist predicts a rise of two degrees Celsius, she's merely naming a number about which she's very confident: the rise will be at least two degrees. The likeliest rise is far higher."

I told the fact-checker: "This doesn't look correct to me. When scientists generate an ensemble (spread) of temperature projections, the quantity that is generally communicated is the *average* or *median* warming. There is roughly an equal likelihood that the true value is either less than or greater than that value. And most scientists do their best to communicate the spread itself, i.e. the uncertainty range, and not just the middle value."

Even after Franzen had been informed of his error, he ended up keeping the incorrect statement that "the rise will be *at least* two degrees" (albeit changing 'The likeliest rise is far higher" to 'The rise might, in fact, be higher"). The final wording still falsely implied that the model averages preferentially underestimate the warming, despite my having communicated to the fact-checker that there's an equal likelihood that they underestimate or overestimate the warming. The uncorrected error conveniently supported Franzen's doomist narrative. Alas, I had only been allowed to see this one passage.

The whole article, it turned out, was riddled with basic science errors. *Business Insider* summarized experts' assessment of his piece thusly: "Scientists blast Jonathan Franzen's 'climate doomist' opinion column as 'the worst piece on climate change.'"[32] The critical problem is one we've already encountered and discussed. Franzen argued that we will fail to limit warming to below 2°C. That in itself is not objectively defensible—it is certainly still within our ability to avert 2°C warming given rapid decarbonization efforts. But more problematically, he invoked the strawman

that we will then fall off a climate cliff, with supposed runaway feedback loops that kick in, rendering mitigation efforts useless. To quote Franzen directly: "In the long run, it probably makes no difference how badly we overshoot two degrees; once the point of no return is passed, the world will become self-transforming." We've already seen that there is no objective scientific support for such runaway warming scenarios. Yet they form the entire basis for Franzen's false prophecy of doom.[33]

Franzen's feelings were apparently hurt by the overwhelmingly negative response to his article. In fact, he has blamed it—or at least online critiques of his brand of doomist prophesizing—for the lack of progress on climate. In an interview with *The Guardian* he complained of the "Twitter rage" against him, arguing that "online rage is stopping us tackling the climate crisis."[34] He insisted that the "messenger was being attacked even if the facts of the message were not being challenged." While I'm sympathetic to his concern about online rage, which—as I have noted myself—can be counterproductive to action, the critiques of his commentary were in fact, as detailed above, grounded in his fundamental misrepresentations of climate science.

One of the more baleful aspects of doomism is the way it endorses intergenerational inequity—that is to say, its total dismissiveness when it comes to the interests of future generations. Rupert Read is an academic from the University of East Anglia in the United Kingdom and a self-avowed spokesperson for Extinction Rebellion. He's also a messenger of doom. After Read delivered a particularly fatalistic public lecture, climate scientist Tamsin Edwards blasted him: "I am shocked at this talk. Please stop telling children they may not grow up due to climate change. It is WRONG…"[35] It certainly is.

There is something especially disturbing when middle-aged men scold teenage girls fighting for a livable future. It's even worse when other middle-aged men stand by and applaud. Perhaps I'm taking just a bit of poetic license here, but that's essentially what happened with provocateur and author Roy Scranton and *Vox* climate pundit David Roberts in an episode I'll now recount.

Scranton is the ultimate doomist. In 2018 he literally wrote a book titled *We're Doomed*.[36] He snidely criticizes youth climate activists, dismissing

their efforts as "Pure Disney." Though he has since deleted his Twitter account, back in December 2018 he took to the social media outlet to castigate youth climate activists as unwitting tools: "Enlisting children to carry the message of catastrophic climate change is at the same time a *reprehensible* abdication of responsibility and an embarrassing display of sentimentality and magical thinking. Pure Disney logic" (emphasis added).[37]

Scranton uses "Disney" so often, in fact, I'm surprised he doesn't have to pay them royalties. He invoked the multinational entertainment conglomerate's name once again to dismiss the writing of environmental author and 350.org founder Bill McKibben.[38] Scranton's flippant language suggests he thinks this is all somehow funny. But in fact, it's dead serious, and others aren't laughing. In response to his reprehensible attack on the youth climate movement and its de facto leader Greta Thunberg, youth climate activist Alexandria Villaseñor retorted, "Greta sparked a movement that has thousands of youth learning about climate change and realizing they have power. What have you done @RoyScranton? besides tell us we're doomed…"[39]

What I found especially disappointing in this particular affair was the reaction of *Vox*'s David Roberts, a pundit whose views about environmental matters are often insightful. Roberts weighed in on a piece Scranton had written for the *Los Angeles Review of Books* that dismissed Bill McKibben and others for their efforts to present a viable path forward on climate.[40] Roberts glibly endorsed Scranton's doomist take: "I like this piece from @RoyScranton & agree that the forced hortatory uplift at the end of climate books/articles is always the worst part." He then contemptuously scorned those who rightfully push back on such doomism, saying it was "fascinating" to him "to watch how fiercely, even angrily," people responded to Scranton's piece.[41] It appears that Roberts has since deleted this tweet. I don't blame him.

People *should* be angry at anyone engaged in self-righteous and self-serving (yeah—doom porn *sells*!) propagandizing at the expense of our children and grandchildren's future. As a scientist who studies the projections and numbers, let me affirmatively state, for the record, that Scranton—and Roberts and Read and Franzen and other doomist men—are

dead wrong. Our demise is only assured if we follow their lead and surrender. If your midlife crisis has caused you to give up on the future, then step aside. Get out of the way. But please don't obstruct others stepping forward to do battle.

## DOCTOR DOOM

Guy McPherson, a retired ecology professor from Arizona, is arguably the scientific leader of the doomism movement, a cult figure of sorts. McPherson, like other doomists, argues that we have already triggered irreversible vicious cycles (for example, the massive release of frozen methane) that will render the planet lifeless in a matter of years. There's nothing we can do about it. What he calls "exponential climate change" will render human beings and all other species extinct within ten years owing to supposed runaway warming—something for which there is, as we have already seen, no shred of scientific evidence. But, if you like, mark December 2026 on your doomsday calendar—that's when McPherson said we will meet our collective demise.[42] (In the wake of the COVID-19 crisis in early 2020, McPherson provisionally moved his doomsday estimate all the way up to November 1, 2020. So if you're reading this, you can breathe a sigh of relief now!)[43]

According to science journalist Scott Johnson, "McPherson is a photo-negative of the self-proclaimed 'climate skeptics' who reject the conclusions of climate science. He may be advocating the opposite conclusion, but he argues his case in the same way. The skeptics often quote snippets of science that, on full examination, don't actually support their claims, and this is McPherson's modus operandi.… Both malign the IPCC as 'political' and therefore not objective. And both will cite nearly any claim that supports their views, regardless of source—putting evidence-free opinions on par with scientific research."[44]

McPherson is prolific, writing books, doing countless lectures, and appearing in online videos where he trumpets his message of imminent doom. He counsels us to grieve for our demise and find solace in "love," ending each of his videos the same way: "At the end of extinction, only love remains." His message has spread like a virus through environmentally

aware regions of the Internet, with copycats writing pieces like "Are We Heading Toward Extinction? The Earth's Species—Plants, Animals and Humans, Alike—Are Facing Imminent Demise. How We Got Here, and How to Cope" (this from the progressive *Huffington Post*).[45] Greenpeace cofounder Rex Weyler has even echoed McPherson's doomsaying of imminent extinction in a commentary posted on Greenpeace's website.[46]

This sort of framing, again, plays right into the hands of the forces of delay and inaction. It is readily used to suppress activism and reduce enthusiasm for action. If we're doomed, then why expend time and effort pushing for action on climate? Such efforts are curiously reminiscent of the way Russia sought to suppress democratic turnout in the 2016 presidential election by convincing enough Democratic voters that there was essentially no difference between Hillary Clinton and Donald Trump. If your vote doesn't matter, then why bother?

Russia used online social media campaigns to drive a wedge between supporters of Bernie Sanders, who promoted hard-core climate policies (such as the outright banning of fracking), and the ultimate Democratic nominee, Hillary Clinton, who favored more "centrist" climate policies.[47] It was a deeply cynical and indeed sinister campaign on Russia's part, for, as we know, Russia is opposed to international climate action and has used social media campaigns to promote climate contrarianism.[48] Russia clearly didn't support Sanders's aggressive climate stance. But its leaders understood that he was a spoiler, and so they ran a massive social media campaign to exaggerate and exploit perceived climate policy differences between him and Clinton. The objective was to make Clinton unacceptable to Sanders supporters and not worth voting for—to convince a large enough number of progressives to simply sit out the election. And they did, helping hand the presidency to Russia's preferred candidate: climate-change denier and fossil fuel stooge Donald Trump.[49]

The Trump connection is an interesting one. McPherson frequently does interviews on a webcast network called American Freedom Radio that features on its page a virtual smorgasbord of right-wing conspiracy theories.[50] McPherson posted a commentary on his website supporting Donald Trump in the 2016 presidential election. Quoting from it directly: "*Donald Trump is another manifestation of the cleansing fire.… [H]e has*

*secured my vote* to quicken the demise—sparking the flame. If you are one of those folks going through an earlier stage of grief and still finding it hard to accept our fate… it's becoming more and more obvious that the jig is up and time is short. In context, my goals for today include being kind to someone, smiling at a stranger, and *calling a few friends to convince them to vote for The Donald*" (emphasis added).[51]

So with McPherson and other doomists we find ourselves in a very odd corner of the universe where right meets left and doom meets denial. Whether climate change is a hoax (as Donald Trump would have us think) or beyond our control (as McPherson insists), there is no reason to cut carbon emissions. It doesn't matter how we get there. To the inactivist agenda, only the destination matters.

Doomists will attack upon the mere suggestion that disaster can still be averted. As one observer noted, "I've seen people post links to apocalyptic films scorning climate activists for even trying to avert catastrophe."[52] I've experienced this personally. In early September 2019, I appeared on Ali Velshi's MSNBC show to discuss the findings of the IPCC's new "Special Report on the Ocean and Cryosphere in a Changing Climate." I was subsequently berated on Twitter by an individual describing himself as a New Green Deal–supporting "Ecotopian Berniecrat." He was upset that I had cited the report's apparently insufficiently doomist prognosis of five to six feet of sea-level rise by the end of the century under business-as-usual fossil fuel burning.[53]

Why would I and other leading climate scientists be lying to understate the climate threat? Climate doomists, like climate denialists, often subscribe to conspiracy theories about scientists. But in the doomist version, the scientists aren't conspiring to promote a massive hoax. Instead, they are engaged in a massive cover-up to hide how bad climate change really is. Scott Johnson noted that "the skeptics dismiss science they don't like by saying that climate researchers lie to keep the grant money coming," while doomists insist that "scientists are downplaying risks because they're too cowardly to speak the truth and flout our corporate overlords."[54] Commenting on the recent trend, my climate scientist colleague Eric Steig perhaps put it best when he asked, "Where did this 'climate scientists are lying to us—telling us it isn't so bad—because of grant money' come from?

Is this a real 'movement,' or just a bunch of Russian bots?," adding, "I miss the days of arguing with climate deniers."[55]

Taking the conspiracy theory to its absurd limit, if climate scientists are lying to maintain their employment, then only unemployed climate scientists can be trusted. That was literally the argument made by one purveyor of climate doom whose Twitter account no longer exists: "I suggest reading Guy McPherson who is unemployed and so tells the truth (working academics are funded by big biz and can't—crowd control), Sam Carana who posts under a pseudonym and Peter Wadhams who is also unemployed—ice expert from Cambridge. All are in the imminent camp." (Actually, McPherson and Wadhams are both professors emeriti.) Note that "imminent" means "doomist."[56]

We've already learned about McPherson. What about these other two individuals? As noted by Dana Nuccitelli in *The Guardian*, Peter Wadhams predicted back in 2012 that we would see an ice-free Arctic by the summer of 2016.[57] It is 2020 and we are nowhere close to that point. Like McPherson, Wadhams insists that Arctic warming will lead to massive releases of trapped methane and abrupt resulting warming. Sam Carana isn't even a real person—it's a pseudonym—so we know nothing about his actual qualifications. What we *do* know is that, as Scott Johnson has stated, he "posts a great deal of strange and unscientific claims" about… you guessed it, Arctic methane.[58]

Why do the doomists seem to be inordinately obsessed with Arctic warming and methane? We know that methane is a very potent greenhouse gas. And some of the best-known natural examples of catastrophic past warming events appear to have involved substantial releases of methane trapped either in permafrost or in the so-called methane hydrate along the sea floor. For example, warming of roughly 14°C (25°F) occurred at the end of the Permian period 250 million years ago, resulting in one of the greatest mass extinction events in Earth's history: 90 percent of all life was wiped out. At the boundary of the Paleocene and Eocene epochs (what is known as the Paleocene-Eocene Thermal Maximum, or PETM) roughly 56 million years ago, Earth experienced warming of as much as 7°C (13°F), with, again, widespread extinction.[59]

So if you're looking for a dramatic, doomsday-like climate-change

scenario, it's very tempting to look toward methane. More specifically, you might focus on mechanisms whereby warming of the Arctic releases massive amounts of methane previously frozen in the permafrost, leading to more warming, more melting ice, more methane release, and a runaway warming scenario. The problem is that, aside from the questionable claims of a handful of contrarian scientists, there's simply no evidence that the projected warming could lead to such an event. Authoritative reviews of the scientific literature on the topic reveal "no evidence that methane will run out of control and initiate any sudden, catastrophic effects."[60]

That hasn't stopped the methane catastrophists from looking for any scrap of data that might support their narrative. Back in September 2019, they were hyping a momentary spike recorded by one isolated methane measurement station in Barrow, Alaska. At the time, I explained that this was almost certainly an isolated blip, perhaps reflecting contamination of the site—and that there was no evidence it was part of a larger pattern or trend.[61] Sure enough, methane levels at that site subsequently returned to normal. At least one media outlet that had uncritically reported the putative methane spike issued a correction, noting that the data had not been "validated," were impacted by "local pollution," and may be "subject to change."[62]

There's another important point to be made here. Although there has been a global uptick in methane, as we noted in the previous chapter the evidence suggests it's coming from natural gas extraction and not natural sources such as melting permafrost.[63] The doomists thus have it completely backward here. Rather than it being out of our hands, with appropriate policies governing natural gas extraction and fugitive methane emissions we can likely prevent the continued buildup of methane in the atmosphere. There is *agency* on our part.

While doomism itself might be dismissed as a rather fringe movement, there is some evidence of "seepage" of doomist conspiracy-mongering into the mainstream climate discourse. Consider, for example, an exchange that took place between climate experts back in January 2020. It started with Kevin Anderson, a climate scientist who has been critical of the mainstream climate science community for what he perceives to be complacency and a lack of urgency in the face of a crisis.

Anderson is no doomist, but he's at the far end of the aggressiveness scale within the climate science community. He has, for example, publicly chastised scientists who continue to use air travel, going so far as to travel on a container ship to a scientific conference to make his point (long before this sort of thing became fashionable à la Greta). Going further, he has argued that even scientists engaged in fieldwork in remote locations should only travel this way: "People have gone to the Amazon for years without flying."[64] Let's leave aside any discussion of how presumptuous it is to tell scientists engaged in laborious and logistically challenging fieldwork that they must take several additional weeks out of their schedules to travel by boat to remote locations. Anderson obviously buys heavily into the "personal action" framing of climate solutions. But he has also blamed his fellow scientists for a failure of systemic action, which leads us back to our story.

In January 2020, Anderson criticized a report by the United Kingdom's Committee on Climate Change (CCC), an "independent, statutory body established under the Climate Change Act 2008… to advise the UK Government… on emissions targets and report to Parliament on progress made in reducing greenhouse gas emissions and preparing for climate change."[65] Anderson plaintively asked, "Why is there so little critique of [the CCC's] 'net-zero' report by academics & the wider climate community? It is designed to fit with the current political & economic status quo, & in so doing proposes cuts in CO2 far smaller than those needed to meet our Paris 1.5–2°C commitments!"[66] Defending the CCC, one commenter pointed out that they "are mandated to fulfil the Paris Agreement but would most likely welcome more analysis of their work."[67]

It was then that Anderson leveled an accusation against the entire scientific community, responding, "I wish I had your confidence in the process of scrutiny. Fine to argue around the edges, but the overall framing is firmly set in a politically-dogmatic stone with academia & much of the climate community running scared of questioning this for fear of loss of funding, presitige [*sic*], etc."[68]

If that sounds like the sort of accusation we expect from climate deniers and doomists, it's because that's the sort of accusation we expect from climate deniers and doomists. The chief executive of the CCC,

understandably perturbed by Anderson's attack, responded, "It's not a politically dogmatic stone. It's the UK's Climate Change Act, which we're obliged [to] follow."[69] UK climate scientist Tamsin Edwards objected to the collective smear against the climate science community, tweeting, "That's quite an accusation about academics.… On what basis do you make the claim that 'much' of the community are mendaciously or cynically silent to protect their own interests?"[70] Anderson's unsatisfyingly vague response? "Repeated discussion over many years with many academics (and others) who work speciifcally [*sic*] on mitigation."[71] A more likely explanation, in my view? Too much exposure to doomist rhetoric. Or perhaps its more civilized close cousin, *soft doomism*.

## "DEEP ADAPTATION"

Doomism sometimes masquerades under a nom de plume. Consider what has come to be known as "Deep Adaptation," introduced and promoted by Jem Bendell, an academic from the University of Cumbria in the United Kingdom. In February 2019, Bendell published an article that *Vice* characterized as "The Climate Change Paper So Depressing It's Sending People to Therapy."[72] But it is not an academic article in the usual sense. It was rejected by scientific journals, and Bendell ultimately self-published it on his website.[73] That means it lacks the rigor of a peer-reviewed scientific article. It has nonetheless been viewed far more than any typical peer-reviewed scientific article—by one estimate, more than 100,000 people have read it.

Although Bendell's article is, at least on the surface, less hard-core than the doomist "all life will end in a decade" messaging of Guy McPherson, Bendell nonetheless argues that near-term "climate-induced *societal collapse*" (a somewhat more murky concept) "is now inevitable in the near term," which he clarifies to mean "about a decade" (emphasis added).[74] Bendell bases this prognostication on the now all-too-familiar (but discredited) claims of a supposed Arctic "methane bomb" that will precipitate runaway warming, the collapse of agriculture, exponential increases in infectious disease, near-term societal collapse, and *possibly*—he at least seems to imply in places—human extinction. Bendell

exaggerates both the projected climate change and its impacts.[75]

Equally problematic, his prescription for how we might address this looming threat involves no real mitigation. There's no mention of reducing carbon emissions, just some vague language about "restorative agriculture" and "resilience" and the insistence that we must "adapt" to the inevitable demise of civilization as we know it.

The BBC interviewed a number of scientists, asking them to comment on the merit of Bendell's assertions.[76] Among them was Myles Allen, professor of geosystem science at the University of Oxford, who asserted that "predictions of societal collapse in the next few years as a result of climate change seem very far-fetched." Allen noted, moreover, that "lots of people are using this kind of catastrophism to argue that there's no point in reducing emissions."

I too was quoted. I described the Bendell paper as "a perfect storm of misguidedness and wrongheadedness," since "it is wrong on the science and its impacts." I said, "There is no credible evidence that we face 'inevitable near-term collapse,'" and I emphasized that Bendell's doomist framing was "disabling" and would "lead us down the very same path of inaction as outright climate change denial." I added that "fossil fuel interests love this framing."

And indeed they must, for it breeds disengagement from the climate battle. One alarmed reader of Bendell's article is quoted in *Vice* as saying, "We're fucked.… Climate change is going to fuck us over.… Should I just accept the deep adaptation paper and move to the Scottish countryside and wait out the apocalypse?'"[77] Another individual, quoted by the BBC, said that "a few months after reading the Deep Adaptation paper," he and his wife decided to sell their home and move out to the country. "When the crunch comes," he said, "there'll be a lot of people in a small area and it's going to be mayhem—and we'll be safer if we move further north because it's colder."[78] We have terms for such folks, like "doomsday preppers" and "survivalists."

If you take the most environmentally aware progressives, lead them to despair, and convince them to dissociate from civilization, they're not out there on the front lines participating in the political process, demonstrating and fighting for the needed systemic changes. Bendell's paper is a more

powerful tool for disengagement than any article ever written by a climate-change denier.

## *SOFT* DOOMISM

If outright doomism is generally too shrill to gain much currency in mainstream climate discourse, what we shall henceforth refer to as *soft doomism* has found its way to the very center of the conversation. Soft doomists don't quite argue for the inevitably of our demise as a species, but they typically imply that catastrophic impacts are now unavoidable and that reducing carbon emissions won't save us from disaster. It's doomism dressed up, you might argue, in more respectable clothing.

Soft doomists tend to use terms like "panic." "Time to Panic" was the headline on a 2019 *New York Times* op-ed by David Wallace-Wells, author of *The Uninhabitable Earth* (which I will discuss later).[79] According to Sheril Kirshenbaum, executive director of the nonprofit organization Science Debate and host of the National Public Radio podcast *Serving Up Science*, "stoking panic and fear creates a false narrative that can overwhelm readers, leading to inaction and hopelessness."[80]

"Panic" is a word that conjures images of people running screaming through the streets with their hands over their heads. It evokes irrational, desperate, rash behavior rather than considered, well-thought-out, deliberate action. The latter is helpful. The former is not. And it can lead us to very strange and uncomfortable places.

Let's concede that the "p" word is appropriate in some contexts. Consider, for example, Greta Thunberg. In her message to world leaders gathered at Davos, Switzerland, in January 2019 for the World Economic Forum, she chastised the crowd for having failed to act meaningfully on the climate crisis, telling them, "I want you to panic." In that context, it is reasonable to interpret her comments as suggesting that the attending politicians and opinion leaders deserve to feel the scorn of young people like herself calling for action. Indeed, her subsequent statement was "And then I want you to act."[81]

But unfocused and diffuse "panic" messaging can lead to counterproductive actions. As we have seen, it has led to support for

potentially dangerous geoengineering schemes, which have been sold as a necessary last-ditch means of averting climate devastation. Read no further than the headline of the December 2019 *Washington Post* op-ed "Climate Politics Is a Dead End. So the World Could Turn to This Desperate Final Gambit."[82]

Soft doomism has become increasingly widespread. Its basic tenets have been adopted by groups like the aforementioned Extinction Rebellion, which takes the position that "we are facing an unprecedented global emergency. Life on Earth is in crisis.… [W]e have entered a period of abrupt climate breakdown, and we are in the midst of a mass extinction of our own making."[83] In mid-January 2020, a curious online article was making the rounds, ironically well-titled "Climate Fatalism."[84] While the article was unsigned, it was sponsored by an organization called the Freedom Lab, which describes itself as an "innovation hub" and "thinktank" that produces "actionable insights," which it shares "through regular publications and public events."[85]

The article embodies the ambivalence and internal contradictions that have come to characterize soft doomism. "Last year," it begins, "several alarming reports made it clear that immediate and radical action is needed to prevent disastrous levels of global warming." It's a promising start, acknowledging the problem and entreating the reader to action. However, in the very next line, the author writes, "Action is nowhere to be found and we are bound to hit the tipping points of global warming that will render any further action irrelevant." It's an abrupt turn toward doomism and futility that is made even more confusing by the sentence that follows, which warns of the threat of the very sort of fatalism that the article is promoting: "As this notion spreads, 2019 could see many of us falling prey to climate fatalism and a shift in political focus towards climate adaptation."

Despite the contradictions, the piece has an agenda. It concludes with a prescriptive statement masquerading as a predictive one: "We will see a shift from preventing climate change to adapting to (and battling) the effects. Much of this will entail engineering, to build dams and extreme-weather-proof buildings, for instance. It's likely that governments will shift funding from preventive measures to these kinds of adaptive solutions." The message is that climate change is bad—very bad, but we will fail to act

to solve it, so we might as well just adapt, be more resilient, and, oh yeah—explore technofixes. We've heard this story before. It is the "non-solution solution" of the previous chapter.

Soft doomism in a sense plays the same role among progressives that soft denial plays among conservatives. That is to say, it is a form of doomist rhetoric that is tolerated in polite company. And unsurprisingly, some prominent progressive climate and environment pundits have engaged in its rhetoric. Consider again the otherwise generally insightful David Roberts of *Vox*. In late December 2019, Roberts tweeted, "We're not going to limit temp to 1.5C. The weird social pressure to continue pretending we can, or might, is weird to me. The situation is tragic. The people & institutions responsible deserve all the anger in the world. But it is what it is."[86]

Climate and energy policy pundit Jon Koomey chided Roberts: "Dave, please stop the defeatist pessimism. Not helpful, and probably not even right. We are able to do this, and given a sufficient shift in the politics, we will do it. But the longer we wait the more stranded assets there will be and the more costly it will be."[87] That comment, of course, precipitated its own feeding frenzy of doomist commentary. One individual wrote, "I know it is technically feasible. It is not socially and psychologically feasible."[88]

That comment, while misguided, usefully betrays an underlying point of confusion—a fallacy that is in fact commonly encountered in these sorts of discussions. The fallacy is conflating physics and politics. While the laws of physics are immutable, human behavior is not. And dismissiveness based on perceived political or psychological barriers to action can be self-reinforcing and self-defeating. Think World War II mobilization or the Apollo project. Had we decided a priori that winning the war or landing on the moon was impossible, these seemingly insurmountable challenges would never have been met. We have encountered compelling evidence that a clean energy revolution and climate stabilization are achievable with current technology. All we require are policies to incentivize the needed shift. That doesn't violate the Newtonian laws of motion, or the laws of thermodynamics. It only challenges us to think boldly. Scratch beneath the surface and we find that most soft doomism is premised not in the physical impossibility of limiting warming, but in a cynical, pessimistic belief that we lack the willpower to act. It's giving up before we have even tried. And

once again, the inactivists are smiling all the way to the bank.

In this vein, let's talk about the so-called "Hothouse Earth" article mentioned in Chapter 5. It was published in August 2018, with Australian environmental scientist Will Steffen as the lead author.[89] In a sense, this article helped lay the groundwork for other doomist and soft doomist accounts like those by Scranton, Franzen, and Bendell. Like the Bendell paper, it went viral. Also like the Bendell paper, it wasn't peer-reviewed research, but simply a "perspective," more of an opinion piece than a scientific article. One important difference was that "Hothouse Earth" was published in the high-profile, prestigious *Proceedings of the National Academy of Sciences*, lending the imprimatur of the US National Academy of Sciences—the highest scientific authority in the land—to the study's findings.

Steffen, the principal author, is executive director of the Australian National University (ANU) Climate Change Institute. Readers may recall from Chapter 5 Steffen's unusually aggressive and prescriptive views on climate action: "*You have got to get away from the so-called neoliberal economics*… [and shift to something] more like wartime footing [to decarbonize society] at very fast rates" (emphasis added).[90]

The "Hothouse Earth" article makes similar claims to those we've encountered before among doomists and soft doomists—indeed, it is the likely inspiration for their thinking. But it is more nuanced and employs more caveats than other accounts, arguing that even if we keep warming under the oft-cited "dangerous" limit of 2°C, hypothesized amplifying feedbacks, such as "permafrost thawing" and "decomposition of ocean methane hydrates," *could* lead to climate change spiraling out of control. The article asserts that "even if the Paris Accord target of a 1.5°C to 2.0°C rise in temperature is met, we cannot exclude the risk that a cascade of feedbacks *could* push the Earth System irreversibly onto a 'Hothouse Earth' [4–5°C warming] pathway," with massive ice loss, sea-level rise, megadroughts, and other dire impacts.

Mainstream climate research, as already noted, doesn't support these claims—at least for the near term. Thus, rather than a summary of our current understanding, the "Hothouse Earth" article is "speculative" and more of an "interesting think piece," according to UK climate scientist

Richard Betts.[91] Betts emphasized that there is "large uncertainty" in the "Hothouse Earth" authors' estimate of 2°C as the trigger point for cascading feedbacks, noting that it reflects "risk averse" assumptions, and that "even if the self-perpetuating changes do begin within a few decades, the process would take a long time to fully kick in—centuries or millennia."

The combination of the authority of a prestigious journal, high-profile authors, and dramatic claims nonetheless ensured that "Hothouse Earth" would get a huge amount of media attention—and naturally, all the nuance was lost in the media frenzy that ensued. A very similar follow-up commentary, coauthored by many of the principals of the earlier article, was published a year later in the prestigious journal *Nature*, triggering yet another round of publicity.[92] Collectively, the two reports were covered by hundreds of media outlets, including CNN, *Newsweek*, *The Guardian*, *National Geographic*, the BBC, the *Daily Mail*, the *Sydney Morning Herald*, the *New York Post*, and many others. With over-the-top headlines, like "Climate Change Driving Entire Planet to Dangerous 'Tipping Point'" (*National Geographic*), and "Scientists Warn Earth at Dire Risk of Becoming Hellish 'Hothouse'" (*New York Post*), the collective coverage suggested that we face imminent and unavoidable catastrophic climate change. It all played into a doomist narrative of helplessness—and, as we shall see later, fueled conservative efforts to caricature and discredit climate predictions.[93]

## UNINHABITABLE EARTH?

There is one rendering of climate doomism that stands out above all others. It has been so influential that it deserves its own section. Albeit more nuanced than most of the doomist genre, "The Uninhabitable Earth," a July 2017 article by David Wallace-Wells that he later developed into a best-selling book, had a profound impact on the larger conversation about climate change.[94] The article, published in *New York Magazine*, predated "Hothouse Earth," Roy Scranton, Jonathan Franzen, Jem Bendell, and the rest of the lot. It was to climate doom porn what Shakespeare is to modern literature. It defined the genre, and its success generated considerable additional demand for more of the same. And make no mistake: climate

doom porn *does* sell. "The Uninhabitable Earth" was the most read article in the history of *New York Magazine*.[95] Perhaps it's for the same reason people ride rollercoasters, engage in bungee jumping, or go skydiving—they sometimes just want to be scared out of their wits. Climate doom ostensibly gives them that same rush of adrenaline. Am I calling it a drug? I guess so. Am I calling its purveyors pushers? I guess, in a sense, I am.

It is perhaps redundant to say that an article entitled "The Uninhabitable Earth" presents an overly bleak view of our climate future. And the subtitle doubles down on the doom: "Famine, Economic Collapse, a Sun That Cooks Us: What Climate Change Could Wreak—Sooner Than You Think." But extraordinary claims, as Carl Sagan famously said, require extraordinary evidence. Does the article deliver?

I expressed my concern about the article initially in a Facebook post. "The evidence that climate change is a serious problem that we must contend with now," I wrote, "is overwhelming on its own. There is no need to overstate the evidence, particularly when it feeds a paralyzing narrative of doom and hopelessness. I'm afraid this latest article does that. That's too bad. The journalist is clearly a talented one, and this is somewhat of a lost opportunity to objectively inform the discourse over human-caused climate change."[96] I expanded on my critique in an op-ed I coauthored for the *Washington Post* warning against the threat of doomist thinking, using "The Uninhabitable Earth" as the central example.[97]

My fundamental point of contention will be familiar to readers by now because it reflects a recurrent problem: the overly pessimistic and bleak depiction of our prospects for averting catastrophic climate change based on overstatement of climate-change impacts. "Uninhabitable Earth" exaggerates, for example, the near-term threat of climate "feedbacks" involving the release of currently trapped methane. The scientific evidence, as we have already seen, doesn't support the notion of a game-changing, planet-melting methane bomb of the sort the article envisions.

The article incorrectly asserts that the planet is warming "more than twice as fast as scientists had thought." That statement was false. The study the article refers to simply showed that one particular satellite temperature dataset that had tended to show *less* warming than other datasets has now been brought in line with them after some problems were corrected for.[98] In

fact, recent research (including work I was involved in) shows that past climate model simulations actually slightly *overpredicted* the warming during the first decade of the twenty-first century.[99] Once appropriate corrections are made, it turns out the models and observations are pretty much in line. While some climate-change impacts, like ice melt and sea-level rise, are indeed proceeding faster than the models predicted, the warming of the planet's surface is progressing pretty much as forecast. And that is plenty bad enough.

One could dismiss isolated mischaracterizations of the scientific evidence as innocent and innocuous oversights. But when there are many of them, and they all seem to point in the same direction—toward exaggerating the magnitude and pace of climate change—it suggests a cherry-picking of the evidence to support a particular narrative: a narrative of doom, in this case.

Even the story about the Svalbard seed vault that opens the article is, at best, misleading. Wallace-Wells begins his piece with "This past winter, a string of days 60 and 70 degrees warmer than normal baked the North Pole, melting the permafrost that encased Norway's Svalbard seed vault—a global food bank nicknamed 'Doomsday,' designed to ensure that our agriculture survives any catastrophe, and which appeared to have been flooded by climate change less than ten years after being built."

It's a nice story. But it's not true. I actually saw the vault a year after Wallace-Wells had written his piece, in October 2018, while attending a climate-change workshop on "Navigating Climate Risk" in Svalbard.[100] The vault was just fine. One of its founders explained that there really never was any flood. Rather, every year when the snow melts on the mountain, they get some water coming in at the top of the tunnel that leads to the seed vault. It's happened every year since it's been open, and they're working to address it.[101]

I'm just one scientist, and perhaps you might dismiss my concerns about the article as biased. After all, I was interviewed by Wallace-Wells at length and not mentioned or quoted. Perhaps there are sour grapes on my part?[102] Fortunately, you don't have to take my word for it. Climate Feedback is a climate-scientist-run website that evaluates the factual basis, reliability, and credibility of climate-themed articles that appear in the media based on

evaluation by a panel of leading experts. Climate Feedback evaluated "Uninhabitable Earth."[103]

To be more specific, Climate Feedback had the article evaluated by fourteen climate scientists chosen for their expertise across the range of issues covered by the article (three more were added after the initial deadline, bringing the total to seventeen). The article earned an average scientific credibility score of −0.7 on a scale that goes from −2 (very low) to +2 (very high). A score of −0.7 puts it just above −1 (low). Climate Feedback provided the following summary: "Seventeen scientists analyzed the article and estimated its overall scientific credibility to be 'low.' A majority of reviewers tagged the article as: Alarmist, Imprecise/Unclear, Misleading."[104] It's one thing to be *alarmed*—and we should be given the evidence. It's something else to be *alarmist*—a term that implies an unfounded, potentially harmful exaggeration of risk or danger.

Some felt this critique was unfair. David Roberts, who, as we have seen, occasionally weighs in with pessimistic and doomist-sympathetic views of his own, dismissed the criticisms by scientists like myself as "off-base scientific niggling."[105] Does he have a point? Scientists, after all, are biased toward, well, the science. They might not, for example, appreciate the poetic license sometimes required for effective journalism. In November 2017, I participated in an event that was part of the New York University Arthur L. Carter Journalism Institute's Kavli Conversations on Science Communication. The host was Dan Fagan, professor of journalism and director of NYU's Science, Health and Environmental Reporting Program. The event was called "The 'Doomed Earth' Controversy" and billed as "The author of the controversial *New York Magazine* cover story about worst-case climate scenarios in conversation with a prominent critic."[106] Yes, that's Wallace-Wells and me, respectively. The discussion was moderated by Robert Lee Hotz, a science writer at the *Wall Street Journal* and a Distinguished Writer in Residence at the NYU Journalism Institute.

After having listened to the roughly forty-five-minute discussion between the three of us (where there was actually more agreement than disagreement), host Dan Fagan took the floor and issued his verdict. He began by expressing his appreciation of a "great discussion" and went on to note that a journalist's "first obligation is to reflect reality." While he

"salute[d] David for his piece because… all pieces of the bell curve… should be written about," he also criticized it. His main concern was that while it "had… boilerplate [language]… about likelihood, it felt… tossed in and it certainly wasn't part of the overall framing of the piece." The piece wasn't clear on "Is this happening in five years? Is this happening in a century?" and as a result it "violated some of the rules that I've been teaching." Namely, the article was "inadequately contextualized," though Fagan appreciated that Wallace-Wells was "operating from the frustration that many of us feel."

Wallace-Wells seemed to have taken the criticism to heart. In August 2018 he asked me to comment on the full-length book version of the article, also to be titled *The Uninhabitable Earth*. The way he described it gave me optimism: "The book is… in part a revision and expansion of [the] article," he said. It was "focused less on worst-case scenarios, and in part [was] a more essayistic meditation on what it will mean, for politics and culture etc., to live in a world transformed by climate change in the coming decades." He asked me to review the prologue in particular, which, as he put it, "frames the whole project." He told me to be "ruthless" in my assessment. I appreciated the opportunity and was happy to oblige. I read it over and reported back to him a few days later. I told him that "the science is solid," but that I had "a number of minor comments" (nine of them, to be specific) that I felt should be addressed. I outlined them for him.

Among my main points, I said that "the claim that 'few experts think we'll hit' the 2C target seems misleading.… Many experts have pointed out a viable path to 2C.… There are no physical obstacles to 2C stabilization. Only political ones—at this point." I also said, "The claim that none of the industrial nations are on track to meet their Paris commitments is questionable. Some analyses suggest that the U.S. is very much on target to do so… and China, the world's largest emitter (!) is on course to exceed its targets. That's the world's two largest emitters right there." Finally, I pointed out, "You say that scenarios exceeding 2C warming are shrouded, delicately, from view. By whom? Certainly not the scientific community. 'Business as Usual' warming scenarios of 4–5C are prominent in the IPCC reports, other scientific assessments, and many popular articles about climate change. If you mean that *journalists* (and the media) are shrouding these scenarios from view then [you] should say so."

The book came out in February 2019. I was disappointed to find that no substantive changes were made in the prologue in response to the points I had raised. As far as the rest of the book is concerned, while the sorts of blatant errors that marred the original article were largely gone, the pessimistic—and, at times, downright doomist—framing remained, as did exaggerated descriptions that fed the doomist narrative. Consider, for example, this passage:

> Some [climate feedbacks] work in [the] direction [of] moderating climate change. But many more point toward an acceleration of warming, should we trigger them. And just how these complicated, countervailing systems will interact—what effects will be exaggerated and what undermined by feedbacks—is unknown, which pulls a dark cloud of uncertainty over any effort to plan ahead for the climate future. We know what a best-case outcome for climate change looks like, however unrealistic, because it quite closely resembles the world as we live on it today. But we have not yet begun to contemplate those *cascades that may bring us to the infernal range of the bell curve* [emphasis added].[107]

The prose gives a reader the impression that there are all sorts of positive feedbacks that climate scientists haven't even "contemplated." And if "cascades that may bring us to the infernal range of the bell curve" isn't a doomist dog whistle for unjustified "runaway warming" scares, I don't know what is. This passage—and many others in the book—would lead readers to assume that we are completely flying blind with regard to climate change. It implies that climate projections are completely unreliable (reminiscent of the claims made by climate-change deniers). A reader would never suspect that, in fact, climate models (1) have done a remarkable job predicting the increase in global temperature over the past half century, and (2) show no evidence of the sort of "infernal cascade" Wallace-Wells asks us to fear.[108]

The publisher (Penguin Random House) features quotations from a variety of impressed reviewers on its webpage for the book. It's hardly surprising that most of these reviewers expressed alarm over what the book

describes. One said "*The Uninhabitable Earth* hits you like a comet, with an overflow of insanely lyrical prose about our pending Armageddon." Another said, "*The Uninhabitable Earth* is the most terrifying book I have ever read." Yet another said "its mode is Old Testament" and called it a "white-knuckled tour through the cascading catastrophes that will soon engulf our warming planet."[109] This is climate doom porn. And, as I said before, climate doom porn sells. After its release on February 20, the book was on the *New York Times* Hardcover Nonfiction Best Sellers List for six weeks in a row.

If you still can't get enough of it, then have no fear, for the doom will be televised. HBO is turning *The Uninhabitable Earth* into a series. Well, sort of. According to Yessenia Funes of *Gizmodo*, it will "influence a fictional anthology series that examines what our future may look like as climate change progresses." The director, Adam McKay, "will help visualize the gloom and doom in all its horrible glory for the show's first episode." Funes doesn't hide her enthusiasm: "I am here for it. Let's freak everyone the hell out."[110] If you thought you just heard me groan, it's because you just heard me groan.

I was invited to appear with Wallace-Wells on the MSNBC *Morning Joe* program shortly after the publication of the book.[111] One of the show's hosts, Mika Brzezinski, opened with, "It could be a world of… mass extinctions and economic calamity. Our next guest argues that *fear* may be the only thing that saves us." Asked about how bad things are going to get, the first words out of Wallace-Wells's mouth were, "It looks pretty bleak." What ensued, however, was a more balanced and nuanced discussion about both the costs of inaction and the need to take action. I imagine that my participation in the segment helped steer the conversation in that direction.

During the commercial break, host Willie Geist turned to Wallace-Wells and said, "Isn't there any good news?" I joked, "I think that's what I'm here for." Then, back on the air, Geist turned to me and asked, in closing, "What's the good news you can tell people about climate change right now?" I pointed out that "there is urgency, as David has said, but there's also agency" (my first use of that framing). I went on to talk about how the conversation is now changing, with even some Republicans starting to come to the table. (We'll talk more about that in the next chapter.)

Wallace-Wells nonetheless continued with rather doomist language in his engagement with the public. A few days after the MSNBC segment, he did an interview with a reporter from *Vox*, Sean Illing. Illing titled his piece "It Is Absolutely Time to Panic About Climate Change: Author David Wallace-Wells on the Dystopian Hellscape That Awaits Us." Wallace-Wells told Illing, "As someone who was awakened from complacency into environmental advocacy through alarm, I see real value in fear."[112]

Wallace-Wells occasionally weighs in on Twitter with alarmist commentary that requires correction by climate scientists. For example, in September 2019 he tweeted that "the world could hit 1.5C—the target of all global climate action—as soon as 2021. It could hit 2C—'catastrophic warming' by 2025."[113] That's wrong. It's the result of an erroneous extrapolation of a claim someone had tweeted that "temperatures [are] up… 0.2°C just between 2011 and 2015."[114] No climate scientist would ever try to measure the warming trend based on a five-year period because of the huge amount of "noise" in measuring temperature differences from year to year. Things like El Niño and volcanic eruptions can skew short-term readings.

The true warming rate is about 0.2°C (~0.4°F) per *decade*. Since current warming stands at about 1.2°C (~2.2°F), it would at current rates take a decade and a half to reach 1.5°C (2.7°F) warming, and another two and a half decades to reach 2°C (3.6°F) warming. But even if we used the incorrect estimate of 0.2°C per five years, Wallace-Wells's math is still wrong. We wouldn't reach 1.5°C for the better part of a decade, and we wouldn't reach 2°C for another twenty years. So it's puzzling how Wallace-Wells came up with his numbers in the first place. What's clear is that it fits with a narrative of impending doom.

Climate scientists immediately corrected Wallace-Wells. Richard Betts noted, "Even if this extrapolation were correct (it isn't), a single year at 2C is not going to be 'catastrophic.' 2C above pre-industrial for decades would indeed bring profound & possibly self-reinforcing changes, but simply hitting 2C for the first time will not make it all kick off."[115] Eric Steig was more blunt: "This is the kind of thing that makes me want to say… 'leave the science communication to scientists'… it's utterly irresponsible and wrong."[116]

Wallace-Wells also continues to mischaracterize the progress that is being made on the policy front. In a December 2019 article in *New York Magazine*, referring to the Conference of the Parties in Madrid, he wrote, "It was, of course, the 25th COP, and judging by the only metric that matters—carbon emissions, which continue to rise—the conference followed 24 consecutive failures. Emissions set a new record in 2018, and are poised to set another again in 2019. Just three years since the signing of the Paris accords, no major industrial nation on Earth is on track to honor the commitments it made in Paris."[117] There are *all kinds of* wrong here.

First of all, he's just wrong. Emissions remained flat in 2019, with power-sector emissions actually dropping, and total emissions are poised to drop in 2020 (though in the latter case that's at least in part due to the COVID-19 pandemic). To quote the International Energy Agency (IEA), "Emissions trends for 2019 suggest clean energy transitions are underway, led by the power sector. Global power sector emissions declined by some 170 Mt [million metric tons], or 1.2%, with the biggest falls taking place in advanced economies where $CO_2$ emissions have dropped to levels not seen since the late 1980s (when electricity demand was one-third lower)."[118] We would like to be seeing them not just flattening but declining. However, it's wrong to claim they are rising or to ignore the transition that is clearly underway toward a renewable-energy-driven economy.

What about Wallace-Wells's assertion that no major industrial nations are on track to honor their 2015 Paris Agreement commitments? I challenged him on this very matter when reviewing the draft prologue of his book. He failed to make any changes, and he repeats the misleading claim here. China, the world's largest emitter, is on course to meet its Paris target early.[119] The United States may meet its obligations in spite of the Trump administration's policies.[120] While there are criticisms to be made about the limits of the Paris Agreement, and there are certainly countries that are failing to live up to their commitments, it's simply not the case that no major industrial nation is on track to honor its Paris obligations.

These errors and mischaracterizations aren't innocuous—they are in service of the doomist narrative Wallace-Wells continues to promote. He argues that the existing framework (the United Nations Framework Convention on Climate Change, or UNFCC, and the annual Conferences of

the Parties) for global climate negotiations has failed us and should be abandoned. Instead, he insists, it should be replaced with something akin to an international version of the Green New Deal. He points to the perceived failure of the most recent climate negotiations in Madrid as motivation for this position.

This argument is misguided on several levels.[121] Not only does it engage in unhelpful despair-mongering, but it takes entirely the wrong message away from what transpired in December 2019 at the COP25 in Madrid. A small number of nations led by fossil-fuel-friendly regimes, including Australia, in essence conspired to sabotage the negotiations. Blaming the "COP model" and attributing blame broadly provides cover for, and enables, the relatively small number of bad state actors that are attempting to poison the well.

This current obstacle is a consequence of an unfavorable geopolitical playing field that has allowed oligarchs and demagogues to rise to power in those countries in recent years. No alternative model for international climate cooperation is likely to circumvent that obstacle. Certainly not one based on, as Wallace-Wells is suggesting, a globalized version of the Green New Deal, which already carries ideological baggage and comes with so much opposition already baked in.

Wallace-Wells, moreover, by dismissing the entire history of efforts by the UNFCC and previous COPs, based on disappointment with COP25, is truly throwing the baby out with the bathwater. He is neglecting, for example, the highly successful COP21 Paris meeting in 2015, in which the nations of the world committed to substantial carbon emissions reductions. While those reductions don't alone solve the problem (they get us almost halfway to limiting warming below 2°C), and not every nation will meet its targets, the Paris Agreement was a monumental achievement. It put a framework in place for ratcheting up commitments as international negotiations proceed in subsequent COPs.[122]

Wallace-Wells, perhaps unsurprisingly, objected to these criticisms. He tweeted, "I haven't given up on the COP/UN model, but I don't think considering whether alternate approaches might be more effective is 'doomist.' We need to make progress wherever we can, and the European Green Deal (for instance) suggests at least one hopeful alternative (as I

mention)."[123] Kalee Kreider is the head of communications at the National Geographic Society, former communications director for Al Gore, and a senior adviser to the United Nations Foundation. She took some offense to Wallace-Wells's dismissive comments about decades of climate policy efforts by the United Nations that she and so many others had contributed to. She replied to his tweet, sardonically, "*Cough*, the Paris Agreement was a US-China deal that then the rest of the world followed. *Cough*. That was how it got done" (emphasis added). In a subsequent tweet she linked to a November 2014 bilateral agreement between the United States and China, the world's two largest emitters, that laid the groundwork for the highly successful Paris international climate agreement.[124]

It is important that we hold our policymakers accountable for taking concerted action on climate, as activists like Greta Thunberg have done. But it's not constructive to dismiss the real progress that is being made, for it plays into the agenda of the inactivists, who have attempted to sabotage climate progress—including the 2019 COP25 negotiations. They would like nothing more than to see us throw up our hands in defeat and declare international climate negotiations dead.

I fear that defeatist rhetoric like Wallace-Wells's not only throws climate leaders who have spent their lives pushing for climate progress under the bus but also rewards the bad-faith efforts of inactivists. I suspect, moreover, that the attitude is contagious. Greta Thunberg not only follows Wallace-Wells on Twitter but retweets his often pessimistic missives.[125] In her January 2019 speech at the World Economic Forum in Davos, she declared that "pretty much nothing has been done" on climate change.[126] Not *enough* is being done, for sure, but to say that "nothing has been done" is simply false. It is dismissive of the actions that countries, states, cities, companies, and individuals are taking every day to help move us off fossil fuels, and it is dispiriting to the individuals who have worked so hard to improve the situation. It also neglects the hard data from the International Energy Agency demonstrating that we are indeed making progress toward decarbonizing the global economy.

In what can only be described as a case of journalistic whiplash, just days after his pessimistic December 16, 2019, *New York Magazine* article, Wallace-Wells published another piece in in the same magazine expressing

a rather glowingly optimistic outlook. Titled "We're Getting a Clearer Picture of the Climate Future—and It's Not as Bad as It Once Looked," the piece, which came out on December 20, had the tag line: "Good News on Climate Change: Worst-Case Looks Unrealistic."[127] The basis of the article was an opinion piece that had just been published in *Nature*, the subtitle of which almost sounded like it was intended specifically for Wallace-Wells: "Stop Using the Worst-Case Scenario for Climate Warming as the Most Likely Outcome."[128] The piece didn't actually cast doubt on worst-case climate responses. It didn't in any way provide new evidence ruling out climate surprises or aggravating feedback mechanisms. It simply argued that the "business-as-usual" trajectory now points toward lower carbon emissions. Why? Because of the *policy progress* that is being made in decarbonizing our economy. The commentary, in short, challenged Wallace-Wells's basic thesis.

## DOOMISM MEETS ALARMISM

The inactivists promote doomism for at least two different reasons. First, it leads to disengagement. It's another way to dampen enthusiasm among climate advocates and activists—simply convince them it's too late to do anything. But there's actually another reason that inactivists seek to promote doomism. To the extent that it can be portrayed as *alarmism*, it feeds a basic anti-environmental trope that has been a staple of inactivists for decades. As environmental author Alistair McIntosh succinctly put it, "by exceeding the consensus expert science whilst claiming to be based on it, [doomism] feeds denialists by discrediting real science… and it sets followers up for disillusion."[129]

Recall the attacks on Rachel Carson by industry groups back in the 1960s. She was denounced as "radical," "communist," "hysterical," "a fanatic defender of the cult of the balance of nature," and a mass murderer.[130] These slanders continue to this day: the fossil-fuel-funded Competitive Enterprise Institute currently claims that "millions of people around the world suffer the painful and often deadly effects of malaria because one person sounded *a false alarm*… that person is Rachel Carson" (emphasis added).[131]

Similar accusations were made against Paul Ehrlich, of *The Population Bomb* (1968) fame, whose early warnings of the impact of unrestricted resource depletion have ultimately proven prophetic; against scientist and science communicator extraordinaire Carl Sagan; and against early climate messengers Stephen Schneider and James Hansen.[132] I myself am regularly dismissed as an "alarmist" by right-wing groups. Indeed, on the day that I wrote this paragraph I was called "the *most* staunch climate alarmist scientist" (emphasis added) in a commentary by CNS News, which is a project of the Media Research Center, a front group for fossil fuel interests and the right-wing Scaife family.[133]

For decades, "false alarm" and "alarmism" have been the rallying calls of conservative interest groups looking to discredit environmental concern —including climate change—as henny-pennyism. A favorite claim relates to the late great climate scientist and science communicator Stephen Schneider. In the early 1970s, when there was still some uncertainty about the relative impacts of warming from greenhouse gases and cooling from sulfur dioxide aerosol pollution, Schneider and coauthor S. Ichtiaque Rasool speculated that the latter effect might win out if sulfur emissions continued to accelerate. That didn't happen because the United States and other industrial nations passed clean air acts in response to the growing acid rain problem. These measures required sulfur dioxide to be "scrubbed" from smokestack emissions prior to entering the atmosphere.[134]

The fact that some scientists—like Schneider—were still wrestling with the competing effects of aerosol cooling and greenhouse warming in the early 1970s has nonetheless given rise to a widespread canard: the notion that "climate scientists were predicting an ice age in the 1970s." The implication is that if scientists so completely botched their predictions back then, why should we trust them now? The reality is (1) they didn't botch the predictions (they just couldn't predict the passage of the clean air acts), and (2) there was no scientific consensus about cooling in the 1970s, just a few scientists, like Schneider, speculating about that possibility.[135] But the notion of a discredited "1970s global cooling scare" has proven an enduring myth that denialists have continued to seize upon. During congressional testimony I gave in July 2006, for instance, climate-change-denying congresswoman Marsha Blackburn (R-TN) attempted to lecture me about

how she "remembered" when she was growing up in the 1960s that climate scientists were worried about another ice age. She had obviously failed to study her denialist talking points closely enough, since the claim is supposed to be about the 1970s.[136]

It's hardly surprising that the forces of inaction would still be exploiting doomist narratives today. They can easily be caricatured as alarmism. "Prophets of doom" is the way Donald Trump described those who were advocating action on climate at the January 2020 World Economic Forum in Davos. Ideally, the accusation of alarmism is paired with the shopworn claim that climate scientists are promoting climate doom only to line their pockets with grant money.[137] There's nothing that fires up the conservative base more than right-wing pundits calling out "alarmist scientists who get… $89 billion in US government research money" by promoting doomist prophecies.[138] The doomists have made it all too easy for them.

Consider, for example, Jem Bendell's over-the-top "Deep Adaptation" article, which was the inspiration for Alistair McIntosh's warning about how doomism can feed denialism by playing into the agenda of the forces of anti-science.[139] McIntosh referred to a 1956 book, *When Prophecy Fails*, which uses the example of one particular doomsday cult to demonstrate the phenomenon. But a very specific example is at hand here.

Ronald Bailey, the author of *Global Warming and Other Eco Myths: How the Environmental Movement Uses False Science to Scare Us to Death*, reviewed Bendell's article for the libertarian magazine *Reason* in a piece titled "Good News! No Need to Have a Mental Breakdown over 'Climate Collapse.'"[140] In his commentary, Bailey invoked Paul Ehrlich, one of the inactivists' favored punching bags, to ridicule Bendell: "Ehrlich is still predicting an imminent ecological apocalypse and I suspect that Bendell will be doing the same thing in the year 2065." Bailey used Bendell's "concocted case for collapse fatalism" quite effectively to mock concern about climate change.

The "Hothouse Earth" article has also been used to caricature climate concern as an alarmist charade. The *Daily Caller*—which I've called "a Koch front group masquerading as a media outlet"—regularly features attacks on climate science and climate scientists.[141] "Scientists Issue 'Absurd' Doomsday Prediction," read its headline about "Hothouse

Earth."[142] The *Caller*'s climate contrarian "energy editor," Michael Bastasch, proceeded to exploit the actual alarmist excesses of the article as an excuse to launch into boilerplate attacks on climate science (for example, "climate models have regularly over-predicted temperature rise"—no, as we have already seen, they haven't) and climate action (quoting, for example, climate contrarian Roger Pielke Sr., who said that an "absurd" emphasis on climate-change impacts "[harm] actual effective policies with reducing risks from extreme weather and other threats"[143]). Bastasch ends by warning of personal sacrifice, attempting to scare his conservative readers into thinking that the *true* threat is aggressive climate action and the dramatic lifestyle changes it will purportedly demand, which "means no fossil fuels… reducing consumption and a whole host of other activities." (The reality, of course, is that climate *inaction* is the greater threat to the economy and our way of life.)

Naturally, the Murdoch media is replete with "false-alarm" climate framing. Consider climate-change denier Miranda Devine, formerly of the Murdoch-owned Australian *Daily Telegraph*, *Sunday Telegraph*, and *Herald Sun*, who now pens columns for the Murdoch-owned *New York Post*. In the wake of the devastating Australian bushfires of the summer of 2019/2020, Devine wrote a column for the *Post* titled "Celebrities, Activists Using Australia Bushfire Crisis to Push Dangerous Climate Change Myth."[144] In the piece, she proceeded to dismiss the well-established linkages between climate change and the unprecedented wildfires based on the standard denialist canards. This included attributing the fires to "arson," "green groups," misguided "hazard protection," and "biodiversity" preservation policies. But her core message was summed up in this single sentence, "Whether or not you believe the most dire predictions of climate alarmists makes no difference. We can't dial down the Earth's temperature any more than we can lock up every teenage arsonist." Such a neat little package of denial, doomism, and deflection wrapped up and topped off with charges of alarmism. To err is Devine. To forgive is… well, difficult, in this case.

I have seen my own words misrepresented and weaponized by denialist media figures in an effort to portray the climate science community as doomist alarmists. A case in point involves the *Boston Globe*'s resident

climate-change denier, Jeff Jacoby. His mischaracterizations of climate science have some scientists howling. They are so egregious that MIT climate scientist Kerry Emanuel, a Republican and political conservative, wrote a letter to the *Globe* in which he chastised Jacoby for presenting "a false choice between panic and the denial of risk." He went on to admonish the *Globe* for publishing a particular commentary that Jacoby had written: "Assessing and dealing with climate risk in an environment of highly uncertain science and expensive options is challenging enough without having to entertain the flippancy of your columnist."[145]

In a *Globe* column from March 15, 2020, "I'm Skeptical About Climate Alarmism, but I Take Coronavirus Fears Seriously," Jacoby quoted me in a way that implied that I myself had accused the climate science community of alarmism.[146] He wrote, "The horrors of pandemics have been documented and depicted often. Yet while climate activists have been forecasting world-ending doomsday scenarios since the 1960s, the apocalypse never seems to materialize." To support his claim, Jacoby then pointed to "facts" from the fossil-fuel-funded, climate-change-denying Competitive Enterprise Institute (rather than legitimate archival evidence). "Although climate is always in flux," he wrote, "unmitigated anthropogenic warming would doubtless lead to cataclysm. But human societies have a genius for mitigating and adapting their way out of existential threats. Which is why it's dangerous, as climatologist Michael Mann has written, to overstate the science of global warming 'in a way that presents the problem as unsolvable, and feeds a sense of doom, inevitability, and hopelessness.'" The source of this quote was my Facebook post criticizing David Wallace-Wells's doomist 2017 *New York Magazine* "Uninhabitable Earth" column.[147]

My actual position was, of course, very much the opposite of what Jacoby had implied. In a letter to the *Globe*, I responded,

> The truth is bad enough when it comes to the devastating impacts of climate change, which include unprecedented floods, heat waves, drought, and wildfires that are now unfolding around the world.…
>
> The evidence is clear that climate change is a serious challenge we must tackle now. There's no need to exaggerate it, particularly

when it feeds a paralyzing narrative of doom and hopelessness.

There is still time to avoid the worst outcomes, if we act boldly now, not out of fear, but out of confidence that the future is still largely in our hands. That sentiment hardly supports Jacoby's narrative of climate change as an overblown problem or one that lacks urgency.

While we have only days to flatten the curve of the coronavirus, we've had years to flatten the curve of $CO_2$ emissions. Unfortunately, thanks in part to people like Jacoby, we're still currently on the climate pandemic path.[148]

## A PATH FORWARD

It is important to communicate both the threat and the opportunity in the climate challenge. I learned this the hard way. For years my standard public lecture on climate change focused only on the science and the impacts, because I am a scientist. I would then pay lip service to "climate solutions," with the obligatory final slide depicting a montage of recycling efforts, wind turbines, solar panels, and the like. I was fortunate that my audiences were made up of thoughtful and sharing folks. And when they would linger afterward to talk with me, I heard the same thing over and over: "That was a great presentation. But it left me so *depressed*!"

My vanity led me to hear only the compliment and not the admonition that followed it. But the fact is that my presentation, by definition, was not *great*. It was *deficient*. I hadn't thought deeply about our predicament, and as a result I wasn't in a position to report on it responsibly. But I was inspired to do my due diligence and to inform myself about where we really stood, and what was truly necessary to avert catastrophe—to study the literature, crunch the numbers, and figure out how far down the climate-change highway we've gone and what exit ramps are still realistically available to us.

I can tell you that those who are paying attention are worried, as they should be, but there are also reasons for hope. The active engagement of many cities, states, and corporations, and the commitments of virtually every nation (with the United States currently a wildcard as this book goes

to press), are very hopeful signs. The rapid movement in the global energy market toward cleaner options is another sign of hope. Experts are laying out pathways to avoid disastrous levels of climate change, and clearly expressing the urgency of action.[149] There is still time to avoid the worst outcomes if—to repeat myself—we act boldly now, not out of fear, but out of confidence that the future is largely in our hands.

What is the antidote to irrational, disabling, doom-and-gloom "futility messaging"? Motivating hope that is grounded in entirely legitimate and defensible reasons for cautious optimism that the worst can still be averted. Recognizing that some harm has already occurred, and that some additional harm is inevitable, provides some needed perspective. It's not a matter of whether we're "effed," after all. It's a matter of *how* "effed" we are.

Let us in this context revisit the two epigraphs that began this chapter, for they address the challenge we face. First is the famous Franklin D. Roosevelt quote: *"The only thing we have to fear is… fear itself—nameless, unreasoning, unjustified terror which paralyzes needed efforts to convert retreat into advance."* Roosevelt's famous admonition describes our climate predicament to a T; the surest path to catastrophic climate change is the false belief that it's too late to act.

Then there is the second quote, by the German literary critic, novelist, and essayist Christa Wolf: *"The word 'catastrophe' is not permitted as long as there is danger of catastrophe turning to doom."* It has become fashionable in the climate discourse to use terms like "catastrophe," "emergency," and even "extinction." We must not allow the policing of language to be used as wedge to divide us. But we cannot let words be used in a manner that robs us of agency. Once again it is important to convey both *urgency* and *agency* in talking about the challenge we face. Personally, I like to speak of the "climate crisis," as it embraces both elements (a "crisis," after all, is defined as "a time when a difficult or important decision must be made").

We do not face a scenario of near-term societal collapse or human extinction. The only assurance of such scenarios would be our abject failure to act. If there were not still a chance of prevailing in the climate battle, I would not be devoting my life to communicating the science and its implications to the public and policymakers. I know we can still avert

catastrophe. And I speak with some authority on the matter. As a scientist who is still engaged in climate research, my views are informed by hard numbers and facts. In the final chapter of the book, we confront the remaining front in the new climate war—ourselves, our own self-doubt that we have it within ourselves as a species to meet the challenge at hand.

CHAPTER 9

# Meeting the Challenge

> The darkest hour is just before the dawn.
>
> —THOMAS FULLER

> Hope is a good thing, maybe the best of things, and no good thing ever dies.
>
> —ANDY DUFRESNE (in *The Shawshank Redemption*)

DESPITE THE CHALLENGES DETAILED IN THIS BOOK, I AM CAUTIOUSLY optimistic—that is to say, neither Pollyannaish, nor dour, but objectively hopeful—about prospects for tackling the climate crisis in the years ahead. The reason for that optimism is a confluence of developments, a "perfect storm," if you will, of eye-opening events that are helping to prepare us for the task ahead. First, there have been a series of unprecedented, extreme weather disasters that have vivified the climate-change threat. Second, a global pandemic has now taught us key lessons about vulnerability and risk. And finally, we've seen the reawakening of environmental activism, and, in particular, a popular uprising by children across the world that has framed climate change as the defining challenge of our time.

The thesis of this book is that these developments—along with the collapse of plausible climate-change deniability—have provided us with an unprecedented opportunity for progress. The inactivists have been forced into retreat from "hard" climate denial to "softer" denial: downplaying, deflecting, dividing, delaying, and despair-mongering. These are the multiple fronts of the new climate war. Any plan for victory requires recognizing and defeating the tactics now being used by inactivists as they

continue to wage war.

With immensely powerful vested interests aligned in defense of the fossil fuel status quo, it won't come without a fight. We will need the active participation of citizens everywhere aiding in the collective push forward. And we need to believe that it is possible. And it is. We can win the battle for our planet.

## THE DENIAL DEATH SPIRAL

When *Washington Post* editorial cartoonist Tom Toles and I published our book *The Madhouse Effect* in the early fall of 2016, colleagues criticized us for writing a book about climate-change denial.[1] The age of denial, they said, was over. The discussion from here on out would be all about *solutions*.

But subsequent history did not cooperate. Climate-change denier Donald Trump was then elected leader of the world's most powerful country. During his administration we've seen the United States go from a leader in worldwide efforts to combat climate change to the only country threatening to withdraw from the 2015 Paris Agreement. We saw a veritable dismantling of fifty years' worth of environmental policy progress in the United States. The intransigence of the United States gave other polluters, such as China, an excuse to ease off on their own efforts. As a result, after flatlining for several years, and appearing to be poised to decline, carbon emissions rose for several years instead.

Something else happened around the same time. We witnessed unprecedented climate-change-fueled weather disasters in the United States and around the world. They came in the form of record floods, wildfires, heat waves, droughts, and superstorms. Damaging, deadly weather extremes drove home the fact that climate change is no longer theoretical and distant. It's here and now. The damaging impacts of climate change had arrived. We know the litany by now: Hurricane Maria in Puerto Rico; flooding in Houston and the Carolinas; wildfires in California; historic drought, flooding, and plagues of locusts in Africa; flooding, heat, drought, and bushfires in Australia. The list goes on. And on. And on.

To quote Groucho Marx, "Who ya gonna believe, me or your lying

eyes?"[2] Denial simply isn't viable when people can see the unprecedented impacts playing out in real time on their television scenes, their newspaper headlines, their social media feeds, and their backyards. And as a result, we are now seeing the last gasps of hard climate denial. We see it in the virtual disappearance of "false balance" in the mainstream media—the practice, widespread in the past, in which climate-change deniers were treated on a par with mainstream climate researchers when it came to journalistic climate coverage.[3]

Hard denial, today, is mostly confined to the media outposts of the fringe right, shoved to the edges of our discourse by a sliding "Overton window" driven toward reality by the stark facts on the ground. Climate denial operations are waning as fossil fuel interests and plutocrats reject their services in favor of the "kinder, gentler" forms of inactivism that make up the new climate war. The conservative Cato Institute, for example, closed up its climate-denial shop in 2019.[4]

The climate-denying Heartland Institute is increasingly ignored and unable to garner mainstream coverage.[5] Their 2019 "conference," held at the Trump International Hotel in Washington, DC, was reduced from the sprawling three days of its earlier incarnations to just a single-day affair. While it had attracted more than fifty sponsors in past years, it drew just sixteen in 2019—fifteen if you account for the fact that one was fake. Attendance was limited to a couple hundred attendees—predictably, given that the declining demographic of denialists is mostly older white men. Despite holding their "conference" at a Trump property and in Washington, DC, "no one from the Trump administration" was in attendance, a fact bemoaned by Heartland's "science director" (and convicted criminal) Jay Lehr.[6] Lehr insisted that this was "a huge loss" for the administration, since the conference would "reveal that neither science nor economics back up the climate scare." Heartland was forced to lay off staff in 2019.[7]

Even soft denial no longer seems to be getting the traction it once did. In June 2020, Michael Shellenberger, cofounder of the Breakthrough Institute, published a commentary titled "On Behalf of Environmentalists, I Apologize for the Climate Scare." Adopting the schtick of self-styled "Skeptical Environmentalist" Bjorn Lomborg, the piece engaged in the usual inactivist tropes of downplaying climate-change impacts and

dismissing renewable energy, all out of alleged "concern" from an ostensibly reformed erstwhile "alarmist." The commentary was panned by the expert evaluators at Climate Feedback, who gave it an average credibility score of −1.2 (between "low" and "very low").[8] Shellenberger originally published the piece at *Forbes*, but they removed it within hours for violating their policies on self-promotion (he was essentially plugging his new book *Apocalypse Never: Why Environmental Alarmism Hurts Us All*). The commentary was subsequently republished by Murdoch's *Australian*. Shellenberger received coverage from the usual nexus of inactivism-promoting organizations and outlets (the Heartland Institute, Glenn Beck, Breitbart News, *Russia Today*, the *Daily Telegraph*, and the *Wall Street Journal*). But other than a critique by *The Guardian*, he got little mainstream coverage.[9]

Shortly thereafter, in mid-July, Bjorn Lomborg published his *own* book, *False Alarm*, once again offering up the same tired tropes. Nobel Prize–winning economist Joseph E. Stiglitz wrote a blistering review of the book for the *New York Times*, which ends thusly: "As a matter of policy, I typically decline to review books that deserve to be panned.… In the case of this book, though, I felt compelled to forgo this policy. Written with an aim to convert anyone worried about the dangers of climate change, Lomborg's work would be downright dangerous were it to succeed in persuading anyone that there was merit in its arguments. This book proves the aphorism that a little knowledge is dangerous. It's nominally about air pollution. It's really about mind pollution." There now seems to be little appetite for inactivist diatribes.

Republican communication experts recognize a sinking ship when they see one. Frank Luntz, the GOP messaging guru we encountered earlier, who coached climate-change-denying Republicans and fossil fuel interests on how to undermine public belief in human-caused climate change, has now flipped. In the summer of 2019 he testified to the US Senate's Special Committee on the Climate Crisis that "rising sea levels, melting ice caps, tornadoes, and hurricanes [are] more ferocious than ever. It is happening." He told the committee that he was "here before you to say that I was wrong in 2001"; now, he hoped to put "policies ahead of politics." He proceeded to advise the senators, based on wisdom derived from his polling and focus

groups, on how best to frame the climate crisis to get buy-in from the electorate.[10]

Luntz is hardly alone. Douglas Heye, a former communications director at the Republican National Committee, warned of the threat to Republicans who continue to deny the climate crisis: "We're definitely sending a message to younger voters that we don't care about things that are very important to them.… This spells certain doom in the long term if there isn't a plan to admit reality and have legislative prescriptions for it."[11]

Republican policymakers seem to be getting the message, too. *Inside Climate News* noted that "an increasing number of Republican politicians have sought to distance themselves from climate denial." It cited the examples of House Minority Leader Kevin McCarthy of California, who recently "introduced a package of bills to promote carbon capture and sequestration technology," and Alaska senator Lisa Murkowski, who "has been attempting to lead a bipartisan effort to pass energy efficiency and technology investment."[12]

Even the fossil fuel industry has turned a corner, no longer denying that its product is warming the planet and changing the climate. In 2018, the cities of San Francisco and Oakland sued the oil companies BP, Chevron, ConocoPhillips, ExxonMobil, and Shell for the damages (due to sea-level rise) that they've caused, indirectly, through the extraction and sale of planet-warming fossil fuels. Citing the reports of the IPCC, a lawyer for Chevron, Theodore Boutrous Jr., assented unambiguously to the strength of the underlying science: "From Chevron's perspective, there is no debate about the science of climate change." The oil companies had admitted, in court, that, as *Grist* put it, "fossil fuels are the problem."[13]

You may have already guessed what came next. As *Grist* described it, Boutrous "twice read a quote from the IPCC that climate change is caused 'largely by economic and population growth.' Then, [he] added his interpretation. 'It doesn't say that it's the production and extraction that's driving the increase,' he said. 'It's the way people are living their lives.'" If you thought you heard a "ping" sound, that's because of the massive deflection we just witnessed.

If these proceedings were a bellwether, and I surely think they were, deniers have essentially thrown in the towel. When it comes to the war on

the science—that is, the *old* climate war—the forces of denial have all but conceded defeat. But the new climate war—the war on *action*—is still actively being waged.

## TIPPING POINTS—THE *GOOD* KIND

There is reason to be optimistic on the political side as well. The 2018 midterm elections in the United States resulted in a historic swing toward Democrats, ushering in prominent political "rock star" newcomers like Alexandria Ocasio-Cortez, who ran on a Green New Deal platform. Significantly, during the first climate-change hearing held by the House of Representatives' Science Committee under fresh new Democratic leadership, Republicans—seemingly aware of the dramatic shift in public perception—no longer sought to challenge the basic scientific evidence behind human-caused climate change. They instead argued for policy solutions consistent with their political ideology. We can argue over whether they are optimal solutions, but they go beyond the diversionary and deflective proposals we've seen from Republicans in the past, including mechanisms such as carbon pricing. There does now seem to be real political movement toward meaningful action on climate.

House Democrats put forward a bold climate plan in June 2020 that included incentives for renewables and support for carbon pricing.[14] Given an even modestly favorable shift in political winds, one could envision this passing the House and moving on to the Senate with a half dozen or more moderate conservatives crossing the aisle, joining with Senate Democrats to pass the bill within the next year or two. Indeed, it is a well-kept secret in Washington, DC, that many Republicans are quietly supportive of climate action but have been afraid to "come out of the closet" for fear of retribution from powerful ideological purists such as the Kochs and Mercers. *New York Times* columnist Justin Gillis met with one highly placed Republican operative who, requesting anonymity, acknowledged that "we are going to have to do a deal with the Democrats. We are waiting for the fever to cool."[15] I have also had amicable and productive anonymous meetings with prominent conservatives, including a well-known columnist for a Murdoch-owned Australian newspaper. That numerous Republican

politicians and conservative opinion leaders *would* support climate action if they felt they were granted the license to do so by party power brokers adds to the notion that a climate-action tipping point could be looming in our near future.

This is not to say that it will be easy to pass climate legislation. Fossil fuel interests, ideologically driven plutocrats like Charles Koch, members of the Mercer and Scaife families, and the global Murdoch media empire are still doing all they can to muddy the waters and block progress. But, as we have seen, there are dramatic demographic shifts underway that favor action on climate. Frank Luntz's recent polling shows that Americans in general support carbon pricing by a four-to-one margin, and Republicans under the age of forty by an amazing six-to-one margin.[16] In short, climate denial is increasingly a liability, while the promise of climate action is an opportunity to win over younger voters.

History teaches us that social transitions are often not gradual but instead sudden and dramatic, and they don't even require a majority in support of change. A committed vocal minority can potentially push collective opinion past a "tipping point." A 2018 study suggested that "opinion of the majority [can] be tipped to that of the minority" once the latter reaches about 25 percent of the public.[17] We appear to have witnessed this phenomenon in action with the rather sudden, dramatic increase in support for marriage equality by Americans during the Obama years. According to Pew Research, public support for same-sex marriage rose from under 40 percent when Obama was elected to over 60 percent when he left office.[18]

Triggered by the horrific killing, captured on video, of a forty-six-year-old black man, George Floyd, by Minneapolis police, a similar tipping point on attitudes toward racial justice seems to have taken place in early summer 2020. One poll showed that the percentage of Americans who think that police are more likely to use excessive force against African Americans jumped from 33 percent to 57 percent. Public awareness and outrage led to massive demonstrations over the unjustified killing. Pollster Frank Luntz commented, "In my 35 years of polling, I've never seen opinion shift this fast or deeply. We are a different country today than just 30 days ago."[19]

It is not unreasonable to speculate that we might be close to such a

tipping point on climate as well. According to a Pew Research poll in 2019, 67 percent of the public thinks we're doing too little to reduce the effects of climate change.[20] That, of course, doesn't mean that they prioritize it, or that they're actively pushing for action on climate. But another 2019 poll, conducted by CNN, found that "82 percent of registered voters who identified as Democrats or Democratic-leaning independents consider climate change a 'very important' top priority they'd like to see get the focus of a presidential candidate."[21] Let us account for the fact that roughly 80 percent of eligible citizens are registered, and that 40 percent of voters are Democrats and about 30 percent independent (which we'll conservatively assume split equally into 15 percent and 15 percent when it comes to which direction they lean).[22] That yields at least 36 percent of American citizens (0.80 × 0.55 × 0.82) who reasonably define the "issue public" for climate action—that is, the set of people who prioritize the issue. That percentage exceeds the 25 percent theoretical threshold required for generating a societal tipping point. It is comparable to the percentage of the American public that supported marriage equality at the beginning of the Obama era, just before that tipping point was reached.

In other words, there's reason to believe that we are currently primed for a marriage-equality-like tipping point with climate action. There is still opposition, but the opposing forces in this case—which include the world's most powerful industrial sector, fossil fuels—are considerably stronger and better funded than those that opposed marriage equality (the religious right). That means that the forward push to get us past the tipping point has to be all that much harder. Fortunately, the forces of progress appear to be aligning in a favorable manner: the visceral evidence of a climate crisis is now before us; we are seeing the demise of denial and the rise of climate activism, particularly from the children's climate movement; and we are learning critical lessons even now from another global crisis, the 2020 coronavirus pandemic.

One group of climate experts has in fact published a set of "concrete interventions to induce positive social tipping dynamics." They propose, as key ingredients, "removing fossil-fuel subsidies and incentivizing decentralized energy generation, building carbon-neutral cities, divesting from assets linked to fossil fuels, revealing the moral implications of fossil

fuels, strengthening climate education and engagement, and disclosing greenhouse gas emissions information."[23] A lot of these basic ingredients indeed seem to be in place, or close to being in place.

First of all, as we have already seen, the fossil fuel industry is starting to "feel the heat." Oil-rich Saudi Arabia has "shifted its strategy in the era of decarbonization" by lowering the price of oil exports in a desperate attempt to maintain demand.[24] Coal, the most carbon-intense fossil fuel, is in a death spiral. The state of New York, for example, has retired its last coal-fired power plant.[25] The Canadian mining giant Teck Resources has withdrawn plans for its $20 billion tar sands project.[26] Natural gas is increasingly being recognized not as a "bridge to the future," but as a liability to local communities.[27]

And now, the banking and finance industry is rethinking its role in funding new fossil fuel infrastructure. The primary reason is what is known as *transition risk*. As we choose to decarbonize our economy, demand for fossil fuels will wane. That makes fossil fuel extraction, production, refining, and transport all bad investments. The finance and investment community increasingly fears a bursting of the so-called carbon bubble.

As *Guardian* correspondent Fiona Harvey explained, "investments amounting to trillions of dollars in fossil fuels—coal mines, oil wells, power stations, conventional vehicles—will lose their value when the world moves decisively to a low-carbon economy. Fossil fuel reserves and production facilities will become stranded assets, having absorbed capital but unable to be used to make a profit." Harvey also pointed out that "this carbon bubble has been estimated at between $1tn and $4tn, a large chunk of the global economy's balance sheet.… Investors with high exposure to fossil fuels in their portfolios will be hurt, as those companies and assets cease to be profitable." Especially worrying, "If the bubble bursts suddenly, as [experts suggest] it might, rather than gradually deflating over decades, then it could trigger a financial crisis."[28]

There is another reason investors are rethinking their fossil fuel investments, however. It is a generalized notion of *fiduciary responsibility*, which can be defined as "the legal and ethical requirement [of a financial adviser] to put your best interest before their own."[29] An expansive view of this responsibility would require that portfolio managers not make decisions

that will mortgage the planet for their clients' children and grandchildren.

Under Australian law, such an expansive view of fiduciary responsibility already applies to pension (or so-called superannuation) fund managers.[30] And it turns out that this has broad international implications, because Australia is home to the world's third-largest net pension holdings, worth just under $2 trillion (a consequence also of Australian law, which requires employers to contribute at least 9 percent of a worker's salary to a superannuation fund[31]). That means that the decisions of Australian "superfund" managers substantially leverage global investment. If Australian superfund managers choose not to invest in fossil fuel companies, it will have reverberations for the fossil fuel industry writ large.

I participated in meetings with several groups of Australian superfund managers in Sydney and Melbourne during my sabbatical in Australia in early 2020. Repeatedly they told me that they now view their investment decision-making through the lens of their larger responsibilities to their clients—in particular, their responsibility not to laden them with risky long-term fossil fuel investments, and their responsibility not to invest in an industry that threatens future livelihood and livability. These audiences were as hungry for detailed facts, figures, and assessments of risk as any I've ever encountered. I left those meetings with the sense that "it may be banking & finance, rather than national governments, that precipitate a climate action tipping point."[32]

There is considerable evidence to support that conjecture. Investors are already taking preemptive actions. According to Axel Weber, the chairman of Swiss multinational investment bank UBS, the finance sector is on the verge of "a big change in market structure" because investors are increasingly demanding that the sector account for climate risk and embed a price on carbon in their portfolio decisions.[33] Mark Carney, governor of the Bank of England, said in early 2020 that because climate change could make fossil fuel financial assets worthless in the future, he is considering imposing a "penalty" capital charge on them.[34]

Insurance giant The Hartford, Sweden's central bank, and BlackRock, the world's largest asset manager, have indicated they will stop insuring or investing in Alberta's carbon-intensive tar sands oil production.[35] BlackRock has gone even further, announcing it will no longer make

investments that come with high environmental risks, including coal for power plants.[36] Goldman Sachs, Liberty Mutual, and the European Investment Bank—the largest international public bank in the world—are among the numerous banks and investment firms that are now pulling away from fossil fuel investments.[37] In the space of a few days in early July 2020, three multibillion-dollar oil and natural gas pipeline projects in the United States—Atlantic Coast, Dakota Access, and Keystone XL, were at least temporarily halted due to what the *Washington Post* characterized as "legal defeats and business decisions."[38] The carbon bubble sure appears ready to pop.

Younger investors, who are far more likely to prioritize action on climate, are playing a particularly vital role here. Consider the actions of twenty-four-year-old Mark McVeigh, an environmental scientist who works for the Brisbane City Council. McVeigh has sued his pension fund for failing to account for climate-change-related damages in its investment decisions. The case is currently working its way through the court system.[39]

While we're talking about the role of young folks, let us consider the impact of fossil fuel divestment, a college-student-led movement. I think back to my first semester at UC Berkeley in the fall of 1984. I had not been politically active in high school. My choice to matriculate to Berkeley had nothing to do with its legacy as a fount of political activism. It had nothing to do with the role it played in the protests of McCarthyism in the 1940s and 1950s, in the civil rights and free-speech movements in the 1960s, or in the Vietnam War protests of the late 1960s and early 1970s. As an aspiring young scientist, I was attracted to UC Berkeley because of its reputation as one of the leading institutions for scientific education and research.

The mid-1980s marked the "Reagan Revolution." Shortly after my arrival that fall, on the night that Ronald Reagan was elected to his second term as president, I watched the Berkeley College Republicans march triumphantly across campus. Complacency had replaced activism even at Berkeley. But activism wasn't dead. It was simply dormant. The anti-apartheid movement—opposing the South African government's brutal and violent policy of discrimination against nonwhites—however, was brewing.

It came to a full boil in 1985. The UC Regents had nearly $5 billion invested in the South African government, more than any other university

in the country, helping prop up this system of discrimination. UC Berkeley students demanded the university divest of its holdings. When the Regents resisted, the students held increasingly large and well-publicized sit-ins and protests on famous Sproul Plaza, the very place where Berkeley students before them had protested in decades past. The students were unrelenting. And in July 1986, under great pressure from the student body, the Regents finally agreed to divest of holdings in the apartheid government and companies doing business with them. That triggered a nationwide divestment movement, and by 1988, 155 institutions of higher learning had chosen to divest.[40] In 1990, five years after the protests had begun at Berkeley, South Africa initiated the dissolution of apartheid. Students at Berkeley—and all across the nation—had helped "change the world."[41] I was part of it.

In 2014, more than two decades later, Berkeley students would once again stage protests in Sproul Plaza. This time it was to demand that the UC Regents divest of fossil fuel holdings. The argument was twofold. First, fossil fuel companies, through the extraction and sale of their product, were causing dangerous planetary warming. Therefore, as with apartheid, there was an obvious moral argument to be made—that the university shouldn't be encouraging harmful activities with their investments. But there was another, more pragmatic reason the student protest made sense: simply put, fossil fuel companies are now bad, risky investments. Their main assets—known but as yet untapped fossil fuel reserves—must ultimately be left stranded.

Fossil fuel divestment has now spread across the country. More than a thousand college campuses and other institutions throughout the United States (accounting for more than $11 trillion in holdings) have divested of fossil fuel stocks.[42] The UC Regents are among them. In September 2019, roughly thirty-three years after their fateful decision to divest from the South African apartheid government, they announced they were divesting of fossil fuel holdings.[43] If past is indeed prologue, we might just speculate that *perhaps* we're just a few years from the bursting of the carbon bubble.

It has been said that "the stone age didn't end for want of stones."[44] Nor is the fossil fuel age ending for want of fossil fuels. It's ending because we recognize that the burning of fossil fuels poses a threat to a sustainable

future. But it's also ending because something better has come along: renewable energy. As we have seen, even in the absence of widespread carbon pricing or adequate subsidies, renewable energy is surging owing to the fact that people are embracing clean sources of energy that are ever more competitive with dirty fossil fuel energy.

There is increasingly a sense of inevitably now in the clean energy revolution. The International Energy Agency, as we learned earlier, reported that "clean energy transitions are underway." The IEA attributed the fall in power-sector carbon emissions and the flattening of overall carbon emissions in 2019 to a combination of wind, solar, and other renewable energy sources. Clean energy collectively saved 130 Mt of carbon dioxide from being emitted that same year.[45] This global picture is encouraging.

What we see at the national level is no less promising. In the United States we've crossed a critical milestone. Renewable energy capacity has now reached 250 gigawatts (a gigawatt is a billion watts), amounting to 20 percent of total power generation, a consequence of growth in installed wind and solar voltaic capacity, enhanced energy storage, and an increase in electric vehicle sales.[46] Renewables, for the first time, outcompeted coal in power generation during the first quarter of 2020.[47] In Australia a similar story is underway. Tesla's big batteries are now outperforming fossil fuel generators on both performance and cost.[48] South Australia is now on its way to 100 percent renewable energy.[49] Similar success stories can be told around the world. We are ready to turn the corner. We are approaching a tipping point of the good kind.

## THE *REAL* PANDEMIC

Opportunity can arise from tragedy. Such seemed to be the case with the COVID-19 outbreak of early 2020. Nature had afforded us a unique teaching moment. Watching the pandemic unfold, both the impacts and the response, was like watching a time lapse of the climate crisis.[50] Was this a climate-change practice run?

Though the climate crisis is playing out considerably more slowly than the pandemic, there is much to be learned about the former from the latter. These important lessons have to do with the role of science and fact-based

discourse in decision-making; the dangers of ideologically driven denial, deflection, and doomism; the roles played by individual action and government policy; the threats posed by special interests hijacking our policy machinery; the fragility of our societal infrastructure; and the distinct challenges of satisfying the needs of nearly eight billion (and growing) people on a finite planet. Will we take away the right lessons?

What can we learn, for example, about the role of science? As with climate change, scientists had warned of the threat of a pandemic many years in advance.[51] They had designed theoretical models for just that scenario that proved essential for anticipating what would happen with the novel coronavirus. The initial spread occurred at an exponential rate, just as models predicted.[52] This meant we could anticipate that more and more people would become infected in the weeks and months ahead, which they did. We knew that the majority of those infected by COVID-19 would experience mild or no symptoms while remaining highly contagious, and we knew that for others, COVID-19 would create the need for emergency medical supports that are not available in sufficient supply.

A popular Internet meme is that "every disaster movie starts with the government ignoring a scientist." And the coronavirus provided some striking examples. Prime Minister Boris Johnson in the United Kingdom initially disregarded what the world's scientists were telling him and instead advocated for "herd immunity"—that is, simply letting the disease spread rampantly among the population, building collective resistance in the remaining population but needlessly sacrificing lives in the process.[53] This decision was based on what turned out to be a faulty analysis by his advisers.[54] Johnson then not only contracted COVID-19 himself but likely spread it to others through irresponsible personal behavior, becoming a poster child for the dangers of disregarding scientific predictions.[55]

The coronavirus outbreak also taught some important lessons about the cost of delay. The United States paid a terrible price by not acting quickly and decisively enough to avoid danger—more than 200,000 deaths at the time this book went to press. It is beginning to dawn on many that we are paying a similar price with the climate crisis. If we had acted decades ago, when a scientific consensus had been reached that we were warming the planet, carbon emissions could have been ramped down gently and much of

the damage that we are now seeing could have been avoided. Now they must be lowered dramatically to avert ever more dangerous warming. With COVID-19, there is a two-week delay between intervention actions and changes to the rate of growth in transmissions and deaths. Both the United States and the United Kingdom were slow to take meaningful preventive measures. Whereas deaths had plateaued in most industrial countries by early April 2020, they continued to climb for these two countries.[56] For both climate change and coronavirus, taking appropriate action pays future dividends. Conversely, the slower we are to act, the higher the cost, as measured by both economic losses and deaths.

The parallels weren't lost on other observers. "By the time the true scale of the problem becomes clear, it's far too late," wrote Patrick Wyman in *Mother Jones*. "The disaster—a crisis of political legitimacy, a coronavirus pandemic, a climate catastrophe—doesn't so much break the system as show just how broken the system already was."[57] *The Guardian*'s Jonathan Watts weighed in, too, with a headline reading, "Delay Is Deadly: What Covid-19 Tells Us About Tackling the Climate Crisis."[58]

As with climate change, unwarranted doomism reared its head. Jem Bendell sought to connect the two phenomena explicitly, blaming the coronavirus on rising temperatures. Saijel Kishan at Bloomberg News reported, "Bendell is… willing to make the connection between coronavirus and climate change. He says that a warmer habitat may have caused the bats to alter their movements, putting them in contact with humans."[59] I know of no scientific evidence for that claim.

Lessons about the dangers of ideologically driven denial were of course in great abundance. The same individuals, groups, and organizations that have for years served as purveyors of climate-change denial were quick to attack and undermine public faith in the science of the coronavirus crisis. This strategy makes sense, given the common underlying ideology and politics. Climate-change denial serves the agenda of powerful corporations and the Trump administration. COVID-19 denial did the same, with corporate profits, near-term economic growth, and Trump's reelection prospects all threatened by large-scale lockdowns.

So we saw the standard denialist modus operandi in play. Russian trolls early on promoted disinformation and conspiracy theories.[60] Right-wing

organizations pumped out anti-science propaganda. A dark-money-funded group called the Center for American Greatness published a commentary mocking the hockey-stick-like projections of coronavirus cases by epidemiologists, comparing them to the supposedly "widely refuted"—you guessed it—climate-change hockey-stick graph that my coauthors and I published more than two decades ago.[61] Even the subtitle of the article ("There's Still Time to Find a Balance Between Public Health and the Economy") cried false dilemma.

The usual denialist suspects were rounded up. Benny Peiser and Andrew Montford—two climate-change deniers—were given substantial real estate on the editorial pages of Rupert Murdoch's *Wall Street Journal* to insist that "scary" coronavirus projections were based on "bad data" and that we must not take "draconian measures" that might harm the economy.[62] As it was published on April 1, you could be forgiven for thinking it was an April Fool's joke. At that very moment, coronavirus cases in New York were surging toward their peak, as subsequent weeks would prove. The climate-change-denying Heartland Institute insisted that social-distancing measures should be lifted.[63] Online, meanwhile, a rogues' gallery of climate-change contrarians, including Judith Curry, Nic Lewis, Christopher Monckton, Anthony Watts, Marcel Crok, and William Briggs, all joined in on the frenzy.[64]

Trump himself emerged early on as a leading source of disinformation. As with climate change, he initially dismissed concerns about COVID-19 as a "hoax."[65] With both COVID-19 and climate change, "Trump… employed similar tactics—namely cherry-picking data, promoting outright falsehoods and using anecdotal experience in place of scientific data," reported *Energy and Environment News*.[66] And in both cases Trump depended upon agenda-driven anti-science contrarians to justify his course of inaction.[67] Writing for Pulitzer Prize–winning *Inside Climate News*, Katelyn Weisbrod described "6 Ways Trump's Denial of Science Has Delayed the Response to COVID-19 (and Climate Change)," with a subtitle noting that "Misinformation, Blame, Wishful Thinking and Making Up Facts are Favorite Techniques."[68]

Fearing a slowdown of the economy and threat to his reelection hopes, Trump repeatedly dismissed the public threat and discouraged people from

taking the actions recommended by health experts, such as social distancing and mask-wearing. Jeff Mason wrote, in an article for Reuters, "Early on he said that the virus was under control and repeatedly compared it to the seasonal flu," and in late March "he argued the time was coming to reopen the U.S. economy, complaining that the cure was worse than the problem and setting a goal of economic rebirth by Easter on April 12." In early April, furthermore, Dr. Deborah Birx, leading the White House task force on the pandemic, told Americans they needed to "do better at social distancing." But, as Mason put it, "President Donald Trump didn't like the message."[69]

As time went on, and Trump's desperation with the lockdown grew, his anti-scientific and pseudoscientific response to the COVID-19 crisis itself constituted a mounting public health threat. There were his entirely unfounded and irresponsible suggestions that the virus could be cured by ultraviolet light or disinfectants. After having initially issued an emergency authorization in March 2020 for the use of two antimalarial medications, hydroxychloroquine and chloroquine, in response to pressure from Trump, the US Food and Drug Administration reversed that decision in June 2020, noting that the medications "were unlikely to be effective" for treating COVID-19, and that any potential benefits were outweighed by safety risks, including heart problems.[70]

Trump discouraged the use of face masks, a simple measure known to greatly reduce transmission of coronavirus. In June 2020, he held dangerous indoor political rallies in Tulsa, Oklahoma, and Phoenix, Arizona, that defied all public health measures (masks were not encouraged, and staff were even ordered to remove the social-distancing stickers on chairs in Tulsa). And he held a crowded "4th of July" event at Mount Rushmore that represented not only a public health threat but an environmental one as well, featuring a fireworks display that experts warned posed a severe fire hazard due to climate-change-fueled heat and drought conditions.[71]

Other conservatives aided and abetted Trump's efforts. At times, it would have been almost comical if it were not so dangerous. Indeed, the *Daily Show* was compelled to compile a "best of" reel it called the "Heroes of the Pandumic."[72] It featured assorted right-wing personalities, Republican talking heads, and politicians dismissing the threat of the virus.

On Fox News, Sean Hannity complained that the "media mob" wanted people to think the pandemic was "an apocalypse," and Rush Limbaugh dismissed it as "hype," insisting that "the coronavirus is the common cold folks." Lou Dobbs on Fox warned, "The national left-wing media [is] playing up fears of the coronavirus." Commentator Tomi Lahren, also on Fox, mocked those who were concerned as crying, "The sky is falling because we have a few dozen cases," adding that she was "far more concerned with stepping on a used heroin needle."

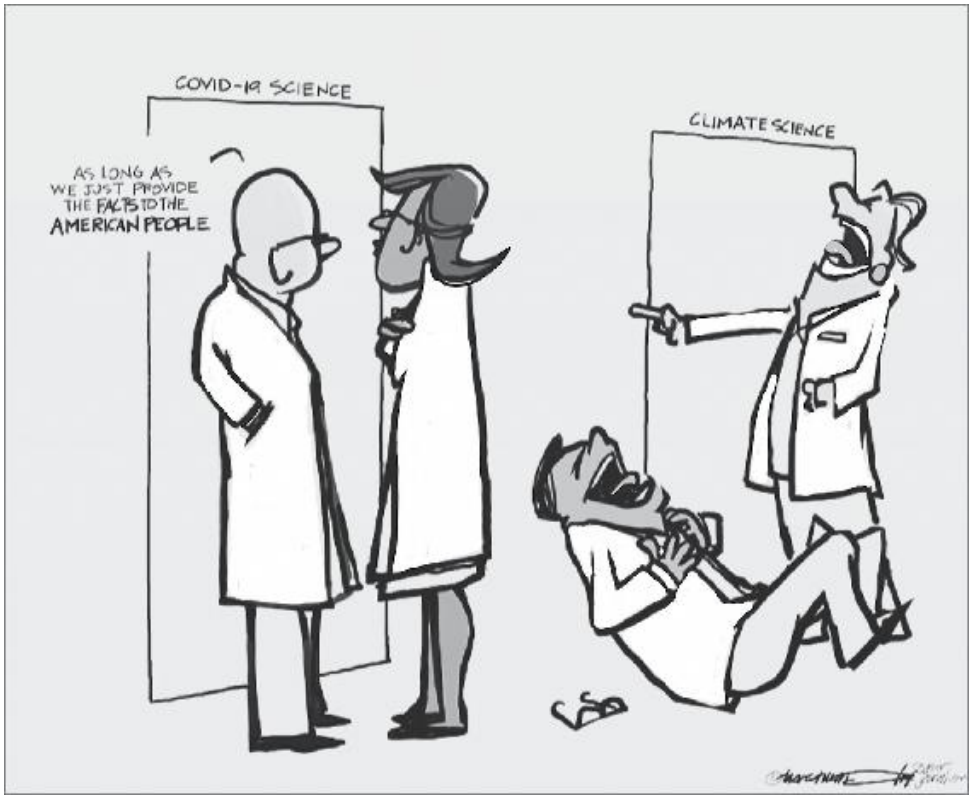
The disdain for science and public health concern went on and on. Fox News personalities Jeanine Pirro, Dr. Marc Siegal, and Geraldo Rivera all dismissed coronavirus as no worse than the flu in what could readily be seen as a coordinated Fox News talking point. Other Fox personalities insisted they were not "afraid" of the virus, that it was "very difficult to contract," and that it was "milder than we thought." A Fox panel told viewers, "It's actually the safest time to fly."

Fox News and other right-wing media even resorted to orchestrated character attacks against the nation's top infectious disease expert, simply because he refused to act as a rubber stamp for Trump's most misguided coronavirus policy gambits. Media Matters described the phenomenon: "Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases for the past 36 years, is a widely respected immunologist and major public face of the Trump administration's response to COVID-19. Despite his credibility established over decades as a public health official, right-wing media have begun to launch attacks against [him], blaming the medical expert for allegedly harming the economy and undermining President Donald Trump."[73] In what might sound all too familiar, the Trump administration even went so far as to circulate an opposition research document cherry-picking and misrepresenting Fauci's statements to try to discredit him as a scientist and as a messenger.[74]

Republican politicians followed suit, too. Trump's most loyal, fiercest bulldogs in Congress treated the pandemic like it was a joke. Congressman Devin Nunes (R-CA) told viewers to "just go out and go to a local restaurants." Matt Gaetz (R-FL) wore a gas mask on Capitol Hill to mock concern about coronavirus. When a reporter questioned James Inhofe (R-OK), the leading climate-change denier in the US Senate, about what

precautions he was taking, Inhofe extended his arm and dismissively asked, "Wanna shake hands?" Eight governors—all Republicans—collectively ignored the words of Dr. Anthony Fauci, who had expressed concern about the lack of adequate lockdown.

Conservative coronavirus denial turned ever more deadly as a coordinated effort emerged among Republican politicians and talking heads to convince the elderly to "take one for the team." Texas lieutenant governor Dan Patrick said on Fox News that grandparents should be willing to die to save the economy for their grandchildren.[75] Conservatives doubled down on this talking point, with other leading personalities, like Fox News's Brit Hume, arguing that it was an "entirely reasonable viewpoint" for the elderly to risk their lives to help the stock market.[76] One right-wing talk-show host took this progression to its logical extreme, insisting that "while death is sad for the living left behind, for the dying, it is merely a passage out of this physical body."[77]




Herein we see yet another remarkable parallel with climate-change inactivism: the transition over time from denial to false solutions, and then, eventually, to "it's actually good for us." This transition took more than a

decade with climate inactivists; with the coronavirus deniers it happened in a matter of weeks.[78] Climate scientist Mike MacFerrin explained, "The right wing's instantaneous flip from 'it's a hoax' to 'let millions die in service to the "market"' is the same script they play with climate change, to a tee. They want you to do nothing."[79] And former CBS News anchor Dan Rather put it this way: "After years when we should have learned of the dangers of 'false equivalence' it baffles me that we are seeing a framing that pits the health of our citizens against some vague notion of getting back to work."[80] I noted, in turn, that it's "not unlike the false equivalence… that pits the health of our entire planet against some vague notion of economic prosperity."[81] The right-wing response to coronavirus was, indeed, a précis of the climate wars.

While it took years for the threat of climate change to crystallize, with the impacts of epic storms, floods, and wildfires, it took only weeks for the reality of the coronavirus to set in as people witnessed colleagues, friends, and loved ones contract the disease, and sadly, in some cases, perish from it. Under such circumstances, the consequences of denial and inaction became readily apparent to the average person on the street (or, more aptly, safely self-quarantined in their home).

The coronavirus pandemic thus provided an unexpected lesson on the perils of anti-science. As I told *Energy and Environment News*, the pandemic "exposes the dangers of denial in a much more dramatic fashion. We may look back at the coronavirus crisis as a critical moment where we were all afforded a terrifying view of the dangerous and deadly consequences of politically and ideology-driven science denial. We looked into the abyss, and I hope we collectively decide that we don't like what we saw."[82] Tweeted Steve Schmidt, former presidential campaign co-adviser for the late senator John McCain, "The injury done to America and the public good by Fox News and a bevy of personalities from Limbaugh to Ingraham… will be felt for many years in this country as we deal with the death and economic damage that didn't have to be."[83]

There were other key lessons to take away from the pandemic that had broad implications for the climate crisis. We were provided with more examples of the concept of a "threat multiplier"—that is, the compounding nature of multiple simultaneous threats. The damage already wrought by

climate change in some places affected their ability to respond to the coronavirus threat. So extensive was the damage to Puerto Rico's health-care infrastructure after Hurricane Maria that vital equipment was lacking when coronavirus came along. A thirteen-year-old named Jaideliz Moreno Ventura was just one of the resulting casualties: she died because Vieques, where she lived, lacked the medical equipment to treat her.[84] Many others were similarly affected, and the tragedy was a legacy of the devastating, climate-change-fueled impacts of Hurricane Maria, along with the insufficient federal support for Puerto Rico under President Trump and his failure to send aid for hurricane recovery, including for critical public health infrastructure.[85]

The pandemic also crystallized the dual roles played by both individual action and government policy when it comes to dealing with a societal crisis. While containment required individuals to act responsibly by practicing social distancing, using masks, and following other advice regarding mitigative behavioral actions, it also required government action in the form of policies (like stay-at-home orders, restrictions on public gatherings, and so on) that would *incentivize* responsible behavior.

The coronavirus crisis, in fact, underscored the importance of government. The need for an organized and effective response to a crisis, after all, is one of the fundamental reasons we have governments in the first place. Crises, whether in the near term like COVID-19 or in the long term like climate change, remind us that government has an obligation to protect the welfare of its citizens by providing aid, organizing an appropriate crisis response, alleviating economic disruption, and maintaining a functioning social safety net.[86]

Citizens, in turn, have a responsibility to hold politicians accountable whenever government fails to uphold its end of the "social contract." In a democratic society, political action and individual action are inextricably linked. We need to deal with problems such as COVID-19 and climate change, and we need competent, science-driven leaders to do that. Consider the contrast between the United States and the United Kingdom, under Donald Trump and Boris Johnson, respectively, on the one hand—two politicians who dismissed the need for lockdown and social distancing—and, on the other hand, New Zealand and Germany, which saw limited

impact under their respective leaders Jacinda Ardern and Angela Merkel, who instead embraced such measures.

As I'm writing, we don't yet know the outcome of the upcoming presidential election that will determine the fate of climate policy in the United States, and indeed the world, for years to come. But is seems plausible that voters will recognize the shortcomings of a president who had "received [his] first formal notification of the outbreak of the coronavirus in China" at the beginning of January 2020, including "a warning about the coronavirus—the first of many—in the President's Daily Brief," and "yet… took 70 days from that initial notification… to treat the coronavirus not as a distant threat or harmless flu strain… but as a lethal force… poised to kill tens of thousands of citizens."[87] It seems equally plausible that an administration that exploited the pandemic by stripping away environmental protections at the behest of big polluters, greenlighting the construction of controversial new fossil fuel infrastructure, and criminalizing climate protests while the public was distracted will see a reckoning come the election.[88]

The most important question of all, though, is this one: Can an event like the coronavirus crisis become a turning point, an opportunity to bring needed focus to an even greater crisis—the climate crisis? The climate crisis is, after all, the greatest long-term health threat we face. Even as we battled the pandemic, climate change continued to loom in the background. "Earth Scorched in the First 3 Months of 2020," reported *Mashable*.[89] In Australia, where I was residing in early 2020 when the COVID-19 epidemic was just beginning to unfold, Australians were still recovering from the calamitous bushfires of the summer of 2019/2020. Meanwhile, the Great Barrier Reef was beginning to suffer the third major bleaching event in five years, an unprecedented and foreboding development.[90]

The COVID-19 pandemic spoke to the fragility of our expanding, resource-hungry civilization and our reliance on massive but fragile infrastructure for food and water on a planet with finite resources. Some argued that this crisis might be sounding the death knell of resource-extractive neoliberalism.[91] I myself am not so sanguine.[92] But I do think it has generated a long-overdue discussion about the public good and environmental sustainability.

Some ecologists believe that our resource-hungry modern lifestyle—in particular, the destruction of rain forests and other natural ecosystems—may be an underlying factor favoring the sorts of pandemics we have just witnessed.[93] That raises some disturbing possibilities, but to appreciate them, we must take a brief scientific digression into the concept of *Gaia*, the ancient Greeks' personification of Earth herself.

Put forward by scientists Lynn Margulis and James Lovelock in the 1970s, the Gaia hypothesis says that life interacts with Earth's physical environment to form a synergistic and self-regulating system.[94] In other words, the Earth system in some sense behaves like an organism, with "homeostatic" regulatory mechanisms that maintain conditions that are habitable for life. Although the concept has often been taken out of context and misrepresented—for example, to depict Earth as a sentient entity—it is really just a heuristic device for describing a set of physical, chemical, and biological processes that yield stabilizing "feedback" mechanisms maintaining the planet within livable bounds. There is no consciousness or motive. It's simply the laws of physics, chemistry, and biology at work in a fascinating and fortuitous manner.

There is evidence that the hypothesis holds within the range of its assumptions. Earth's *carbon cycle*, which governs the amount of $CO_2$ greenhouse gas in the atmosphere, is heavily influenced by life on Earth. Photosynthetic organisms, such as cyanobacteria (blue-green algae) and plants, for example, take in $CO_2$ and produce oxygen, which is needed by animals like us. There is evidence that as the Sun has become brighter over Earth's lifetime of the past 4.5 billion years, the carbon cycle has intensified, decreasing atmospheric $CO_2$ levels and helping keep Earth from becoming inhospitably hot. A specific example is the famous Faint Young Sun Paradox—the surprising finding that Earth was habitable to basic lifeforms more than 3 billion years ago despite the fact that the Sun was 30 percent dimmer—which we encountered back in Chapter 1. Readers may recall that the great Carl Sagan proposed an explanation: namely, there must have been a considerably larger greenhouse effect at the time. (Incidentally, Sagan and Margulis were married for about seven years. I often wonder what other scientific synergies must have emerged in their daily dinner-table conversations.)

During the height of the COVID-19 crisis, air traffic, transportation, and industrial activity greatly diminished, and pollution, including carbon emissions, was reduced. I couldn't help but pose a rhetorical question.[95] Are pandemics such as coronavirus, metaphorically speaking, acting like Gaia's immune system, fighting back against a dangerous invader? Aren't *we*—through the damage we are inflicting on the planet, its forests, its ecosystems, and its oceans and lakes, actually the metaphorical *virus*?[96] I wasn't the only one asking such questions.[97] My question was intentionally provocative, and I was sensitive about even asking it, since such thinking can easily be misconstrued and abused for misanthropic and ecofascist purposes.[98]

Here's the point, though. Unlike microbes, human beings have agency. We can choose to behave like a virus that plagues our planet, or we can choose a different path. It's up to us. Our response to the coronavirus pandemic shows it's possible for us to change our ways when we must. The COVID crisis was acute and immediate, and the penalty of inaction was swift. Climate change may seem slower than coronavirus and farther away, but it is very much here, and it requires many of the same behavioral changes. In this case our commitment must be sustained rather than fleeting. We must flatten the curve—of carbon emissions—to get off the climate pandemic path.[99]

While the coronavirus pandemic was truly a tragedy, we must consider the opportunities it has brought along in its wake as we attempt to work our way back to normal life and governments implement economic stimulus plans to jump-start their economies. The pandemic has given us an opening to get off the path of climate distress and onto a healthier path. We must work even harder to decarbonize our economy and minimize our environmental footprint. There are clear side benefits to an economy that is less vulnerable to disruptions in the production and transport of fuel. Regardless of what else happens, the sun will still shine, and the wind will still blow. Renewable energy is both safer and more reliable than fossil fuels. We were already seeing the decoupling of our global economy from fossil fuels before the pandemic. (We had substantial economic growth in 2019 without a rise in carbon emissions.) Why not take this opportunity to accelerate the transition from fossil fuels to renewable energy?

The good news is that this seems to be happening, despite the Trump administration's best efforts to impede this transition by seeking to fast-track the further dismantling of climate and environmental protections.[100] *Inside Climate News* reported in July 2020 that two of the world's largest oil companies, Shell and BP, were lowering their outlooks for demand for their products and slashing the value of their assets by billions, saying the coronavirus pandemic could accelerate a shift to clean energy.[101] In early April 2020, a group of state officials from agencies such as the California Energy Commission, collectively representing more than 25 percent of total US power generation, announced a new coalition dedicated to 100 percent clean energy. In doing so, they explicitly acknowledged both the challenges and the opportunities for change in the wake of the pandemic.[102] New York State, the world's eleventh-largest economy, put forward a COVID-19 recovery plan centered on renewable energy.[103] ClimateWorks Australia had a stimulus-ready plan already in place for Australia to move toward net-zero carbon emissions.[104] It appears we may, indeed, be turning a corner. That's just one reason to be optimistic. There are others.

## THE WISDOM OF CHILDREN

The Bible prophesied that "a little child shall lead them" (Isaiah 35:9). And such has been the case with climate action. Over the past few years, we have witnessed the rise to prominence of Greta Thunberg, a teenager from Sweden, who achieved by the age of sixteen an iconic global cultural status typically reserved for pop stars and Hollywood celebrities. She has been nominated for the Nobel Peace Prize and was featured on the cover of *Time* magazine. Thunberg has been diagnosed as having Asperger syndrome, but instead of seeing it as a liability, she calls it her "superpower."[105] Now seventeen, she possesses a remarkable ability to speak truth to power in strong, laser-focused, perfectly delivered language.

In 2018, at age fifteen, she began protesting outside the Swedish parliament to raise awareness about the threat of climate change. Her efforts garnered increasing levels of media attention. She went on to speak at the 2019 United Nations Climate Change Summit, to the British and European Parliaments, and, perhaps most famously, to the attendees of the 2019

World Economic Forum in Davos, where she chided the politicians and other influential individuals gathered there for their failure to address the existential challenge of our time, warning them "our house is on fire."

Thunberg's efforts have been infectious. She has sparked a global youth movement called "Fridays For Future," with literally millions of children around the world marching, striking, and protesting for climate action weekly. Kids in the United States wear T-shirts bearing her likeness. Adults are now mobilizing to support the movement, too. Inactivists have become so worried that they've even manufactured and promoted an "anti-Greta," a teenager who dismisses the climate crisis, in a desperate and feeble attempt at distraction and misdirection.[106]

They *should* be worried. In response to this popular uprising, the UK and Irish parliaments have now both declared a "climate emergency."[107] The majority of UK voters now support dramatic action to lower greenhouse gas emissions to nearly zero by 2050 regardless of cost.[108] There is clearly a sense of urgency. But there is also recognition of *agency*—a sense that action is possible, that our future is, to a great extent, still in our hands.

While Thunberg has garnered the lion's share of attention, there are other leaders of this movement. Among them is Alexandria Villaseñor, who, beginning in December 2018, at the age of fourteen, skipped school every Friday to protest against lack of climate action in front of United Nations Headquarters in New York City. She cofounded the US Youth Climate Strike and Earth Uprising youth climate activist groups. Then there's Jerome Foster, who as of 2020 was eighteen years old. An activist from Washington, DC, he is founder and editor in chief of *The Climate Reporter*. I joined Villaseñor and Foster in Easthampton, Long Island, in August 2019 in a panel event called "The Youth Climate Movement Could Save the Planet"—a sentiment with which I agree.[109] Afterward, the two even *inducted* me "officially" into the youth climate movement after I was able to demonstrate competency in Instagram technique.

It was a light moment, but the topic couldn't be more serious. The local paper, summarizing the discussion, said of the youth leaders, "Despite little meaningful movement to address a growing emergency, they have hope. Their generation, they said, is mobilizing to preserve a livable world."[110]

These kids have helped accomplish what seemingly nobody else could. They've helped place climate change on the front page of the papers and at the center of our public discourse. They are the main reason I'm optimistic that we're finally going to win this battle.

In solidarity with these youths, a group of just under two dozen climate scientists, myself included, published a letter in *Science* magazine that was ultimately cosigned by thousands of other scientists around the world. The letter offered support to them for their efforts.[111] It read, in part, "The enormous grassroots mobilization of the youth climate movement… shows that young people understand the situation. We approve and support their demand for rapid and forceful action. We see it as our social, ethical, and scholarly responsibility to state in no uncertain terms: Only if humanity acts quickly and resolutely can we limit global warming… and preserve the… well-being of present and future generations. This is what the young people want to achieve. They deserve our respect and full support."

They deserve not only our respect and support but our protection as well.[112] We saw earlier, back in Chapter 4, how leaders of the youth climate movement like Greta Thunberg and Alexandria Villaseñor have been targeted by trolls and bots and even heads of state, including Donald Trump and Brazilian president Jair Bolsonaro.

The attacks on Thunberg reached fever pitch in the lead-up to the high-profile, high-stakes events of September 2019: the Global Youth Climate Strike and the UN Climate Change Summit in New York City. Andrew Bolt, the Australian climate-change-denying propagandist at Murdoch's *Herald Sun*, attacked Thunberg, then sixteen, as "strange" and "disturbed."[113] Christopher Caldwell, a Senior Fellow and contributing editor for the right-wing Scaife-funded Claremont Institute, was granted space in the *New York Times* to attack her in a piece titled "The Problem with Greta Thunberg's Climate Activism: Her Radical Approach Is at Odds with Democracy."[114] Patrick Moore, chairman of the board of directors of the CO2 Coalition, a climate-change-denying Koch brothers front group that is the modern-day successor to the infamous George C. Marshall Institute we encountered back in Chapter 2, went so far as to tweet "Greta = Evil."[115]

The Eye of Sauron is focused upon these kids. The most powerful

industry in the world, the fossil fuel industry, sees them as an existential threat and has them firmly in its sights. Consider the recent actions of the Organization of the Petroleum Exporting Countries (OPEC), a trillion-dollar international organization founded in 1960 by five petrostates—Iran, Iraq, Kuwait, Saudi Arabia, and Venezuela. It now consists of fourteen oil-exporting countries that own 80 percent of the world's proven oil reserves.

In July 2019, OPEC's secretary general, Mohammed Barkindo, referred to the youth climate movement as the "greatest threat" the fossil fuel industry faces. He expressed concern that the pressure being brought to bear on oil producers by the mass youth movement was "beginning to… dictate policies and corporate decisions, including investment in the industry." Barkindo acknowledged that even the children of OPEC officials were now "asking us about their future because… they see their peers on the streets campaigning against this industry."[116]

Unintimidated, members of the youth climate movement actually welcomed the comments "as a sign the oil industry is worried it may be losing the battle for public opinion." The criticism, as *The Guardian* characterized it, "highlights the growing reputational concerns of oil companies *as public protests intensify along with extreme weather*" (emphasis added).[117] Note, by the way, the acknowledgment here of the role played by a synergy of underlying factors—in this case both the youth climate movement and mounting weather disasters. It is indeed no single factor—but a convergence of them—that has led both to intensified attacks by inactivists and an unprecedented opportunity for change.

The kids are at the center of it all. And they are being attacked simply for fighting for their future. It is morally incumbent upon the rest of us to do more than just pat them on the back. Communication expert Max Boycoff expressed the worry, in a September 2019 op-ed, "that we adults, who got us into this mess, are not doing enough.… Adult utterances about 'legacies' and 'intergenerational' generally ring hollow when the scale of engagement and action pales in comparison to the scale of the ongoing challenge."[118]

The children have created an opportunity that didn't exist before—they've gained a foothold for the rest of us. It is time for us to take the opportunity we've been given as we prepare for battle—the battle to preserve a livable planet for our children and grandchildren.

## THE FINAL BATTLE

Though they are on the run, the forces of climate-change denial and inaction haven't given up. Nor are they, as Malcolm Harris wrote in *New York Magazine*, "planning for a future without oil and gas." "These companies," Harris observed, after attending a fossil-fuel-industry planning meeting, "want the public to think of them as part of a climate solution. In reality, they're a problem trying to avoid being solved."[119]

Climate inactivists are now engaged in a rear-guard action as their defenses start to crumble under the weight of the evidence and in the face of a global insurgency for change. But let us also recognize that they are still in possession of a powerful arsenal as they wage the new climate war. It includes an array of powerful *D*s: disinformation, deceit, divisiveness, deflection, delay, despair-mongering, and doomism. The needed societal tipping point will not easily be reached as long as these immensely powerful vested interests remain aligned in defense of the fossil fuel status quo and in possession of these formidable weapons. It will only happen with the active participation of citizens everywhere aiding in the collective push forward.

It is the goal of this book to inform readers about what is taking place on this front and to enable people of all ages to join together in the battle for our planet. With that goal in mind, let's revisit the four-point battle plan outlined at the very start, reflecting now on everything we've learned:

*Disregarding the Doomsayers:* We have seen how harmful doomism can be. It is disabling and disempowering. And it is readily exploited by inactivists to convince even the most environmentally minded that there's no reason to turn out for elections, lobby for climate action, or in any other way work toward climate solutions. We must be blunt about the very real risks, threats, and challenges that climate change *already* presents to us. But just as we must reject distortions of the science in service of denialism, so, too, must we reject misrepresentations of the science—including unsupported claims of runaway warming and unavoidable human extinction scenarios—that can be used to promote the putative inevitability of our demise.

Unfortunately, *doom sells*! That's why we've seen a rash of high-profile feature articles and best-selling books purveying what I call "climate doom

porn"—writing that may tap into the adrenaline rush of fear but actually inhibit the impulse to take meaningful action on climate. It's why we see headlines with an overly doomist framing of what the latest scientific study shows (or at least plays up the worst possible scenarios).[120]

Feeding doomism is the notion that climate change is just too big a problem for us to solve. Especially pernicious in this regard is the dismissal of climate change as a "wicked problem." While definitions vary, what's relevant here is how it is defined in common parlance. Wikipedia defines a wicked problem as "a problem that is difficult *or impossible to solve* because of incomplete, contradictory, and changing requirements that are often difficult to recognize" (emphasis added).[121]

The idea that the climate problem is fundamentally unsolvable is itself deeply problematic. Jonathan Gilligan, a professor in earth and environmental science at Vanderbilt University, agrees, explaining, in a Twitter thread, "There are profound problems with the 'wicked problem' idea, that tend to produce a sense of helplessness because wicked problems are, by their definition, unsolvable."[122]

Others weighed in on how the "wicked problem" framing can constitute a form of soft denial. Paul Price, a policy researcher in Dublin City University's Energy and Climate Research Network, explained, "Social science use of 'wicked' & 'super-wicked' too often seems a form of 'implicatory denial,' a rhetorical fence to avoid physical reality."[123] Atmospheric scientist Peter Jacobs added, "There is almost literally no environmental problem that one couldn't successfully reclassify as 'wicked' at the outset if one wanted to, even topics where we've successfully mitigated much of the harm (ozone depletion, acid rain, etc.)."[124]

In any case, the "wicked problem" framing is convenient to polluting interests, which have worked hard to sabotage action on climate. And it's wrong. The truth is, if we took the disinformation campaign funded by the fossil fuel industry out of the equation, the climate problem would have been solved decades ago. The problem is not hopelessly complicated.[125]

Nevertheless, the forces of doomism and despair-mongering remain active, and we must call them out whenever they appear. In March 2020, as I was writing the final section of this book, social media was abuzz: Bernie Sanders had dropped out of the Democratic presidential primaries, leaving

Joe Biden the presumptive nominee. Some Sanders supporters were particularly aggressive in insisting that this spelled climate Armageddon. A commenter tweeted at me, "If we don't reduce carbon output by 50% of 2018 by 2030 climate change becomes a run away [*sic*] process that cannot be stopped."[126] I responded, "That's false.… Climate-change deniers distort the science. Let's not resort to their tactics."[127] The commenter continued, "Biden's plan doesn't come close to accomplishing that. There is no reason to vote in this election because it's apocalypse either way."[128]

It was a perfectly toxic brew of misguided thinking, consisting of distortions of the science in the service of doomist inevitability and false equivalence—between a president who has done notable damage to international climate efforts and a candidate whom Politifact calls "a climate change pioneer."[129] The cherry on top is the overt and cynical nihilism—the notion that there is nothing we can do, so we might as well simply give up. It would be easy to dismiss this as a one-off comment. But in fact it is reflective of a hostile online atmosphere that has been fueled by bad state actors. Bernie Sanders had said just a month earlier, "In 2016, Russia used Internet propaganda to sow division in our country, and my understanding is that they are doing it again in 2020. Some of the ugly stuff on the Internet attributed to our campaign may well not be coming from real supporters."[130]

This sort of propaganda may be more harmful now than climate-change denial itself. It must be treated as every bit as much of a threat to climate action. Those who promote it should be called out in the strongest terms, for they threaten the future of this planet. When you encounter such doomist and nihilistic framing of the climate crisis, whether online or in conversations with friends, coworkers, or fellow churchgoers, call it out.

Don't forget, once again, to emphasize that there is both *urgency* and *agency*. The climate crisis is very real. But it is *not* unsolvable. And it's *not* too late to act. Every ounce of carbon we don't burn makes things better. There is still time to create a better future, and the greatest obstacle now in our way is doomism and defeatism. Journalists and the media have a tremendous responsibility here as well.

*A Child Shall Lead Them:* Back in 2017, I coauthored a children's book, *The Tantrum That Saved the World*, with children's book author and

illustrator Megan Herbert.[131] It told the story of a girl, Sophia, who is frustrated by the animals and people—including a polar bear, a swarm of bees, a Pacific Islander, and others—who continue to show up at her door. They've been displaced from their homes by climate change. Sophia becomes increasingly frustrated by this disruptive activity and throws a tantrum. But she ultimately redirects her anger and frustration—and the tantrum itself—in an empowering way. She becomes the change she wishes to see in the world, starting a whole movement that demands accountability by the adults of the world to act on the climate crisis. Less than a year later, Greta Thunberg would rise to prominence and the youth climate movement would take the world by storm. Yes, life does indeed sometimes imitate art—in this case, in a most profound way.

The children speak with a moral clarity that is undeniable to all but the most jaded and cynical. It is a game-changer. But, as we've seen, that's what makes them such a threat to vested interests—the heads of petrostates and the fossil fuel industry itself. They have attacked the children because the children pose a serious threat to the industry's business-as-usual model. Fossil fuel interests rely on that model continuing for record profits.

Some colleagues of mine blithely dismiss the notion that we are, even if involuntarily on our part, in a "war" with powerful special interests looking to undermine climate action. Ironically, they are engaged in a form of denial themselves. The dismissiveness of soothing myths and appeasement didn't serve us well in World War II, and it won't serve us well here either. Especially when we are dealing with an enemy that doesn't observe the accepted rules of engagement. To carry the analogy one step further, the attacks on child climate activists most surely constitute a metaphorical violation of the Geneva Conventions. So yes, we are in a war—though not of our own choosing—and our children represent unacceptable collateral damage. That is why we must fight back—with knowledge, passion, and an unyielding demand for change.

This problem goes well beyond science, economics, policy, and politics. It's about our obligation to our children and grandchildren not to leave behind a degraded planet. It is impossible now not to be reminded of this threat whenever I have an opportunity to share the wonders of this planet with my wife and fourteen-year-old daughter. In December 2019, before I

began my sabbatical in Australia, I traveled with my family to see the Great Barrier Reef. Within a month after our visit the third major bleaching event of the past five years, the most extensive yet, was underway. Some experts fear that the reef won't fully recover.[132]

It fills me with an odd sort of "survivors' guilt" to have seen the reef with my family just in the nick of time. The next stop on our vacation was no less sobering. We went to the famous Blue Mountains of New South Wales. Unfortunately, the majestic vistas were replaced by a thick veil of smoke from the unprecedented bushfires that were spreading out across the continent.

I feel some wistfulness about the fact that my daughter, when she grows up, may not be able to experience these same natural wonders with her children or grandchildren. It's appropriate to feel grief at times for what is lost. But grief about that which is wrongly presumed to be lost yet can still be saved—and which is used, under false pretenses, in the service of despair and defeatism—is pernicious and wrong. Since I have already used at least one *Lord of the Rings* metaphor in this book, you'll forgive me if I use another. I'm reminded of the Steward of Gondor, who wrongly presumes his son to be dead and his city to be lost, telling the townspeople to run for their lives, and his assistants to take his still-living son off to be burned. Fortunately, Gandalf whacks him upside the head with his staff before his orders can be carried out. Sometimes I feel that way about doomists who advocate surrender in the battle to avert catastrophic climate change.

*Educate, Educate, Educate:* As we have discussed, the battle to convince the public and policymakers of the reality and threat of climate change is *largely* over. The substantive remaining public debate is over how bad it will get and what we can do to mitigate it. So online, don't waste time engaging directly with climate-change-denying trolls and bots. And where appropriate, report them. Those who seem to be *victims* of disinformation rather than *promoters* of it deserve special consideration. Try to inform them. When a false claim appears to be gaining enough traction to move outside the denialist echo chamber and infect honest, well-meaning folks, it should be rebutted.

You have powerful tools at your fingertips. A personal favorite resource

of mine is Skeptical Science (skepticalscience.com), which rebuts all the major climate-change-denier talking points and provides responses that you can link to online or via email. Inform yourself about the latest science so you are armed with knowledge and facts, and then be brave enough to refute misinformation and disinformation. Online there are Twitter accounts you can follow that provide up-to-date information about the science, impacts, and solutions. A few personal favorites of mine are @ClimateNexus, @TheDailyClimate, @InsideClimate, and @GuardianEco. Feel free to follow yours truly (@MichaelEMann), too, if you don't mind the occasional cat video!

Climate-change deniers constantly complain about language and framing. Don't fall for it. Don't make concessions to them. In sports parlance, they're trying to "work the refs." The classic example is the shedding of crocodile tears over use of the term "climate-change denier" itself. In point of fact, it's an appropriate, accepted term to describe those who reject the overwhelming evidence. The goal of the critics in this case is to coerce us into granting them the undeserved status of "skeptics," which actually *rewards* their denialism. Legitimate skepticism is, as we know, a good thing in science. It's how scientists are trained to think. Indiscriminate rejection of evidence based on flimsy, ideological arguments is not.

When we falsely label climate-change denialism as "skepticism," it legitimizes disinformation and muddies the climate communication waters. It makes concessions to those who have no interest at all in good-faith engagement, are unmovable in their views, and are intentionally trafficking in doubt and confusion. What is so pernicious is that at the same time it actually *hinders* efforts to convince and motivate the "confused middle"—those who are liable to throw up their hands in frustration when presented with the apparent predicament of a debate between two ostensibly legitimate camps.

But enough about climate-change deniers. They are increasingly a fringe element in today's public discourse, and our efforts to educate are best aimed at those in the confused middle. These folks accept the evidence but are unconvinced of the urgency of the problem and are unsure whether we should—or can—do anything about it.

My advice is to spend your time on those who are reachable, teachable,

and movable.[133] They need assistance. As we have seen, far too many have fallen into climate despair, having been led astray by unscientific, doomist messaging, some of it promoted by the inactivists in a cynical effort to dispirit and divide climate activists. Others are victims of other types of climate misinformation. When you encounter, for example, the claim that it's too expensive to act, point out that the opposite is true. The impacts of climate change are already costing us far more than the solutions. And indeed, 100 percent green energy would likely pay for itself.[134]

Call out false solutions for what they are. We've seen that many of the proposed geoengineering schemes and technofixes that have been proposed are fraught with danger. Moreover, they are being used to take our eye off the ball—the need to decarbonize our society. Even some of the fiercest climate hawks are sometimes way off base here. Elon Musk, for instance, has suggested that nuclear bombs could be used to make Mars's atmosphere habitable. While such proposals seem almost amusingly flippant, they are dangerous—not because we might expose little green men to nuclear radiation, but because they offer false promise for a simple escape route, providing fodder for those who argue "we can just find another planet if we screw up this one."

Climate change is arguably the greatest threat we face, yet we speak so little about it. Silence breeds inaction. So look for opportunities to talk about climate change as you go about your day—that's the gateway to all of the solutions we've discussed. Unlike coronavirus, we cannot look forward to a literal vaccine for the planet. But in a metaphorical sense, knowledge *is* the vaccine for what currently ails us—denial, disinformation, deflection, delayism, doomism, you know the litany by now. We must vaccinate the public against the efforts by inactivists to thwart climate action, using knowledge and facts and clear, simple explanations that have authority behind them. That's empowering, because it means we can *all* contribute to the cure.

*Changing the System Requires Systemic Change:* Inactivists, as we have seen, have waged a campaign to convince you that climate change is *your* fault, and that any real solutions involve individual action and personal responsibility alone, rather than policies aimed at holding corporate polluters accountable and decarbonizing our economy. They have sought to

*deflect* the conversation toward the car you drive, the food you eat, and the lifestyle you live.

And they want you arguing with your neighbor about who is the most carbon pure, dividing advocates so they cannot speak with a unified voice—a voice calling for change. The fossil fuel industry and the inactivists who do their bidding fear a sober conversation about the larger systemic changes that are needed and the incentives they will require. And it's for one simple reason: it means the end of their reign of power.

Make no mistake. Individual action is part of the solution. There are countless things we can do and ought to do to limit our personal carbon footprint—and indeed our total environmental impact. And there are many reasons for doing them: they make us healthier, save us money, make us feel better about ourselves, and set a good example for others to follow. But individual action can only get us so far.

We were recently afforded a cautionary tale about the limits of behavior change alone in tackling the climate crisis. The dramatic reduction in travel and consumption brought about by the global lockdown response to the coronavirus pandemic reduced global carbon emissions by only a very modest amount.[135] Referencing this fact, Glen Peters, research director on past, current, and future trends in energy use and greenhouse gas emissions at the Center for International Climate Research (CICERO), posed a question: "If such radical social change leads to (only) a 4% drop in global emissions, then how do we get a 100% drop by ~2050? Is #COVID19 just going to show how important technology is to solve the climate problem?"[136] It's a valid point.

The answer is that there *is* no path of escape from climate-change catastrophe that doesn't involve polices aimed at societal decarbonization. Arriving at those policies requires intergovernmental agreements, like those fostered by the United Nations Framework Convention on Climate Change (UNFCCC), that bring the countries of the world to the table to agree on critical targets. The 2015 Paris Agreement is an example. It didn't solve the problem, but it got us on the right path, a path toward limiting warming below dangerous levels. To quote *The Matrix*, "There's a difference between knowing the path and walking the path." So we must build on the initial progress in future agreements if we are to avert catastrophic planetary

warming.

The commitments of individual nations to such global agreements can only, of course, be met when their governments are in a position to enforce them through domestic energy and climate policies that incentivize the needed shift away from fossil fuel burning and other sources of carbon pollution. We won't get those policies without politicians in office who are willing to do our bidding over the bidding of powerful polluters. That means that we must bring pressure to bear on politicians and polluting interests. We do that through the strength of our voices and the power of our votes. We must vote out politicians who serve as handmaidens for fossil fuel interests and elect those who will champion climate action. That brings us full circle, because we are now back to talking about the responsibility of individuals—but now, it's about the responsibility to vote and to use every other means we have to collectively influence policy.

Herein we have encountered a new challenge. Opposition to key policy measures is now coming not just from the right, as traditionally expected, but from the left, too. While a vast majority of liberal democrats (88 percent) support carbon pricing, there is a movement underway, as we have seen, among some progressive climate activists to oppose it. Their opposition is based on the perception that it violates principles of social justice (though there's no reason that needs to be the case), or that it buys into market economics and neoliberal politics.[137] Others insist that it can't pass because it's unpopular with voters (the opposite is actually true), or that it could too easily be reversed by a future government (which one could say of any policy that isn't codified as a constitutional amendment).[138]

Some climate opinion leaders are in denial of this development. In early April 2019, I complained that "the greatest trick the devil ever pulled was getting progressives to oppose carbon pricing." I was referring not to the majority of self-identifying progressives, but to the small number of progressive climate activists who now oppose such measures.[139]

The often vituperative pundit David Roberts defensively tweeted in response that "the number of progressives who outright oppose carbon pricing is tiny & utterly insignificant in US politics. Just another example of phantom leftists against when [*sic*] Reasonable People can define their own identities."[140] This argument ignores the most prominent progressive in

modern American politics, Bernie Sanders, who, in response to direct questioning by the *Washington Post* in November 2019, indicated he didn't support carbon pricing.[141]

It's not just Sanders. Roberts was immediately contradicted by Twitter users who came out of the woodwork to demonstrate my very point.[142] One self-avowed Unitarian Universalist (a religion known for its progressive philosophical and political outlook[143]) responded to Roberts, "I'm an advocate for climate action thru [Citizens Climate Lobby] & other groups. Almost ALL progressive folks I encounter (friends, Twitter, EJ) reflexively oppose carbon price of all sorts. They generally retreat to 'just ban FFs' as more likely & better. There's a lot of work to do."[144]

This opposition to carbon pricing seems to be tied to a larger trend on the left against "establishment" politics. This development has been fueled at least in part by state-sponsored (Russian) trolls and bots looking to sow division in Democratic politics in an effort to elect fossil-fuel-friendly plutocrats like Donald Trump to power. That tactic was successful in the 2016 presidential election and was very much still in play during the 2020 election, as detailed by the *Washington Post* in a February 2020 article.[145]

The same witches' brew that helped bring Donald Trump to power in 2016—interference by malevolent state actors, cynicism, and outrage, including among some on the progressive far left—appears, as this book goes to press, to be a potent threat to climate action today.

Let's recognize, though, that while some of the outrage has been manufactured by bad actors who have magnified and then weaponized divisions, some legitimate underlying grievances have also played a role. Some environmental progressives profess a distrust of neoliberal economics. And why not? It's gotten us into this mess. Some prominent figures, such as Naomi Klein, have openly challenged the notion that environmental sustainability is compatible with an underlying neoliberal political framework built on market economics. It's entirely conceivable she's right.

Some progressives feel that current policies don't do enough to address basic societal injustices. At a time when we see the greatest income disparity in history, along with a rise in nativism and intolerance, surely they have a point. They argue that any plan to address climate change must

address societal injustice, too. But I would argue that social justice is *intrinsic* to climate action. Environmental crises, including climate change, disproportionately impact those with the least wealth, the fewest resources, and the least resilience. So simply *acting* on the climate crisis is acting to alleviate social injustice. It's another compelling reason to institute the systemic changes necessary to avert the further warming of our planet.

Yes, we have other pressing problems to solve. And climate change is just one axis in the multidimensional problem that is environmental and societal sustainability. I don't purport to propose, in this book, the solution to all that ails us as a civilization. I do, however, offer what I see as a path forward on climate.

As we pass the milestone of the fiftieth anniversary of the very first Earth Day (April 22, 1970), I believe that we are at a critical juncture. Despite the obvious political challenges we currently face, we are witnessing an alignment of historical and political events—and acts of Mother Nature—that are awakening us to the reality of the climate crisis. We appear to be nearing the much-anticipated tipping point on climate action. In a piece titled "The Climate Crisis and the Case for Hope" published in September 2019, my friend Jeff Goodell, a writer for *Rolling Stone*, posited that "a decade or so from now, when the climate revolution is fully underway and Miami Beach real estate prices are in free-fall due to constant flooding, and internal combustion engines are as dead as CDs, people will look back on the fall of 2019 as the turning point in the climate crisis."[146] We can debate the precise date of the turning point. But I concur with Jeff's larger thesis.

It is *all* of the things we have talked about—behavioral change, incentivized by appropriate government policy, intergovernmental agreements, and technological innovation—that will lead us forward on climate. It is not any one of these things, but *all of them* working together, at this unique moment in history, that provides true reason for hope. To repeat one of the epigraphs that began this final chapter, "Hope is a good thing, maybe the best of things." Alone it won't solve this problem. But drawing upon it, we will.