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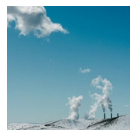
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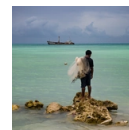
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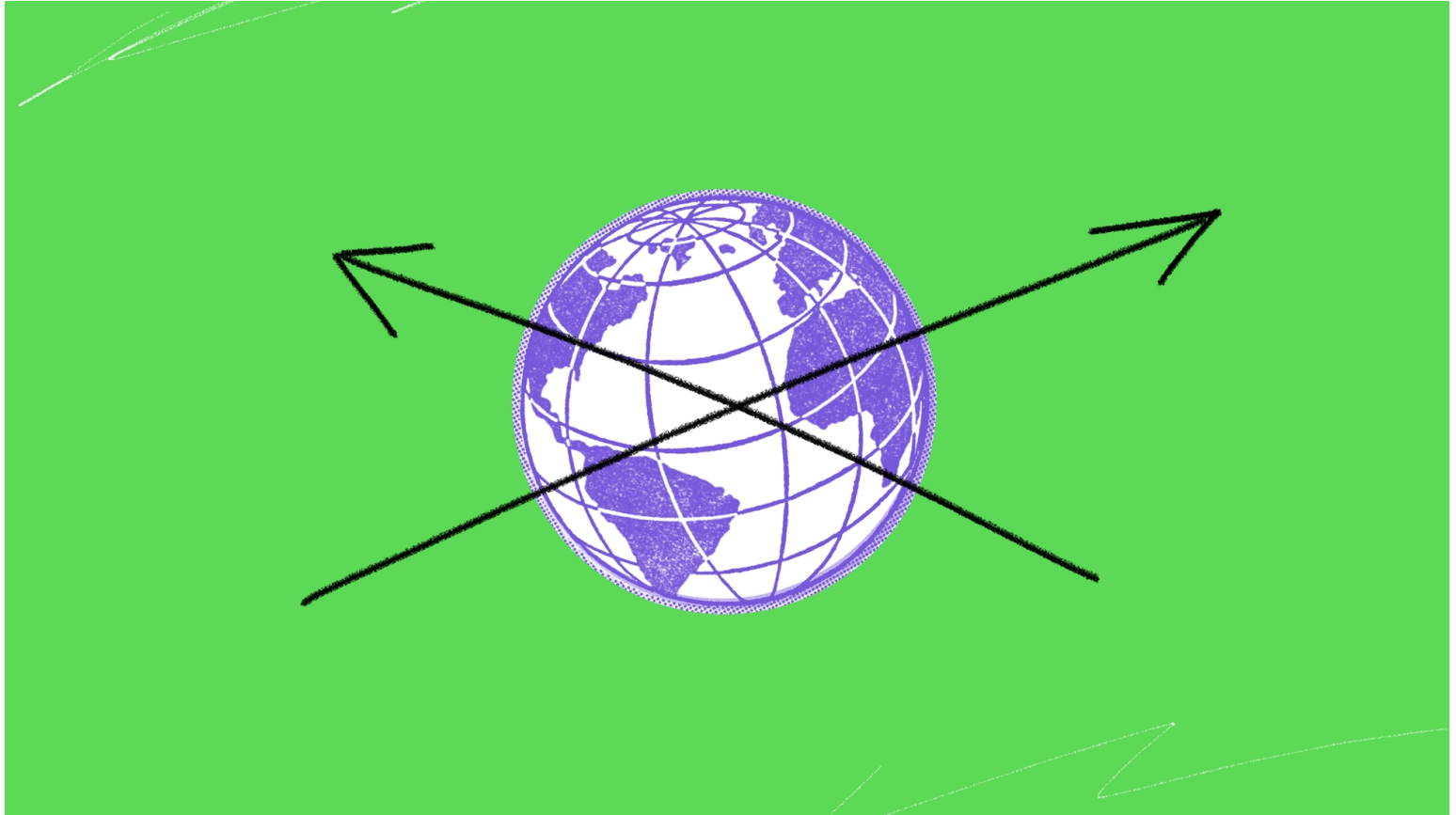
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# There's No Scenario in Which 2050 Is 'Normal'

The two paths to avoid the worst of climate change would still dramatically change the world as we know it.

By Robinson Meyer



Getty; The Atlantic

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Earlier this month, the United Nations–led Intergovernmental Panel on Climate Change released the latest volume of its current “synthesis report,” its omnibus summary of what humanity knows about the climate. As I wrote at the time, while the other volumes focus on the impacts of climate change, this newest report narrows in on how to prevent it.

One of the main tools that the volume uses to estimate how we might avert climate catastrophe is so-called energy-system models. These are complicated computer programs that simulate the global economy’s use of energy in all its guises—coal, natural gas, wind, solar—and what the greenhouse-gas footprint

of that energy use will be. A single model might encompass natural-gas demand in Mongolia, highway usage in Scotland, electric-vehicle purchases in New Jersey, and thousands of other numbers before spitting out a certain year's carbon emissions.

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These models are useful because they produce scenarios: story lines that show how the world can meet its energy needs while gradually zeroing out its carbon pollution. They can help us understand how current—and future—energy policy will affect the trajectory of emissions. (By feeding the output of energy-system models into climate models, which project how the level of carbon dioxide in the atmosphere will alter temperature, precipitation, and much else, you can then see how those emissions will drive climate change.) The models can tell us, for instance, that based on the commitments countries initially made under the Paris Agreement, the world's average temperature is set to rise more than 2 degrees Celsius above its preindustrial level, violating the very goal of that treaty.

Of course, that has long been clear. But the energy-system models used in the most recent IPCC report tell us something else too: The path to avoiding the worst impacts of climate change requires something *impossible*. Well, not actually impossible, but exceptionally difficult to imagine.

Of the hundreds of scenarios that the IPCC analyzed, all fell into one of three buckets. In the first bucket, every scenario forecasts that the world will soon

be removing tens of gigatons of carbon dioxide from the atmosphere every year. Carbon removal is still a bit of a dream. Not only is it technologically unproven at scale; it is extremely energy intensive. But the IPCC report implies that within the lifetime of children alive today, the world might be spending more than a third of its *total energy production* removing carbon from the atmosphere, according to Zeke Hausfather, an IPCC author.

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The world won't derive any immediate economic gain from this waste-management exercise; it won't turn that carbon into something useful. It will simply need to spend what could equal trillions of dollars a year on carbon removal to help rein in climatic upheaval. What's more, this mass removal will need to happen while the world does everything else that decarbonizing entails, such as building wind and solar farms, expanding public transit, and switching to electric vehicles. Every climate plan, every climate policy you've ever heard about will need to happen while tens of gigatons of carbon removal revs up in the background.

That may sound unbelievable. But now let's turn our attention to the second bucket of scenarios. They tell a different story, one in which the world rapidly curtails its energy usage over the next two decades, slashing carbon pollution not only from rich countries, such as the United States, but also from middle-income countries, such as Brazil, Pakistan, and India.

By "curtailing energy demand," I'm not talking about the standard energy-

transition, green-growth situation, where the world produces more energy every year and just has a larger and larger share of it coming from zero-carbon sources. Rather, these scenarios imagine a world where *total global* energy demand collapses in the next few decades. There's a good reason for this—as far as the models are concerned, this tactic is one of the best ways to crash carbon pollution within 10 years—but it is not how any country approaches climate policy.

Take these scenarios' assumptions about car ownership, for example. Today, there are about 1.3 billion cars and light-duty trucks on the road worldwide. The U.S. Energy Information Administration predicts that this number will reach 2.21 billion by 2050—a 70 percent increase—of which less than half will be electric vehicles. But the low-energy scenarios require the global vehicle fleet to nearly *halve* during the same period of time, shrinking to about 850 million cars and light trucks by 2050.

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Don't get me wrong: This sounds fantastic. I'd love to live in a world where most people don't have to own a car to make a living or participate in society. Yet it also does not strike me as particularly likely, and it is not the only life-altering shift imagined by the low-energy scenarios. These scenarios envision a similar revolution in energy-efficiency technology sweeping through other aspects of society, such as building construction, residential heating, and manufacturing. Historically, energy efficiency has improved by about 2 percent a year; the low-energy-demand scenarios require much faster shifts.

Oh, and by the way, these low-energy-demand scenarios require a huge amount of carbon removal too—something like 3 billion tons of it. “Even with low-energy demand, there’s still a fair amount of [carbon removal] deployed. It’s just in the three-to-five-gigaton range rather than the five-to-15-gigaton range,” Hausfather, the IPCC author, told me. (He recently became the lead climate researcher at the online-payment company Stripe, which has paid to remove more carbon from the atmosphere than any other company.)

And then there’s the third bucket. In these scenarios in the new report, humanity fails to limit global temperature growth to 1.5 degrees Celsius (or 2.7 degrees Fahrenheit), blowing past the more ambitious of the Paris Agreement’s climate goals. Passing 1.5 degrees Celsius means that the world could encounter deadly droughts, mass migrations, and fatal outdoor temperatures by the middle of the century.

Perhaps you can see the problem: None of these outcomes is particularly easy



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even less appetite for the rapid energy cuts that must come in *this* decade to meet the low-energy-demand scenario. And if you give up on either of those approaches, that all but ensures the world will exceed the 1.5-degree-Celsius threshold, which will lead to widespread turmoil.

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When you look at the three buckets this starkly, a few things become apparent. The first and the most significant is that humanity must invest more in carbon removal as quickly as possible. So far, most of the money spent on carbon removal has come from the private sector; two weeks ago, I wrote about Stripe’s effort. But the funding to remove *billions* of tons a year can come only from the government. Many climate thinkers hope that the federal

government will step in and administer carbon removal as a public waste-management service, at least in the United States. There's currently little bipartisan political will to do so, but it is beyond past time to begin implementing that.

The second is that coping with climate change will require disruption on a scale that our political system has yet to comprehend. In some cases, that disruption will come beforehand and prevent the damage; in others, it will result from the climatic damage. But it will come nonetheless. If I asked you, *Forty years from now, will only about 5 percent of Americans own a car, or will the world spend a large share of its energy production sucking carbon from the atmosphere?*, you would rightly respond that neither sounded particularly realistic. And that is the point: We have been backed into a corner. The scale of change headed our way is unimaginable. And it is also inevitable.

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Robinson Meyer is a staff writer at *The Atlantic* and the author of the newsletter [The Weekly Planet](#).

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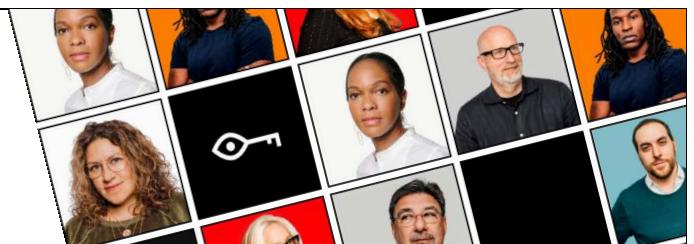
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