

# Opinion: Predicting the future of greenhouse gas emissions

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With the U.S. federal government [finally putting in place](#) a major program to stimulate the decarbonization of our energy economy, news analysis has turned to the practical problems of the transition from fossil fuels. Some of us have been focused on those practical problems for a long time. Our economy and our households are addicted to fossil fuels.

The transition away from that addiction will take a generation: it is a matter of decades, not days, weeks, months, or even years. The process began before last week's "anti-inflation" bill and would have continued with or without the bill. But now, the process is accelerated by an act of the government of the world's largest economy.

Typical of the skeptical reporting on the federal climate bill was a story filed by Katherine Blunt and Phred Dvorak in the [Wall Street Journal](#), where they observed that:

"The [landmark climate bill](#) passed by Congress on Friday aims to reduce [carbon emissions](#) with subsidies for speeding the build-out of renewable-energy projects. Success in meeting its emissions goals will depend on how quickly that build-out happens. Despite the new financial support for [renewable technologies](#), the industry faces supply-chain snarls, logjams in securing project approvals and challenges in constructing new [high-voltage power lines](#) and large-scale batteries to support an unprecedented build-out of wind and solar farms."

The assumptions in this piece are that technology will stand still and massive renewable energy projects will depend on the electric grid and foreign manufacturing. Perhaps, but this \$370 billion must be added to the trillion-dollar infrastructure bill and the federal government's pivot to green purchasing and operations. These are powerful incentives that will stimulate technological innovation and local government use of eminent domain powers. In addition, large-scale projects may be displaced by consumer products that enable households to decarbonize and partially or completely disconnect from the electrical grid.

We should assume that the technology of renewable energy will advance in the coming decades, just as communication and computing advanced over the past half-century. What if solar cells become smaller, more efficient, and integrated into normal windows? What if a solar array

costs \$500 instead of \$15,000 and includes the replacement of a few of your home's windows? What if batteries are no longer the size of your big screen TV but the size of your laptop? What if they cost \$300 instead of \$3,000? Mainframe computers the size of a suburban living room once cost millions of dollars and had less computing power than your smartphone. A generation ago, we watched movies on video cassettes and cable TV. The technology of renewable energy is now being developed by some of the smartest people on the planet. Who knows what they may come up with?

As for supply chains, President Biden recently signed the bipartisan Chip Act, and as reported by the [\*New York Times\*](#)' Shira Ovide:

"The United States has authorized \$280 billion in taxpayer money to subsidize rich computer chip companies and invest in technology research for the sake of keeping America strong and innovative. President Biden on Tuesday signed the law, officially known as the CHIPS and Science Act of 2022, calling it "an investment in America itself." If this law does what its many backers in government and private industry hope, the U.S. will have more control over the future of essential computer chips and have a hedge if China grows more hostile toward Taiwan, a U.S. ally. The law also aims to keep America on the cutting edge of technology by putting more government support into research."

Since China subsidizes its high-tech businesses, these federal funds will level the competitive playing field and, as automation advances, will return some manufacturing to the United States. Supply chains are rapidly becoming supply webs as companies learn to navigate disruptions in the global economy. In sum, predicting the precise pace of decarbonization is impossible due to a rapidly changing and highly dynamic organizational and technological environment.

It will take time and will require a partnership between the public and private sectors, but the main locus of decarbonization activity will be in the private sector. This is because energy, while regulated and intertwined with lots of rules and subsidies, is a private business in most parts of the world. While climate activists supported the "inflation reduction" bill as the best climate bill they could obtain given the current political environment, they consider this new federal effort insufficient. Lisa Friedman and Coral Davenport reported on this in the [New York Times](#) on August 12 and wrote that that:

"For the septuagenarian lawmakers who wrote the historic climate bill that Congress passed on Friday, and the 79-year-old president who is about to sign it into law, the measure represents a 'once in a generation' victory. But younger Democrats and climate activists crave more. They look at the bill as a down payment, and they worry a complacent electorate will believe Washington has at last solved climate change—when in fact scientists warn it has only taken the first necessary steps. 'This bill is not the bill that my generation deserves and needs to fully avert climate catastrophe, but it is the one that we can pass, given how much power we have at this moment,' said Varshini Prakash, 29, who co-founded the Sunrise Movement, a youth-led climate activism group."

While I also would have preferred a larger-scale effort from the [federal government](#), my preference is based on an analysis of the risks posed by climate change when compared to the risk of over-subsidizing the private sector. I think we need to create an atmosphere of certainty for the green economy to build on the tremendous and growing momentum that already exists for renewable energy. These funds, and the policy thrust they represent, reinforce a trend already in place and stimulate confidence in the transition to renewable energy. Three hundred and seventy billion dollars is real money that can't be ignored. But government and [public policy](#) were never going to deliver a renewable

resource-based economy—that action will take place in the private sector. This bill may be sufficient to stimulate the private actions needed. If it's not, more can be added later.

Our addiction to energy is not going to be cured by government. And if the choice is between fossil fuel-based energy and no energy, we will all use [fossil fuels](#). The fossil fuel interests know that and do their best to force us to contemplate that trade-off. They are not the only businesses that are good at manipulating consumers. Tobacco interests have long perfected taking advantage of consumer addiction. Despite well over half a century of settled science about the harm of smoking, there are one billion smokers in the world, and last year, seven million people died from this addiction. So, I do not underestimate the fossil fuel industry's potential for future harm. It's a shame because if they would redefine themselves as energy companies and deliver renewable energy, they could avoid bankruptcy. Unlike smoking, which is far from a necessity, our very economy and way of life depend on energy. Most of the GDP is not in the energy business, but nearly all businesses rely on energy. Therefore, the economic power of Google, Apple, Amazon, and Microsoft must be mobilized behind the goal of less expensive, more predictably priced, more reliable, and cleaner energy. Let them duke it out with ExxonMobil. The U.S. government is a small part of the total picture here, so let's understand that a problem as massive as climate change requires much more than U.S. government policy and money to address. Our government must provide leadership, but even if our economy were completely free of greenhouse gasses, other nations must also decarbonize.

No one really knows how to maintain our economic well-being while transitioning to a new energy system. It is arrogance and folly to pretend that anyone knows how to do this. I'm reminded a little of a meeting I attended in EPA shortly after Superfund was enacted in December of 1980. Someone at the meeting was talking about how great it was that we

had all this money and could now clean up America's toxic waste sites. An engineer spoke up and mentioned that we really didn't know how to clean up a contaminated site, we were uncertain about the costs of site clean-up, and we would need to determine when to stop cleaning and consider the job done. Someone else then said, "Yeah: How clean is clean?" A question many of us had never thought of until that moment. Greenhouse gas pollution is technically simpler than toxic waste but economically more difficult to attack. Modeling and predicting the impact of public policy on the pace of pollution reduction requires analysts to make a huge number of assumptions about the pace of economic, technological, and behavioral change. We should be skeptical about these predictions and humble about our ability to predict the future of greenhouse gas pollution on this planet.

Humility does not seem to invade the mindset of the experts informing Lisa Friedman and Coral Davenport's reporting on reaction to the climate bill. According to their piece:

"...scientists say the United States needs to do more. It must stop adding carbon dioxide to the atmosphere by 2050, which the bill won't achieve... [emphasis added] To reach his 2030 goal [of 50% emission cuts], Mr. Biden would still have to impose new regulations on emissions from power plants, vehicle tailpipes and methane leaks from oil and gas wells. State and local governments would have to set new standards to compel the rapid adoption of electric cars, wind and solar powered electricity, and [energy](#) efficient buildings to make up the last percentage points."

Maybe, but maybe not. I am always amazed by the confidence and certainty expressed by some climate "experts." The scale and uncertainty of the problem and possible solutions need to be understood. As should the role of public policy itself. Public policy is not rational, it does not work like the scientific method. It is incremental: remedial, serial, and

partial. It does not solve problems, but makes them less bad. The Clean Air Act of 1970 made America's air far cleaner today than it was when the bill was passed. Air pollution is less bad, but not gone. The climate problem will never be solved, but I believe humanity will make it less bad and preserve the planet for future generations. I don't know if we'll achieve that goal by 2050. I base my belief on optimism and history, but it is not a prediction, and I could be very wrong.

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