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Introduction

Between the rapid spread of the coronavirus’s Delta variant and a slew of extreme wildfires and storms around the world, the summer of 2021 was a hellish harbinger of an increasingly likely – but not yet inevitable – future.

IN EARLY AUGUST, THE Intergovernmental Panel on Climate Change (IPCC) issued a new global assessment – the first in almost a decade – warning that humanity has already warmed the planet by 1.1° Celsius and is now on track to cross the 1.5°C threshold by 2040. According to the secretary-general of the United Nations, António Guterres, the report should be seen as a “code red for humanity.”

The ideal of limiting global warming to 1.5°C above pre-industrial levels, the key motivating factor behind the 2015 Paris climate agreement, has almost slipped from our grasp. The challenge now is not only to prevent even more catastrophic warming beyond that 1.5°C increase, but also to adapt to the new conditions that have already been locked in.

It is difficult to overstate the potential impact of these changes. Even a 1.5°C world implies a new normal fraught with risk and instability. We can expect many more disasters like the Bootleg Fire that has razed a large swathe of California, the flooding that recently devastated Germany and other European countries, and this year’s deadly monsoon season in India.

With the COP26 climate-change summit in Glasgow fast approaching, the IPCC’s latest warnings will be weighing heavily on governments that have been struggling to mobilize an effective multilateral response to the COVID-19 pandemic. All eyes will be on the world’s leading carbon emitters. They include large, rising economic powers like China and India as well as the rich industrialized countries that historically have contributed disproportionately more to the global-warming problem.

To be sure, the third decade of the twenty-first century has already produced promising new climate commitments. More and more governments and major corporations are setting targets to reduce their greenhouse-gas emissions to “net-zero” by mid-century. China, the world’s largest emitter, aims to become carbon neutral by 2060; the United States, four years after pulling out of the Paris accord, has under President Joe Biden re-entered it and joined the European Union in pursuing a target of net-zero emissions by 2050; and business and finance, having seen the writing on the wall, are gradually moving in a greener direction.

But these shifts are past due. As more firms hop on the “sustainability” bandwagon, new standards and frameworks to sort out genuine green businesses from greenwashers are urgently needed. At the same time, mainstream economic thinking must quickly evolve to account for new environmental realities – though exactly how this should be done is the subject of intense debate.

Everyone, then, has new summits to reach. The COP26 conference will be a crucial test. Stronger decarbonization and climate-financing commitments must be made to bring the world back onto a sustainable path. But even then, the real work will have only just begun. **PS**

PS Editors

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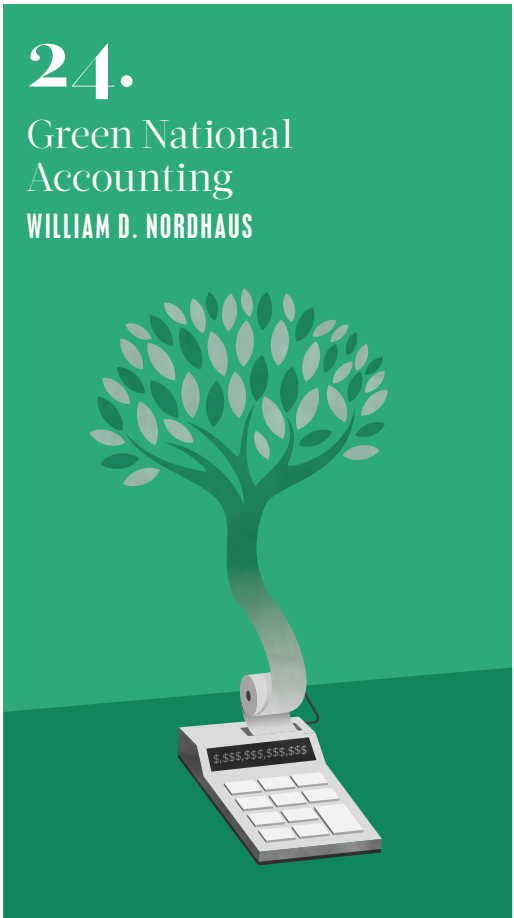
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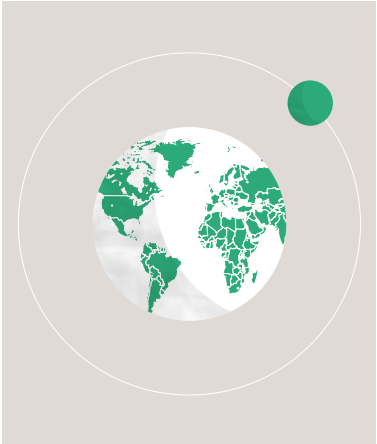
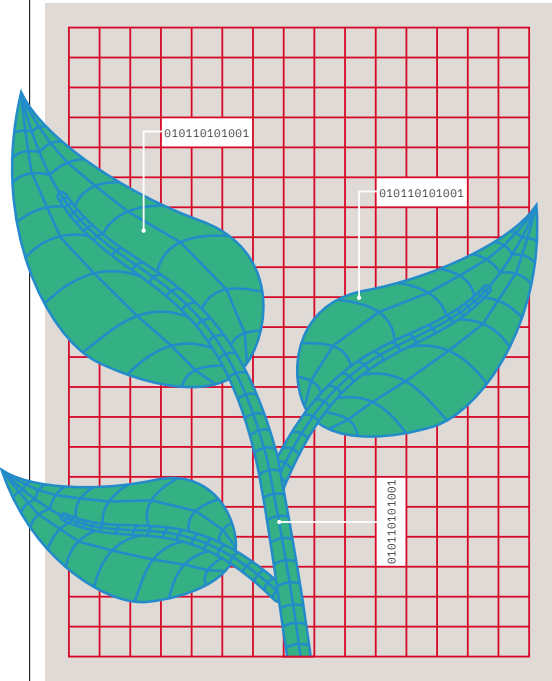


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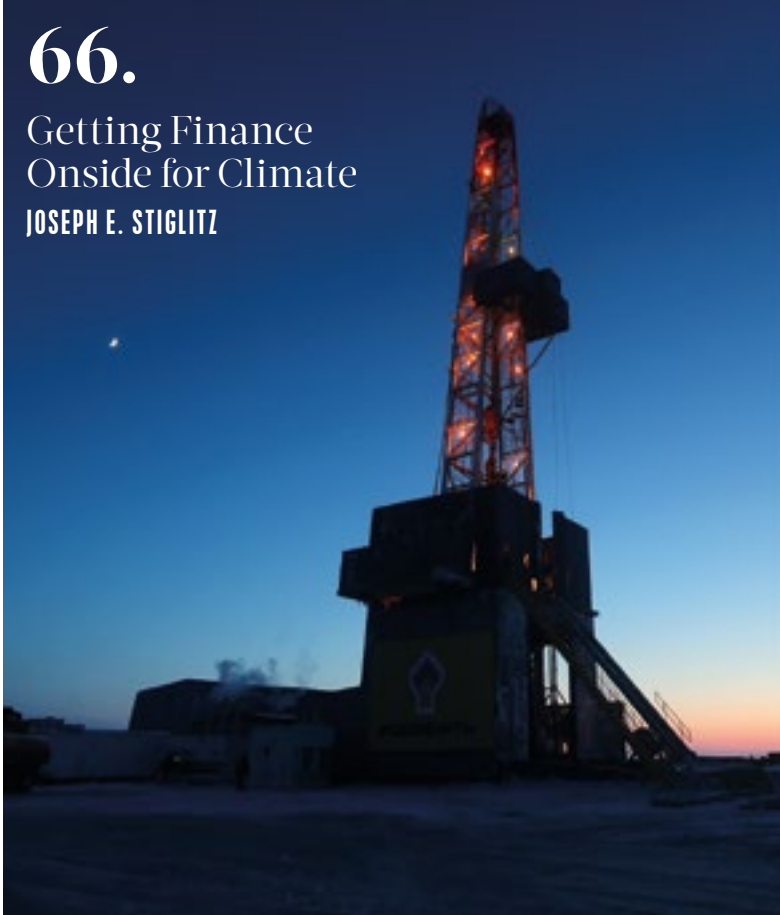
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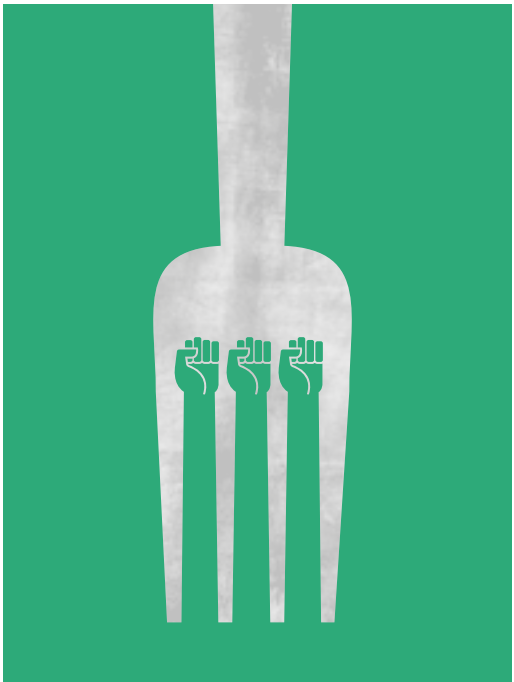
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Now or

From
Intention
to Action
at COP26

Never

PATRICIA ESPINOSA

*Executive Secretary of the
UN Framework Convention
on Climate Change*

Evidence of the devastation that awaits us if we fail to address climate change continues to mount. Recent catastrophic flooding in Asia and Western Europe, record-shattering temperatures in North America, and raging wildfires in southern Europe – all of which mirror disasters that developing countries have faced in recent years – remind us that no country is safe. The future of each one depends on the actions of all.

THE SCIENTIFIC PERSPECTIVE IS BLEAK. In May, the World Meteorological Organization warned that there is a 40% chance that the annual average global temperature will exceed 1.5° Celsius above pre-industrial levels, at least temporarily, in the next five years – and the odds continue to rise. This could trigger potentially disastrous tipping points.

The Intergovernmental Panel on Climate Change (IPCC) has recently published its latest major climate-change report in the lead-up to the 26th United Nations Climate Change Conference of the Parties (COP26) in Glasgow. Each successive IPCC report has been starker than the last, and the latest did not break the pattern.

After all, the world is not on track to meet the Paris climate agreement’s goal of limiting the global temperature rise to 2°C above pre-industrial levels – let alone its “ideal” target of 1.5°C – by the end of the century. On the contrary, as last February’s preliminary issue of the synthesis report of all nationally determined contributions (NDCs) showed, we are headed toward a rise of 3°C, or even more, by 2100.

Yet all hope is not lost. While we are moving toward the point of no return, it is not too late to change course, moving onto a more sustainable pathway that enables us to forestall the worst impacts of climate change. And, in the Paris climate agreement, we already have a comprehensive roadmap in place.

A map that is not followed, however, means little. For the Paris climate agreement to lead us to the necessary transformation, all countries must cooperate in implementing it. That means fulfilling their individual commitments and working to slash carbon emissions by 45% by 2030 (from 2010 levels), and to achieve net-zero emissions by 2050. This is the timeline the IPCC recommends for staying below the 1.5°C threshold. It also means pursuing adaptation and strengthening resilience to future climate-related challenges.

This is a tall order. But there is reason to believe the world can fulfill it. For example, recent virtual sessions of the subsidiary bodies of the UN Framework Convention on Climate Change were encouraging. Delegates engaged effectively on a wide range of crucial topics and, while agreement on several key issues remained out of reach, progress was made.

One key lesson of those discussions was that, to move the agenda forward, political guidance is essential. This message was put across forcefully at the ministerial meeting recently convened by the COP26 president designate, H.E. Alok Sharma. Ministers and high-level representatives from countries in all key negotiating groups were in attendance.

Every COP has been significant. But escalating environmental challenges mean that each has been more



consequential than the last. COP26 is no exception. On the contrary, given the COVID-19 pandemic’s devastating impact on societies worldwide and its disruptive effects on our process, the stakes have risen exponentially. But this crisis also represents a powerful opportunity for progress, as countries seek to “build back better.”

The world must make COP26 a success. Our only chance of getting onto a path that would keep us below the 1.5°C threshold, it is a crucial credibility test for the global fight against climate change. If we pass that test, confidence in our collective ability to address borderless challenges – such as pandemics – will be strengthened.

To this end, there are many important issues that must be resolved at COP26. But four priorities stand out.

1 First, past promises must be kept. Demonstrating that commitments made up to 2020 have been fulfilled is essential to build trust among countries. This includes, for example, the goal of mobilizing \$100 billion annually by 2020 to aid developing economies in the green transition, and offering support in the form of capacity-building and technology transfer.

Developed countries have mobilized vast resources to support their economies during the COVID-19 pandemic. They must show a similar level of commitment to driving the transition toward a more

sustainable and climate-resilient future – and that means ensuring that their developing counterparts have the needed support.

2 Second, outstanding disagreements on finance, transparency, adaptation and resilience, loss and damage, and technical support and guidance for developing countries must be resolved, so that the Paris climate agreement can be fully implemented. Protecting people and the planet is more important than any technical disagreement, however complex or contentious it may be.

3 Third, ambitions must be raised. Countries must commit to do much more in all three key areas of the climate agenda: mitigation, adaptation, and finance. The next NDC synthesis report, to be delivered prior to COP26, will give a more complete picture of progress so far, as it will include more major emitters. Whatever that report shows, there is no doubt that more ambitious, resolute plans from both government and business will be essential to move the world onto the 1.5°C pathway.

4 Finally, no voice can remain unheard, and no proposal unattended. In addressing a crisis as profound as climate change, everyone has a role to play. That is why balanced representation of all regions and groups is essential to a successful COP26, with observers and other non-Party stakeholders, including the nine NGO

“
It is up to our governments to lead, our businesses to innovate, and our societies to come together...”

constituencies, engaging positively in the process. Initiatives such as the Marrakech Partnership for Global Climate Action and the Race to Zero campaign should make meaningful contributions to climate action and promote climate ambition globally.

The bottom line is that two or three “big” announcements will not make for a successful COP26. Only a balanced package of decisions and actions reflecting the expectations, concerns, and needs of all stakeholders – not to mention ramped up ambition – can do that.

It has become something of a cliché to say that global problems require global solutions. And yet, as recent crises have shown, this could not be more true. From COVID-19 to climate change, no one is safe until everyone is safe.

Runaway climate change is not inevitable, but if we do not act fast, it will be. We proved up to the tasks of figuring out its drivers and devising a comprehensive global strategy for addressing it. Now, it is up to our governments to lead, our businesses to innovate, and our societies to come together, in service of a common cause: building a sustainable future. **18**

Patricia Espinosa is Executive Secretary of the United Nations Framework Convention on Climate Change.



What Climate Change Requires of Economics

DARON ACEMOGLU

Professor of Economics at MIT

This summer's record-breaking heat wave in the American northwest offered a reminder – as if it were needed – of what anthropogenic climate change will mean for living conditions now and in the future. Average global temperatures have already risen to 1.2° Celsius above pre-industrial levels and could increase by another 5°C over the next 80 years. This warming is hastening the extinction of many species and rendering parts of the world less hospitable for human habitation. By some estimates, climate change may force more than one billion people to migrate by 2050.

CONFRONTED WITH SUCH MASSIVE long-term risks, many of our long-held assumptions will need to be revised, and the economics discipline is no exception. If we are going to avoid misguided policy pathways such as those that would abandon economic growth completely (even though billions of people around the world are still in poverty), we need to adapt mainstream economics to new climate realities.

True, the discipline has long recognized the importance of environmental issues. William D. Nordhaus, the recipient of the 2018 Nobel prize in economic sciences, introduced the costs of greenhouse-gas (GHG) emissions into standard economic-growth models in 1991, and this work has shaped how economists and many policymakers think about climate change.

But existing approaches in economics still do not provide the right framework for managing the problems that will confront us over the next several decades. As with most early works, Nordhaus's seminal contribution can be improved in many ways. For example, his framework does not recognize the endogeneity of

technology, and its assumptions about the future costs of climate change do not reflect the severity of the problem.

When we account for endogenous technology, we find that the transition to cleaner energy is much more important than simply reducing energy consumption, and that technological interventions need to be redirected far more aggressively than they have been. Similarly, when one incorporates more realistic assumptions about the costs of global warming – including the possibility of climate tipping points – one's conclusions about how to approach the problem tend to change substantially.

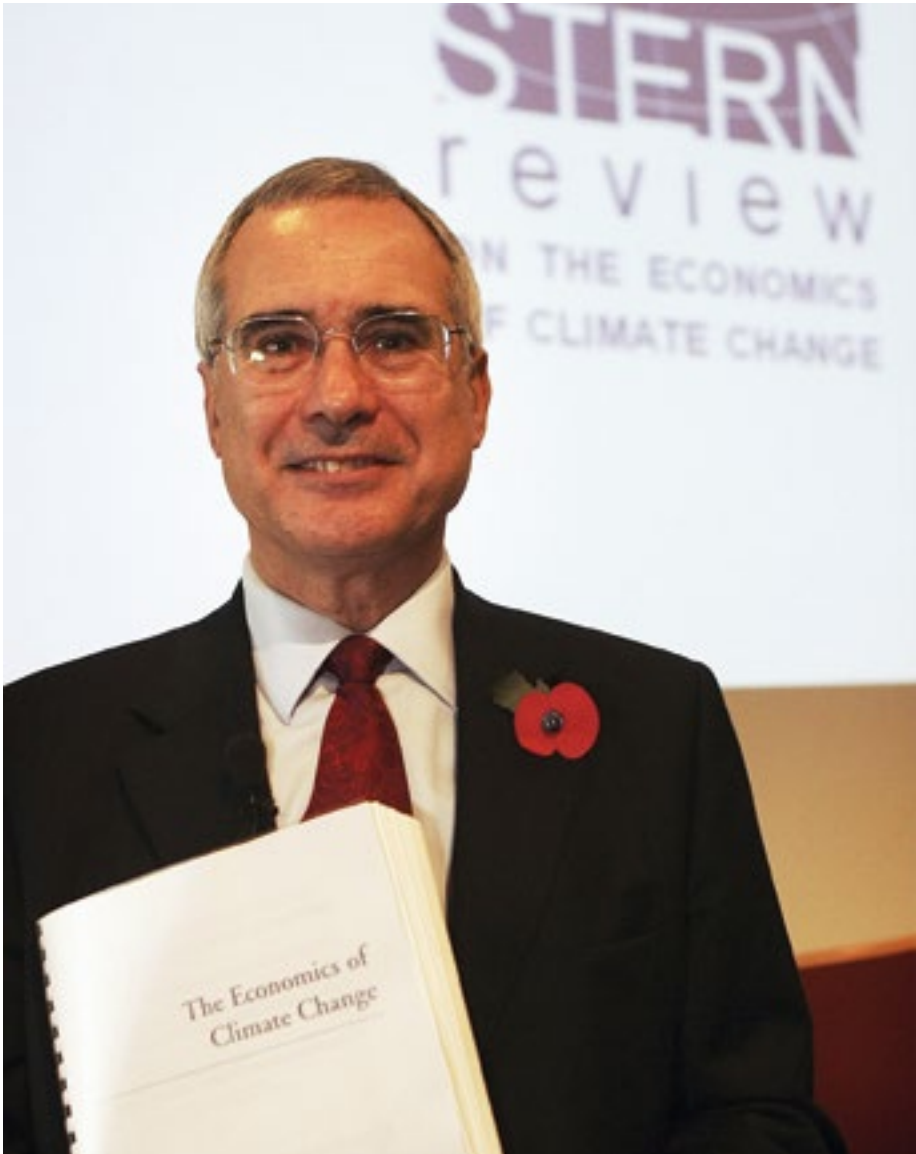
But these improvements alone will not suffice. Economics will need to undergo even deeper changes, for at least two reasons. The first concerns the bedrock of most dynamic economic analysis: the utility function, which represents the trade-off between current and future consumption. This device helps us determine how much consumption a decision-maker should be willing to sacrifice today to realize more value at some point in the future. It has proved its uses in many domains of analysis: ▶



How much current consumption do we need to sacrifice to avoid the damage that global warming will cause in the future?"



Economics



▼ NICHOLAS STERN.

individual consumption, investment decisions, public spending, innovation, tax policy, and more.

The key question for a climate-policy utility function is: How much current consumption do we need to sacrifice to avoid the damage that global warming will cause in the future? The answer will depend on how we approach the problem of discounting. When thinking about individual or corporate decisions whose consequences will play out within the next decade or so, it makes sense to start from the premise that one dollar will be less valuable ten years from now than it is today. But when applied to decisions whose effects will be felt 100 years from now, this kind of discounting has some unpleasant implications.

Suppose we apply a discount rate of 5%, which is common in analyses

“We may also need to develop a more holistic assessment of economic policy in general.”

of individual or corporate decision-making and implies that a dollar a year from now is worth 95 cents today. But this discount rate would also mean that a dollar 100 years from now is worth only about half a cent and that a dollar 200 years from now is worth about 0.003 cents. At this rate, we should sacrifice one dollar today only if it will yield benefits equivalent to about \$200 a century from now – a benefit-cost analysis that lends itself to climate inaction in the present.

Economists have recognized this inconvenient implication of discounting for climate policy at least since the 2006 *Stern Review*. In that report, Nicholas Stern and his colleagues dispensed with the hard discounting approach and thus arrived at policy recommendations that were more aggressive than those supported by the economic consensus at the time. But because the *Review* did not offer a philosophical justification for its chosen method, it was criticized by other economists, including Nordhaus.

Still, there is a plausible economic (and philosophical) case to be made for why future essential public goods should be valued differently than private goods or other types of public consumption. Reconciling these distinctions with other aspects of our economic models, not least those dealing with risk and uncertainty, is an urgent task for the economics profession.

After all, we also need a proper framework for evaluating the role of geoengineering in combating climate change. Many prominent voices, including Bill Gates (in his new book) and the inventor/venture capitalist Nathan Myhrvold, are increasingly calling for such an approach. But schemes like solar radiation (whereby sulfates or calcium carbonate dust would be sprayed into the atmosphere to block sunrays) would seem to come with nontrivial catastrophic risks of their own. Does it make sense to combat one existential risk with another? I don’t think so, but we must come up with a more systematic way to evaluate such questions.

“The climate crisis demands that we consider more radical ideas.”

▲ A WOMAN AND HER CAT REST INSIDE A COOLING STATION DURING THE 2021 HEATWAVE IN THE US PACIFIC NORTHWEST.

The second area that is due for a fundamental rethink is the theory of optimal economic policy. Here, the standard approach harks back to the seminal work of Dutch economist Jan Tinbergen, who articulated a powerful principle. The best way to neutralize a market failure or negative externality, according to Tinbergen, is with a policy instrument designed specifically for that purpose (which implies that an intervention that is not focused on a well-defined problem may not be justified).

When applied to the negative effects of GHG emissions, this principle suggests that we simply need to find the right (carbon) tax and implement it consistently. But the insufficiency of this solution is already becoming clear. If preventing catastrophic climate change requires a rapid transition to cleaner technologies, a carbon tax must be

complemented with subsidies or other incentives to drive innovation and deployment in the right direction.

In fact, we may also need to develop a more holistic assessment of economic policy in general. The Tinbergen principle is convenient because it allows us to compartmentalize policy decisions: interventions for dealing with the economic fallout of COVID-19, for example, need not address climate change. But picking our battles is no longer a luxury we can afford. For example, when we allocate massive amounts of public money to revive the pandemic-hit airline industry – a major source of emissions – we should use that occasion to push it in a cleaner direction.

The climate crisis demands that we consider more radical ideas. If we can reach a consensus on the need for massive investments in the clean-energy transition, perhaps we can also agree to orient that spending around the creation of good jobs. That may well violate the Tinbergen principle. But if it helps to prevent the deepening of social, economic, and political fault lines that have appeared in many Western advanced economies, it will have been well worth it. **IS**

Daron Acemoglu, Professor of Economics at MIT, is co-author (with James A. Robinson) of Why Nations Fail: The Origins of Power, Prosperity and Poverty and The Narrow Corridor: States, Societies, and the Fate of Liberty.



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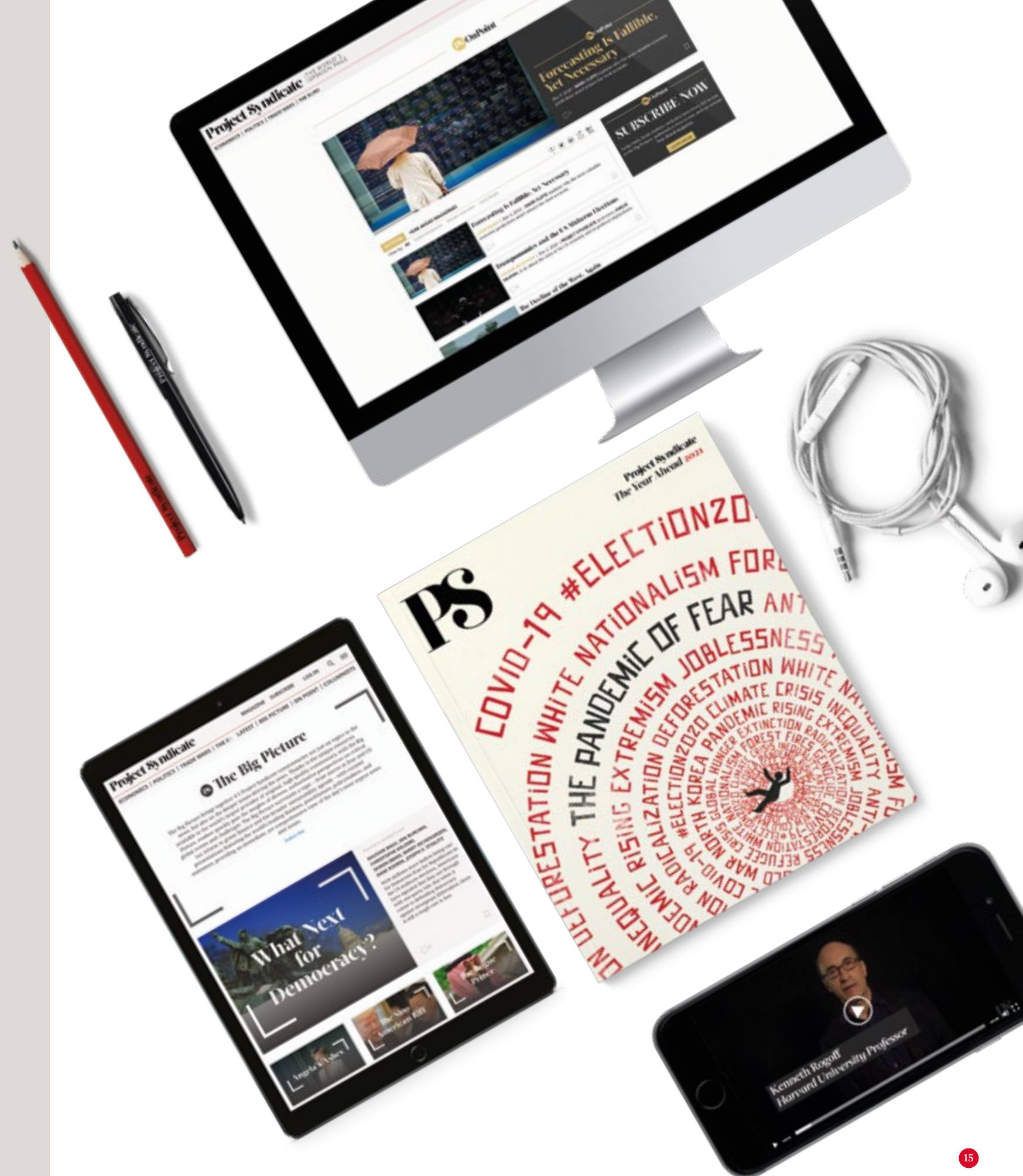
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Prudence Over Sustainability

DEIRDRE NANSEN McCLOSKEY

*Professor Emerita of Economics
and History at the University
of Illinois at Chicago*

~~Unsust~~

“Sustainability” is an increasingly popular term used to signal one’s virtue in contemporary public discourse, but it is a poor basis for sound public policy. It conveys a biologist’s view of the economy without any of the prudence that economists favor. ▶

ainable



THE BIOLOGIST PAUL R. EHRLICH GAVE exceptionally imprudent advice in his 1968 book, *The Population Bomb*, in which he suggested that humanity was heading for acute resource scarcities and mass starvation. What happened instead is that world income kept rising, as it had been doing for two centuries, and as it shows every sign of continuing to do. Pessimism has been a poor predictor.

As the British historian Thomas Macaulay presciently asked in 1830, “On what principle is it, that when we see nothing but improvement behind us, we are to expect nothing but deterioration before us?” It was a good question then, and it is an even better one now. Environmental fundamentalists who insist that “this time is different” are defying both logic and the historical evidence.

In terms of real (inflation-adjusted) income, the rate of “improvement behind us” has been about 2% per year on average. That might not sound like much, but it is a rate that produces astonishing results over the long run. It means that our great-grandchildren in 2100 will be over four times better off than we are today.

As such, economic prudence dictates that some resources, like oil, should be used as much as is profitable at the prevailing opportunity cost of extraction plus a carbon tax for spillovers. Other resources, such as hardwood, should be used now at a high “unsustainable” rate, because

they will be worth relatively less to our much richer great-grandchildren. To deny today’s poor the hardwood to build their houses (or the income from chopping hardwood down) for the sake of later generations is not ethical. Indeed, it amounts to taking from the poor to give to the rich.

Beyond incomes, another key consideration is technology. Most of today’s “sustainability” talk is based on our current, feeble knowledge of the future. In the 1950s, futurologists predicted that we would have flying cars by now. We don’t, but we do have many other things that they never could have imagined. Hollywood screenwriter William Goldman’s famous observation about which films will succeed with future audiences applies equally to the future of technology: “Nobody knows anything.”

The reason is simple. If we knew, we would already know what we are going to know next year but do not know now. This basic contradiction cannot be evaded by handwringing about economic “headwinds,” and certainly not by the Precautionary Principle, which holds that we should not adopt any new products or processes whose full effects are unknown. A better name would be the Oblomov Principle, in reference to the 1859 Russian novel in which a nobleman who is incapable of decisive action simply stays in bed all day.

Anyone who thinks she knows the future should put her money where her mouth is. If you think a lack of sustainability will lead to scarcities of certain resources, you should be willing to bet everything in forward markets where those commodities are traded.

To his credit, Ehrlich did put his money where his mouth was. In 1980, he and the economist Julian Simon made a famous wager. Ehrlich chose five resources (copper, chromium, nickel, tin, and tungsten) that he thought would rise in price (adjusted for inflation) during the 1980s, and Simon bet him \$10,000 that the prices would in fact fall.

Simon was banking on the prudent, elementary economic observation that if something becomes scarcer, there is a greater incentive to look for more of it or to invent some way out of the scarcity. If there is a housing shortage in some city, the smart money builds more houses to meet the increased demand (unless city-planning rules stand in the way, as is sadly the case in too many places nowadays).

But, more important, Simon was betting on the creativity of free people. It is this factor that explains the astounding Great Enrichment of the past two centuries, when standards of living in countries such as Finland and Japan improved by a gob-smacking 3,000%.



To remain prudent about costs and benefits, we need to listen to engineers and economists.”



We owe this progress to the gradual spread of the liberal idea articulated in 1776 by Thomas Jefferson and, separately, by Adam Smith: namely, that all people are created equal. The liberals of that period did not promise equality of opportunity or outcome; they promised liberation from human coercion (here, the slave-owner Jefferson did not put his money where his mouth was). They imagined and then started to create a society where ordinary people could “have a go” without asking anyone’s permission.

Those who rose to the occasion built the world we now live in. They did it not with investment or exploitation but through innovation, broadly defined. Their feats could be as modest as a woman opening a hair salon in her neighborhood, or a poor man moving to California for work. And they could be as influential as a German nobleman (Wilhelm von Humboldt) inventing the modern university, a French gardener (Joseph Monier) inventing reinforced concrete, a North Carolinian trucker (Malcolm McLean) inventing containers for shipping, or a Swedish nurse (Aina Wifalk) inventing the modern upright walker.

Simon pointed out that there really is no such thing as a “resource.” The “ultimate resource,” as he put it, is human ingenuity, which has been gradually liberated since 1776. Rare-earth elements were merely interesting dirt until people started using them to build

computers. Oil oozing from the ground was merely an agricultural nuisance until people learned how to make kerosene out of it.

In the end, Ehrlich lost the bet and paid up. The prices of all five commodities had fallen by 1990. Prudence won out over the kind of sustainability advocated by biologists and Swedish teenagers. To remain prudent about costs and benefits, we need to listen to engineers and economists. We need to be sensibly optimistic about technological breakthroughs, like the recently announced method of using E. coli bacteria to turn used plastic into vanilla flavoring (of all things).

As dyed-in-the-wool pessimists, most sustainability advocates don’t want to hear such things. To them, optimists who have confidence in the potential of modest geoengineering techniques – such as making all roads white to reflect the sun – are today’s Great Satans. So, too, are economists like the Nobel laureate William D. Nordhaus, who points out that because we will obviously have greatly enhanced technological abilities in the future, we can look forward to improved carbon-capture technologies rather than slamming the brakes on the industrial civilization that holds the key to our salvation.

Let’s be prudent and sensible, not sustainable and pathologically precarious. **IS**

Deirdre Nansen McCloskey, *Professor Emerita of Economics and History at the University of Illinois at Chicago, is the author of Why Liberalism Works and Bettering Humanomics and co-author (with Art Carden) of Leave Me Alone and I’ll Make You Rich.*

MEMBERS OF OCEAN REBELLION PROTEST AGAINST FOSSIL FUELS IN CORNWALL.

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WORLD LEADERS

Care Over Growth

TIM JACKSON

*Director of the Center
for the Understanding of
Sustainable Prosperity*

The sun rose resplendent over the highest town in the Alps at the beginning of last year. In a world that now seems more distant than the moon, the captains of capitalism had gathered for their annual jamboree. A cross between a beauty pageant and a religious rite, the World Economic Forum had been meeting in Davos for half a century to celebrate the “freedom” of the market. ▶

BUT BENEATH THE SHINY SURFACE lay the discernible cracks of a system in chronic disrepair. The snow above the town was thinner than at any time since the Forum’s first meeting in the early 1970s. In Australia, the fires that had burned through the long “black summer,” were raging still. It would turn out to be the warmest January on record.

Climate change was not the self-satisfied Davos crowd’s only concern. There was a growing recognition that the global economy had run into new and uncomfortable difficulties. These were variously attributed to a debt overhang, trade wars, or political populism in the hands of capricious leaders. Nobody could decide who was most at fault. But the damage was plain to see.

Capitalism had left too many people behind. Its rewards had been too

unevenly distributed. Its promise had been corrupted by greed and irresponsible governance. A decade of austerity had undermined the fabric of society. “Capitalism, as we know it, is dead,” proclaimed the billionaire founder of Salesforce, Marc Benioff, before announcing a new and wonderful successor: “stakeholder capitalism,” whose arrival would save the day.

Nobody pointed out what was blindingly obvious: capitalism was responsible for its own deficiencies – from its neglect of nature, its denigration of work, and its corruption of politics to its distortion of the money system and its insistence that more is always better. These tendencies all ran against the grain of evidence and reason. But all had been coded for a century or more into the DNA of profit maximization, under the mantra of “growth at all costs.”



► SWEDISH CLIMATE ACTIVIST GRETA THUNBERG PARTICIPATES IN A DEMONSTRATION AT THE JANUARY 2020 MEETING IN DAVOS.

“Ask people what matters most in their lives, and the chances are that health will come out somewhere near the top of their list.”

Within weeks, none of this would matter. In a desperate attempt to slow down a global pandemic unprecedented in our lifetimes, growth, confidence, even capitalism itself would be beating a swift retreat. We would be given an object lesson in our own survival.

But it should not have been so surprising. Ask people what matters most in their lives, and the chances are that health will come out somewhere near the top of their list. We naturally want health for ourselves, for our friends and families, and – sometimes – for the fragile planet on which we live. Health – rather than wealth – provides the true foundation for our shared prosperity.

What’s particularly fascinating is how this truth upends the vision of progress coded into economics. When wealth is the goal, perhaps growth makes sense. But if health is our aim, it categorically doesn’t. As Aristotle pointed out in his *Nicomachean Ethics* (named after his physician father): health is about balance. The good life is characterized not by a relentless pursuit of more, but by a careful quest for a “virtuous” balance between too little and too much.

Our own physiology underscores this point. Too little food leaves us struggling with the symptoms of malnutrition. Too much tips us into the “diseases of affluence” that now kill more people than under-nutrition does. Good health depends on us finding and nurturing this fine nutritional balance.

That task is tricky, even at the individual level. Just think about the challenge of keeping your exercise, your diet, and your appetites in line with the outcome of a healthy body weight. But, as I’ve argued in *Post Growth: Life After Capitalism*, living inside a system that has its sights continually focused on more makes the task nearly impossible. It is no wonder that obesity rates have tripled globally since 1975, and that almost two-fifths of adults over 18 are now overweight.

Capitalism not only fails to recognize the point where balance lies. It has absolutely no idea how to stop when it gets there. The bankrupt creed of more has unbalanced our psychological search for security. It has accelerated our obsessive pursuit of novelty. And it has imposed untenable burdens on the climate.

“To paraphrase Thomas Jefferson: The care of life and health, and not their destruction, is the first and only task of economics.”



Another insight that emerges from resetting our priorities is that if health is the end, then care must be the means to reach it. The economy of care – those essential sectors of human activity that protect, nourish, and improve the health of people and the planet – should lie at the heart of things. Here, it doesn’t take a genius to recognize another profound lesson from the pandemic: these were precisely the sectors that capitalism had systematically undervalued for decades. Worse still, it was the nurses, teachers, distribution workers, and cleaners who bore the brunt of this failure.

Had capitalism cared for the economy of care, the damage from COVID-19 might not have been so profound. Instead, the system produced precarity in work, instability in finance, tension in the body politic, and a divided and impoverished world. Even in adversity, it would be the rich and the privileged who survived and fared best. Chronically underpaid and dangerously exposed to the virus, it was the frontline workers who over-populated the tragic statistics of the pandemic.

The starkest lesson of all was that it didn’t have to be like this. With almost shocking alacrity, the crisis revealed what capitalism has long denied: that it is both legitimate and possible for government to intervene in the health of society – and to do so dramatically if necessary. It is for governments to protect livelihoods, re-purpose

supply chains, build hospitals, and invest in the economy of care. The rightful vehicle for that process is the sovereign power over money itself – a fact denied for ideological reasons by those who would profit from tragedy.

The transition to a net-zero carbon economy is often construed primarily as a technological challenge. The enormous potential of green stimulus to boost investment in renewable energy and build the infrastructure for a low-carbon society is undeniable. But to focus on the tech frontier is to miss the beating heart of the human economy, which is more reliant on the time we spend in service to each other than on the ingenuity we exercise in making things.

Much of what was put in place, at enormous speed, in response to the pandemic can serve as the foundations for a deeper and more substantial economic renewal. Reversing the decades-long precarity in care. Regenerating the devastating loss of the natural world. Replacing a culture of frenetic consumerism with an economy of relationships and meaning. Never have these things made so much sense to so many. Never has there been a better time to turn them into a reality.

To paraphrase Thomas Jefferson: The care of life and health, and not their destruction, is the first and only task of economics. **IS**

Tim Jackson is Director of the Center for the Understanding of Sustainable Prosperity and author of *Post Growth: Life After Capitalism*.



Green National Accounting

WILLIAM D. NORDHAUS

Nobel laureate economist

Once, on a flight out of Albuquerque, I was reading a glossy magazine article criticizing gross national product when I encountered the following quote from a “young radical”: “Don’t tell me about your GNP. To me, it’s really Gross National Pollution.”

THAT'S CUTE, I THOUGHT, BUT IS IT TRUE?

Actually, it is completely false. Our output measures do not count pollution. They include goods like cars and services but not carbon monoxide (CO) pumped into the air. The point is worth considering: measures of national output do not adequately correct for pollution or other spillover effects of the economy. That is why a serious effort has been made to develop accounts that properly reflect these factors. "Green national accounting," however, has turned out to be extremely difficult terrain.

Most discussions of national output refer to gross domestic product: the value of the goods and services produced by the economy, less the value of the goods and services used up in producing them. GDP thus includes consumption goods like food, investment goods like new houses, production for government, and adjustments for foreign trade.

GDP has its critics. One elementary problem is that it includes gross investment and does not subtract depreciation. Hence, it includes all new houses built in a year but does not subtract the houses that are

burned up by wildfires. A better measure would include only *net* investment as part of total output. It is also useful to focus on the income of residents, which would be represented by national product rather than domestic product. By subtracting depreciation from GDP and looking at the income of residents, we can obtain net national product.

If NNP is a sounder measure of a country's output, why do national accounts rely on GDP? One reason is that depreciation is difficult to estimate, whereas gross investment can be estimated fairly accurately. Moreover, while NNP includes all the goods and services produced by residents of the country, it excludes important costs that are not produced and sold in markets. For example, it includes the electricity produced and sold by an electric utility but not the health damages caused by the pollution that the utility emits.

So, the problem with GDP and NNP, then, is that they do not include a subtraction for pollution. By contrast, a measure of green output would include important non-market goods, services, and investments along with corrections for negative externalities. ▶

“

Most specialists would agree that it is important to correct for pollution, climate change, and other non-market activities and externalities in the economic accounts.”

Measuring the Non-Market

Most specialists would agree that it is important to correct for pollution, climate change, and other non-market activities and externalities in the economic accounts. But how can this be done in practice? How could we figure out how to subtract the economic harm done by water pollution or carbon dioxide (CO₂) emissions from the value of food and shelter?

This seems like an impossible task, but the late Martin L. Weitzman of Harvard University showed the way. Weitzman’s approach, which has since been incorporated in green accounting (or full-income accounting), is actually quite intuitive. The idea is to extend the standard national economic accounts – which cover market transactions – to include non-market activities or processes. The standard accounts collect data on the quantity of production and prices (of apples, lumber, gasoline, cars, and so on), calculate the values as the product of prices and quantities, and then calculate total national output as the sum of the values of final outputs sold to consumers and other sectors.

The Weitzman approach assumes that the harmful externalities are priced and then adds their value to the totals. But here, harmful activities have a *negative* price because they are “bads” rather than “goods.” If there are five million tons of air pollution in a year,

and the damage from air pollution is \$100 per ton, \$500 million would be subtracted from national output.

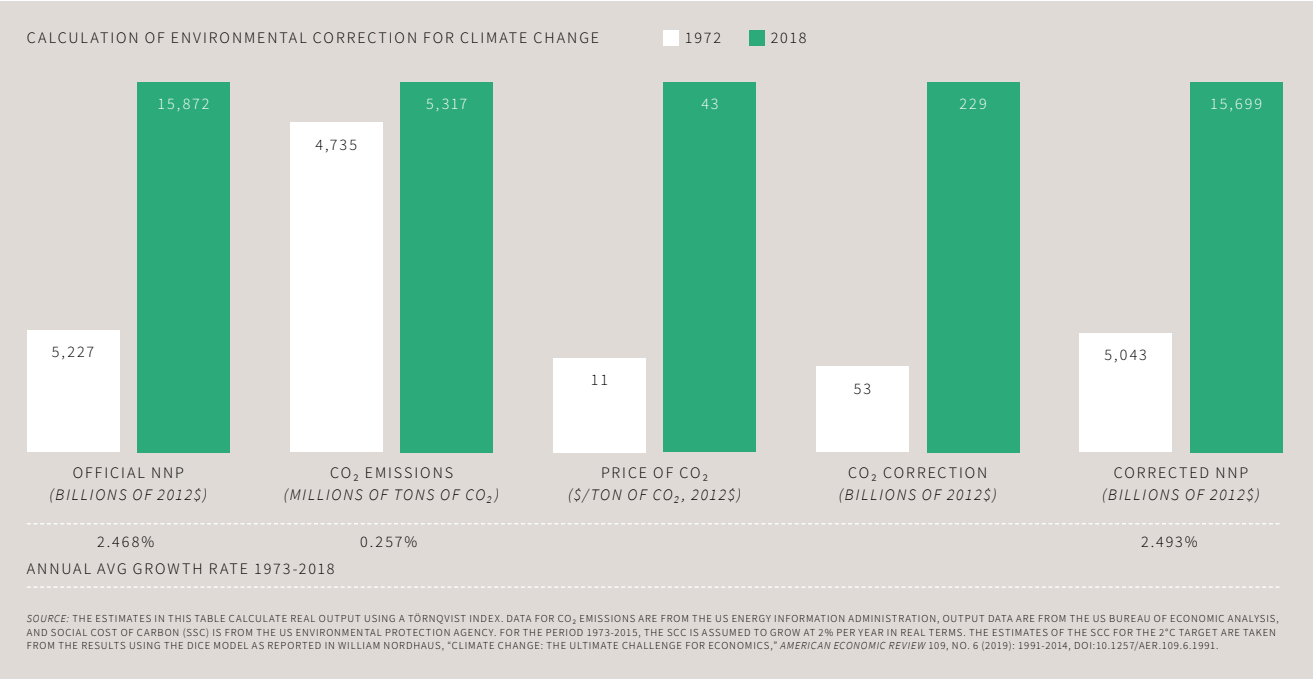
This process would seem to be straightforward, except that the concept of the “price of pollution” can be puzzling. The price of potatoes is observable in the grocery store, but what is the price of the CO emitted from a truck? From the point of view of the firm and its commercial accounts, the price is zero, which is why there is no item called “sales of CO air pollution” in the national economic accounts. But the cost to people is not zero, because CO pollution damages human health.

According to the Weitzman approach, if each ton of CO does \$100 of damage, that is the appropriate price to use when subtracting the costs of pollution and other externalities in calculating green output. But, of course, actually calculating the costs of such pollution and other externalities is extremely difficult, because the data are sparse at best (if they exist at all).

Owing to this problem and other measurement difficulties, no comprehensive environmental accounts exist for any country. But we can use the sparse existing research to get a flavor of how environmental accounts have been or could easily be constructed to account for things like greenhouse-gas (GHG) emissions and air pollution.



WILLIAM D. NORDHAUS.



From a conceptual vantage point, the starting point is NNP. In developing an estimate, we can calculate both a *level correction* and a *growth correction*, with the level correction adding or subtracting the estimates of the negative externalities or other omissions from NNP. If these externalities are growing, this will reduce the green growth rate, whereas if they are shrinking, the green growth rate will increase.

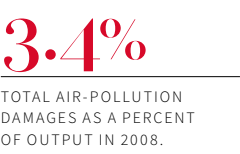
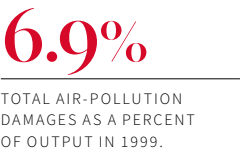
Accounting for Carbon

Let us now turn to some actual cases. The first example is the impact of the climate-change externality, particularly CO₂. This is so simple to calculate that anyone can do it on a spreadsheet. The idea is to obtain estimates of the quantity and the price and then correct the accounts for the total. You would begin with a measure of GHG emissions (in this case, CO₂) and then multiply the quantity by the price of emissions, as determined by the US government’s estimate of the “social cost of carbon.”

In 2018, the United States emitted 5.3 billion tons of CO₂ at an estimated social cost of \$44 per ton, meaning that \$233.2 billion would be subtracted from the \$15.9 trillion of output that year – a level correction of 1.5%.

But now we need to look at the growth effect. As the table shows, US climate-corrected NNP actually grew between 1973 and 2018, reflecting the fact that emissions declined by 2.2% per year relative to output. Green NNP rose faster than conventional NNP. The negative growth effect is counterintuitive until we realize that it arises because CO₂ emissions declined, making their effect on green output larger at the beginning than at the end. Thus, correcting for CO₂ emissions lowers the *level* estimate of output but raises the *growth* rate of output by a tiny amount.

One pertinent question, then, is what the growth correction would be with more ambitious climate targets, such as the 2° Celsius limit on global warming set by the Paris climate agreement. This would imply a much higher social cost of carbon and therefore a much higher price of carbon in the calculation. One estimate is that the carbon price would be more than five times higher with the more stringent target. Using the same method as shown



in the table, the level correction for the 2°C target is much larger, at 8% for 2018, and the growth correction is also correspondingly larger.

When environmental costs are larger, this implies that true output is also lower than conventionally measured output. But when environmental costs are declining, the growth correction is both positive and large.

The Price and Cost of Pollution

Now we can turn to a more complicated problem: air pollution. This includes some of the deadliest and costliest externalities, such as those associated with burning coal and other activities. Most of these activities are regulated in the US, but few are priced at a level that reflects their social costs.

In a 2011 study, Nicholas Z. Muller, Robert Mendelsohn, and I estimated air-pollution damages in the standard manner by multiplying the price (damages per unit of pollution) by the quantities of five major pollutants (nitrogen oxides, sulfur dioxide, fine particulate matter, ammonia, and volatile organic compounds) for 10,000 sources. What we found is that the total damages as a percent of NNP declined from 6.9% of output in 1999 to 3.4% of output in 2008. These corrections are clearly a substantial fraction of output and are also a much larger fraction of the output of the highly polluting industries. ▶

PUMPJACKS AND WELLS AT AN OIL FIELD IN CALIFORNIA.



Again, the growth effect was counterintuitively negative, because, as with CO₂, the pollution subtraction at the end of the period was smaller than the subtraction at the beginning. The decline in pollution had the effect of raising total NNP growth from 2.03% per year to 2.45% per year – a substantial impact that has not been emphasized in discussions of the economics of pollution.

These two examples – greenhouse gases and air pollution – hardly exhaust the areas of interest in green accounting. Other relevant sectors would include forests, water, road and highway congestion, and toxic waste, but there are few estimates for those. Meanwhile, estimates of augmented accounts have been produced in other areas such as health, home cooking, family care, and leisure. But while these can have substantial effects on total output and on growth, they generally fall outside the purview of green accounting.

What Green Accounting Shows

Here, then, is the summary of green national output: When we include impact estimates for resources and the environment that are currently excluded from the conventional national accounts, the difference in terms of the *level* of output can be substantial. A rough estimate is that including the impact of excluded sectors such as those reviewed here would subtract on the order of 10% of output from the US; but, because the research is incomplete, the total might be larger.

Correcting this omission, however, will tend to raise the *growth rate* of green output, at least for the US over the last half-century. The reason is that most measures of pollution have been declining relative to the overall economy – the result of cleaner power plants, factories, and automobiles. It is the growth of pollution relative to other goods and services that affects the growth rate. The growth effect in the sectors examined to date is on the order of +1.5 percentage points per year – a substantial number that would add up considerably over the years. True, major sectors are missing from the estimates. But, while approximate, these numbers do cover some of the most important externalities.

The finding that US environmental policies are adding to genuine

“Pollution *should* be in our measures of output, but with a negative sign.”

economic growth is important for debates about environmental policy. I would count this as a major victory for the green movement. The reason for this surprising finding is interesting. If we go back a half-century to the dawn of environmental regulation in the US, externalities such as air pollution reflected activities for which the marginal benefits of reducing pollution were far greater than the marginal costs. Environmental policy was, in effect, picking low-hanging and inexpensive fruit, reducing health and other damages substantially at minimal cost.

If we look only at the standard economic accounts, we will largely miss the improvements in economic welfare associated with picking the low-hanging environmental fruit, because the health benefits of environmental regulation are not counted in the standard accounts. But if we extend our horizon to include external benefits, the past half-century of environmental policies have actually improved growth substantially.

So, if the young radical was to come back today as an old radical, his attitude toward national accounts might be quite different. Those who claim that environmental regulations harm economic growth are completely wrong, because they are using the wrong yardstick. Pollution *should* be in our measures of output, but with a negative sign. If we use green national output as our standard, then environmental and safety regulations have increased true economic growth substantially in recent years. **18**

William D. Nordhaus, a Nobel laureate in economics, is a professor at Yale University. This commentary has been adapted from The Spirit of Green: The Economics of Collisions and Contagions in a Crowded World (Princeton University Press, 2021).



Climate change is
a health crisis
everywhere.

But reducing carbon
emissions will bring
health benefits, from
safer food and water
supplies to cleaner
air and less
extreme weather

Shantvar Apor / Wellcome Photography Prize 2021



Michael Snyder / Wellcome Photography Prize 2021



Find out why climate change matters for health,
how science can help, and what we can do to
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Emission Control

Greening the
Hardest Sectors

JULES KORTENHORST
CEO of RMI

World leaders are making increasingly ambitious commitments to reduce greenhouse-gas emissions and limit the catastrophic effects of climate change. But to convert commitments into results, more must be done to decarbonize all sectors of the global economy rapidly. This process will be relatively easier for sectors like electricity and passenger cars, where clean-energy solutions are ready for deployment at scale. But it will be much more difficult for aviation, cement, shipping, steel, and other “hard-to-abate” sectors.

ACHIEVING NET-ZERO EMISSIONS in these sectors requires the rapid commercialization of technologies that are not yet quite ready for deployment at scale; and commercialization, in turn, will require coordination across industries. Suppliers of products such as steel need to align with their customers, financial partners, policymakers, and other stakeholders to agree on a decarbonization pathway for their industries.

Such a consensus is necessary to ensure that everyone understands which technologies are progressing and at what pace. With that knowledge, everyone can align on the process of investing in low-carbon assets with long life cycles, such as steel mills, cement factories, ships, and airplanes.

Achieving this level of alignment across global industries is not easy, but it can be done. Consider the shipping industry, which has already developed a global decarbonization pathway under the leadership of the Global Maritime Forum’s Getting to Zero Coalition. This four-step alignment process, enshrined in the Poseidon Principles, is now being replicated across other hard-to-abate sectors under the leadership of the Mission Possible Partnership.

The MPP is a global coalition of industrial and climate leaders focused on supercharging efforts to decarbonize some of the world’s highest-emitting industries in the next ten years. Its immediate priority this year is to shine a spotlight on the leading hard-to-abate sectors at the COP26 climate-change conference in Glasgow this November.

While the previous United Nations climate-change conferences have focused primarily on national

commitments and policymaking, additional mechanisms need to be activated to accelerate the pace of emissions reductions. Ambitious climate targets will not be within reach until the leaders of the industries that produce the most emissions have decarbonized their entire global supply chains. As my former colleague Paul Bodnar of BlackRock likes to say, “The real economy is not a side show.” Elevating industry to the same level of importance as national governments is critical.

A few key technologies will be essential to decarbonization efforts across all hard-to-abate sectors. Chief among these is green hydrogen produced with renewable electricity and electrolyzers. Efforts to scale up green hydrogen production are already underway with programs such as the Green Hydrogen Catapult

and the US Department of Energy’s recently announced Hydrogen Shot, which is modeled after the successful SunShot program that rapidly brought down solar-panel costs. Moreover, there are early signs of rising industrial demand for the low-emissions products that green hydrogen enables. The automaker Volvo, for example, has announced that it will source fossil-fuel-free steel from the Swedish green-steel venture HYBRIT.

Technologies to improve efficiency are another key (though less exciting) ingredient in decarbonizing hard-to-abate sectors. Whether it means deploying lightweight aircraft or constructing buildings with less steel, the less energy an industry uses overall, the easier the process becomes. A recent analysis from the Energy Transitions Commission (ETC) shows that the first step to



▶ EUROPEAN COMMISSION EXECUTIVE VICE PRESIDENT FRANS TIMMERMANS AND EU COMMISSIONER FOR ENERGY KADRI SIMSON PRESENT A CLEAN-HYDROGEN STRATEGY.

“A few key technologies will be essential to decarbonization efforts across all hard-to-abate sectors.”



OFFSHORE WIND PROVIDES GREEN ELECTRICITY



WHICH IS USED TO PROVIDE HYDROGEN.



THIS IS THEN SAFELY STORED



AND EVENTUALLY TRANSPORTED THROUGH A NETWORK TO INDUSTRY.

▶ A SHIP OPERATED BY EVERGREEN MARINE CORPORATION, A SIGNATORY TO THE SHIP RECYCLING TRANSPARENCY INITIATIVE.



building a net-zero global economy by 2050 is simply to use less energy, followed by scaling up and universalizing clean-energy sources.

The ETC also highlights the importance of carbon capture and sequestration, which will be needed not only to offset industrial processes that cannot be fully decarbonized, but also to reduce the level of carbon dioxide already emitted into the atmosphere. Accounting for historic emissions is a complex process that most industrial leaders have yet to consider fully. But they had better start thinking about it now, because any realistic pathway to keep global warming within 1.5° Celsius of pre-industrial levels will have to include reducing atmospheric CO₂.

Not only do we need to remove massive quantities of CO₂ from the atmosphere; we also must find long-term storage solutions to keep it locked away for hundreds or even thousands of years. This is where the gap between the net-zero objective and existing technologies is the largest.

Who should bear the costs of tackling this problem? Certainly,

many argue that the countries and companies responsible for the largest share of historic global emissions should assume a corresponding responsibility for CO₂ removal. In an upcoming article, the World Economic Forum’s Global Future Council on Net-Zero Transition will explore this issue and describe different approaches for how we might reach a consensus on responsibility for historic emissions.

As we look toward COP26, we must pay ample attention to all these challenges. National governments and global industries alike need to act immediately to reduce emissions; merely committing to act in the future is no longer acceptable. The longer we fail to lock in more sustainable development pathways, the harder it will be to keep global temperatures at a safe level. Even if we do reduce annual emissions somewhat, it is the cumulative amount of CO₂ in the atmosphere that matters. If that is still growing, the problem will not be solved.

We need global leaders everywhere to understand the scale and urgency of the crisis we face. Radical collaboration and coordinated

action are required right now, from everyone. It is not just future generations that are depending on us. So too are the tens of millions of people already suffering in terrible heatwaves, fires, floods, droughts, and storms. From California and Texas to entire regions of Africa, Asia, and the Middle East, the catastrophic consequences of the climate crisis are compounding. While the costs of reducing emissions are significant, they are negligible compared to the costs of failing to do so. **18**

Jules Kortenhorst is CEO of RMI.



Latin America's

Burning Challenge

JORGE GASTELUMENDI

*Global Policy Director
at the Atlantic Council*

“We are entering times of rebellion and change. There are those who believe that destiny rests on the knees of the gods; but the truth is that it confronts the conscience of man with a burning challenge.” The Uruguayan novelist Eduardo Galeano’s words are as relevant to Latin America today as they were when he wrote them 50 years ago.

THE REGION’S PROSPECTS FOR managing climate change now must be considered within the context of the COVID-19 crisis. The pandemic has hit Latin American countries where it hurts the most, underscoring their historic underinvestment in the kind of social programs needed to lift the poor and protect the middle classes.

Even before the massive costs inflicted by the pandemic, the region had one of the world’s highest rates of informal employment. Most of its health-care systems were underfunded – as in Peru, which had only around 100 intensive-care beds at the beginning of the pandemic (one per 30,000 people). And around 21% of Latin America’s population was living in slums with limited or no running water, sewage removal, green areas, or reliable electricity.

In the midst of this pandemic, the crisis posed by climate change has remained as present and dangerous as ever. According to the World Bank, “every year on average, between 150,000 and 2.1 million people are pushed into extreme poverty, in the region, because of [natural] disasters.”

Whether Latin American countries can decarbonize and build climate resilience ultimately depends on whether they can deliver on their social agendas. The two questions are – and always have been – inextricably linked. It is no accident that the region’s track record of achieving climate targets has been as dismal as its record on securing social and economic justice.

Pursuing more sustainable development and addressing the damage caused by the pandemic will require not only time and

resources but also new social and political arrangements. There are signs that such changes are already afoot (or soon will be) in Cuba, Chile, Peru, and Colombia.

But the risk now is that many of the fiscal packages that have been rolled out in response to the pandemic will perpetuate carbon-intensive practices. Many governments, still reeling from the current crisis, are neglecting to prepare for the medium- and long-term effects that climate change will have on their citizens’ lives and livelihoods.

In the February 2021 *Greenness of Stimulus Index*, which assesses the environmental implications of pandemic-response policies across the G20, all of the Latin American countries studied – Argentina, Brazil, Colombia, and Mexico – scored in negative territory. They belong to the

“Whether Latin American countries can decarbonize and build climate resilience ultimately depends on whether they can deliver on their social agendas.”

majority of countries whose recovery packages lack an “explicit focus on climate change and environmental goals,” all but ensuring that they will do more harm than good.

Brazil, for example, has taken steps to deregulate land use in the Amazon, supposedly in the name of economic growth. Brazilian authorities have relaxed restrictions on environmentally destructive logging and mining, and have loosened the requirements for obtaining development permits. The government is also trying to push through legislation that would allow farmers who have illegally occupied land to claim a legal title if they can prove that they made it “productive.” And these measures come on top of others that reduced oversight in the Amazon during the pandemic, when one-third of enforcement agents were asked to stay home.

Earlier this year, at US President Joe Biden’s Leaders Summit on Climate, Brazilian President Jair Bolsonaro committed to eliminating illegal deforestation by 2030. But his government’s policies are moving Brazil in the opposite direction. As the World Resources Institute (WRI) reports: “Primary forest loss in Brazil increased by 25% in 2020 compared to the year before.”

Brazil’s current policies are disastrous not only for the climate but also for its own economy. Though they purport to support growth and incomes, they will impose far greater long-run costs on Brazilians. By contrast, a recent report from The New Climate Economy and WRI Brasil estimates that a greener response to COVID-19 – including investments in a more sustainable agricultural model – could create two million additional jobs and boost Brazil’s GDP by as much as \$535 billion over the next decade. The same policies would also enhance resilience and protect Brazil’s natural resources from further degradation, helping to prevent the permanent “savannization” of its rainforests.

“Chile has now emerged as a potential climate leader for the region.”

2,000

CHILE’S INVESTMENT IN RENEWABLE ENERGY FACILITIES WILL POTENTIALLY CREATE MORE THAN 2,000 JOBS.



Whereas Brazil stands out for its negative environmental contributions, Chile serves as an example of how Latin American governments can use the recovery to advance the climate agenda. Under its *Paso a Paso Chile se Recupera* (Chile Recovers Step by Step) package, the government has committed 30% of its recovery funds to investments in sustainable development, advancing both emissions-reduction and climate-resilience targets.

But, most importantly, the plan’s primary focus is on policies and investments to address the socio-economic needs of local communities. From expanding access to water and abating urban pollution to electrifying bus transport and retrofitting public buildings, these programs will create new job opportunities, giving a larger share of the public a stake in achieving a successful low-carbon transition.

Moreover, Chile’s plan positions the energy sector as the engine of economic recovery. Investments estimated at more than \$5 billion will go toward the construction of 28 new renewable-energy facilities, creating more than 2,000 additional jobs.

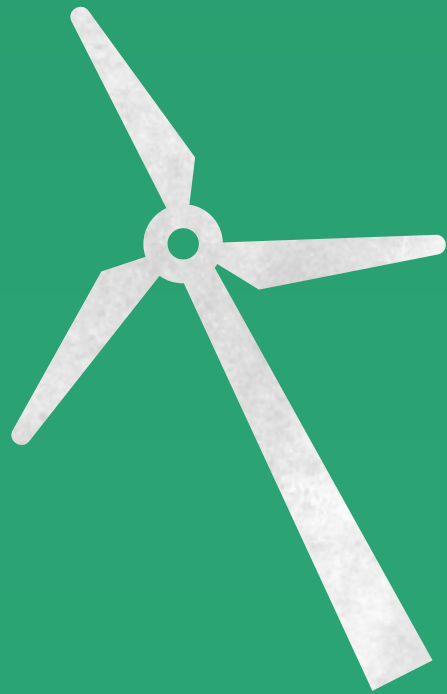
Chile has now emerged as a potential climate leader for the region. But as it moves ahead, analysts from the National Resources Defense Council note that, it must “ensure that benefits are equitably shared” and that “clean energy infrastructure does not result in negative social and environmental impacts.” If Chile can provide a “just transition” for all communities as it “phases down coal,” they conclude, it “will also help to create important lessons for its neighbors.” **IS**

Jorge Gastelumendi is Global Policy Director at the Atlantic Council’s Adrienne Arsht-Rockefeller Foundation Resilience Center and a Co-Lead of the COP26 High-Level Climate Champions Race to Resilience campaign.



DEFORESTATION IN THE NORTHEAST OF BRAZIL.

SOLAR PANELING IN CHILE.



We Need to Talk About Geoengineering

GERNOT WAGNER

*Clinical Associate Professor
of Environmental Studies
at New York University*

There ultimately is no way to stabilize the climate without addressing the fact that humans are emitting far too much carbon dioxide into the atmosphere, year after year. But cutting emissions is not the only response to the climate crisis, nor was it the one that scientists proposed over half a century ago in the first-ever government report on climate change.

TO ADDRESS THE PROBLEM OF “Atmospheric Carbon Dioxide,” noted US President Lyndon B. Johnson’s Science Advisory Committee, the “solution” could not be to emit less of the stuff, because that apparently seemed unimaginably costly and difficult to do. Instead, the committee suggested that the effects of excessive CO₂ in the atmosphere might be mitigated by brightening the world’s oceans to radiate more heat back into space.

Since then, many additional methods of “geoengineering” have been proposed by both scientists and science-fiction authors alike. Some ideas are more realistic than others, and none can substitute for the top-order priority of severing the link between economic activity and CO₂ emissions. Nonetheless, emissions represent only the first of many links in the long causal chain from economic activity to climate crisis.

Economic activity produces emissions that drive up atmospheric concentrations, which in turn increases temperatures, thereby creating new conditions that are damaging to human welfare. Whereas cutting CO₂ and other greenhouse-gas emissions addresses the first part of the chain, climate adaptation concerns the latter end – from changing temperatures to the impact on society. But the tail end should not necessarily come last in the sequence of our response. If anything, we should

have introduced more aggressive adaptation measures a long time ago.

This delay owes much to a previous, longstanding fear among environmentalists that the mere mention of adaptation would undermine the primary aim of cutting carbon emissions. According to this argument, adaptation would create a “moral hazard”: the idea that insulating people from the consequences of their actions will lead them to engage in even riskier behavior (think seat belts or condoms).

Most environmentalists have since changed their tune, however. In the mid-1990s, then-US Vice President Al Gore avoided discussing adaptation lest it detract from carbon-cutting efforts. Yet, by the early 2000s, he and most others had begun to include it as a point of emphasis alongside mitigation. And by 2013, adaptation was a key tenet in a climate-policy blueprint issued by President Barack Obama’s Council of Advisers on Science and Technology.

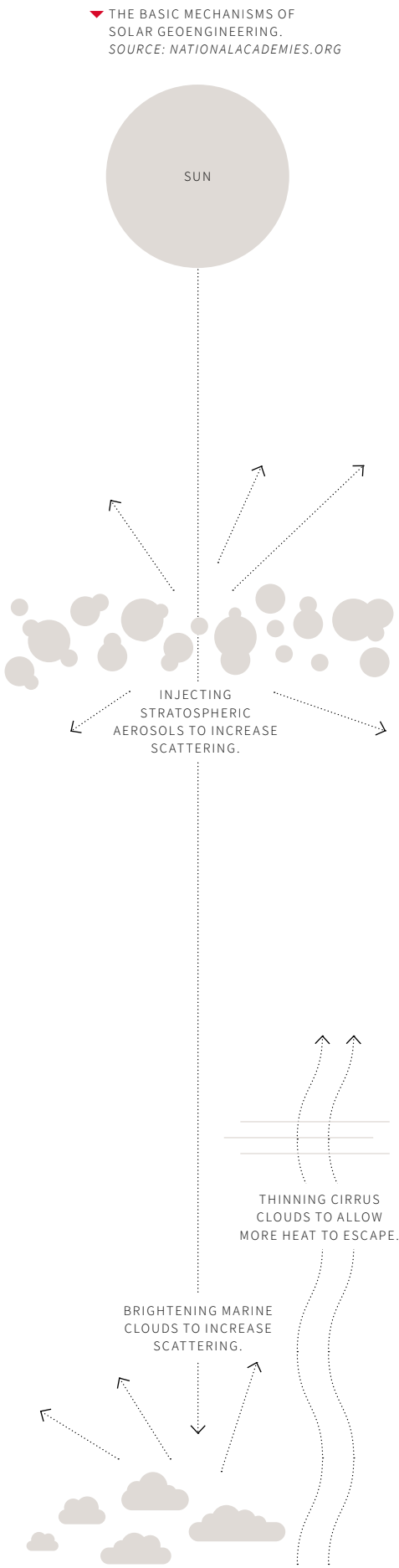
But mitigation and adaptation do not exhaust all the options. Carbon removal specifically breaks the second link in the chain, from emissions to concentrations. Technically, emissions could stay the same, while removal sucks enough carbon out of the atmosphere to decrease concentrations, lessening the *net* effect and giving rise to many a “net-zero” climate commitment.

That sounds like a win-win. But it turns out to be a rather expensive proposition, especially when looking beyond trees and other “nature-based” solutions. While these remove carbon from the atmosphere, they retain it in the biosphere and are vulnerable to deforestation and natural disasters alike. Other more high-tech methods could put carbon back into the geosphere, storing it permanently underground (from where it came before it was burned as fossil energy).

As with adaptation in earlier decades, the prospect of carbon removal brings moral hazard to the fore, raising many difficult political questions. With so many opportunities for mitigation available, can we really justify subsidies for expensive carbon-removal technologies? Moreover, why should big polluters be let off the hook?



▼ 2010 ERUPTION OF ICELAND’S EYJAFJALLAJÖKULL VOLCANO.



That second question goes to the heart of many political debates around climate and economic policy more broadly. Is climate change caused by too much pollution, or is it a problem of economic growth itself? Those who believe it is the latter argue for a full-scale reining in – or rechanneling – of economic activity and market forces; some even call for “degrowth” and other more sweeping societal transformations. Given these associations, it is easy to see why those on the left would be suspicious of carbon removal, and why those on the right might be eager to embrace it.

The political dynamics driving the carbon-removal debate are even stronger in discussions of solar geoengineering. By reflecting more of the sun’s radiation, this potential intervention aims to break the link between atmospheric CO₂ and rising temperatures. It would not address ocean acidification and other problems directly tied to higher atmospheric concentrations, but it could have its own advantages. Chief among these is that the effects could be virtually immediate, reducing temperatures within months and years, rather than decades and centuries.

Serious discussions of solar geoengineering have long since moved on from the Johnson White House’s ideas about brightening the world’s oceans. The most-discussed method today envisions the seeding of small reflective particles into the lower stratosphere to mimic the global cooling effects of large volcanic eruptions. (This is precisely what the Indian government does in sci-fi author Kim Stanley Robinson’s new novel, *The Ministry for the Future*, following a heat wave that kills tens of millions of people.)

Some describe this scale of geoengineering as a “last-ditch” option that should be reserved only for a planetary emergency. Others emphasize that it should be viewed only as a potential complement to serious emissions reductions and other interventions – from adaptation to carbon removal – with each addressing climate risks differently.

But, again, those who merely argue for more research into solar geoengineering usually meet with strident “moral-hazard” objections, as if simply studying the issue will distract from emissions cuts.



“We are not in a position where we can peremptorily reject potential solutions to the climate crisis.”

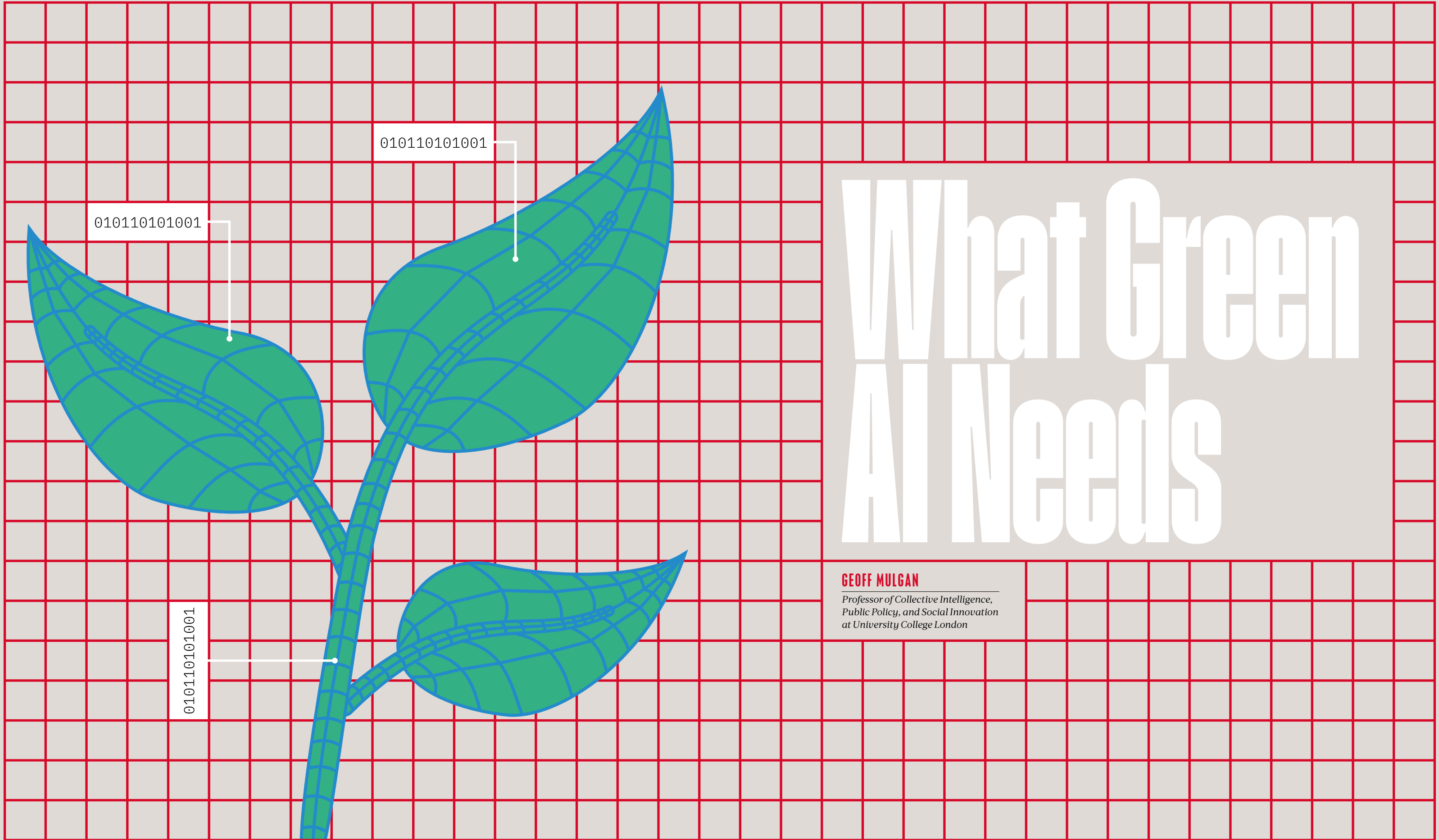
We must move beyond that argument. Remember, adaptation measures used to be viewed the same way.

Regardless of whether one believes that solar geoengineering is inherently dangerous, potentially useful, or both, one should support more careful, open, and transparent research into the matter. We are not in a position where we can peremptorily reject potential solutions to the climate crisis. If nothing else, geoengineering research could help to educate those who are still dragging their feet on emissions reductions.

After all, by failing to break the other links in the climate chain, we are making it more likely that either carbon removal or solar geoengineering will become a key element in the twenty-first-century climate-policy portfolio – whether one likes it or not. **18**

▲ CARBON CAPTURE TREE PLANTING IN NORTH CUMBRIA.

Gernot Wagner, Clinical Associate Professor of Environmental Studies at New York University, is author of the forthcoming *Geoengineering: The Gamble* (Polity, 2021).



What Green AI Needs

GEOFF MULGAN

*Professor of Collective Intelligence,
Public Policy, and Social Innovation
at University College London*



Long before the real-world effects of climate change became so abundantly obvious, the data painted a bleak picture – in painful detail – of the scale of the problem. For decades, carefully collected data on weather patterns and sea temperatures were fed into models that analyzed, predicted, and explained the effects of human activities on our climate. And now that we know the alarming answer, one of the biggest questions we face in the next few decades is how data-driven approaches can be used to overcome the climate crisis.

▲ REAL-TIME TRAFFIC INFORMATION IS DISPLAYED ON CHONGQING'S SMART TRANSPORTATION BIG DATA APPLICATION PLATFORM.

DATA AND TECHNOLOGIES LIKE ARTIFICIAL intelligence (AI) are expected to play a very large role. But that will happen only if we make major changes in data management. We will need to move away from the commercial proprietary models that currently predominate in large developed economies. While the digital world might seem like a climate-friendly world (it is better to Zoom to work than to drive there), digital and internet activity already accounts for around 3.7% of total greenhouse-gas (GHG) emissions, which is about the same as air travel. In the United States, data centers account for around 2% of total electricity use.

The figures for AI are much worse. According to one estimate, the process of training a machine-learning algorithm emits a staggering 626,000 pounds (284,000 kilograms) of carbon dioxide – five times the lifetime fuel use of the average car, and 60 times more than a transatlantic flight. With the rapid growth of AI, these emissions are expected to rise sharply. And Blockchain, the technology behind Bitcoin, is perhaps the worst offender of all. On its own, Bitcoin mining (the computing

process used to verify transactions) leaves a carbon footprint roughly equivalent to that of New Zealand.

Fortunately, there are also many ways that AI can be used to cut CO₂ emissions, with the biggest opportunities in buildings, electricity, transport, and farming. The electricity sector, which accounts for around one-third of GHG emissions, advanced the furthest. The relatively small cohort of big companies that dominate the sector have recognized that AI is particularly useful for optimizing electricity grids, which have complex inputs – including the intermittent contribution of renewables like wind power – and complex usage patterns. Similarly, one of Google DeepMind's AI projects aims to improve the prediction of wind patterns and thus the usability of wind power, enabling “optimal hourly delivery commitments to the power grid a full day in advance.”

Using similar techniques, AI can also help to anticipate vehicle traffic flows or bring greater precision to agricultural management, such as by predicting weather patterns or pest infestations.

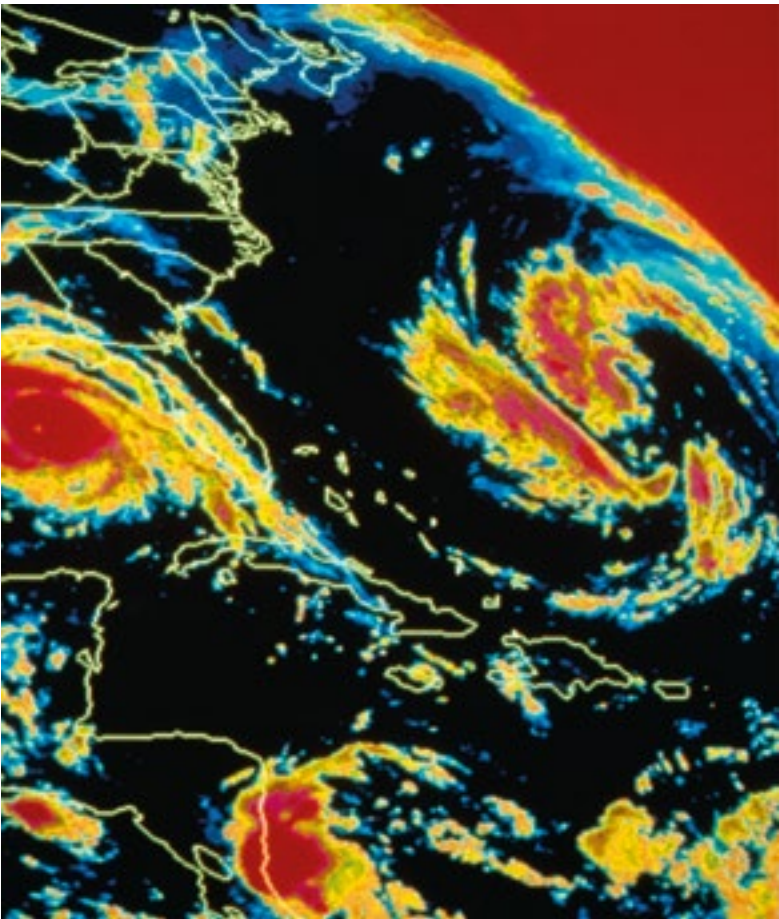
But Big Tech itself has been slow to engage seriously with the climate crisis. For example, Apple, under pressure to keep delivering new generations of iPhones or iPads, used to be notoriously uninterested in environmental issues, even though it – like other hardware firms – contributes heavily to the problem of e-waste. Facebook, too, was long silent on the issue, before creating an online Climate Science Information Center late last year. And until the launch of the \$10 billion Bezos Earth Fund in 2020, Amazon and its leadership also was missing in action. These recent developments are welcome, but what took so long?

Big Tech's belated response reflects the deeper problem with using AI to help the world get to net-zero emissions. There is a wealth of data – the fuel that powers all AI systems – about what is happening in energy grids, buildings, and transportation systems, but it is almost all proprietary and jealously guarded within companies. To make the most of this critical resource – such as by training new generations of AI – these data sets will need to be opened up, standardized, and shared.

Work on this is already underway. The C40 Knowledge Hub offers an interactive dashboard to track global emissions; NGOs like Carbon Tracker use satellite data to map coal emissions; and the Icebreaker One project aims to help investors track the full carbon impact of their decisions. But these initiatives are still small-scale, fragmented, and limited by the data that are available.

Freeing up much more data ultimately will require an act of political will. With local or regional “data commons,” AIs could be commissioned to help whole cities or countries cut their emissions. As a widely circulated 2019 paper by David Rolnick of the University of Pennsylvania and 21 other machine-learning experts demonstrates, there is no shortage of ideas for how this technology can be brought to bear.

But that brings us to a second major challenge: Who will own or govern these data and algorithms? Right now, no one has a good, complete answer. Over the next decade, we will need to devise new and different kinds of data trusts to curate and share data in a variety of contexts.



“
The failure to mobilize the power of AI reflects both the dominance of data-harvesting business models and a deep imbalance in our public institutional structures.”

▼ DATA VISUALIZATION OF WEATHER PATTERNS.

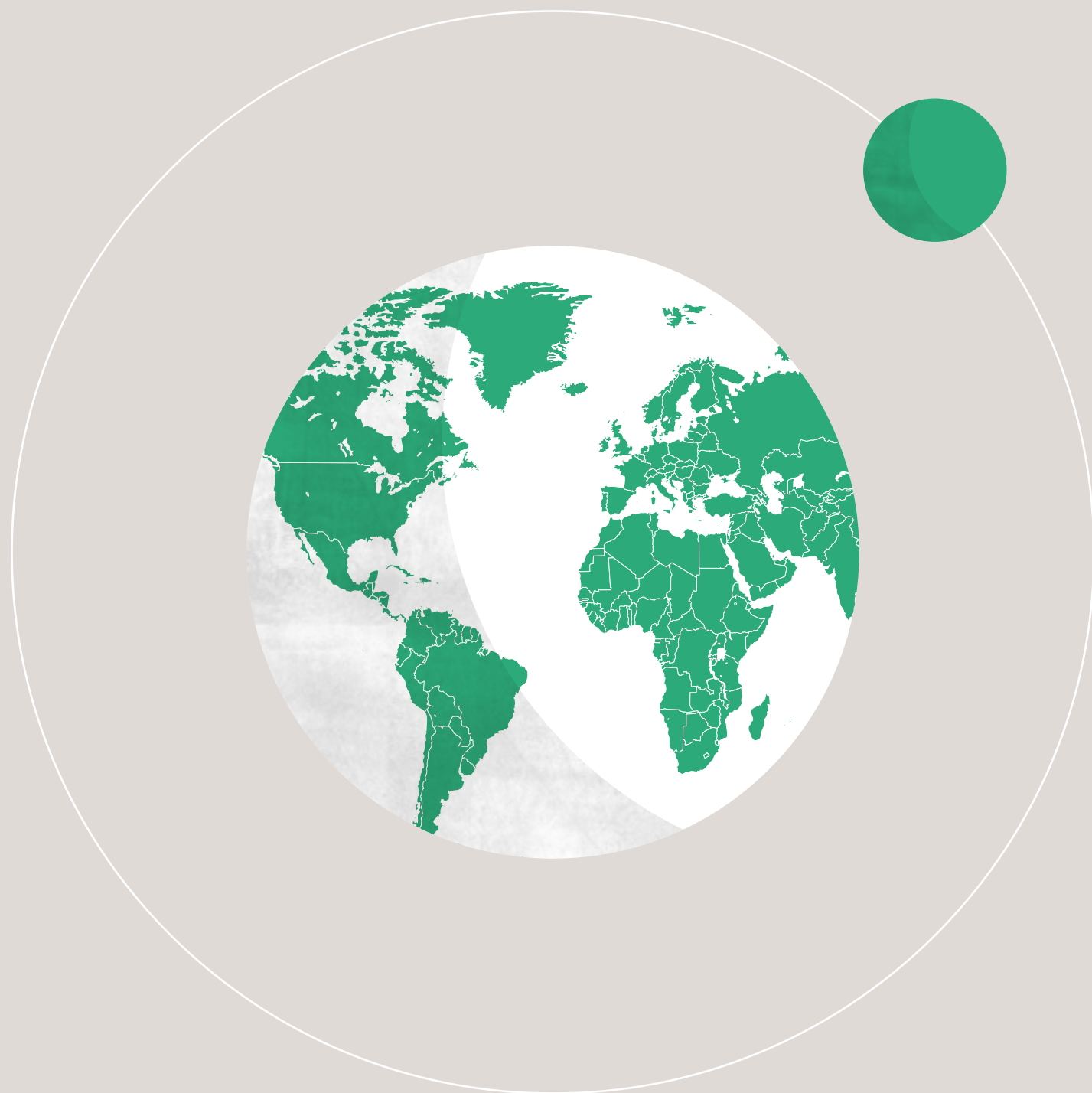
For example, in sectors like transportation and energy, public-private partnerships (for example, to gather “smart-meter” data) are probably the best approach, whereas in areas like research, purely public bodies will be more appropriate. The lack of such institutions is one reason why so many “smart-city” projects fail. Whether it is Google's Sidewalk Labs in Toronto or Replica in Portland, they are unable to persuade the public that they are trustworthy.

We will also need new rules of the road. One option is to make data sharing a default condition for securing an operating license. Private entities that provide electricity, oversee 5G networks, use city streets (such as ride-hailing companies), or seek local planning permission would be required to provide relevant data in a suitably standardized, anonymized, and machine-readable form.

These are just a few of the structural changes that are needed to get the tech sector on the right side of the fight against climate change. The failure to mobilize the power of AI reflects both the dominance of data-harvesting business models and a deep imbalance in our public institutional structures. The European Union, for example, has major financial agencies like the European Investment Bank but no comparable institutions that specialize in orchestrating the flow of data and knowledge. We have the International Monetary Fund and the World Bank, but no equivalent World Data Fund.

This problem is not insoluble. But first, it must be acknowledged and taken seriously. Perhaps then a tiny fraction of the massive financing being channeled into green investments will be directed toward funding the basic data and knowledge plumbing that we so urgently need. **IS**

Geoff Mulgan, a former chief executive of NESTA, is Professor of Collective Intelligence, Public Policy, and Social Innovation at University College London and the author of Big Mind: How Collective Intelligence Can Change Our World.



The Promise of Green Hydrogen

THOMAS KOCH BLANK

*Senior Principal, Breakthrough
Technologies at RMI*



While we already have mature technologies that can replace fossil fuels in many parts of our economy, there are areas where eliminating carbon pollution will be much more difficult. Steel, shipping, aviation, and trucking, for example, account for a combined 40% of our global carbon footprint and are on track to consume two times the remaining carbon budget for staying below 1.5° Celsius of warming.

▼ TOSHIBA DISPLAYS AN ENERGY MANAGEMENT SYSTEM PANEL AT ITS HYDROGEN RESEARCH AND DEVELOPMENT CENTER.

FORTUNATELY, “GREEN” HYDROGEN – H₂ produced through electrolysis using renewable energy – holds enormous promise for these sectors. Through various applications, this tiny molecule can provide the heat, reduction properties, fuel, and other services needed to replace fossil fuels. In fact, given the technical challenge of getting these “hard-to-abate” sectors to a state of carbon neutrality, hitting 2050 net-zero targets without it would be virtually impossible.

H₂ uptake can serve other objectives beyond decarbonization. For example, hydrogen’s ability to substitute for natural gas in many applications allows for a degree of energy independence and reduced reliance on liquefied natural gas or pipeline imports from Russia. And while renewables like solar and wind are limited by the extent of electrical grids, hydrogen can be transported by pipeline or potentially by ship. That means it could become an exportable renewable-energy source, eventually replacing petroleum as the main global energy commodity.

H₂ uptake is starting from vastly differing points, depending on the market. In Europe and

Southeast Asia, political and market incentives are already fully aligned for the deployment of H₂ infrastructure. But in large oil- and gas-exporting economies, the incentives are often conflicting. Notably, there is significant misalignment in the United States, where natural gas fulfills all the political priorities that hydrogen can provide for other markets.

As a crucial element in achieving 2050 net-zero targets, hydrogen production, storage, and transport represents a multi-trillion-dollar opportunity, not only for energy incumbents but also for investors. While hydrogen is currently more expensive (per unit of energy delivered) than competing options such as fossil fuels, the scaling up of electrolyzer production is driving down costs. Within the next decade, we can expect H₂ to reach break-even points with fossil fuels across different applications, after which hydrogen uptake will bring cost savings.

Green hydrogen is particularly attractive for developing economies. There is a strong geographical overlap between countries and regions with the lowest production

cost for renewable energy and those with lower per capita GDP. These countries thus could secure a global competitive advantage by becoming hydrogen producers and exporters. Doing so would also help them attract zero-carbon heavy industry, such as fertilizer manufacturing or hydrogen-based direct reduction steelmaking. And, of course, the development of these sectors would lead to significant job creation.

H₂ is also attractive for wealthy industrialized countries, which currently lead the world in the manufacture of hydrogen electrolyzers. However, if the recent history of the photovoltaic (solar panel) industry is any guide, wealthy countries may need stronger industrial policies to ensure that production does not migrate to China and other regions.

There is more work to do before hydrogen can realize its full decarbonization potential. As matters stand, green hydrogen represents a very small portion of existing hydrogen production. Instead, most hydrogen is “gray,” because it is made using fossil fuels through a steam methane reforming (SMR) process. Though there is potential to capture and store some of the associated carbon dioxide emissions to make a slightly cleaner fossil-based “blue” hydrogen, this option would not be emissions-free. H₂ therefore has a complex CO₂ footprint, for now.

Furthermore, for hydrogen to deliver on its promise, the decarbonization of electric grids must happen in parallel. But as with electric vehicles (EVs), we cannot wait for a 100% clean grid to begin deploying electrolyzers; we must start now.

This is not as financially risky as it sounds. There will undeniably be a threshold where green hydrogen becomes the lowest-cost source of hydrogen generally. Notably, the US Department of Energy’s recently announced goal of reducing the cost of “clean hydrogen” to \$1 per kilogram is nearly impossible to achieve with hydrogen produced through the SMR process at sustainable price levels for natural gas. That means US policy is already aligned behind green hydrogen.

Nonetheless, using green hydrogen to decarbonize heavy industry will demand a truly awesome amount of electricity. Producing

the necessary volume of hydrogen would almost double total current global electricity generation. The only way to meet this demand is to build renewable energy even faster.

That, in turn, will lead to critical infrastructure-design questions, such as whether to prioritize H₂ pipelines or power lines. And the growth of this sector will have many regulatory implications. To ensure a rapid build-out of hydrogen infrastructure, it will be important to enable monetization, create rate structures to encourage capital-expenditure deferral, and provide system-wide planning across infrastructure types.

Equally, a move to H₂ will accelerate the obsolescence of many fossil fuel-based assets. For these large volumes of stranded assets not to produce negative side effects, they will need to be repurposed or helped into early retirement with various financial incentives.

One high-potential area for repurposing infrastructure is in natural-gas pipeline networks, which, in some cases, can be retrofitted to allow for hydrogen transport. Some thermal power plants can also potentially be repurposed; but, here, the end-to-end efficiency of power-to-hydrogen-to-power is low, so the profitable use cases are limited. For the steel industry, the picture is grimmer, as existing blast furnace capacity may need to be replaced with direct reduction. Similarly, gasoline and diesel fueling infrastructure will need to be replaced. But the future of such infrastructure is already in doubt, owing to the growing market for battery EVs.

Hydrogen brings enormous opportunities but also a daunting scaling challenge. Globally, the industry currently has the capacity



“
Backed by direct and indirect political priorities, hydrogen markets have already gained momentum and crossed the point of no return.”

▲ A HYDROGEN STATION IN BERLIN.
▼ BEHYDRO'S 1-MEGAWATT DUAL-FUEL HYDROGEN ENGINE.



to produce only around one gigawatt of hydrogen electrolyzers each year, whereas, according to the International Energy Agency’s analysis on what a 1.5°C pathway requires, green hydrogen production will need to grow 1,000-fold from today to 2030.

There are actions that can and must be taken to meet this challenge. First, we need policies to ensure stable demand at scale, so that electrolysis makers can leap-frog into industrialized manufacturing. Second, governments must provide subsidies to cover the initial “green premium” until learning-curve effects take over. And, finally, we must address the tension between current asset locations and the places with the lowest-cost clean-sheet footprint for decarbonized industries.

Backed by direct and indirect political priorities, hydrogen markets have already gained momentum and crossed the point of no return. As such, they are quickly bringing cleaner industry and a decarbonized economy within striking distance. **IS**

Thomas Koch Blank is Senior Principal of Breakthrough Technologies at RMI.

Media Capture

*How Money, Digital Platforms,
and Governments Control the News*

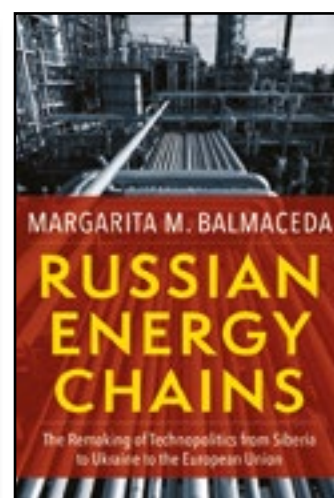
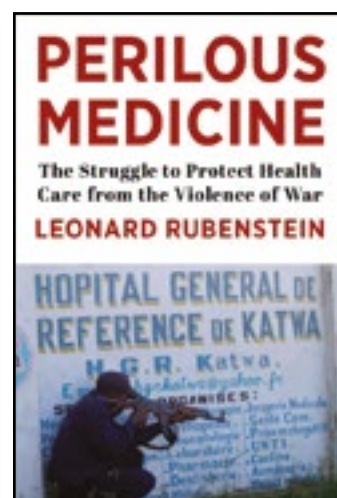
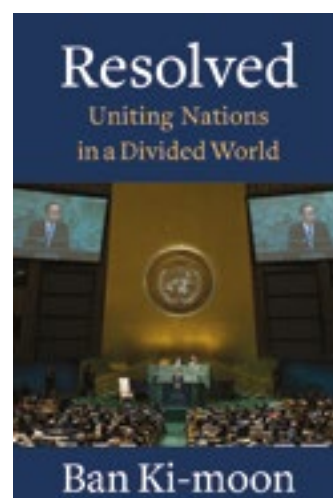
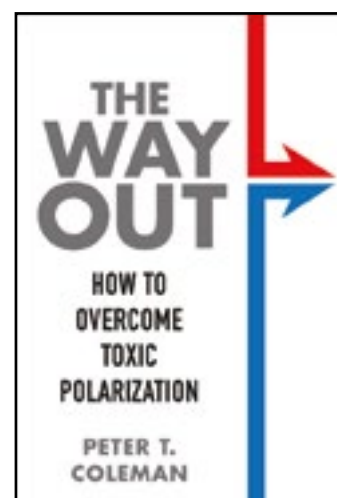
EDITED BY ANYA SCHIFFRIN

“Media capture is one of the most pressing problems facing democracies today. Bringing together the voices of scholars and reporters, this book provides a fascinating overview of the many ways in which this phenomenon is affecting political landscapes around the world. Importantly, it also proposes novel solutions for combating media capture and protecting journalists. A must-read!”

—Julia Cagé, author of *Saving the Media: Capitalism, Crowdfunding, and Democracy*



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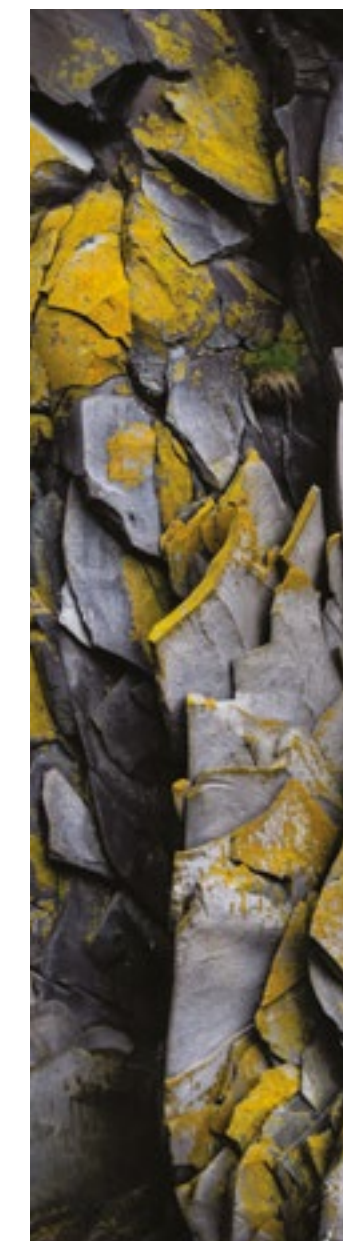


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India's Green Growth Imperative

DHRUBA PURKAYASTHA

India Director at CPI

India’s commitments under the 2015 Paris climate agreement, which aims to limit global warming to well below 2° Celsius relative to pre-industrial levels, include three quantifiable objectives. By 2030, the country aims to reduce the emissions intensity of its GDP by 33–35%, ensure that renewable energy sources account for about 40% of its installed power capacity, and, through afforestation, create an additional carbon sink of 2.5–3 billion tons of carbon dioxide equivalent.

INTERNATIONAL OBSERVERS LIKE Climate Action Tracker and Climate Transparency regard India as one of the few G20 countries to be “2°C compatible” and on track to fulfill its so-called nationally determined contributions (NDCs) under the Paris accord. But even if India achieves its NDC targets and adopts measures to help keep global warming to 1.5°C, on current trends its CO₂ emissions in 2030 could be about 90% higher than in 2015.

India must therefore decarbonize more, and fast. But India also needs to invest in manufacturing and infrastructure to improve its competitiveness, create enough jobs to lift one-third of its 1.3 billion people out of poverty, and increase its chances of meeting the United Nations Sustainable Development Goals (SDGs). Achieving these objectives without drastically increasing CO₂ emissions will require India to pursue a radically different green growth strategy.

This will not be easy. True, with renewable energy sources currently accounting for 140 gigawatts, or 37%, of India’s 380 GW of installed power capacity, the country looks set to

achieve its 40% target by 2030. But only 15.5% of the electricity consumed in India is clean, while the remainder is sourced through fossil fuels. That is primarily because large additions of renewable-energy capacity do not translate into lower CO₂ emissions in linear fashion. The effect instead depends on the capacity utilization of renewable sources, the grid’s capability to absorb variable power, and the flexibility of power systems to ramp up during peak loads.

Moreover, while India is the third-largest emitter of greenhouse gases (GHGs), its per capita electricity consumption is among the world’s lowest, at about one-third of the global average. But it is imperative that the country’s electricity consumption increases as the economy continues to develop.

The energy sector alone accounts for 78% of India’s GHG emissions, while industry is responsible for 7%, and agriculture and land use 10%. Within the energy sector, industry is the biggest consumer of electricity, using 42% of India’s output. As the country’s low per capita resource consumption rises toward the global average, and with demand for carbon-

intensive commodities such as steel, cement, and chemicals expected to grow, electricity consumption is likely to increase at least threefold between 2014 and 2030.

Structurally transforming the Indian economy will entail a shift in the share of GDP from agriculture to industry and services, accompanied by a reduction in energy poverty and improved access to reliable electricity. This would be the required development trajectory for achieving the SDGs, but it would result in India increasing its CO₂ emissions.

So, how, and to what extent, can India decarbonize? The solution lies in deploying clean technology on a large scale, reducing the cost of finance, and pricing and paying for CO₂ emissions mitigation.

To promote both decarbonization and economic development through a green investment and growth strategy, policymakers should consider adopting a sequenced approach. They could start by investing in large-scale renewable-energy projects, before electrifying transportation, and then expanding and integrating distributed green energy for cleaner electricity access.

The next step would be to create additional rural non-farm livelihoods in agro-processing (such as milling, grinding, crushing, and packaging), storage, and warehousing. After that, policymakers should aim to increase energy efficiency in heating, cooling, lighting, and electric motors. India also will need to adopt clean technologies such as carbon capture and storage, hydrogen as a fuel and reducing agent for steel, and green cement manufacturing. And, it must expand its forestry-based carbon sinks on a massive scale.

Speeding up decarbonization in line with India’s NDC calls for massive investments totaling some \$2.5 trillion by 2030. Moreover, most emission-mitigation technologies require large upfront capital investments relative to subsequent operating costs, which is why India’s

\$2.5 trillion

SPEEDING UP DECARBONIZATION IN LINE WITH INDIA’S NDC CALLS FOR MASSIVE INVESTMENTS TOTALING SOME \$2.5 TRILLION BY 2030.



▼ PASSENGERS TRAVEL IN GOVERNMENT-SUBSIDIZED E-RICKSHAWS IN NEW DELHI.

▲ A FARMER BURNS STRAW STUBBLE AFTER HARVEST IN AMRITSAR.

relatively high cost of finance is an important factor. And increased risk perceptions of the country – including climate-related financial risks – make it difficult to reduce borrowing costs for climate investments. Large-scale green investments in India therefore may not provide adequate risk-adjusted returns.

That means India requires interventions from government and intergovernmental institutions to enable finance to flow toward decarbonization investments. These measures could include creating pooled or specific risk-mitigation mechanisms to “de-risk” finance; shifting investments from banks to financial markets; reducing reliance on credit ratings for lending and investment; measuring, registering, and pricing carbon mitigated incrementally beyond NDC targets; and compensation for additional perceived risks borne by banks and institutional investors.

The risks are indeed high. A long coastline, widely varying seasonal monsoons, and significant dependence on agriculture make India highly vulnerable to the effects of climate change. This is

evident from increasingly frequent cyclones, droughts, and erratic temperatures across the country.

India therefore requires climate-adaptation investments that would preserve ecosystems and reduce coastal erosion while protecting livelihoods. Because the private sector usually perceives core adaptation investments as economically unviable, the public sector must lead by making suitable investments and developing public-private-partnership business models to attract private investors.

Indian policymakers should thus regard meeting national climate targets under the Paris agreement as only a first step. The far bigger challenge is to foster sustainable green growth that provides a better future for India’s people while also helping to protect the planet. **IS**

Dhruba Purkayastha is India Director at the Climate Policy Initiative and Director of US-India Clean Energy Finance.





What the Energy Transition Needs

MADS NIPPER

CEO of Ørsted

There are encouraging signs of progress in the fight against climate change. Thousands of businesses have joined the Race to Zero campaign and countries have enhanced their nationally determined contributions (NDCs) under the 2015 Paris climate agreement. But there is still a significant gap between ambition and meaningful action. As the Climate Action Tracker's latest research indicates, current national policies put us on a path to 2.9° Celsius of warming, relative to pre-industrial levels, by the end of this century – substantially above the Paris climate agreement's goal of 1.5°C.

IN THIS CRITICAL DECADE OF CLIMATE action, the United Nations climate-change conference (COP26) this November will serve as a litmus test for global ambitions. Make no mistake: the goal of building a net-zero-emissions society by 2050 is indeed ambitious and will be quite challenging; but it is absolutely feasible. According to the International Energy Agency, all of the technologies needed for the necessary cuts in global emissions by 2030 already exist. And for mid-century targets, a McKinsey & Company analysis shows that over 85% of the necessary emissions reductions can be achieved with technologies that are either already mature or in their early adoption phase.

Since energy production and usage accounts for around 73% of global emissions, getting this part of the transition right is our

best chance to take a quantum leap toward net-zero. But first we must overcome some obstacles. It is well documented that the costs of renewable energy – specifically solar and wind – have plummeted over the last decade, making renewables the cheapest source of power in more than two-thirds of the world. But if that is the case, why is the energy shift happening too slowly?

What Governments Must Do

Simply put, the green transition is being delayed by a lack of appropriate regulatory and institutional frameworks and policies designed to send the right market signals. The decreasing cost of renewable energy is just one important variable in the equation. Governments also need to establish renewable-energy targets and market instruments ▶



Strong partnerships between public and private actors will be essential to achieving scale.”

\$131 trillion

THE INTERNATIONAL RENEWABLE ENERGY AGENCY ESTIMATES THAT INVESTMENT IN ENERGY TRANSITION WILL REQUIRE AROUND \$131 TRILLION BETWEEN NOW AND 2050.

to pave the way for de-risking, better planning and permitting processes, and investments in modern electricity grids and infrastructure, as argued in a recent Ørsted/World Resources Institute working paper.

What concrete steps can governments take? First, the energy transition will require substantial investments – \$131 trillion between now and 2050, according to an estimate by the International Renewable Energy Agency. Because the majority of the investments in the energy transition are expected to come from the private sector, strong partnerships between public and private actors will be essential to achieving scale. Governments can commit to strong, mandatory climate policies and renewable-energy targets to signal to investors and the market that the energy transition will be a priority both now and in the long term. Pairing these targets with the right markets and contract designs will help increase the potential of new projects to attract private investment.

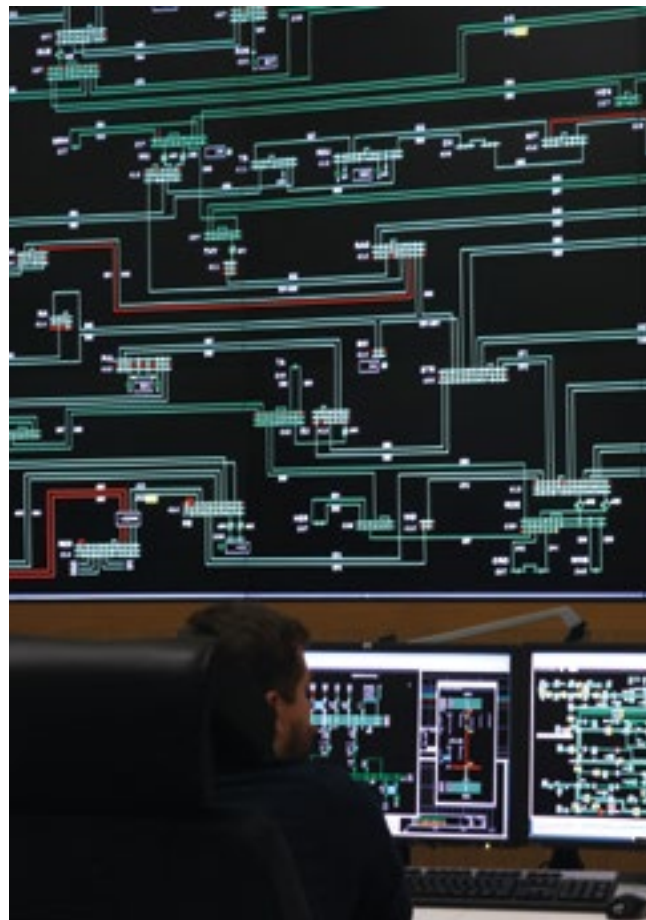
Scaling investments in renewable energy must also be done in a way that ensures that the transition occurs in harmony with people and nature. To ensure that the benefits – such as the creation of good jobs – can be felt across all communities, early engagement and collaboration with local stakeholders will be crucial. Putting sustainability at the heart of the transition is equally important, which is why

we recently announced that all our new renewable-energy projects will have a net-positive contribution to biodiversity by 2030, at the latest.

Governments also must improve the availability, affordability, and predictability of seabed leases for offshore wind. This is an urgent issue. The share of renewable electricity generation needs to grow eight times faster than the current rate in order to meet the goals of the Paris agreement. Every delay to the permitting and consent process puts more distance between us and a path to the 1.5°C target.

Finally, governments must ensure that renewable-energy systems are both modern and future-proof. Wind and solar power projects get most of the media attention, but investments to improve and expand electricity grids within and between jurisdictions are equally important. Besides being crucial to the transmission and distribution of power to where it's needed, this infrastructure also will make the energy system more flexible and resilient.

Wind and solar power, together with expanded electrification, can take us most of the way to our decarbonization goals; but these technologies alone will not be enough. In hard-to-abate sectors such as heavy transport, steel, and ammonia – all of which account for around 20% of global emissions –



▲ A TECHNICIAN MONITORS THE ELECTRICITY LEVELS OF THE GERMAN TRANSMISSION GRID.

▲ A HYDROGEN FUEL-CELL VEHICLE IS ON DISPLAY AT THE BMW RESEARCH CENTER FOR HYDROGEN TECHNOLOGY.



renewable hydrogen and green fuels must be deployed at scale.

A key challenge for the hydrogen and green-fuel industries and for off-takers, however, is that supply and demand need to be developed simultaneously. We can't afford to wait another decade for large-scale commercial uptake of these technologies. Governments must step in to help accelerate the shift by removing regulatory barriers and providing direct support for these technologies' development.

Similar to offshore wind power, the costs of renewable hydrogen and green fuels can be reduced through industrialization and production at scale. As we recommend in a white paper on "Power-to-X" (processes that convert electricity into other fuels), governments can establish regulatory frameworks to promote flagship projects, integrate Power-to-X facilities in infrastructure planning, and accelerate the deployment of renewables to provide stable, low-cost energy for the sustainable production of clean hydrogen

What the Private Sector Must Do

While government action – through regulatory policies and incentives – is vital to unlock further progress, the green transition will require a whole-of-society effort. The private sector, for its part, has a key role to play in speeding up the process, by investing billions of dollars in the energy

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The investments we need are substantial but eminently manageable within the right frameworks.”

transition, bringing down technology costs, decarbonizing its activities, and advocating for enhanced action from all relevant stakeholders. Private- and public-sector actions can reinforce each other to create “ambition loops” and provide greater momentum in the fight against climate change.

The race to net-zero will not be a walk in the park. Still, I see at least five steps that a company can take to demonstrate that it is committed to effective action.

First, managers should look within both their operations and their supply chains to set 1.5°C-aligned emissions-reduction targets wherever possible. Second, companies should ensure that long-term targets are paired with short-term action and climate-aligned investments. Third, corporate leaders should ensure that biodiversity targets are also embedded in their climate and sustainability plans. Fourth, they should not look at emissions offsets as a silver bullet; in fact, offsets should mainly be used for emissions that are difficult to mitigate at this stage. Lastly, companies should reduce their overall energy use through efficiency measures, and then convert their remaining consumption to renewable energy.

COP26 and Beyond

As world leaders and negotiators converge on Glasgow this November, all stakeholders – including governments, businesses, and

households – must keep demanding more concrete climate action. We all have a responsibility to keep each other in check.

In the run-up to COP26, we at Ørsted hope to see more countries adopt enhanced nationally determined contributions under the Paris accord and implement policies to enable immediate action for mitigation, adaptation, finance, and strengthened collaboration. As a company at the frontline of climate action, we are available to share our insights and advice for governments seeking to accelerate the pace and increase the scale of the energy transition.

Thousands of businesses, investors, cities, and citizens around the world have given governments the green light to hasten the green transition. We know that a net-zero economy will bring many benefits. We have the technologies to get there. The investments we need are substantial but eminently manageable within the right frameworks. We need to go all in now. **IS**

Mads Nipper is CEO of Ørsted.



Moving to How

Changing the Climate
of Financial Regulation

SARAH BLOOM RASKIN

*US Deputy Secretary of
the Treasury (2014-17)*



As this year’s brutal summer showed, it has become increasingly easy to track the consequences of climate change. Just as extreme weather is claiming more and more human lives, more and more species are being lost to extinction. Entire communities have been displaced by savage storms and intolerable temperatures, and rising sea levels and unstable agricultural production threaten to destroy millions of jobs.

▲ A SECTION OF THE B267 HIGHWAY DESTROYED BY FLOODING IN WESTERN GERMANY.

THESE COSTS ARE NO LONGER theoretical or far off. They are here now, and though they are being shouldered across the board, the people who feel them most intensely have less access to information, work outdoors, or live in insufficiently protective conditions. Those who cannot easily relocate or afford sufficient property and casualty insurance are increasingly vulnerable. Despite these growing costs, US financial regulators have yet to show that they are thinking creatively about potential solutions. Their reluctance stands in stark contrast to financial regulators in other rich countries, where policies and processes are being reimagined to accelerate a rapid, orderly, and just transition to a renewable, biodiverse, and sustainable economy.

Institutions like the European Central Bank, the Bank of England, the Bank of Japan, and the Bank for International Settlements are actively working to repurpose instruments like stress tests, living wills, and risk-based capital standards – all within their existing mandates. They are also pursuing new alliances with local regulators to bridge the regulatory gaps between the financial sector and the shadow banking system. To be sure, the US financial regulatory structure is complicated, consisting of regulators in a wide range of siloed agencies with discrete statutory mandates.

A non-exhaustive list includes the Federal Reserve System, the Securities and Exchange Commission, the Federal Housing Finance Agency, the Commodity Futures Trading Commission, the Federal Deposit Insurance Corporation, the Consumer Financial Protection Bureau, and the Comptroller of the Currency. But even though the United States lacks a single monolithic financial regulator, the complexity of its regulatory apparatus need not imply climate inaction. While none of its regulatory agencies was specifically designed to mitigate the risks of climate-related events, each has a mandate broad enough to encompass these risks within the scope of the instruments already given to it by Congress. Accordingly, all US regulators can – and should – be looking at their existing powers and considering how they might be brought to bear on efforts to mitigate climate risk. In light of the changing climate’s unpredictable – but clearly intensifying – effects on the economy, US regulators will need to leave their comfort zone and act early before the problem worsens and becomes even more expensive to address. This imperative means two things. First, regulators must move faster in preparing firms within their jurisdiction to weather climate effects that are not being eliminated by markets. Second, they need to ask themselves how their existing instruments can be



used to incentivize a rapid, orderly, and just transition away from high-emission and biodiversity-destroying investments. Acting *before* any major crisis has occurred is not exactly the American way. Historically, US regulators have preferred to rely first on market discipline and private-sector initiative. Only when those fail have they intervened to mitigate the damage (almost always at taxpayers’ expense). Many readers will recall that this was the general approach taken in the 1990s and early 2000s, when the government sought to engineer artificial prosperity through dangerous forms of home ownership. Thousands of derivatives were allowed to bloom. As financialized home mortgages lured in more and more Americans, federal regulators ignored signs of predatory lending, the systemic steering of racial minorities into complex and confiscatory subprime loans, and rising waves of foreclosures. The result was a full-blown crisis that caused trillions of dollars in losses. Only then did regulators rush in to revise their policies, rein in their permissions, identify the obvious consequences of failure, and figure out what changes to laws and rules were needed to prevent a reoccurrence. Sadly, this is a deeply entrenched pattern. In the savings and loan

“In light of the changing climate’s unpredictable – but clearly intensifying – effects on the economy, US regulators will need to leave their comfort zone...”

▲ A STATUE OF GEORGE WASHINGTON STANDS AT THE ENTRANCE TO FEDERAL HALL ACROSS FROM THE NEW YORK STOCK EXCHANGE. ▼ US PRESIDENT JOE BIDEN DURING A CLIMATE CHANGE VIRTUAL SUMMIT.

crisis of the late 1980s and early 1990s, it took the sector’s collapse to lead to the statutory creation of corrective measures. Fast-forward to today, and the default assumption of many US regulators is that a smooth transition from the historically embedded carbon-based economy to the renewables-based and sustainable economy of the future will occur on its own. Embracing this default assumption is like taking your hand off the rudder when navigating a narrow passage between dangerous currents. We should not act as if there were no navigational instruments to assist us. Yet that is effectively what US financial regulators are doing by not exploring the possibilities offered by the tools at their disposal. The most prudent course is for each financial agency to start acting immediately within its respective remit, rather than diverting its expertise into well-worn debates about whether climate-related harms do or do not represent collective harms to society. The complex, non-monolithic nature of the regulatory system should be recognized as a virtue. While the system’s structure sometimes leads to a lack of coordination and a degree of bureaucratic close-mindedness and insularity, it also means that each agency can act creatively on its own, introducing diverse solutions based on a broad array of perspectives. Moreover, thanks to federalism, regulatory experimentation can be carried out on a smaller, regional scale to establish proof of concept. Existing coordinating bodies like the Financial Stability Oversight Council can then pick up some of this work,



depending on existing membership and the scope of US President Joe Biden’s May 20, 2021, Executive Order on Climate-Related Financial Risk. More broadly, though, US regulators need to be encouraged to think more imaginatively about how they can engage with local transition efforts. For example, how might financial policies from diverse agencies be stitched together to produce outcomes that enable firms to hit their net-zero targets? How can financial policy be used to help accelerate a transition that redeploys workers for new jobs, or to assist households that are being asked to change their spending habits? And how can regulatory changes relating to disclosure, access to credit, and pricing of risk support a rapid and just green transition? While financial regulators repurpose their instruments and reimagine their processes, financial firms should be doing the same, acting now to identify their environmental assets and liabilities, rather than waiting for slow regulators to do it for them. When an institution knows what it has in its portfolio, it can anticipate how it will fare in the face of successive climate-related shocks, and it can better determine correct asset pricing and valuations, as well as the adequacy of its reserves. In short, neither industry players nor regulators should wait around for someone else to tell them what to do and when to start. Most of the necessary tools are already there. What is lacking is a willingness to break the habit of acting only after a disaster. Financial regulators must reimagine their own role so that they can play their part in the broader reimagining of the economy. **IS** *Sarah Bloom Raskin, a distinguished fellow at Duke University School of Law’s Global Financial Markets Center and a senior fellow at the Duke Center on Risk in Science & Society, is a former deputy secretary of the US Department of the Treasury and a former governor of the Federal Reserve Board.*

Getting Finance Onside for Climate

JOSEPH E. STIGLITZ

Nobel laureate economist

The world has finally awoken to the existential imperative of securing a rapid transition to a green economy. Finance will play a pivotal role in that process. But while financial institutions have made a big show of doing their part – issuing green bonds and installing green lightbulbs – far too many continue to provide capital to the fossil-fuel industry and support other parts of the economy that are incompatible with a green transition.

SUCH FINANCING ACTIVELY FUELS the climate crisis. Many of these investments are long-lived. Discovering, developing, and fully exploiting a new oil field takes decades, stretching well beyond the horizon in which the world *must* become carbon neutral to prevent catastrophic levels of warming. As such, these projects almost certainly will become “stranded assets”: holdings that have lost their value and usefulness amid the fight to save the planet.

These losses pose a risk to the investor and, potentially, to the economic system and the planet. Because most owners of stranded assets will selfishly fight to exploit their holdings no matter what, financing for these investments creates an adverse political dynamic. There are powerful lobbies committed to fighting the green transition, lest they be the ones

left holding the bag. Moreover, if the transition succeeds, these same groups will demand compensation – effectively “socializing” the downside risk of investments that never should have been undertaken in the first place. If history is any guide, they will succeed in making themselves whole.

Ideally, we would simply ban such investments. But, for now, this option is politically infeasible in the United States and many other countries. Another option is to deploy regulatory tools. Since markets are short-sighted and often fail to account fully for key risks, the obligation to ensure financial stability falls on those charged with overseeing the economy, including central banks.

The 2008 financial crisis showed what can happen when even a small part of the world’s asset base (US subprime mortgages) gets repriced. ▶

“The 2008 financial crisis showed what can happen when even a small part of the world’s asset base gets repriced.”





The repricing of assets that are likely to be affected by climate change could have systemic effects that will dwarf those of 2008. The fossil-fuel sector is just the tip of the (melting) iceberg. For example, rising sea levels and increasingly common extreme weather events, from wildfires to hurricanes, could force a sudden repricing of vast swathes of land and real estate, too.

Thus, regulators need to require full disclosure of climate risk – which includes not just physical dangers but also direct and indirect financial risks. Even if there is not unanimity about the magnitude of these risks or the pace of the coming change, prudence requires disclosure of what could happen under the plausible scenarios that have been extensively discussed in Intergovernmental Panel on Climate Change assessments and elsewhere.

“
We may need
both carrots
and sticks
to nudge the
industry along.”

Moreover, a policy regime capable of achieving carbon neutrality by 2050 (combining carbon pricing with regulations) will almost surely have a significant impact on asset prices.

If the economy moves too slowly in a green direction, it increases the “transition risk.” Rather than a smooth, efficient transition to carbon neutrality, with gradual adjustments in asset prices, we could end up with a more chaotic one in which prices would jump at critical moments when markets fully internalize the reality of the change.

To mitigate this risk, finance must not only stop providing funds for investments that despoil our environment; it also must provide funds for the investments needed to move us in the right direction. We may need both carrots and sticks to nudge the industry along.

AN EXPLORATION WELL
IN KHATANGA BAY.



A HOME DESTROYED
BY THE 2021 DIXIE FIRE
IN CALIFORNIA.

For example, banks that make climate-risky investments should be obligated to hold more reserves to reflect that risk. Investors have been warned: those who nonetheless continue to make investments in fossil fuels should not effectively be subsidized by the public through the deductibility of losses. In the US, the government underwrites the vast majority of residential mortgages; going forward, it should do so only for green mortgages (loans for homes that are well insulated and energy efficient).

Furthermore, to encourage investments that are predicated on a high carbon price, governments could issue “guarantees” that if the price of carbon turns out to be lower than expected in, say, 20 years, the investor will be compensated. This would function as a kind of insurance policy, pressing governments around the

world to uphold their commitments under the Paris climate agreement.

These and other similar policies will assist the green transition. But even with such prodding, the private financial sector is unlikely to do enough on its own. Many of the critical investments that we need are long-lived, and private financial markets too often focus on the short term.

To help fill the gap, green development banks have already been created in many jurisdictions, including the state of New York. Elsewhere, existing development banks’ mandates have been broadened to include green development. These institutions are making an important contribution not just in providing finance, but also in assisting with the design and structuring of the green projects themselves.

The climate crisis demands enormous economic and societal changes. We have no choice but to change how we consume, produce, and invest. The challenge is manageable. But if it is to be managed well, finance must play its part. And that will take more than a little prodding from civil society and governments alike. **PS**

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Reclaiming Central Banks

ANN PETTIFOR
Director of Policy Research
in Macroeconomics (PRIME)



Fifty years ago, a US president closed the gold window, ended capital controls, and launched a new era of globalized finance. The “Nixon Shock” reshaped the international monetary system overnight, and then gradually changed the status of central bankers. Instead of acting as servants of the domestic economy, monetary policymakers have become masters of the globalized and financialized world economy. And this development bears directly on our ability to tackle the problems of climate change and biodiversity loss.

DESPITE THEIR TECHNOCRATIC mystique, central bankers are politically appointed public servants on government payrolls, and still derive their authority from the taxpayers in their respective jurisdictions. As former Bank of England deputy governor Paul Tucker observes, “the right to create money is always latently a power of taxation.”

Central bankers’ status and constitutional role is therefore primarily a democratic question, not an economic or technical one. As the managers of public institutions that hold a monopoly over the issuance of currencies and liquidity, they wield awesome, powerful instruments that can be deployed only because they are backed by government treasuries.

Treasuries, in turn, are backed by a country’s fiscal resources – including tax revenues – and by

public institutions that are vital to the private financial sector, such as the contract-enforcing judicial system. The stronger a sovereign’s public institutions and tax base, the more expansive the central bank’s powers to generate liquidity, and the more highly rated the country’s bonds and currency will be.

Despite the long-reigning ideology of “free markets,” capitalism has always depended on public institutions and resources for its capital gains and profits, just as central banks have always presided over a hybrid private-public financial system. What is new is the extent to which central-bank resources (balance sheets) have been expanded and deployed in the private interests of vast, unregulated, and systemically risky capital markets across the “shadow-banking” system.

60%

EARLIER THIS YEAR, THE EUROSISTEM’S BALANCE SHEET EXCEEDED MORE THAN 60% OF ITS GDP.

130%

THE BANK OF JAPAN’S BALANCE SHEET NOW STANDS AT 130% OF GDP.

40%

THE FED’S BALANCE SHEET GREW TO AN EQUIVALENT OF ABOUT 40% OF NOMINAL GDP.



Humanity is now facing terrifying climate and ecological threats.”



Outlining the history of these developments, the political economist Benjamin Braun notes that “the stagflation crisis of the 1970s and [former US Federal Reserve chair] Paul Volcker’s labour-crushing crackdown on inflation in the US in the early 1980s” led to the transfer of responsibility for monetary policy away from those directly accountable to elected representatives. Ever since then, Braun argues, financialized capital has depended on “independent” central banks and arbitration courts to protect it “against local democracy.”

Meanwhile, the Bank for International Settlements has tallied up the value of the extraordinary fiscal, monetary, and macroprudential measures that central banks have deployed since 2007 to shore up private financial markets and mitigate their adverse economic impacts. Notably, BIS

economists find that central-bank programs to purchase *private* assets accounted for half of total purchases over this period. And as other researchers have shown, a significant share of these financial flows have gone to support fossil fuels and other carbon-intensive sectors.

The overall sums involved here are massive. Earlier this year, the Eurosystem’s balance sheet exceeded €7 trillion (\$8.3 trillion), which is more than 60% of the eurozone’s GDP. The Bank of Japan’s balance sheet now stands at 130% of GDP. The Fed’s grew from \$4.3 trillion in mid-March 2020 to a peak of \$8.2 trillion in late July 2021. That is equivalent to about 40% of nominal US GDP, a level not seen since World War II.

Moreover, since 2007, central bankers have used their public authority to participate in, influence, and shape ►

► FEDERAL RESERVE BOARD CHAIRMAN JEROME POWELL.



▲ THE “FEARLESS GIRL” SCULPTURE IN FRONT OF THE NEW YORK STOCK EXCHANGE.

the vast \$52 trillion shadow-banking system, where they have become private dealers of last resort, and market makers of first resort. The expansion of shadow banking follows from the 1981-2014 period, when 30 governments around the world decided to privatize their pension funds. As a result, a vast pool of the world’s savings flowed into asset-management funds in globalized, largely unregulated capital markets. Because the sums were too large to be accommodated by commercial “Main Street” banks, the shadow-banking system emerged.

These earlier political decisions to financialize the global economy are still with us, and will pose hurdles to our efforts to tackle broader societal challenges like climate change. Given the precarious state of the biosphere, it is imperative that central banks’ activities be reoriented toward what Braun calls “public purpose,” and away from the task of sustaining private gains in capital markets.

Humanity is now facing terrifying climate and ecological threats. While there is still a chance to slash greenhouse-gas emissions at the pace needed to keep global warming

“We are moving faster toward the point of civilizational collapse than scientists previously thought.”

below 1.5° Celsius, biodiversity loss is already well underway. In fact, we are moving faster toward the point of civilizational collapse than scientists previously thought. In research published in the *Proceedings of the National Academy of Sciences* in June 2020, Gerardo Ceballos, Paul R. Ehrlich, and Peter H. Raven argued that “the ongoing sixth mass extinction may be the most serious environmental threat to the persistence of civilization, *because it is irreversible*.” (Emphasis added.)

Many, including key figures in US President Joe Biden’s administration, believe that ensuring the survival of human civilization is a task that can be left to private capital markets. In his first press conference as the US climate envoy, John Kerry paid homage to BlackRock’s climate-conscious CEO, Larry Fink, and in effect begged Wall Street to come to the rescue of the administration’s climate plan. The US national climate adviser, Gina McCarthy, then drove home the point: “The question won’t be whether the private sector is going to buy into it; the private sector is going to drive it.”



▲ FRANKLIN D. ROOSEVELT.
▼ WHITE HOUSE CLIMATE ADVISER GINA MCCARTHY.

“If we are going to avert both a political and a climate breakdown, we will need to transform the international monetary system...”

In the Great Depression, the face most Americans associated with the response was the democratically elected president, Franklin D. Roosevelt. Are we now supposed to look to an unelected, unaccountable fund manager – or, perhaps, to Fed Chair Jerome Powell – to rescue human civilization from collapse? The present structure of globalized finance lends itself to precisely this undemocratic outcome. But we must resist it, lest we end up with a return of fascism on top of the climate crisis.

If we are going to avert both a political and a climate breakdown, we will need to transform the international monetary system so that it upholds democracy and the policy autonomy of nation-states. That means reintroducing capital controls, re-regulating global banking, re-nationalizing pensions, and restoring political and economic power to elected assemblies – not simply to their executives and to central bankers.

To be sure, the separation of powers between central banks and politicians will have to be maintained to avoid corruption. But central bankers will need to be



required, through legislation, to reorient their vast array of planning tools to the needs of democracy and the domestic economy. Fifty years ago, a political decision by one elected president and his advisers transformed the international financial architecture overnight. Such democratic transformations are entirely possible, and another one is now urgently needed. **18**

Ann Pettifor, Director of Policy Research in Macroeconomics, is the author of The Case for the Green New Deal.



A Just Transition Needs a Job Guarantee

PAVLINA R. TCHERNEVA

*Associate Professor of Economics
at Bard College*

The climate crisis will wipe out millions of jobs long before the feared robots do. It is estimated that heat stress alone will eliminate the equivalent of 80 million full-time jobs by 2030, not counting those lost as a result of wildfires, floods, storms, and other extreme weather events. These will come on the heels of the historically unprecedented 255 million job losses globally in 2020. With recent developments having thrown predictive climate models off their scale, the odds are that expected climate-related employment losses have also been underestimated. ▶

THIS YEAR’S BRUTAL SUMMER SHOULD have made it clear that no place, person, or job is safe from the ravages of climate change. Yet, economists in the United States have been fretting over an “overheating” economy, deliberating whether policymakers should tighten credit conditions and clip the pace of employment and income growth in order to fight price increases stemming from supply-chain bottlenecks and sectoral disruptions. Working families thus face the threat of not one but two heat waves: the bankrupt orthodox view that inflation must be fought with unemployment, and the looming job losses from global warming.

A job guarantee is an antidote to both. It is a public-employment policy that ensures a decent job at a family-sustaining wage, with benefits, to any person who needs one, and it performs this function in a way that tempers inflationary pressures. It is also the clearest answer to the international consensus, enshrined in the 2015 Paris climate agreement, that any climate action must uphold a commitment to “the imperatives of a just transition of the workforce, and the creation

of decent work and quality jobs in accordance with nationally defined development priorities.”

Hence, when the US Congress drafted the Green New Deal (GND) resolution, informed observers singled out its proposal for a federal job guarantee as the crucial element. Likewise, the 2020 “democratizing work” manifesto, which appeared in 43 newspapers in 27 languages around the world, identified the right to employment as a core demand and a critical component in decarbonizing the economy. The International Labour Organization also has formally recognized the idea as the best means for shaping “a fair, inclusive and secure future of work with full, productive, and freely chosen employment and decent work for all.”

If “decent work for all” is to become an actionable policy benchmark, access to a living-wage job must be guaranteed to everyone – not merely implied in the text of stimulus packages and other policies. The GND’s federal job guarantee would provide the missing jobs that conventional market mechanisms fail to supply, spearheading projects

“Beyond its function as an employment safety net, the job guarantee is a critical mechanism for heading off economic instability.”

▲ ALEXANDRIA OCASIO-CORTEZ RALLYING HUNDREDS OF YOUNG CLIMATE ACTIVISTS.

that serve a public purpose, including tackling the most urgent climate-related challenges.

As I explain in my book, *The Case for a Job Guarantee*, the benefits of such a program are manifold. From Franklin D. Roosevelt’s presidency to the GND resolution, a job guarantee has always been a “green” idea aimed at preserving both people and the planet. It ensures a transitional job offer to all working families, including those whose homes, businesses, and livelihoods are being washed away by floods and incinerated by fires. It is the bridge to decent jobs for fossil-fuel workers once the green transition brings an end to extractive industries. It provides the very employment needed to rebuild communities and mend the planet, and opens up the shortest path to a post-pandemic recovery.

Beyond its function as an employment safety net, the job guarantee is a critical mechanism for heading off economic instability, whether this stems from structural shifts in globalization, technological change, or garden-variety recessions. The program would swell in times of greatest need, when prices, incomes, and private employment are declining. But it would also be self-limiting, shrinking when other parts of the economy furnish their share of well-paying jobs.

Thus, much like other automatic stabilizers that have long been preferred to generalized stimulus policies, the job guarantee will fluctuate. The difference is that, unlike other stabilizers, it has the potential to help remake the economy.

With a job guarantee in place, economists could no longer justify unemployment as a “natural tribute” in the fight against inflation. But in its absence, “decent work for all” will remain an empty slogan, and unemployment a perennial threat. We cannot speak earnestly of inclusion if people of color, caregivers, those with disabilities, and youth are systematically excluded from good jobs.

Job guarantee proposals are extremely popular, and not just with leading climate organizations like the Sunrise Movement, which has been organizing around it. Coal-mining communities in West Virginia and Kentucky are beginning to see its transformative potential.

79%
IN 2020, 79% OF US RESPONDENTS BACKED THE IDEA OF A JOB GUARANTEE.

72%
AROUND THE SAME TIME, 72% OF RESPONDENTS IN THE UK ALSO APPROVED OF THE IDEA.

79%
IN FRANCE, 79% SUPPORT A FEDERAL JOB SCHEME.

93%
MORE RECENTLY, 93% OF US RESPONDENTS SUPPORTED A NATIONAL EMPLOYMENT AND TRAINING INITIATIVE.

▼ A RECENTLY LAID-OFF PLUMBER ENROLLED IN A WIND TURBINE TECHNICIAN CLASS.

From New England and Appalachia to California, a growing coalition of individuals, organizations, and civil-rights leaders in the US is making the policy a central demand.

A job guarantee enjoys the kind of bipartisan support that few other programs can claim. In a 2020 poll in the US, 79% of respondents spanning “demographic, partisan, and gender lines” backed the idea, as did 72% of respondents in a UK poll taken around the same time. In France, 79% of voters support a federal job guarantee, and the policy has been endorsed by the mayors of Paris and Lille. More recently, a stunning 93% of US respondents supported a national employment and training initiative that creates paid work for the unemployed, as a component of COVID-19 recovery efforts.

Moreover, the COVID-19 crisis has shown that finance is not scarce. Country after country has passed large budgets to fight the pandemic. It is no accident that the biggest spending increases were in monetarily sovereign countries that issue and control their currencies, and where government finance is provided by central banks and finance ministries. The size of stimulus efforts in 2020 ranged from 18.7% of GDP in Canada to 21.8% in Japan and 26.9% in the US. Countries that lack monetary sovereignty had much less fiscal space available to respond to the pandemic – a challenge that will surely hinder their climate responses, too.

But whether governments understand it or not, the cost of inaction or delayed action in tackling the climate crisis is already baked into every country’s budget. Misplaced fiscal rectitude cannot be allowed to cripple a bold policy agenda. As US House Budget Committee Chair John Yarmuth recently pointed out, monetarily sovereign countries might face resource and inflation constraints, but they cannot run out of funding. And as the biggest polluters, they have a moral obligation to launch a global Green Marshall Plan.

The planet is not a paying customer. We don’t have the luxury of time to structure the “correct” commercial return on climate-related investments, or to nudge the right private actors or incentivize markets to tackle the problem. For a challenge of planetary proportions that offers no obvious financial



return, governments must act boldly, directly, and in concert to craft a just transition for all.

As climate scientists have long warned, even the most sophisticated models do not fully account for potential tipping points, feedback loops, and hidden heating sources. The same is true for economic models. Problems like mass unemployment, extreme inequality, and the absence of good, stable jobs create their own feedback dynamics and tipping points. Historically, these have included the rise of authoritarianism, jingoism, xenophobia, prejudice, racial and ethnic tension, democratic breakdown, and social, economic, and political instability.

The precise content of climate justice will remain contested terrain, as claims range from more modest demands for good jobs to more radical visions of ending extractive capitalism and economic imperialism. There are myriad ways to arrange human economic affairs. The job guarantee is the basic foundation from which to build solutions to the economic challenges in front of us. **IS**

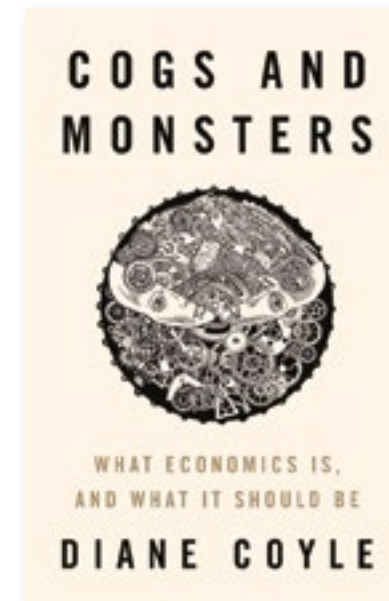
Pavlina R. Tcherneva, Associate Professor of Economics at Bard College, is a research scholar at the Levy Economics Institute and author of The Case for a Job Guarantee.

Our future depends on nature.
But in the next decade more than **1 million species** may disappear.

WITHOUT THEM THERE IS NO US

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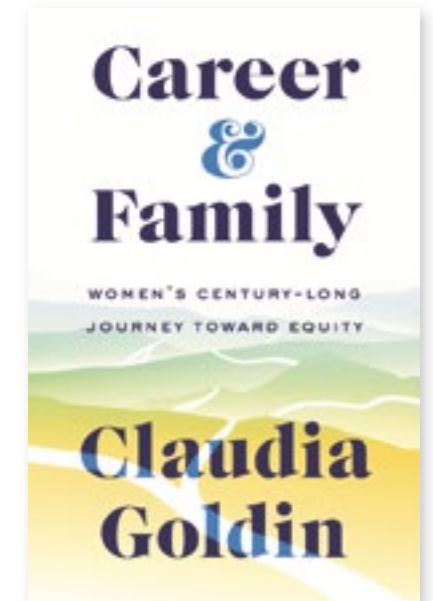
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—Andy Haldane, Chief Economist at the Bank of England



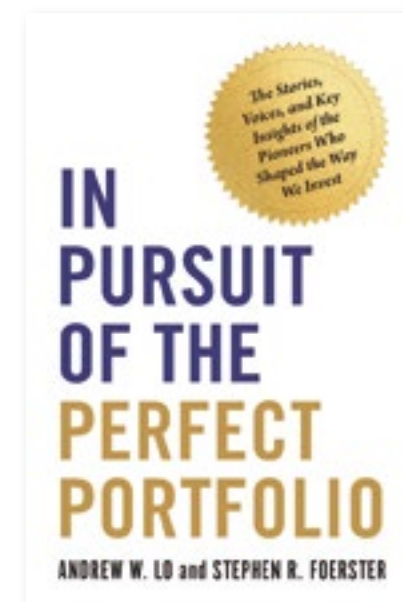
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—Adam Hanieh, Institute of Arab and Islamic Studies, University of Exeter



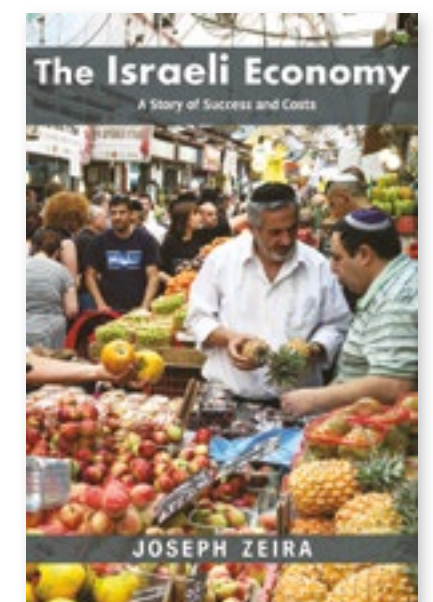
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—Alice Evans, King’s College London



“Nordhaus, winner of the Nobel Prize for his pathbreaking contributions to the economics of climate change, shows... we have the reasons, economic tools, and technologies to achieve a Green Earth.”
—Jeffrey D. Sachs, Columbia University, president of the UN Sustainable Development Solutions Network



“A delightfully written account of the finance pioneers who have shaped our understanding of how to build optimal investment portfolios.”
—Burton G. Malkiel, author of *A Random Walk Down Wall Street*



“Zeira’s brilliant book analyzes the factors that led to Israel’s remarkable economic development, and also offers a sober assessment of some of the most pressing economic challenges the nation faces today.”
—Effi Benmelech, Northwestern University



The Food Revolution Is Up to Us

CHRISTIANA FIGUERES

*Co-Founder of
Global Optimism Ltd.*

This year, the United Nations is convening a special gathering to “raise awareness and elevate public discussion” about how food-system reform can help us to achieve the Sustainable Development Goals. But the world needs much more than a food-systems summit. It needs a food revolution. With nature’s capacity to support human life having already reached a breaking point, changing what we put on our plates has become an urgent priority – one that will play a crucial role in determining the future living conditions on planet Earth.

ACROSS G20 COUNTRIES, THE MAJORITY (60%) of people know that we must make a rapid transition to renewable energies this decade. Not only are the necessary technologies increasingly available and affordable; pressure from both civil society and the financial sector is growing. Yet only 41% of people recognize that we also need to transform our food systems just as fast. This glaring gap in awareness shows that we need a wake-up call.

For decades, land-based ecosystems have been absorbing around 30% of excess carbon-dioxide emissions, protecting us from the worst climate shocks. But over the last 50 years, we have obliterated at least half of these natural assets. When forests, for example, are destroyed for industrial food production, they do not just stop absorbing CO₂; they start emitting it. Assets that were contributing to the planet’s resilience suddenly become liabilities that are undermining it. This double-whammy is why food production now accounts for over one-third of global emissions.

We are tantalizingly close to being on track for a fossil-fuel-free future. But that achievement will mean little to

future generations if we do not also transform our broken food system. Just as we are pushing fossil fuels into retirement (while thanking them for all they have done for us), so too must we phase out industrial agriculture.

Industrial agriculture was designed for the noble purpose of feeding a growing population. But it is no longer fit for that purpose. In addition to its massive contribution to global warming – which will cause more crop failures, driving up hunger – the current system results in massive levels of food waste, the monopolization of seeds (which leaves smallholder farmers at the mercy of multinational corporations), the degradation of once-fertile soils, poisoned waterways, and catastrophic biodiversity loss. This amounts to an injustice that we can no longer tolerate. Ultimately, if we fail nature, we fail on climate, and we fail ourselves.

Many people recognize that we are approaching dangerous climatic tipping points, and most – 82% across G20 countries – want change that protects nature. So, let’s show them what that would look like. This year’s Food Systems Summit is an ►



Industrial agriculture is no longer fit for purpose.”

opportunity to build momentum in some of the biggest priority areas of food-system reform. For example, we urgently need to make regenerative farming the dominant model globally. This form of agriculture relies on farming and grazing practices that nurture the soil, rather than killing it.

Furthermore, to continue to meet the nutritional demands of the world’s population, we also need to expand where food is grown. Agriculture can be practiced in every space available, from rooftops, balconies, and converted car parks to fields and home gardens. And, finally, we need to ensure that people understand that what we eat can contribute directly to our own well-being, as well as that of the planet.

The good news is that we’re not starting from scratch. The EAT-Lancet Commission has already scientifically defined a diet that would nurture both people and the planet. This diet, which is readily available to people around the world, features a drastic reduction in meat consumption and a commensurate increase in plant-based proteins.

Plant-based proteins are to the food sector what renewables are to the energy sector. Safe, tasty, and increasingly affordable and accessible, these proteins will soon proliferate widely, in part because investors already see their market potential. By 2040, children will be horrified to learn that we used to mass-produce and slaughter animals in factory farms, just as they will be incredulous that we used to drive around in cars that spewed toxic fumes into the air.

Another piece of good news is that we are quickly strengthening our understanding of the relationship between soil health and food production. We already know how to improve crop rotations, and we are expanding the use of water-harvesting systems and conservation-based agriculture. This allows us to move away from ploughing that irritates the soil and releases carbon emissions.

Moreover, the Land Institute is developing new forms of perennial – rather than annual – staple food crops. Instead of having to sow their seeds every year, farmers will be able to harvest the same plant for four, five, or six years in a row. And because these perennial crops have root systems that run deeper

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Changing what we eat is a radical act that will make us and nature healthier and happier.”

than those of annual crops, they are more resilient and absorb more carbon in the soil. They also require much less diesel in the tractor.

We know that we can move quickly as a global community when we need to. The pandemic has taught us that rapid change is possible. Now, we must bring the same urgency (and even more follow-through) to fixing our relationship with food and how we produce it. Our food system is our most essential life-support mechanism. But we won’t be able to transform it in time if only a minority of us are even aware of the challenge.

This year’s summit is an opportunity to raise awareness. But it should be understood as only one step along the way. We can each take an additional step with every meal we share. Changing what we eat is a radical act that will make us and nature healthier and happier. By making nature-conscious eating choices and helping to spread the word, each of us can contribute to keeping planetary warming within the 1.5° Celsius limit laid out in the Paris agreement. A healthier plate makes for a safer planet. **PS**

Christiana Figueres, a founding partner of Global Optimism, is a co-author of the bestselling book The Future We Choose: The Stubborn Optimist’s Guide to the Climate Crisis, and a co-presenter of the Outrage + Optimism podcast. She was executive secretary of the United Nations Framework Convention on Climate Change from 2010–16, overseeing the landmark Paris agreement on climate change, adopted by 190 countries and the European Union.

▶ A WOMAN TENDS AN URBAN FARM IN JAKARTA.

▲ THE MEAT-FREE IMPOSSIBLE WHOPPER USES A PLANT-PROTEIN BURGER PATTY.



Greening Next-Generation Europe

CONNIE HEDEGAARD

European Commissioner
for Climate Action (2010–14)



The COVID-19 crisis could have killed the climate cause. Instead, the pandemic has reinvigorated it – not least in Europe. Never before have so many of the region’s economy and finance ministers and business leaders realized that decarbonization and the green transition can actually drive, rather than hinder, job creation, infrastructure investment, and industrial innovation. As Europe gears up for a post-pandemic economic recovery, decarbonization is not only essential, but also presents genuine opportunities if we get it right.

ONE OF THE MOST ENCOURAGING examples of this new mindset is the European Union’s €750 billion (\$884 billion) Next Generation EU recovery fund, which must allocate 37% of the money to climate initiatives, while the disbursement of the remaining 63% will be subject to a “do no significant harm” principle.

Given that the EU and its 27 member states have committed to reducing carbon dioxide emissions by 55% by 2030, and to becoming carbon neutral by 2050, ensuring that political decisions and new investments do not worsen the climate problem is common sense. But it nonetheless marks a new way of thinking and a recognition that climate concerns and emissions reductions must be integrated into a wide range of policies.

True, Europe’s energy transition is already well underway. An increasing number of EU member states are phasing out coal, renewables are expanding steadily, and policymakers recognize that energy-efficiency efforts are a key tool in bringing down the total cost of the green transition. But decarbonization will require us to stop using fossil fuels, while sectors such as construction, transportation, and agriculture will need to contribute substantially more to emissions reductions than they have so far. In other words: Now comes the hard part.

Setting targets is an important first step, followed by getting the price of carbon right. The EU’s Emissions Trading System, established in 2005, is now really starting to work, with a current price tag of around €60 per ton of CO₂ emitted.

But European business leaders in the CEO Alliance – a group convened

by Volkswagen Group CEO Herbert Diess – say that securing the most cost-efficient transition will require greater efforts. In early July, the alliance – comprising leaders of firms that together employ more than two million people and have annual revenues of more than €800 billion – called for “a strong carbon price signal [...] across the whole economy” and a rapid reduction of “subsidies for technologies with high CO₂ emissions.”

Moreover, the 12 energy, transport, and technology companies in the CEO Alliance are now working together to try to fast-track projects including battery development, sustainable buildings, smart power grids, digital carbon-footprint tracking, and electric transportation, including e-buses.

Collaboration among industries, and between the public and the private sector, may be Europe’s biggest challenge in the green transition. When clear and ambitious EU climate targets start to seep into policymaking and investment decisions, and countries start to price negative externalities and reform their tax systems accordingly, cooperation becomes a necessity. In politics, business, and science, new ways of working together are imperative.

This raises the question of whether the European governance model is fit for purpose, and able to deal effectively with complex climate issues. To manage its green transition successfully, Europe must align the need for efficient and forward-looking policymaking with continued adherence to inclusive, democratic processes. But is decision-making that involves several different levels of government fast and agile enough? ▶

The EU is not China, and does not want to be. But some of Europe’s competitors seem to move faster than we do once they finally decide on a policy. Addressing climate change with the necessary urgency and efficiency will require input not just from the natural sciences and economics, but also from the social sciences and humanities.

In the aftermath of the pandemic, the EU is taking bold new steps. In mid-July, the European Commission unveiled its Fit for 55 package, proposing 13 legislative proposals that aim to help the bloc achieve its 2030 emissions-reduction goal. The suggested measures, which EU member states and the European Parliament will negotiate over the next year, clearly show the level of Europe’s climate aspirations and ambitions.



Collaboration among industries, and between the public and the private sector, may be Europe’s biggest challenge in the green transition.”

But legislative changes alone will not suffice. For starters, large-scale new decarbonization projects require capital investments. The so-called taxonomy of green investments that Europe is now implementing is thus a crucial development – and one that could be replicated internationally. Specific criteria are helpful when it comes to assessing future investment risks and avoiding stranded assets. Given that more than 130 countries have recently agreed on a global minimum corporate-tax rate, a worldwide agreement on such a taxonomy should be within reach.

Europe also faces an enormous challenge in upskilling and reskilling its workforce for the green transition. This will include making the labor force fit for widespread electrification of economies, retraining former coal-industry workers or others who had jobs in the old economy,

▲ GIRLS PROTEST AT A CLIMATE STRIKE RALLY IN SYDNEY.



▲ EUROPEAN COMMISSION PRESIDENT URSULA VON DER LEYEN AND EU COMMISSIONER FOR ECONOMY PAOLO GENTILONI UNVEIL THE EUROPEAN GREEN DEAL.

and developing the right skills for sustainable retrofitting of buildings.

Decarbonization will also affect all sorts of individual habits, including diet, travel and work patterns, and general consumption behavior. As the green transition increasingly challenges citizens to rethink their values and actions, politicians seeking re-election will find it more difficult to lead the necessary reforms.

But the COVID-19 pandemic has provided an excellent opportunity to reflect upon our tendency to prefer business as usual to innovation and behavioral change. European political and business leaders have signaled clearly that they understand the urgent need for greater climate action, and have set their boldest and most ambitious targets yet. At the same time, Europe’s young generation has never been more impatient to see



Europe’s younger generation is already fully committed to a green future.”

lofty rhetoric and noble intentions translated into real and visible action.

If those in power once again disappoint and fail to deliver a real transformation, Europe would become even more polarized than it already is. Europe’s younger generation is already fully committed to a green future. Faced with an ever more urgent climate crisis, the region’s current policymakers and business leaders must ensure that their “next-generation” policies are worthy of that title. **18**

Connie Hedegaard served as European Commissioner for Climate Action (2010-14), and as Denmark’s Minister for the Environment (2004-07) and Minister for Climate and Energy (2007-09).



Transport's Make-or-Break Decade

KRIS PEETERS

*Vice President of the
European Investment Bank*

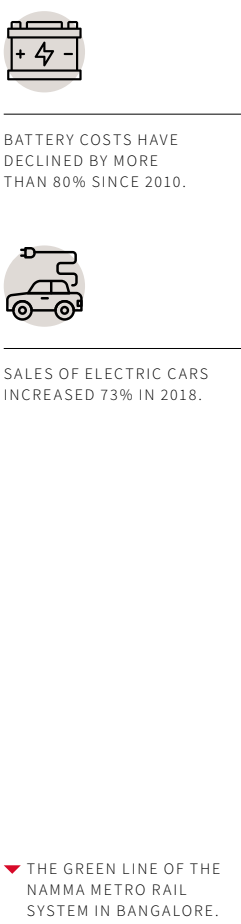
Pick any sector of the European economy, and you will find a lot of companies cutting greenhouse-gas emissions. But, while sectors like construction, electricity production, and agriculture now emit much less than they did in 1990, transport emissions have increased by 33%. Unless we put the brakes on transport pollution soon, the European Union will have a very hard time reaching its climate goals.

THERE IS AN IMPORTANT ECONOMIC dimension to the challenge ahead. Europe’s highly competitive automotive and transport industry plays a key role in driving economic growth and employment. If Europe falls behind in developing and adopting sustainable technologies within the next decade, it will pay a high price.

The EU cannot afford to follow Asia and North America’s lead on sustainable technology. Nor can it keep taking baby steps. Instead, policymakers must act boldly to accelerate the transition to sustainable transportation by supporting innovation and dismantling barriers to green investment in the sector.

Innovation does not mean only inventing new technologies. More fundamentally, it means devising new ways of doing things. And when it comes to transport, plenty of technologies that are already available can drive rapid progress on sustainability.

For example, electric vehicles and battery technology are becoming more advanced, accessible, and



affordable by the day. Battery costs have declined by more than 80% since 2010, and sales of electric cars increased globally by 73% in 2018 alone. Meanwhile, big data, artificial intelligence, and digitization are enabling further innovations, from ride-sharing platforms to self-driving cars. Given that cars, trucks, and other road vehicles account for over 70% of all transport emissions, the potential for progress is huge.

Yet cutting-edge technologies are not the only way to achieve more sustainable transport systems. During the COVID-19 pandemic, cities across Europe created temporary bicycle lanes, leading to a surge in cycling. Some heavily trafficked roads, such as Paris’s Rue de Rivoli, were also transformed into pedestrian zones.

These initiatives not only promoted zero-emissions transport and helped local businesses survive the pandemic. More fundamentally, they proved that significant progress can already be made.

Still, overcoming many transport challenges will demand much more research and development. Slashing emissions from ships and planes is

Public banks such as the European Investment Bank have a vital role to play here.”

one clear example. More broadly, large and timely investments are needed to cut technology costs, increase efficiencies, support first-movers, and create new markets.

But investing in new green technologies is risky. We often don’t know what the big breakthroughs will look like, or which technologies will prevail. It’s hard to commit large amounts of capital to charging networks or hydrogen gas if it is not clear which fuels people’s vehicles will be using.

Faced with a high degree of uncertainty, firms and public institutions often adopt a wait-and-see attitude and delay investment. With banks wary of taking the plunge, many companies in Europe cannot find the investment they need to support innovation. In the meantime, investors might continue to finance old, “dirty” technologies, in order to meet short-term needs.

Changing investors’ calculations requires creating financial tools that spread risk among many parties, along with policies and regulations that make it easier to develop new infrastructure and technology.

Public banks such as the European Investment Bank have a vital role to play here. By taking advantage of loan guarantees, venture capital, and public-private partnerships, we can take more chances on innovative startups, research projects, demonstration plants, and the commercial deployment of new technologies.

Already, the EIB has backed an early demonstration plant by Northvolt in Sweden to develop some of the world’s most modern batteries, and has committed financing to the Dutch company Allego to deploy ultra-fast charging stations in many European cities. Moreover, we are assisting in the rollout of 5G mobile networks across Europe. This will enable superior communication between connected vehicles, making driving much safer and improving the chances that technologies like self-driving cars will succeed. The EIB is also a key supporter of electric trains and trams across Europe, the goal being to reduce the number of cars and trucks on the road.

Moreover, we constantly review new financing plans for European startups developing electric bicycles,



vision sensors for autonomous vehicles, and charging systems. And our advisory services help cities across Europe achieve objectives like finding new financing for electric buses or designing towns that encourage cycling and walking.

Yet the climate crisis demands global solutions. That is why the EIB is also supporting green transport far beyond Europe’s borders. For example, we backed the construction of metro systems in the Indian cities of Bangalore, Lucknow, and Pune. And, together with the World Bank and the governments of Luxembourg and Germany, we established the City Climate Finance Gap Fund, which focuses on launching green investments in the Global South, including in the transport sector.

But the fact remains that there is not enough public money in the world to finance the transition to a low-carbon future. Ultimately, the private sector must take the lead. Major industrial players, entrepreneurs, and grassroots organizations must adopt a more agile, daring, and even revolutionary approach. The EIB will be there every step of the way, offering guidance and sharing the risk.

Record-breaking temperatures and extreme weather across Europe and North America this summer should leave little doubt that we have entered a make-or-break decade on climate. To create a sustainable future, we must embrace creativity and openness, ensuring that Europe’s brightest minds and boldest initiatives receive the support they deserve. **ES**

Kris Peeters is Vice President of the European Investment Bank.



Carbon Neutrality with Chinese Characteristics

NANCY QIAN

Professor of Managerial Economics and Decision Sciences at Northwestern University's Kellogg School of Management

China's commitment to achieving carbon neutrality by 2060, now enshrined in its 14th Five-Year Plan (5YP), has been met with international enthusiasm. If China succeeds, it could singlehandedly reduce global temperatures by 0.25° Celsius, relative to their expected rise. But is its plan realistic? ▶

GETTING TO CARBON NEUTRALITY IS A formidable challenge for any country, especially one with a large and developing economy. There are two dimensions to the problem: reducing economic activities that produce greenhouse-gas (GHG) emissions, and producing fewer emissions either through offsets such as reforestation or by substituting renewable energy sources for fossil fuels.

In China’s case, GHG-emitting economic activities are unlikely to decline. China is a middle-income country with 1.4 billion people, around half of whom live on incomes equal to or lower than those of Sub-Saharan Africa. Even if China can develop its high-tech sectors (as the new 5YP aims to do), there will still be hundreds of millions of people who will need jobs in energy-intensive sectors like manufacturing.

Moreover, although China’s economic growth will be slower than in the early 2000s, household energy consumption will continue to increase, owing to rising demand for cars and other household appliances typical for middle-income earners. In 2020, there were 281 million cars (204 per 1,000 people) in China, compared to 279 million (816 per 1,000 people) in the United States and 78.9 million (649 per 1,000 people) in Japan. If China’s car-ownership rate reaches the same level as that of the US or Japan, the number of cars there will triple.

To be sure, China’s population is predicted to decline to less than 1.2 billion by 2065. Nonetheless, its total energy consumption will remain high. For comparison, in 2019, Americans consumed 26,291 terawatt-hours (TWh) per year with a population of 328.2 million, while the Japanese consumed a total of 5,187 TWh per year with a population of 126.3 million. If the 1.2 billion Chinese of 2065 were to engage in the same activities as their richer counterparts do today, they would consume anywhere from 48,050 TWh (behaving like the Japanese) to 93,725 TWh (behaving like Americans) per year.

China’s ability to phase in renewable energy sources is more promising. The country has already made enormous investments in building a public transportation system that does not rely on fossil fuels, and it is quickly forging ahead in the



AMERICA CONSUMES 26,291 TWH OF ENERGY ANNUALLY WITH A POPULATION OF 328.2 MILLION.



JAPAN CONSUMES A TOTAL OF 5,187 TWH OF ENERGY ANNUALLY WITH A POPULATION OF 126.3 MILLION.



WITH A POPULATION OF 1.2 BILLION IN 2065, CHINA COULD POTENTIALLY CONSUME 93,725 TWH OF ENERGY ANNUALLY.

WORKERS AT A NUCLEAR POWER PLANT IN GUANG’AN, CHINA.



burgeoning field of electric vehicles. The big unknown is whether China will be able to generate enough energy for all its household and industrial needs without fossil fuels.

There are positive signs that it can. The new 5YP aims to increase the contribution of wind, hydroelectric, and solar power to 25% of the electricity mix by 2030, up from 15% in the previous 5YP. Although this is an ambitious target, recent technological advances have made it eminently achievable.

For example, because China’s solar, wind, and hydroelectric resources are concentrated in its western provinces while most of its electricity usage is concentrated in its eastern coastal areas, highly inefficient long-distance electricity transmission previously limited the potential for renewables. But after investing heavily in resolving this issue, China has mastered ultra-high-voltage electricity transmission, which allows electricity to move across the country at low cost. This advanced technology is now central to the government’s new infrastructure plan, which aims to transform the structure of China’s energy sector over the next five years.

Another source of renewable energy is nuclear power. China currently has 50 operable reactors that account for 4% of its total electricity generation. Another 18 are under construction, promising to increase the share to around 6%. Since 2016, Chinese authorities have been approving 6-8 new reactors per year, a rate that would bring the total to around 350 by 2060.

For nuclear power alone to replace coal, which accounts for 66% of the electricity mix, China will need to build more than 500 reactors by 2060. And if its energy needs double, it will need around 1,000 more reactors, giving it a reactor-to-population ratio similar to that of France, where 56 plants produce 70% of the power used by its 67 million people.

Building 1,000 more reactors in the next 40 years would seem financially and logistically impossible. But probably not for China, which has already transformed other forms of infrastructure over a similar period. For example, between 1988 and 2019, it extended its national highway system from around 35,000 kilometers (22,000 miles) to 161,000 kilometers, surpassing the US.

RAPID HIGHWAY SYSTEM EXPANSION IN SHANGHAI.



China is also less constrained by the key challenge facing most other countries when it comes to building nuclear reactors: public fear. After Japan’s Fukushima disaster in 2011, Germany decided to abandon nuclear power, even though it accounted for 29% of its energy mix (as of 2014). Similarly, after the partial meltdown at Three Mile Island in 1979, the construction of new nuclear plants in the US nearly came to a halt. Nuclear power now accounts for 20% of the US electricity mix, and continues to face staunch resistance from an unusual alliance of fossil-fuel interests and environmental organizations.

And yet, there is a consensus in the scientific community that nuclear power is both cost effective and environmentally friendly. New third-generation reactors are much safer and more efficient than the first-generation reactors that came to be associated with incidents like Chernobyl. Now, the consequences of an accident or a terrorist attack would be comparable to those of many other common risks that we simply take for granted. In pursuing its decarbonization targets, China can follow the data, rather than special interests.

Yes, China’s domestic politics could still create some hurdles, particularly if instability in its Western regions frustrates the growth of wind, hydroelectric, and solar power. But the Chinese government has more political leeway than others when it comes to imposing its preferences.

If China can build 350-1,000 nuclear reactors safely, it will have established a mass-production supply chain capable of providing other countries – particularly middle-income economies such as India, Indonesia, and Mexico – with the same technologies at lower cost.

All told, the facts favor China’s ambitious goal of reaching carbon neutrality by 2060. The whole world stands to benefit from its success. **18**

Nancy Qian, Professor of Managerial Economics and Decision Sciences at Northwestern University’s Kellogg School of Management, is Founding Director of China Econ Lab and Northwestern’s China Lab.

From Paris to Glasgow

LAURENCE TUBIANA

*CEO of the European
Climate Foundation*

The COP26 climate conference will be a clarifying moment, poised between global cooperation and competition. As one of the key French officials tasked with delivering a deal at COP21 in Paris in 2015, I can attest to the weight of expectations placed upon this year’s hosts, Italy and the United Kingdom.

THE SUMMIT IN GLASGOW THIS November is by far the most fraught meeting of governments since Paris. Paradoxically, greater global integration continues alongside emerging fault lines, including the injustices of the COVID-19 pandemic and a growing desire for inward, nationalistic policies.

While global trade is on track to increase by 8% this year, after falling by 5.3% in 2020, the rollout of medical supplies along global supply chains has exposed deep sources of antagonism and rivalry. The issue of vaccine solidarity – compounded by wealthy countries earmarking trillions for their own economic recoveries – has seriously strained multilateral ties. COP26 is approaching under a cloud of tension.

This year’s conference will test the spirit of cooperation that emerged in

Paris, where – after several abortive efforts – 196 governments adopted the historic Paris accord and made “net zero” a geopolitical reality. The agreement has since provided the organizing principle for all climate action – one that nation states, regions, cities, businesses, investors, civil society, and individuals all had a voice in, and can all act upon. This was people-powered multilateralism at its best.

Six years later, we ought to be seeing a positive domino effect of bold pledges from states. Instead, we are watching a nervous game of poker. As with vaccines, wealthier countries are not sharing their wealth and technology.

Tellingly, the international community still has not met the Paris agreement’s target of \$100 billion per year for supporting climate investments in developing



When we were negotiating the Paris agreement, the preceding G20 gathering was similarly fraught – some might say disastrous.”

RESIDENTS WATCH AS AN ARMY HELICOPTER COLLECTS WATER TO TACKLE WILDFIRES IN GREECE.

countries. This figure is a threshold, not an end goal: it is essential that we clear this hurdle for all parties at COP26 to know that wealthy countries mean business and are sincere in their solidarity.

Equally concerning is the absence of specifics for how G20 countries intend to meet abstract net-zero targets. Many remain fully locked into fossil fuels. Since these economies account for almost 80% of worldwide emissions, they must start including more concrete, comprehensive decarbonization planning as part of their Nationally Determined Contributions (NDCs) under the Paris agreement.

The European Commission’s new Fit for 55 plan shows how this can be done in a detailed, sector-specific way. Unfortunately, the European Union is the exception. Everyone else is still playing poker, even as the room fills up with water.

Just this year, climate-driven disasters have struck Brazil, Canada, Madagascar, China, Germany, Russia, the United States, and many others. There is no need to recall every cataclysmic

weather event, because it is already sufficient to say that the problem has broken beyond our readiness.

As climate modeling improves, the path to remaining within 1.5° Celsius of warming is narrowing before our eyes. In early August, the latest report from the Intergovernmental Panel on Climate Change showed that we are dangerously close to 1.5°C already. Every fraction of a degree matters. The differences between a 1.5°C world and a 2°C world would be dramatic.

When we were negotiating the Paris agreement, the preceding G20 gathering was similarly fraught – some might say disastrous. Many felt the COP21 was doomed to fail as a result. But after weeks of intense work and dialogue, the Paris summit managed to exceed most expectations, mine included.

How can the UK and Italy steer the talks toward another successful outcome? If the parallels with 2015 offer any indication, the key for this final “sprint” is to emphasize that no one, and no single country, can tackle the climate crisis alone. Because every single party to the United Nations Framework

Convention on Climate Change has an equal say, any single signatory can cause negotiations to stumble. Good faith dialogue, concrete plans, and serious means to finance them are the only way forward.

There are some recent positive developments to build on. Earlier this year, South Korea and Japan – respectively the world’s second- and third-largest coal financiers after China – both pledged to end their public coal investments abroad.

But there are also clear areas where governments have more work to do. According to the International Energy Agency, staying on track for net-zero emissions by 2050 requires that no new coal, oil, or gas projects be started after 2021. That means all of the world’s largest emitters must immediately end coal investments abroad and clarify how they will phase out their own use of coal.

Only a sincere spirit of multilateralism can solve the imbalance at the heart of the climate crisis, the impacts of which are profoundly unfair. Countries that are hardly responsible for the problem’s escalation are the ones facing the most

severe, often existential risks. Why would small island states negotiate themselves into submersion?

The Paris agreement was only possible because of its commitment to multilateralism, and this remains the best guide to ensuring its relevance. It is telling that soon after a G20 climate meeting delivered few tangible positives this year, the world’s Least Developed Countries issued a statement calling on their wealthier counterparts to “take responsibility.”

Sovereign, competitive impulses will always strain the space for cooperation. But within that space, there are ample opportunities to achieve positive-sum outcomes – in technological innovation and adoption, for example. These instincts are rooted in the national interest, and thus should be responsive to the fearsome, increasing prospect of overshooting 1.5°C.

In this spirit, some concrete steps to defuse tensions at COP26 would include a dedicated item for meaningful discussions on “loss and damage,” while this summer’s ferocious weather events still loom large in everyone’s memory. The conference also must press the issue of financing for climate adaptation efforts as part of the broader drive to meet the minimum \$100 billion per year target. Finally, G20 countries that have not delivered their NDCs must do so as soon as possible, demonstrating that their policies are sufficient to keep the world on a 1.5°C pathway.

G20 countries anxious to promote their role as climate leaders must listen carefully to the warnings from others, particularly those on the front lines. If we see momentum on these fronts between now and November, the UK and Italy could herald COP26 as a success, keeping the 1.5°C goal in our sights. **IS**

Laurence Tubiana, a former French ambassador to the United Nations Framework Convention on Climate Change, is CEO of the European Climate Foundation and a professor at Sciences Po, Paris.



JOHN KERRY SPEAKS AT THE UNITED NATIONS SIGNING CEREMONY FOR THE PARIS AGREEMENT.

G20 LEADERS IN VIDEO CONFERENCE IN MARCH 2020.

The World's Opinion Page

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1 PROJECT SYNDICATE'S NETWORK OF MEMBER PUBLICATIONS 13

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