

No. 15 / Winter 2022

# BREAKTHROUGH

JOURNAL



**PHILLIPS** The Green New Deal's Union Problem / **LIND** The End of Social Engineering / **GLOCK** Sprawl Is Good / **SHEN** In Praise of Deregulation / **MORAN** Greenflation Is Real

# BREAKTHROUGH JOURNAL

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*Breakthrough Journal* and the Breakthrough Institute are grateful for the support of the following foundations and individuals: Pritzker Innovation Fund, William and Flora Hewlett Foundation, The Bernard and Anne Spitzer Charitable Trust, Rodel Foundation, Aimee and Frank Batten Jr. Foundation, Bellwether Foundation, Crary Family Foundation, Fieldstead and Co., Garrett Gruener & Amy Slater Fund, Michael Burnam-Fink, The Jeff and Jacqueline Miller Fund, Ross Koningstein, Mac McQuown, Rothrock Family Fund, Winkler Family Foundation, Zachary Bogue, David Douglas and Pamela Gannon, Parker and Miles Collier, and Kent Walker and Diana Walsh.

*Breakthrough Journal* is published by the Breakthrough Institute; [journal@thebreakthrough.org](mailto:journal@thebreakthrough.org); [www.thebreakthrough.org](http://www.thebreakthrough.org). Issue No. 15, Winter 2022. Printed in the U.S.A. For a subscription to *Breakthrough Journal* or to send an address change, please visit our website: [www.thebreakthrough.org/journal](http://www.thebreakthrough.org/journal) or send an email to [journal@thebreakthrough.org](mailto:journal@thebreakthrough.org). A yearly subscription is \$30. The opinions expressed in *Breakthrough Journal* are those of the authors and do not necessarily reflect the views of the editors. Copyright 2021 by *Breakthrough Journal* and the authors.

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FROM THE EDITOR

# AFTER THE GREEN NEW DEAL

*INTRODUCING ISSUE 15 OF  
THE BREAKTHROUGH JOURNAL*

KATHRYN SALAM

**N**ot so long ago, climate activists were dreaming of a transformative Green New Deal—a massive outlay of government investment that would suck carbon out of the economy; build the infrastructure of a new, green America; and create millions of good jobs. Hazy imaginings became more defined as Representative Alexandria Ocasio-Cortez and Senator Ed Markey released their draft version of a deal in 2019 and as President Joe Biden, vowing to place climate at the center of his presidency, adopted elements of their vision into his own \$5.5 trillion spending proposal upon taking office.

Fast-forward to now, when many of the green elements of Biden's original infrastructure plan have been relegated to a separate bill—the roughly \$1.75 trillion Build Back Better initiative,

whose future is as yet unclear—and others have been axed entirely. As I write, more of the Build Back Better spending could be dedicated to a five-year repeal of the SALT cap (\$475 billion)—in effect, a tax cut for high-income households—than to clean energy tax credits (\$320 billion) or other climate initiatives (\$235 billion), according to calculations from the White House and the Committee for a Responsible Federal Budget.

So what happened? There are many answers, from partisanship; to an everythingism that lumped together environmental, social, and infrastructure concerns; to compromises that resulted in a deal that could win support but not excitement. In other words: politics as usual. But on a deeper level, the legislation, meant to address two of the most important challenges the United States faces—one, reviving the country's infrastructure and the fortunes of its workers, and two, addressing climate change—may have just gotten climate policy and the politics that surround it all wrong.

At least that is an argument that winds through the articles collected for this issue, starting with author Leigh Phillips's searing look at the Green New Deal's labor problem. The proposal may have been conceived as a modern version of the Rooseveltian policies that first won organized labor over to the Democratic Party, Phillips writes in "Blue Collars, Green Jobs?". But it and subsequent efforts have faced significant criticism from trade unions, who have dismissed elements of the plans as happy talk. While sections of the right have interpreted the pushback as signaling the disintegration of the left, parts of the left have dismissed union voices as obsolete.

Instead, Phillips writes, the climate left should recognize an opportunity: nascent ecomodernism on the part of labor, which demands technological climate solutions, including nuclear; has more knowledge of how energy and infrastructure systems work in practice than any other group; prefers an engineering-based approach; and demands a focus on protecting energy sector workers' wages, working conditions, pensions, and benefits. "What such examples suggest," Phillips points out, "is that many on the climate left have got things the wrong way round when they ask: 'What will it take to win labor

to better climate policies? Labor already has solid climate policies. What will it take instead for the climate left to understand that?”

In “Civil Engineering, Yes; Social Engineering, No,” Michael Lind, professor and author, most recently, of *The New Class War*, also sees a blind spot in the development of the Green New Deal. While it is true that the United States needs both investment in infrastructure and a strategy for mitigating and adapting to climate change, combining the two has done a disservice to both. In their zeal for green infrastructure planning, he writes, progressive technocrats have turned matters of taste—“ideal neighborhoods, ideal transit systems, ideal landscape uses, and, more recently, ideal energy systems”—into matters of morality, coming to solutions that are neither good for the economy nor the people upon whom their plans are enacted. Far more productive, he argues, would be to solve the challenges separately, starting by understanding the United States’ true infrastructure needs given its economic goals—maintaining its great-power status and exporting more to global markets—while maintaining a technology-neutral stance to climate mitigation.

Tugging further on Lind’s thread of technocratic solutions gone awry, Judge Glock, senior director of policy and research at the Cicero Institute, takes aim at one of environmentalists’ most sacred truths: that dense cities are key to avoiding catastrophe. In fact, he argues in “Sprawl Is Good,” “sprawling cities are more environmentally sound than their dense counterparts and will become even more so as technology evolves.” Not only are packed cities more dangerous for their residents—air pollution causes more harm in dense cities than in sprawling ones, while rises in temperature are more extreme there, too—they’re not necessarily good for the environment, since building high-rises can be more energy intensive than building single-family homes. Meanwhile, efficiency improvements in automobiles have removed one bugbear for green activists—car emissions. More than the Manhattans of the world, he writes, it is the Atlantas, Nashvilles, and Columbuses that represent a more environmentally sound and economically affordable future.

In “Deregulation Is Not the Enemy,” University of Virginia Assistant Professor Shiran Victoria Shen takes on another conviction among some environmentalists—that deregulation is bad. Whereas neoliberal economists had decided by the 1990s that slaying the regulatory state was the key to unlocking competition and stalled economies, environmentalists pinned vast harm on deregulatory processes and argued for more regulation to control emissions, pollution, and resource use. Those ideas have stuck around, as evident in Biden’s promises to reinstate scores of environmental regulations canceled by his predecessor. Environmental champions have cheered him on while the pro-business crowd has booed, but as Shen sees it, they both have the trade-off wrong. The results of deregulating the power sectors in the United States and China show that, if steered in the right direction, the process can be good for the economy and good for the environment, and make for good politics, too.

Another inconvenient truth: At a time when anxieties over rising inflation are coming to dominate the political conversation, green inflation may well be real. In “Greenflation Is Real,” analyst Michael Moran looks at the environmental, social, and governance movement for socially responsible investing. He explains that, for its proponents, ESG metrics are a way to harness the market in pursuit of sustainability. But for skeptics, “focusing corporate leadership and investor sentiment on such ‘non-material’ indicators will raise the cost of everything a company does, which in turn will be passed on to consumers in the form of higher prices for heating a home, buying a down vest, or filling a weekly grocery basket.” Some have dismissed green inflation concerns as political. But environmentalist groups do so at their own peril—and the environment’s as well.

The environmental movement must also be wary of the politics around meat. An early draft of the Green New Deal hinted that Americans would need to limit their beef consumption, provoking an immediate backlash, Breakthrough’s Alex Smith explains in “The Coming ‘Meat Vortex.’” Meat production is a huge environmental problem, yet animal protein is unshakably popular, which has kept the meat industry too powerful to pressure. Meat, in

short, has been politically untouchable. But there are lessons, Smith shows, from other climate successes. “The United States needs to replicate, for meat, the politics that have allowed clean energy to get cheaper and opened political space for further innovation.” In short, it needs a “meat vortex” that could make more environmentally friendly meat alternatives cheaper, tastier, and more attractive than the animal kind.

Fixing beef could be a major climate boon, and not just in the United States. Environmentalists have long worried about the added emissions associated with greater meat consumption around the world as more people become wealthy enough to afford it. In “Green Growth Won’t Kill the Planet,” journalist Fred Pearce turns those equations around. “As the old adage has it,” he writes, “you can only manage what you can measure.” And that has long been a problem for ecomodernists; it is relatively easy to assess climate progress, but there hasn’t been a good, universal set of metrics for what a decent standard of living looks like. “Without a working definition,” he argues, “there has also been no clear understanding of what actual trade-offs—or synergies—might be entailed in achieving decent living standards while fixing the climate.” But recently, the Indian-born technologist Narasimha Rao developed a quantifiable definition. His measure leaves more people below the poverty line than previous estimates, but he has also shown that clearing his bar would not pose a threat to the climate. Decency, as Pearce puts it, is not incompatible with sustainability.

Also taking an international perspective in her reporting in “The Blue-Green Dream,” columnist Elisabeth Braw finds many of the forces discussed in this issue already at work in the real world. In Copenhagen, after devastating flooding, city planners knew they had to do something to prepare the city for more frequent deluges. But they also knew that functional solutions wouldn’t be enough. Climate change mitigation would have to be appealing to taxpaying residents, too. And so, rather than concrete, they opted for new green-blue construction, focused around parks that could become water basins, elevated walkways, and grassy berms. It was all lovely, but the problem comes, of course, when needed solutions offer no added beauty

or convenience to residents. Meanwhile, the experience shows that “even within the Western world, climate change could thus create yet another have-have not divide” if cities less able to afford appealing infrastructure lose high-income workers to cities that already have the money for innovative development. “Residents who can’t leave” will be “left behind with only the most rudimentary, visually unattractive, and less livable solutions.” That may well be a recipe for conflict.

“Environmentalism and war purport to be polar opposites,” notes defense writer Michael Peck in this issue’s review essay. “One focuses on protecting nature, the other often ends up destroying it. But armies of environmentalists armed with lasers and spaceships? Ecology at the point of a sword?” Welcome, he writes in “Environmentalism at Swordpoint,” to *Dune*, Frank Herbert’s classic 1965 science fiction novel now back in theaters as a Denis Villeneuve production. Many understand the story as a parable of irregular warfare, but it offers a challenge to the ecomodernist as well. Herbert’s classic has remained popular by skirting a common sci-fi trap: technology can’t fix everything. But innate human powers don’t work so well, either.

If this issue sounds like a downer, it isn’t. Rather, in at least one important way, I think it reveals real progress. The challenges addressed here—inflation, economic growth, unions, infrastructure, decent living standards—represent the frictions that arise as work on climate change moves from the theoretical to implementation (a stage of the process underlined by this issue’s two tech talks from Susteara and The Metals Company).

The fact that we are here is a good thing. //

ESSAYS / 01

## BLUE COLLARS, GREEN JOBS?

*ENVIRONMENTALISTS MUST STOP  
DISMISSING UNIONS AND EMBRACE  
THEIR ECOMODERNISM INSTEAD*

LEIGH PHILLIPS

It was an odd sight: in June 2019, members of California’s Building and Construction Trades Council stood outside the launch of Democratic Los Angeles mayor Eric Garcetti’s “Green New Deal LA” in angry protest. Odd, because the union’s denunciation of the deal as a betrayal of the working class stood in direct contrast to the rhetoric of the policy’s partisans, who said it had been designed specifically to replicate the Rooseveltian policies that first cemented organized labor’s allegiance to the Democratic Party in the 1930s.

“Green New Deal LA”—a municipal spin on the climate-and-jobs resolution of the same name introduced in Washington, DC, by US Representative Alexandria Ocasio-Cortez—was supposed to

be drafted with workers at its heart. The red thread running through both plans is what the climate Left (of which I consider myself a member, despite disagreements) describes as a Just Transition: as urgent as aggressive action to mitigate greenhouse gas emissions may be, the argument goes, the decarbonization of the economy cannot leave workers behind. This means embracing the Keynesian government interventionism of the original New Deal to transcend the profit-driven amorality of the market—hence public spending to ensure solar panels on every roof; schools and homes across the land retrofitted with insulation; and much more clean infrastructural largesse besides.

Yet the building trades workers out that June day were pelting rhetorical tomatoes at that very kind of spending as envisioned by the Green New Deal. And this wasn’t the first note of anger, either. Earlier in the spring, Richard Trumka, then president of the American Federation of Labor and Congress of Industrial Organizations (AFL-CIO)—the umbrella organization to which most unions belong—had also criticized the deal, pointing out that “[unions] weren’t part of the process, so the worker’s interest wasn’t really figured into it.” As Brian D’Arcy, the business manager of the LA local of the International Brotherhood of Electrical Workers, explained at the June rally, his members were enraged by what they felt were “elites” in the Democratic Party focusing on the Green New Deal at the expense of the party’s blue-collar supporters. He said some were even considering decamping to Trump’s Republican Party.

A few days after the protest, representatives from the Building and Construction Trades Council took what they called their “Blue Collar Revolution” to that year’s California Democratic convention in San Francisco, where they reminded delegates that building trades workers were, as their placards read, “the people who built California.” That’s not an exaggeration. The council is the California affiliate of North America’s Building Trades Unions, which bring together 14 of the most powerful unions across the United States and Canada, including those representing teamsters, electricians, boilermakers, iron workers, plasterers, and other workers in the construction industry. They didn’t just build the state; they basically built the continent.

Their anger is worth taking seriously, yet few have. Even as Fox News took to gleefully reporting on the supposed falling-out between labor and the Left, many on the climate Left have dismissed it as a case of conservative union bureaucrats aligning themselves with employers or claimed the building trades are notoriously conservative and so not representative of the union movement as a whole. One writer at the Left-leaning *In These Times* said that, at best, labor leaders like Trumka have “straddled the line between the [AFL-CIO’s] conservative and progressive members,” and that the United Mine Workers of America (UMWA), which has been particularly vociferous in its criticisms of the Green New Deal, is pretty small these days and so its position was also not representative: “With 80,000 members today, UMWA is more of a retirees’ organization than a fighting union.” Meanwhile, in a July 2019 article in *The Nation*, activist and writer Bob Massie suggested that union opposition to a Green New Deal is because “fossil-fuel executives and lobbyists have fanned this fear . . . that a shift to renewable energy would throw them out of work,” adding that the American Petroleum Institute has paid for union safety and training programs.

The idea that any disagreement with the Green New Deal represents a rising conservatism within unions is risible—as are right-wing commentators’ predictions of unions coming to back Trump. To categorize the building trades as dupes of bosses and lobbyists and as historically and intrinsically conservative, even if it were true, is to dismiss almost the entirety of America’s industrial unions. It would be giving up on all industrial workplaces as a site of social justice struggle.

The frustration from these unions is instead an entirely legitimate rage at what they feel is yet another attack on working-class standards of living, a repetition of such assaults that have been unremitting since the 1980s. If there is no effort made at understanding why they feel this way and course-correcting in response, then there can be no Just Transition at all.



Representative Alexandria Ocasio-Cortez speaks on the Green New Deal with Senator Ed Markey (right) in front of the Capitol Building in February 2019.

Image: Senate Democrats

### The Bitter Lesson of 1989

Crucial to comprehending industrial labor’s mistrust of the Green New Deal is Trumka’s own role leading the UMWA during a bitter (but ultimately victorious) 10-month strike in 1989–1990 against the Pittston Coal Company, which was then one of the largest coal companies in Appalachia. The firm had refused to continue paying into an industry-wide health and retirement fund established in 1950, leaving thousands of retired and disabled miners and their widows without benefits. Given the prevalence of black lung and other disabilities from mining accidents, this is a group of workers for whom health, pension, and disability protections are particularly important.



The Pittston strike, one of the few in the 1980s that labor actually won, thus became a beacon in the dark days of Reaganite corporate cutbacks, union-busting, and broken promises. It taught Trumka—and the rest of the labor movement—to be suspicious of anyone who promised workers that they would be taken care of. That sentiment lives on today as history repeats itself. Indeed, one of Trumka’s last major fights (he died in August 2021) at the AFL-CIO alongside those in the UMWA was over coal companies’ filing for bankruptcy in order to avoid, once again, contributing to health and pension funds. One can immediately see from the history of miners’ repeated struggles over pension and disability protections how comments from some on the Left dismissing the UMWA as merely a retirees’ organization sting particularly badly.

Against this history, it is easy to see why labor wouldn’t take Green New Deal pledges to put workers first at face value. And easy to understand the unusually distemperate open letter that the Energy Committee of the AFL-CIO sent in March 2019 to Ocasio-Cortez and Democratic Senator Edward Markey, sponsor of the Green New Deal resolution in the Senate. The letter said that the resolution “is far too short on specific solutions that speak to the jobs of our members and the critical sectors of our economy.” The committee further warned: “We will not accept proposals that could cause immediate harm to millions of our members and their families. We will not stand by and allow threats to our members’ jobs and their families’ standard of living go unanswered.”

It is worth highlighting that nowhere in this letter did the union representatives reject the need for aggressive climate action, as Fox News or the climate Left might have it. Indeed, beyond reported sound bites, it is clear from what labor leaders and rank-and-file members have actually said and done that the environment ranks high among their concerns. “We need to address the environment. We need to do it quickly,” Trumka said immediately after the release of Ocasio-Cortez and Markey’s Green New Deal resolution. But, he continued, “we need to do it in a way that doesn’t put these communities behind, and leave segments of the economy behind.”

That’s a sentiment built on the oldest traditions of unions, which are perhaps the original environmentalists. From William Blake’s “dark satanic mills” of Industrial Revolution-era Yorkshire to the mid-20th-century chemical industry spills requiring Superfund cleanups to the black lungs of Welsh and Appalachian coal miners, workers have always had an immediate, personal interest in environmental protection—and have fought for it, often struck for it, winning in the form of regulations and health and safety standards. Wherever unions are strong, environmental protections are strict. And these protections are in service of human well-being rather than in service of an abstract “nature” falsely separated from people.

So if both labor and Green New Deal proponents care about the environment, and if they are both fighting for workers’ rights, what went wrong? For labor, the main issue is that few Green New Deal promoters thought to formally talk to workers—the people most directly affected by the legislation—before drafting it. Such an oversight is astounding. The AFL-CIO Energy Committee brings together almost all the unions that work in the energy sector, both fossil and clean, but also the UMWA and the formidable United Steelworkers. There is perhaps no greater collective body of tacit and formal knowledge about energy and the machines and processes it involves than what sits in the heads of members of these North American industrial unions.

By ignoring those voices, the Green New Deal leaves out technological climate solutions that the sector has been advancing for decades. The resolution introducing the deal “is not rooted in an engineering-based approach and makes promises that are not achievable or realistic,” the letter from the AFL-CIO’s Energy Committee to Ocasio-Cortez and Markey noted. At the same time, all the unions concerned have not just endorsed aggressive climate action, but have also said in various ways that they are even open to a Green New Deal-style policy framework of government funding of clean infrastructure and tech. But they have multiple conditions: Green New Deal proponents must speak to trade unions before developing their policies; they must drop their opposition to a number of technologies and practices, such as nuclear power, carbon capture, and the idea that all fossil fuel

combustion can be turned off tomorrow, which industrial unions put forward as key to greener development; and above all, they must start fighting alongside energy sector workers in particular to defend and enhance their wages, working conditions, pensions, and benefits.

If all this sounds a bit ecomodernist, that's because it is. Contra the titillating right-wing narrative of blue-collar hardhats hippie-punching effete spotted-owl-bothering coastal elites and the climate Left narrative of conservative business-unionism, the conflict is better understood by recognizing the existence of an instinctive—if so far unconscious—ecomodernism on the part of industrial workers and their trade unions, resulting from their deep implantation within energy, transport, manufacturing, and extractive systems. To reference a popular meme of the last couple years, one might exclaim like the first astronaut: “Wait, trade unions are ecomodernist?” To which the answer from the other astronaut with the gun is: “Always have been.”

### **Solar McJobs**

So where does labor's ecomodernism lead? The debate over the future of energy holds some clues.

Just as US unions are demanding that the Green New Deal's drafters get over their allergy to nuclear energy, trade unions around the world have backed the development of nuclear as a low-carbon alternative to fossil fuels. France's General Confederation of Labor (CGT), the country's largest trade union center, historically linked to the Communist Party, is working hard to push back against antinuclear energy misinformation and to save existing plants from premature closure, as are the various unions in Ontario representing nuclear sector workers. The UK's General, Municipal, Boilermakers' and Allied Trade Union (GMB), a generalist trade union representing workers from many sectors and one of the nation's largest, has likewise pushed for more investment in nuclear, arguing that there can be no net

zero greenhouse gas emissions by mid-century without the clean energy source. The Australian Workers' Union (AWU) this year called for an end to the commonwealth's ban on civilian nuclear energy and said it should put small modular reactors at the heart of its decarbonization plans.

Yet the climate Left has stuck doggedly by solar, wind, and other intermittent renewables—to the exclusion of other sources of power. That's frustrating for labor for two reasons. First, workers in the energy and allied sectors understand that firm sources of clean electricity need to be part of the mix or the grid won't work. Second, they know they are facing a substantial reduction in income and benefits, as demonstrated in a major investigative piece on the domestic solar industry from labor reporter Noam Scheiber that appeared in the *New York Times* in July. Many climate watchers are slowly becoming aware of the slave labor involved in solar panel manufacture in China's Xinjiang province, but fewer will have been aware of the poor wages and working conditions in the domestic solar industry. For industrial unions and their members, though, the problems Scheiber detailed were all too familiar. As Scheiber reported, highly skilled construction, extractive, and operational jobs for traditional energy infrastructure—from coal mines and gas pipelines to nuclear power plants—typically earn at least \$100,000 in wages and benefits if unionized, while the unskilled lifting of solar panels onto racks or roofs are commonly nonunionized and earn little above minimum wage. Union representatives trying to organize those working in the sector who were quoted in the piece spoke of their frustration at the sector being, as one called it, “incredibly anti-union.”

The response from environmental groups is typically that unions should simply work harder to unionize such low-wage, low-skill solar “McJobs” or that there should be legislation to ensure that such projects respect prevailing regional wages.

While it is true that unionized workers consistently earn considerably more and enjoy better benefits than those in similar but nonunionized jobs, a trade union is not a magic wand that can turn any unskilled minimum-wage work

into a career that supports a family. It is also just very hard for unions to organize workers in what are often transient, seasonal, and unskilled jobs. That's why trade unions have reason to be suspicious of those who say that post-energy transition jobs will meet the same prevailing wages as today. The math just doesn't work, and both sides know it. Earlier this year, unions in Illinois were pushing for such provisions in future renewable energy projects in a comprehensive energy bill there, but a coalition of climate activists and green NGOs including the Sierra Club and the Natural Resources Defense Council (NRDC) opposed the move. The margins on many such projects can be thin, and higher wages would make them unprofitable. The promised low price of the energy is typically what has allowed such projects to win a purchase agreement in the first place, which means that guarantees of good paying jobs would make them less competitive.

Further, these projects are typically rolled out by private start-up contractors not by public utilities. Because the government regulates such utilities' rate of return on investment, they are often less sensitive to the need to keep labor costs low. Some public electric companies, like the Tennessee Valley Authority, even have mandates to pursue not profit but a balance between keeping costs low for consumers and the economic development that comes from decent incomes. As a result, prevailing-wage provisions could work to the advantage of options such as nuclear power that are both low cost over the long term and require high-skilled and therefore high-wage, typically unionized, labor. Yet the Sierra Club is one of the foremost opponents of nuclear power in the country, and the NRDC is skeptical.

To be clear, these criticisms are not arguments against renewables as a whole. The International Brotherhood of Electrical Workers organizes solar farm workers alongside their counterparts at coal and nuclear plants. Offshore wind farms involve construction and operational jobs that use many of the very same advanced, high-paid, unionized skill sets as offshore fossil energy. In terms of the tasks involved, jobs in geothermal (which provides reliable, 24/7 electricity akin to that from nuclear, large-scale hydroelectricity, and fossil energy) are likewise an almost one-for-one swap for oil and gas.

These may not be the local, decentralized technologies environmental advocates typically envision, but are the types of projects unions have shown themselves ready to back. Unions are not against variable renewables, but are instead in favor of right-sizing them alongside clean-electricity partners that offer firm supply. This is the same all-of-the-above approach to technology that ecomodernists support—and that the preponderance of evidence suggests will deliver the fastest decarbonization across the most sectors.

### **Follow Us! We Promise You Less!**

Labor's concerns overlap with ecomodernism in another area too: consumption, or as it is often denigrated by activists, "consumerism."

Labor makes no declarations that Western workers consume too much or that the global economy must degrow, neo-Malthusian positions that are held by a great many environmentalists. And why would they? After four decades of neoliberal austerity across much of the Western world, a suite of market-fundamentalist policies and practices resulting in wage restraint, cuts to social programs, privatization, union-busting, outsourcing, deindustrialization, growing inequality—and, in many instances, declining living standards—it makes no sense for workers to embrace a political vision that tells them: "Follow us! We promise you less!" Rather, they want both aggressive action on climate change and a maintenance of the technologies of modernity that deliver real benefit.

Further, it is precisely because industrial workers and farmers are embedded within the very energy, transport, manufacturing, extractive, and agricultural sectors most relevant to decarbonization—and also (when in the private sector) regularly deal with bosses who must maximize profits—that they know perhaps better than anyone why decarbonization is difficult. They are able to hold in their head both that carbon-intensive companies have worked hard to delay climate action and that fossil fuels have historically delivered tremendous benefits to humanity. It is not merely obvious to them

that coal has kept people warm in winter and powered the factories that built the modern world, but this is something they are *proud* of. They were the ones who did all of this, made all of this, with their hands and brains.

That is to say, distinct from the dominant climate Left narrative of global warming as a product of elite corruption or capitalism, something imposed upon the rest of us in the face of our opposition, the industrial worker's understanding of the problem is clear: as social democratic political theorist Jonathan Symons puts it in his book on the history and philosophy of ecomodernism, "[Greenhouse gas] emissions are the unintended consequence of the technologies that well-meaning people depend upon in their everyday lives." Take travel, for example. Sara Nelson, the president of the Association of Flight Attendants, and a potential contender for AFL-CIO president in its 2022 elections, is a supporter of the Green New Deal while also sounding the same alarms as Trumka and others. When asked whether airline fuel efficiency was sufficient and how workers could be protected if flights must be grounded in pursuit of climate goals, she laughed.

Nelson said that, instead, there needs to be government support for the development of sustainable air fuels—a policy most climate activists oppose as a "techno-fix" that does nothing to change existing social relations. Even so, she emphasized, "we have to be pretty clear that interstate commerce in the United States, international trade and transportation just don't work without air travel, right?" She went on to say that the idea that every plane will stay on the ground in ten years is a nonstarter. "There is not a flight attendant or pilot or anyone in aviation who actually believes that aviation is going to be grounded. That's simply not true. The opposite is true."

Tell that to many climate activists, from Greta Thunberg to Extinction Rebellion, NGOs like Plane Stupid and Stay Grounded, and the academic pressure group Flying Less, which want to substantially reduce or even eliminate aviation. They view it as luxury consumption enjoyed only by the global rich and incompatible with a low-carbon economy. (One might ask Thunberg how the 60-foot racing yacht she sailed in across the Atlantic to attend a climate

protest in New York—a multimillion-dollar boat owned by Monaco's royal family—comes to be considered by the climate Left as less of a luxury than the £49 EasyJet flight that allows a working-class woman from a deindustrialized northern town in England to take a holiday jolly to Ibiza every once in a while.) Even Ocasio-Cortez's original Green New Deal documentation maintained that aviation would have to be replaced by high-speed rail, before she distanced herself from that idea.

To be sure, decarbonizing consumption is going to be hard—and aviation particularly so. But cancelling it won't work. What will are solutions from people—like the workers—who are familiar with the industry. Some are already electrifying short haul. Others will need to do more work on carbon-neutral fuels, outside of a nuclearization of the entire shipping fleet. Which particular options—synthetic kerosene, hydrogen, ammonia, or some new generation of biofuels—produced via which suite of technologies remain up for debate, and, as with decarbonization of electricity generation, it is probable that many options rather than a single one will fit the bill. The scale of the challenge, however, isn't a reason to abandon efforts.

Ikaika Hussey, a Hawaiian trade union organizer and veteran of a bitter 2018 strike of hotel staff and members of the UNITE HERE hospitality workers' union, is spearheading efforts in the state to develop a worker-owned carbon-neutral synthetic jet fuel factory. "Hawaii is so dependent on air travel. Tourism is a major part of our economy," he told me over the phone. "So the reality is that we need to solve this piece of the puzzle. It won't work telling people 'just don't fly.'" Hussey is working with researchers such as negative emissions specialist Klaus Lackner at Arizona State University and seeking out partnerships with business and government to support the project Hawaii Federated Industries. Currently in design and engineering phases, the plan is to draw down CO<sub>2</sub> from the atmosphere via direct air capture technology and marry that to sustainably produced hydrogen to produce clean and cheap carbon-neutral kerosene, while saving the state billions in fuel import costs.

What is all this, but ecomodernism *avant la lettre*?

## But Can Ecomodernists Be Trade Unionists?

What such examples suggest is that many on the climate Left have got things the wrong way round when they ask, “what will it take to win labor to better climate policies?” Labor already has solid climate policies. What will it take instead for the climate Left to understand that?

It should be underscored that none of this amounts to an attack on climate activism as a whole. A great deal of such campaign work and analysis is excellent, is grounded in evidence, and has worked wonders in putting the issue at the center of politics in the United States and around the world. Activists are to be commended for this. But not without reservation since there is a class dynamic within this community that necessarily informs the sort of solutions it seeks. The activists primarily come from urban, middle-class professional backgrounds, not infrequently from the academy (and the humanities academy in particular).

A few things flow from this. First, there tends to be a lack of engineering discipline. In simple terms, that means less formal and tacit knowledge about how machines, factories, and energy systems function. Related to this is the assumption that, in the industrial and allied sectors, a job is a job is a job, and thus that, for example, pipe fitting and slapping solar panels on roofs are fungible in terms of skills and earnings (even as they would never make the parallel mistake to equate the skills and earnings of a dentist and an adjunct professor).

Second, there is a tendency to treat the industrial workers as an object of pity or charity, rather than as people consciously active in their self-emanicipation. Thus, for many on the climate Left, industrial union support for fracked natural gas as a bridging fuel can only be the result of “false consciousness,” rather than the product of deep knowledge of energy systems that recognizes one cannot turn off all fossil fuel production overnight.

Third, there has been a blind spot to the politics of it all. One of the few places where Green New Deal organizing has worked is in Maine, where campaigners reached out to industrial labor from the get-go. There, a state-level version of a Green New Deal was passed and signed by the governor, with the full backing of the state AFL-CIO. One of the key elements that unions insisted upon was that registered apprenticeships make up a steadily increasing proportion of the labor force for new energy projects—starting at 10 percent of a work site immediately and moving up to a quarter by 2027. Such training can help ensure higher earnings, even in the face of potential resistance from clean energy developers. There is no way that the activists, who rarely if ever are in a job situation where apprenticeships occur, could even know that this was a crucial issue to bring labor onboard. It was an unknown unknown.

This last lesson about what is known to workers is perhaps the most important of all. For the ecomodernist movement, the inherent but not explicit ecomodernism of workers and their unions is a potentially tremendous opportunity. But there is something of a sting in the tail as well.

Workers and their unions have enormous social and political weight. Far more weight than the very vocal but numerically limited and geographically concentrated climate Left, and also more weight than the sometimes ecomodernism-curious climate wonks in think-tank land. The climate Left hardly makes the difference in electing anyone, and wonks, for all their utility in crafting clever policy, never do. Unions, meanwhile, make or break election after election, for blue and for red. Understandably so; the term “working class” describes the vast majority of people in modern society. Workers also have the ability to withdraw their labor and go on strike. The fear of such during the Depression was what put the fear of God into elites to prompt the original New Deal.

And so ecomodernists opening themselves to working more with trade unions—in particular, those representing workers in energy, transport, and industry—and supporting an instinctively ecomodernist trade union program for decarbonization would bring in a mighty ally. Simultaneously, it would

offer the trade unions all the intellectual and political resources of a movement as committed to engineering discipline as they are, while, crucially, handing them a powerful shield against accusations of climate indifference or denial.

Certainly, politicians are aware of the heft of the unions.

Much of the discussion on the role of Senator Joe Manchin in undermining the Clean Electricity Performance Program (CEPP) in the Democrats' \$3.5 trillion budget reconciliation bill has focused on the moderate Democrat's connections to the coal industry. The CEPP was supposed to be the centerpiece of Biden and his party's climate policy, aimed at boosting clean energy production by paying bonuses to electric utilities if they cut their emissions by a given amount per year and imposing fines if they didn't. And because the proposal defined clean energy as including both renewables and nuclear, it enjoyed strong support from some in the American ecomodernist community.

There is much truth in the argument that the West Virginia senator might just be, as *Slate's* Jordan Weissmann put it, a sentient brick of coal. Manchin did, after all, found the coal brokerage firm Enersystems in 1988, a firm whose leadership passed to his son when he was elected West Virginia secretary of state in 2000 and whose ownership is held in blind trust. Maybe, like his fellow obstructionist, Arizona Senator Kyrsten Sinema (a former Green Party activist, by the way), he's also just too conservative to be a Democrat. All of this can be true while also noting that, in an AFL-CIO panel discussion on the clean energy transition earlier this year, Manchin focused mostly on the collapse of family-supporting industrial jobs, deindustrialization, and the need for America to start building things again. "You give us a chance, give a coal miner a chance, we'll build you the best damn windmill you've ever seen. Or the best solar panel," he said. "But that's not the way the market's going."

He closed by remarking that he is often asked, "What happened to West Virginia?" Meaning how did it happen that this state of coal miners—so solidly

blue since the original New Deal that it was one of only six states to back Jimmy Carter over Ronald Reagan in 1980, and one of only ten to give the nod to Michael Dukakis over George Bush Sr. eight years later—turned red in the late 1990s? His response: "I say nothing. What happened to the country?" He continued: "We feel like the returning Vietnam veteran: we've done every dirty job you asked us to do, took our orders, never complained, did the heavy lifting, and now we're not good enough, we're not clean enough, we're not green enough, and we're not smart enough. So the hell with you, I'll vote for somebody else. That's how we [Democrats] lost West Virginia."

It's Hillary Clinton's "basket of deplorables" all over again. The CEPP does not correct the problem of deindustrialization if the wind turbines and solar panels are made overseas. The nature of the nuclear supply chain, however, is such that much of it is already onshore. Plus, its heightened requirements for precision engineering work in a multiplying manner to attract other industries with similar need for precision engineering—ones that are more likely to require high-skilled and thus high-pay and often unionizable jobs. These are the ancillary jobs Manchin mentioned. Again, this is not an argument against wind and solar at all, still less for 100 percent nuclear, but instead an argument for everything in its right place.

The irony here is that the New Deal politics promoted by the climate Left are broadly social democratic, and social democracy was born in many countries as the parliamentary expression of trade unionism. With this political philosophy's commitment to shaping markets through economic planning rather than leaving them to their own devices, it could in principle offer a response to Manchin's lamentation, while Manchin's own centrist allergy to dirigisme never can. The Left have the correct economics but the wrong technologies, and the Right have the correct technologies, but the wrong economics. Can American ecomodernism's postpartisan politics improve on this?

I think so. And ecomodernism, as it spreads out from its American birthplace, may already be evolving in this manner. Jonathan Symons, a social

democrat himself, argues that if ecomodernism had first emerged in Europe instead of in the United States, Canada, or Australia—lands of deep-seated social democratic tradition—it would have been born as a social democratic philosophy. Symons may not be wrong when we consider that as ecomodernism has spread from its California birthplace to Canada, the UK, Australia, and northern Europe, it is not uncommon for ecomodernists there to also be social democrats. Here, organizing alongside industrial workers and their unions is a no-brainer.

I reckon the resolution of all these contradictions—within the climate Left, within ecomodernism, and between the various agonists within labor over global warming—is to take the best from the climate Left (its preferred economics) and the best from ecomodernism (its preferred technologies) and work with industrial trade unions to further state-led economic development goals. In doing so, such a strategy will result in a much more rapid decarbonization than is possible by any other method, while ensuring the social base to enforce—and the opportunities that deliver—a genuine Just Transition.

In all this, the headline demand must be reindustrialization, not climate. It's just that the social democratic strategy for the former is the best option for the latter. //

## **CIVIL ENGINEERING, YES; SOCIAL ENGINEERING, NO THE INFRASTRUCTURE AND ENERGY POLICIES AMERICA REALLY NEEDS**

MICHAEL LIND

Infrastructure investment and climate change are both issues the United States needs to address. First, in the service of economic growth and higher quality of life, the nation needs a rational and proportionate program of investment in infrastructure. Meanwhile, in the face of anthropogenic climate change, it needs a rational and proportionate program for mitigation and adaptation. To meet both, progressives have put forward elaborate infrastructure and climate change proposals. But these have been neither rational nor proportionate. Indeed, what purport to be up-to-date, science-based public policies turn out on inspection to be driven by the century-old ideology of neoliberal progressive technocracy.

Progressive technocracy is a version of collectivism that is reformist and elitist, as opposed to revolutionary and egalitarian

like Marxism. Its utopia is a planned society administered by social scientists and technical experts. In it, social engineers, insulated from democratic accountability and wielding vast authority, are empowered to devise long-range plans to promote social and environmental goals, which are handed over to deferential elected officials to implement with few changes—against the opposition of the ignorant masses if necessary.

Technocratic progressivism is not new; after all, Wilsonian progressivism favored institutions like the civil service and city-manager government to insulate government decision-making from voters and elected representatives. Likewise, Fabian socialism in the United Kingdom promoted government by experts. But for a century, technocratic progressivism remained an elite minority persuasion. The left-technocrats, sometimes called “planners,” had to share the center-left political space with other groups—organized labor, socialists, mutualists, left-libertarians—more suspicious of top-down social engineering.

In the last generation, however, technocratic progressives have achieved near-hegemony on the center-left in the United States and other Western democracies. Some reasons for their ascendance include the collapse of trade union power, the discrediting of state socialism, and the illiberal turn within the left against left-libertarianism. Egging them on has been the infusion of donations to technocratic progressive nonprofits and university programs from Silicon Valley and Wall Street moguls who find technocracy the most congenial version of liberalism.

With the rise of this group of progressives has come a new zeal for planning. While Marx refused to speculate about the details of a future socialist society, utopians on the left, from Fourier with his communal phalansteries to the New Urbanists of the 1990s, have always been willing to provide intricate plans for urban zoning, transportation, energy use, diet, and even dress. Progressive technocrats, too, come with blueprints for ideal neighborhoods, ideal transit systems, ideal landscape uses, and, more recently, ideal energy systems. Plans turn seemingly technical disputes into emotional debates

fraught with consequence—in urban planning, for example, rectilinear street grids and front porches are said to build community, while cul-de-sacs and private backyards are alleged to be antisocial.

The progressive planners have often disagreed with each other, but they share a dislike of choice. They demonize “sprawl”—really, any urban development that sprang up without centralized planning. They detest personal automobiles, which give the working class the ability to wander away from the pedestrian, bicycle, and mass transit grids college-educated planners built for them to follow. Collectivists by temperament, progressive planners generally prefer dense, low-rise apartment blocks to single-family homes. For energy, they converged on what writer and scientist Amory Lovins called the “soft path” of reliance on decentralized wind and solar power, as opposed to the “hard path” of centralized energy utilities using fossil fuels or nuclear energy. It all meshed very nicely: happy pedestrians and bikers visit organic farmers’ markets in dense urban villages crisscrossed by trolleys, while a high-speed passenger train zooms past clean white windmills in the distance. Wise technocrats keep the show going from their control rooms offstage.

### **Enter the Planners**

There’s a reason this progressive technocratic vision, which has been roughly the same for decades, has not come to pass. Most Americans like their single-family homes, their cars and shopping malls and big-box stores. They do not want to live in modern simulacra of the town squares and tenement neighborhoods of the 1900s.

As long as progressive technocrats were mostly marginalized in center-left politics, they didn’t have to worry much. But along with the declining influence of private-sector trade unions and social democracy and civil libertarians on the Democratic Party, rising concern about global warming in the last three decades has given progressive technocrats an opportunity to move



from the political sidelines to the center. Because of the “climate emergency,” the various causes of twentieth-century progressive planners—high-density housing, replacement of automobiles by mass transit, renewable energy—are no longer matters of personal taste. Now these generations-old top-down social engineering schemes are necessary to save the planet. If these plans are not immediately adopted into a war-like mobilization, progressive technocrats claim, civilization will collapse, and hundreds of millions or billions of people—perhaps humanity as a whole—will die.

This new synthesis, lashing various older technocratic social engineering projects together with alarm about a climate apocalypse, was popularized by the author Naomi Klein in books like *This Changes Everything: Capitalism vs. the Climate* and *On Fire: The (Burning) Case for a Green New Deal*, which called for massive government investment and intervention to mitigate climate change. Critics countered that Klein and others were using the idea of the Green New Deal as a Trojan horse into which a variety of unrelated left-wing projects could be crammed. And they seem correct; in *On Fire*, Klein declared that “climate disruption demands a reckoning on the terrain most repellent to conservative minds: wealth redistribution, resource sharing, and reparations.”

However, with the Green New Deal, the progressive technocrats, mostly within the pro-business neoliberal wing of the Democratic Party, have dropped eco-socialism for eco-capitalism. Instead of fighting anthropogenic global warming by abolishing capitalism—as eco-socialists might prefer—green neoliberals rely heavily on tax breaks, renewable portfolio mandates, and other subsidies to reward investors in politically favored solar and wind farms or affluent purchasers of low-carbon luxury consumption items like Priuses and Teslas.

Inasmuch as the United States in 2019 was responsible for only 11 percent of global greenhouse gas emissions, according to the Rhodium Group, even the complete success of the Green New Deal at the national level would hardly “save the planet.” But perhaps the intention was always more self-serving. Adopting a watered-down version of the Green New Deal allowed neoliberal

Democrats to sidle away from their earlier role as cheerleaders for free market globalization and rebrand themselves as saviors of the planet. The neoliberals of the 1990s and 2000s promised a globalization-induced renaissance in American manufacturing for export. They predicted an expansion of “knowledge economy jobs” that would replace well-paid manufacturing jobs. None of that ever took place. Instead, mercantilist China has caused American producers to lose global and domestic market share in one industry after another. Meanwhile, high-wage jobs for programmers—“Learn to code!”—have been greatly outnumbered in the United States by low-wage jobs in health care, retail and leisure, and hospitality.

Unlike global competition for sales in foreign markets, which is difficult and risky, state-sponsored green capitalism can offer neoliberal investors guaranteed returns. For example, the government may impose renewable energy portfolio mandates to force utilities to buy expensive and unreliable solar and wind energy from privately owned producers. In this way, public utilities can print money for passive “green investors,” while passing the costs along to the working-class majority in the form of higher energy bills.

Some cash may go toward paying construction workers to install solar panels, windmills, and the like, but most of the technologies will still be imported from Chinese factories because the United States, after a generation of corporate offshoring to lower labor costs, cannot manufacture them at scale anymore. It is thus no coincidence that American supporters of the Green New Deal tend also to be dovish toward China in matters of trade, arguing that the coming climate crisis gives the United States no time to rebuild its own capacity to manufacture equipment needed for renewable energy installations. “Biden’s Tough Stance on China Will Lead to Global Climate Doom” is the headline of a March 2021 essay by Michael Klare, *The Nation’s* defense correspondent and professor emeritus of peace and world-security studies at Hampshire College. The subtitle? “To tackle the climate crisis, Biden should build an alliance with China aimed at collective survival.”

The Biden administration's original \$3.5 trillion "infrastructure" budget represented the ultimate culmination of the technocratic tendency toward top-down, centralized, comprehensive planning. It sought to bundle hundreds of priorities together in one big green package. Thanks to the resistance of moderate Democrats, traditional infrastructure elements like highway maintenance and repair of water systems were easily pulled out of the omnibus bill by the bipartisan coalition that insisted on a stand-alone vote for a \$1.2 trillion package that has been enacted. What remains in the \$1.75 trillion Build Back Better bill, is spending on various unrelated, long-time center-left goals like urban densification and public day care, plus spending on a vast network of new high-voltage power lines and electric automobile-charging stations—policies that make sense only on the implausible premise that wind farms and solar energy farms will replace most fossil fuels and nuclear power in a few decades at most.

## Energy First

The criticisms of the Green New Deal are clear. But something can't be defeated with nothing.

A thoughtful alternative to the Green New Deal would separate infrastructure and energy policy—and answer the energy question first. After all, an energy economy dominated by solar and wind would indeed require massive investments in high-voltage power grids to carry electricity from wind and solar plants in less-populated areas to cities. As nuclear power advocates Madison Czerwinski and Emmet Penney point out in a recent article for *Real Clear Energy*, under Biden, the Department of Energy (DOE) has put out a plan calling for the "U.S. to quadruple its annual solar installations to reach 1,000 gigawatts of capacity by 2035—40% more than the total amount of solar worldwide as of 2020. To accommodate the expansion of solar and wind, the [DOE's new *Solar Futures*] study finds that transmission will need to expand by at least 33% over the same time period and up to 90% by 2050." Yet if the goal of reducing greenhouse gas emissions is promoted by

replacing coal with lower-carbon natural gas or zero-carbon nuclear energy, the existing US electric grid, modernized and expanded as the population grows, is adequate. Natural gas and nuclear fuel can be stored on the sites of existing electric utilities. There might be room for a few more natural gas pipelines, but there is no need for an expensive new interstate high-voltage grid system. Nor is there a need for sprawling, land-consuming wind farms and solar installations that would require countless farms, ranches, and homes to be sacrificed to eminent domain. (To generate the same amount of electricity as nuclear power, weather-dependent renewables require 400-450 times the land area.)

Even if global warming really were a dire emergency, rather than a manageable chronic nuisance, then it would make sense for the federal government to borrow money at historically low interest rates to pay for mass construction of standardized nuclear power plants for existing public and private electric utilities. The irrational dread of nuclear energy among environmental activists and the American public makes a green transition based on nuclear power politically unlikely, but this is all to show that the question of energy should be answered prior to the question of infrastructure.

On that score, given our inability to foresee future technological breakthroughs, a technology-neutral approach to greenhouse gas mitigation is the second-best course to a state-capitalist nuclear build-out. A moderate carbon tax could create an incentive to phase out the burning of coal in electricity generation, without discriminating against further development of natural gas, nuclear power, or other sources. So could national clean energy portfolio standards for public utilities that include nuclear power as a kind of low-carbon or no-carbon energy. Any tax breaks for the generation or use of clean energy should include nuclear power.

## Great Power, Great Infrastructure

When the issue of energy sources is addressed separately, as it should be, the question of what kind of national infrastructure investment the United States needs remains to be answered. The answer? It depends. For any country, it depends on that particular nation's role in the world economy. A country that exports commodities to foreign refiners and manufacturers needs rail lines, canals, pipelines, and highways to transport crops, lumber, livestock, ores, or oil and gas from their sources to inland and maritime ports. A country that exports manufactured goods to foreign markets needs a different infrastructure supporting its networks of factories and suppliers. And a country that manufactures little but is a global financial entrepôt with an economy dominated by banking, insurance, and professional services requires yet a third approach.

The imperatives of national security influence national infrastructure choices as well. Unlike weak countries that depend on others for protection, great powers must possess strategic industries that can be used for military as well as civilian production, along with the skilled workforces and infrastructure systems those actual or potential military industries require.

If the United States is to maintain its status as one of several great powers in the face of military and economic challenges from China and in time perhaps other rising powers, American economic policy should be based on what economist Robert D. Atkinson and I have called "national developmentalism." Political scientists first used the term "developmental state" for polities like post-1945 Japan, South Korea, and Taiwan, whose governments' industrial policies helped local manufacturers catch up with their rivals in the more developed West.

But the developmental state is familiar in Western fora as well, including eighteenth-century mercantilist Britain and France and nineteenth-century Prussia-Germany. There have always been elements of national developmentalism in the United States, such as the plans of Alexander Hamilton

and Henry Clay to use tariffs and subsidies to foster infant industries, as well as the role of the federal government in developing modern radio and television, aviation, nuclear energy, computers, and the Internet.

National developmentalists in Walpole's Britain, Bismarck's Germany, and the America of Hamilton, Lincoln, and the Roosevelts have agreed about the centrality of technology-based manufacturing as the foundation for relative global military power and economic influence. The importance of manufacturing does not lie in its provision of "good jobs," as has become a rallying cry today. After all, even at the height of employment in manufacturing in the mid-twentieth century, most workers did not work on assembly lines. And manufacturing jobs are valuable to the national economy even when they have been poorly paid and exploitative. Apart from its contribution to the nation's military-industrial capacity, manufacturing is important to the national economy as a whole because of its disproportionate contribution to both private and public R&D and technological innovation, in the never-ending race among rival countries to stay at the leading edge of the technological frontier.

Manufacturing industries tend to be characterized by increasing returns to scale, meaning that efficiency increases as markets and sales grow. Ambitious manufacturing nations therefore want their manufacturing firms, be they private or public or mixed, both to dominate their home markets and to capture high shares of targeted global markets. In the past, colonial empires would conquer other countries and force their inhabitants to buy the high-value-added manufactured goods of the metropolitan power, at the expense of native manufacturing. And while the discrediting of territorial imperialism after World War I has changed the rules for global competition among great powers for third-country markets and resources, the strategic imperatives remain the same.

From all of this follows the conclusion that if the United States (or a United States-led bloc) seeks to maximize its capacity in strategic manufacturing industries, it must try to maximize the global market share of its national

producers, in an era in which almost all of the growth in consumer demand will be outside the borders of the United States and its allies. In turn, a strategic plan for US infrastructure would have less to say about mass transit for urban commuters and would be far more focused on foreign demand for United States-made goods and services.

A comprehensive American national infrastructure policy might start overseas with the ports and interior transportation systems in India and Africa, where the growth of consumer demand will follow the massive growth of local populations in the decades ahead. In the nineteenth century and early twentieth century, foreign investors put funds into railroads and other kinds of infrastructure to extract the resources of undeveloped economies. In the last generation, global firms have invested in manufacturing facilities in China, Mexico, and other countries to exploit cheap labor. Resources and labor costs will continue to matter. But the major consumer markets for advanced industrial nations are found in other advanced industrial nations, now limited mostly to Europe, North America, and East Asia. In the long run, rising incomes and increasing consumption among billions of people yet to be born in Africa and South Asia have the potential to create enormous new markets for exports of both finished manufactured goods and manufactured inputs made in America.

China's leaders understand this dynamic. China's Belt and Road Initiative of commercial and transportation infrastructure investment in countries in Asia, Africa, the Middle East, and Europe complements its industrial policy, which seeks to create national champions in its home market while enlarging the foreign market shares of Chinese manufacturers. The United States needs its own version of a belt and road strategy, enabled by US unilateral development finance institutions, like a greatly expanded US Export-Import Bank, as well as far greater contributions to regional development banks controlled by the United States and its military allies.

## A Big Green Bow

Now let us retrace the paths of United States-manufactured exports from maritime and inland ports abroad, where they had arrived on their way to foreign producers or consumers, all the way back to the US ports from which they departed. Most global commerce moves by ship on the high seas and inland waterways. Deploying advanced technology including robotics, artificial intelligence, and machine-to-machine communications to modernize US seaports and the US inland waterway system to make the process of shipping as efficient and low-cost as possible should be a national priority.

Retracing the paths of United States-manufactured exports further back, we find that high-tech rail, highway, and air transportation systems within the country are essential to carry goods from factories to ports and transport foreign raw materials and manufactured inputs from ports to factories. The greatest concentration of factories in North America is and will remain in what Joel Kotkin and I have dubbed "the New American Heartland"—the manufacturing cluster that runs from Canada and the Great Lakes down the Mississippi River valley to the Gulf of Mexico, with branches into Florida, Texas, and Mexico.

Most US factories will be located in low-density areas on the outskirts of metropolitan regions. The urban periphery is also where most Americans in the future will live, regardless of their jobs, given that most residential and commercial growth has for decades taken place in the suburbs and exurbs, with no sign of a reversal (and with a possible acceleration post-COVID-19). In the areas of transportation and logistics, the plans of progressives are most at odds with what the US economy and workforce need. Progressive planners who denounce cars and automobile-dependent sprawl are wrong. Personal cars are good. The decentralization of industry and population to lower real estate costs and improve the quality of life of citizens is good. Highways allow Americans, particularly working-class Americans, access via their personal cars to a wide variety of possible homes at affordable prices at some distance from their jobs. Personal car use also allows workers

to access a far greater number of jobs within reasonable commuting times than does reliance on walking, bicycling, or mass transit. According to the Brookings Institution, in 2011 only 22 percent of potential jobs for low-income workers in the nation's 100 largest metropolitan areas were accessible to them via mass transit each way in less than an hour and a half. Working-class car ownership or rental combined with convenient road infrastructure opens up working-class job opportunities.

In most places, light rail is an expensive anachronism. The main commuter infrastructure needed in twenty-first-century America consists of new ring roads or "beltways" that allow commuters and freight trucks to bypass congested downtowns. Most travel for work, shopping, and commerce already takes place within urban peripheries. Suburb-to-suburb ring roads benefit exurban manufacturing by providing multiple flexible routes for trucking that can minimize congestion-caused delays. Ring roads that permit rapid car or bus travel within a broad metro area benefit both the minority of workers employed in manufacturing and the majority of workers employed in domestic service sectors. One of the service sectors with growing employment is health care, an industry that, like new manufacturing, is also likely to be suburban and exurban, because it is cheaper to build new hospitals and medical facilities on low-cost land outside of downtown centers.

Robotic port facilities and caravans of self-driving trucks and cars whizzing safely at high speeds down new exurban ring roads past single-family-home residential neighborhoods are unlikely to capture the imagination of the urban intelligentsia the way that depictions of pedestrian villages linked by monorails have. High-rise downtown neighborhoods in hub cities will continue to be sites where affluent corporate and nonprofit managers work and live and play and show off, with the help of retinues of menial service workers. But the decentralization of industrial production and service sector employment that began with the first light-rail systems in the 1800s and accelerated with the introduction of cars and trucks and electrical grids in the twentieth century will not be reversed.

There is nothing wrong with having a national industrial strategy; on the contrary, it is essential if the US seeks to remain a great military and manufacturing power. And, of course, we want our bridges designed by expert engineers, not amateur hobbyists or elected city council members. In all of these areas, reliance on the judgment of trained and experienced experts is essential. The error of technocratic progressivism arises from the illegitimate transfer of an engineering mentality that is appropriate in matters of infrastructure investment and technology promotion into the realm of social reform, where calls to defer to the authority of expert planners can threaten individual freedom and representative democracy.

The United States should develop both a climate change mitigation strategy and an infrastructure strategy geared to economic growth—but the two strategies do not need to be wrapped together with each other and miscellaneous unrelated items by a big green ribbon. America needs a technology-neutral national climate change mitigation strategy that does not discriminate against the most promising source of zero-carbon energy—nuclear power. America also needs a national infrastructure strategy that prioritizes manufacturing for export, while enabling low-cost living and commuting for the post-urban working-class majority in decentralized metro areas and regions. What America does not need is top-down progressive social engineering disguised as civil engineering. //

ESSAYS / 03

# SPRAWL IS GOOD

## *THE ENVIRONMENTAL CASE FOR SUBURBIA*

JUDGE GLOCK

In the years leading up to the coronavirus pandemic, the intelligentsia came to a consensus that sprawling, car-dominated cities were doomed. The future, they said, was in dense, transit-dependent metropolises. The seeming success of compact cities such as San Francisco, Boston, and New York gave this theory credence. And the supposed dangers of sprawl to the climate gave it urgency.

Yet the facts show that sprawling and car-dependent cities have grown more rapidly than dense ones for decades and are far more affordable. The pandemic, meanwhile, showed they will expand even more rapidly in the future. By contrast, the climate-driven demands for density and transit are just the most recent version of a solution that has long been searching for a problem. Advocates will continue to search. In reality, sprawling cities are more environmentally sound than their dense counterparts and will become even more so as technology evolves.

Instead of warring against sprawl and cars, planners and environmentalists should recognize how the green spaces of suburbia, allied to autonomous electric vehicles and green single-family homes, can provide both the affordability and sustainability most Americans crave.

### **The Long Triumph of Sprawl**

There has been much discussion of the benefits of density, of which there are many. If there weren't, nobody would live in Manhattan or San Francisco. These cities allow many people, especially young, high-productivity singles and those who work in business services like finance or law, to congregate and learn from each other. Economists call these benefits "agglomeration effects."

But too many advocates today ignore the other side of the coin, known to economists as "the demons of density." These include things like congestion, crime, and, of course, pollution. Such problems explain why, as technology has evolved, people try to get more of the benefits of living near each other—the agglomeration effects—without the demons of living directly on top of one another. And so, despite periodic stories of a return to the city, America has been taking advantage of new technologies to become more and more sprawling: in other words, to live in places with lower density and more ease of driving by car.

Since 1950, the average density of the largest American cities has dropped from 6,000 people per square mile to 3,000. The fastest growing metros in terms of population have been the most sprawling ones. While places like New York or San Francisco have about 50 percent more people than in 1950, Houston, Dallas, and Jacksonville have 500 percent more. Atlanta, Phoenix, and Austin have almost 1000 percent more. Studies confirm that there is a direct correlation between how sprawling an area is and how fast it grows. This is not surprising, because housing prices in, for example, Texas are less than half the cost of those in California, which has some of the densest cities in the nation, and the cost of living in general is lower.

Complementing sprawl has also been a long-term trend toward people driving more and taking transit less. In 1960, about 12 percent of all Americans took transit to work. By 2020, it was about 5 percent, and the decline of non-work trips on transit was even faster. Meanwhile, the number of Americans who travel to work by car, especially those who travel alone in a car, continues to increase. The miles driven by car per capita have almost doubled. This is not because of supposed subsidies to cars; according to the Bureau of Transportation Statistics, cars pay for almost all of the cost of roads through gas taxes and other charges, while transit riders pay barely a third of the cost of their rides, and that ratio is dropping as transit use declines. For decades, in fact, more and more of the gas tax has been siphoned off to pay for increasingly expensive and increasingly empty buses and trains.

The COVID-19 pandemic has accelerated these trends, further increasing the demand for distant “exurban” development. In the past decade, exurbs grew at almost two times the national rate. But, during the pandemic year alone, construction in exurbs increased another 20 percent. A recent study for the National Bureau of Economic Research has shown that prices and rate of building have risen the fastest in the most far out parts of metro areas during the pandemic. That makes sense: people are moving farther away because, in a post-pandemic world, they won’t need to travel as often to work. The percentage of those who telework has gone from 5 percent of the workforce to what seems to be a long-term trend of 20 percent. Since this telework shift has been starkest for office workers, and since almost all transit systems are geared toward serving central business districts, the increase of telework has hit transit hard. Indeed, while passenger miles traveled by car have returned to pre-pandemic levels, bus travel is down 40 percent since 2019. Urban rail travel is down by half.

Some might long for a return to dense urban areas and a pre-automobile age. The Urban Land Institute says, “arguably, no tool is more important than increasing the density of existing and new communities.” As a recent *National Geographic* headline stated, “To Build the Cities of the Future, We Need to Get Out of Our Cars.” Yet those who hope for massive in-migration

to transit-dependent urban areas have been disappointed for decades. And not just in the United States. In fact, the same trend toward more sprawling cities, more cars, more driving, and less transit has been observable all around the world. Densities in Paris, for instance, have dropped by half since 1950, even as the miles driven per person by car have doubled.

These tendencies represent more than the effect of one or another policy, and more than a short-term trend. Rather, they indicate a clear global and long-term preference. The pandemic has only made the shift toward the modern, sprawling city more rapid and obvious.

### **The Environmental Costs of Density**

People choose more sprawling areas because they limit many of the downsides of urban living, from cost to congestion. But we learned in the pandemic one of the most important environmental costs of density: disease. For most of human history, cities were “demographic sinks” because births did not make up for high death rates due to infectious disease. Cities had to be continuously replenished by people moving from the countryside.

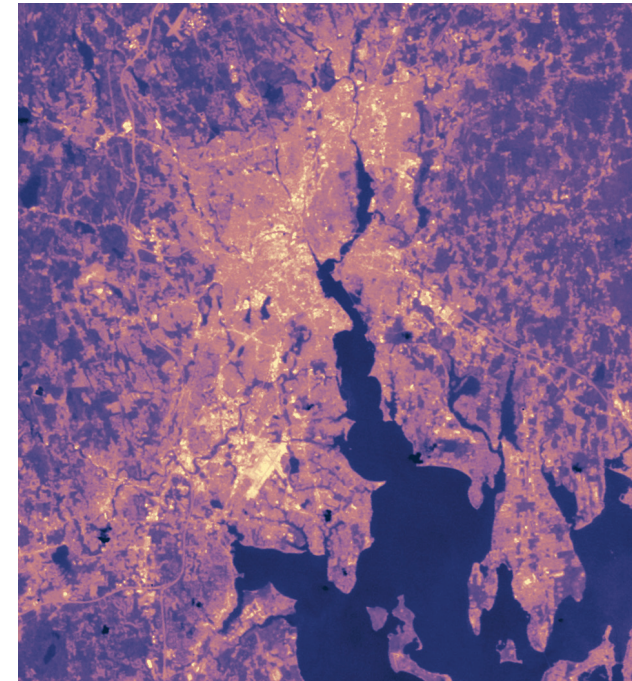
In the early 20th century, the triumph of public health against smallpox, typhoid, cholera, and other infectious diseases allowed for more urban living. Yet cities never entirely overcame the dangers of density for disease transmission. We saw this again during the COVID-19 pandemic. One study found population density accounted for up to 76 percent of the difference between infection rates in different parts of the United States. There was also a correlation between infection and density in the 1918 flu and doubtless will be in the next pandemic.

A more prosaic concern with density is air quality. The more concentrated humans are, the more likely they will be breathing each other’s pollution, whether that comes from congested streets, local industry, or simple heating and cooling devices. The larger the urban area, by contrast, the more space there

is for air pollution to spread out and disperse, and this is true around the world. A study released this year in *Regional Science and Urban Economics* using data from Germany found what dozens of other studies have found. Simply, that “higher population density worsens local air quality.” Another recent study of U.S. cities showed “denser cities are linked with worse air quality,” and that dangerous particulate matter especially tended to increase in denser areas. By its authors’ calculations, a dense American city has dozens more pollution deaths a year, merely because of its density, than a more sprawling city of similar population. While pollution everywhere is lower than it was in the smog-choked cities of the Industrial Revolution, the move to the suburbs has been an important part of why more people breathe clean air today.

There are other local environmental costs to density as well. Urban residents have to endure a “heat island” effect, where urban concrete and asphalt amplify temperatures. The United States Environmental Protection Agency (EPA) notes that such effects can make daytime temperatures up to 7 degrees Fahrenheit hotter in cities than in rural and suburban areas, and nighttime temperatures up to 5 degrees hotter. (For perspective, the Intergovernmental Panel on Climate Change’s estimate for the total impact of global warming by 2100 is about 5 degrees Fahrenheit.)

For all the talk of urban planning for “climate resilience,” and pitches for green roofs, cooler building colors, and so forth, there has been limited discussion about how spread-out suburban areas could reduce the heat island effect even more substantially. Yet, as a recent article in *Nature Communications* argues, “sprawling development will lead to a better thermal environment” by creating more green space and lowering the heat island effect by several degrees. By contrast, the article notes that other strategies, such as green roofs, tend to have much more localized and limited effects. The heat island effect of dense areas in fact exacerbates the problems of local air pollution. Heat breaks down nitrogen dioxide and volatile organic compounds into ozone, which irritates eyes and lungs. This explains why air pollution is far worse in summer months and why local air pollution will be amplified by density in the future.



**The heat island effect in Providence, RI, 2010.**  
**In a 2010 comparison of 42 cities in the Northeast, NASA researchers found that “densely developed cities with compact urban cores are more apt to produce strong heat islands than more sprawling, less intensely developed cities.”**

Brightness Temperature (°C)  
 20 30 40

Image: NASA

Perhaps the most important tool for reducing the heat island effect is trees, which provide shade and absorb solar radiation. Suburbs are, almost by definition, more verdant than cities. Famously sprawling cities like Atlanta or Houston have tree cover on more than 30 percent of their landmass, while older, denser cities such as Philadelphia, San Francisco, and Chicago have under 20 percent. Besides reducing the heat island effect, nearby trees have been shown to intercept particulate matter and absorb ozone, sulfur dioxide, and nitrogen dioxide, thus reducing local air pollution as well. The personal and psychological effects of trees are real too. Studies have shown that the presence of trees decreases stress, increases attentiveness and sense of safety and comfort, and reduces the likelihood that pregnant women will have low-birthweight babies. There is no way to have the same access to trees in dense urban areas.

Since the publication of Ian McHarg’s justly famous work *Design with Nature* (1969), urban planners and developers have become aware of the need to



include natural landscapes in new communities. They now build depressed swards to absorb rainwater, retain hills and creeks as contributors to natural beauty, and create green pathways to allow migration of animals. Yet these features all tend to spread out development and lower density, as McHarg himself noted. His book included maps of Philadelphia that showed how social and physical ills increased with density. As he said, it was “not poverty, but density” that “bears a remarkable correspondence to the pattern of pathology” in urban living, in everything from crime to chronic disease. It should be no surprise that McHarg helped design the very livable, but sprawling, master-planned community of The Woodlands outside Houston.

There is also an assumption across much of the popular environmental literature that single-family homes are environmentally destructive, while tall buildings are green. Advocates claim that building up instead of out limits buildings’ footprints and that tall buildings require less energy to heat or cool, thus reducing greenhouse gas and other emissions. We now know this is false.

For one, taller buildings rely on steel and concrete to support themselves. These materials take five times more energy and carbon dioxide to produce than wood, which predominates in single-family or smaller homes and is a renewable carbon sink. Beyond the materials used, each additional story of a tall building requires more support beams and structures on every story of that building, which increases the ratio of material to livable space. These tendencies help explain why building taller is more expensive. Going from two to four stories increases the cost of each square foot of a building by 25 percent. Going from five to ten stories increases the cost of each square foot by over 50 percent. Those costs are the result of more—and more energy-hungry—materials.

Large buildings also use more energy to function. Tall buildings require fans to push and pull air through their HVAC systems, as well as energy-hungry pumps to lift water to the top floors. For very large buildings, elevators use up to 10 percent of all energy. Common areas such as stairwells and

lobbies need to be heated, cooled, and lit, adding to both environmental and economic costs without contributing to anyone’s living space. One recent study found that “each additional story in a building is associated with a 2.4 percent increase in electricity use and 2.9 percent increase in fossil fuel use.” Taller buildings specifically tend to absorb more heat and then give it off, exacerbating the heat island effect, even as they cast shadows that limit natural light. Taller buildings, in short, create more burdens on both the local and global environment than small ones.

### **The Environmental Costs of Transportation**

Today, much of the discussion around the environmental impact of density revolves around a single metric: vehicle miles traveled (VMT), the number of miles cars travel on the roads. The assumption, embodied in many state and local regulations, is that denser cities tend to bring destinations closer and therefore reduce VMT, which therefore reduces air pollutants and greenhouse gas emissions from burning gasoline in cars.

There are several faulty assumptions behind the attempt to reduce VMT. First and foremost, there is little correlation between density and VMT. A 2009 metasurvey of the literature by the National Research Council found that doubling residential density in an urban area, which in fact has never happened for any major city in modern history, would reduce VMT by only 5 to 12 percent. The massive costs of such doubling, and the minor reduction in car-related emissions, would make such an effort one of the least cost-efficient means to reduce carbon emissions imaginable.

Any benefits of density-related reductions in VMT are offset by other factors. For one, denser areas tend to have more congestion (think 14th Street in New York City), so traveling a mile in a dense city will require more starts and stops, and will therefore burn more gasoline, than traveling on a less-congested suburban highway or arterial road. The CO<sub>2</sub> emissions when traveling at 5 mph are 300 percent higher than when traveling at 55 mph, and this

ratio is even worse when the slower speed is due to congestion. Focusing on *miles* traveled, rather than actual greenhouse gas emissions, is a blunt and inopportune metric that tends to bias planners against suburban and exurban development.

More importantly, we know that the relationship between VMT and all kinds of pollution, including greenhouse gases, has weakened over time. Much of the rage against cars in previous decades came from their supposed impact on local air quality, so much so that the 1991 federal transportation act gave grants to cities to reduce driving, with the stated purpose of improving air quality. Thankfully, those efforts to reduce driving failed, and, despite massive increases in VMT, the prevalence of the six major air pollutants measured by the EPA has dropped by 70 percent since 1980. The most important reason is increasingly efficient and environmentally sound cars. According to the EPA, new passenger vehicles now emit 99 percent less air pollution than they did five decades ago. The efficiency improvements explain why the concern with local automobile emissions, once the foundation for the anti-automobile movement, has almost been forgotten.

The reduction in greenhouse gas emissions from driving has been more limited since these cannot be scrubbed away through physical or chemical processes. Yet, since 1970, the average miles per gallon of the US vehicle fleet, which closely approximates gas emissions, has more than doubled, from 10.3 mpg to 24.9 mpg in 2019. This explains why despite recent increases in VMT, total greenhouse gas emissions from transportation, the majority of which is from cars and trucks, have declined since 2006. Under new federal requirements, the Biden administration aims to increase general fleet efficiency to 52 mpg by 2026, which means total emissions from cars will drop even further.

Over even a medium-term time frame, the increasing adoption of hybrid, electric, and autonomous vehicles will almost completely sever the connection between VMT and greenhouse gases. Those who are attempting to redesign cities, projects that will take decades or even centuries, merely

to reduce the use of gasoline-powered cars are thus engaged in a futile exercise that will only become more futile with time. It would be like attempting to redesign cities in 1900 to reduce horse manure. The technology will change faster than the city will.

Meanwhile, anti-automobile policies can have negative environmental effects right now. For instance, in 2007, amendments to the California Environmental Quality Act required that all new housing developments show how they mitigate global warming. Most importantly, new developments had to show they would reduce VMT relative to current California standards. Yet the typical Californian today produces only nine tons of carbon dioxide a year, about half the national average. These lower emissions are not because of lower VMT, which are close to the national average, but because of California's balmy climate and green electric grid. Yet the law, and some of California's other supposed environmental acts, has been used to prohibit "sprawling" development and thus push people out of an otherwise climate-friendly state. Every home not built, no matter where it is located, is keeping at least two more people out of California, which is effectively doubling those persons' carbon emissions. It is difficult to imagine many laws with such a deleterious climate impact, made worse because it exacerbates what attorney Jennifer Hernandez has called California's "Green Jim Crow."

Even today, mass transit is not an environmental improvement over cars. As cars have been getting more efficient, the buses that make up the majority of US public transit have been getting less so. One reason is that although total bus VMT keeps increasing, the number of bus passengers has been declining for years. In other words, each bus is carrying fewer people. The increasing subsidies thrown at transit systems mean that they burn ever more fuel to carry ever-more empty seats. In 2018, passenger cars and light trucks in US cities used up to 3,400 British thermal units (an energy measure) per passenger mile traveled, while transit buses used over 4,500. Although rail energy costs are lower than both cars and buses, that is largely a result of the New York City Subway, which itself transports the vast majority of US rail passengers. Yet, even before the pandemic this system was in trouble due

to falling ridership, flooding, and an assortment of ills. New rail projects have even more empty seats than buses.

Throwing more subsidies at new buses or trains that travel routes humans don't want to take will only lead to more empty seats and more burned energy, just as cars are getting more efficient and greener. The transit catastrophe of the pandemic means that the environmental costs of moving passengers by bus or rail has become even greater. By all indications, the future of the city, and the future of the environment, will be based on energy-efficient cars and increasingly distant homes.

### **The Future Is Spread Out**

Just like density, sprawl has costs as well as benefits. For instance, sprawl can result in the loss of species' habitats and natural landscapes. But these problems can be accommodated. The fact that only 2 percent of the American landmass is urbanized, and that not even the most sprawling projections of the future would imagine that figure going over 5 percent, means Americans can protect species and environmentally sensitive areas as we expand. We can, as McHarg noted, design with nature.

Sprawl isn't for everybody, and just as we shouldn't force everybody to live in dense metropolises, we shouldn't force anybody to live in sprawling ones either. For many people, Manhattan or its equivalents will be the best and most exciting option, and American cities need to accommodate those preferences. Good policy and increasingly green technology—especially when it comes to building materials and transportation—can ameliorate the demons of density in those areas. But it cannot eliminate them.

The future of the American city will not be a growing number of Manhattans. It will be more Dallases and Atlantas and Nashvilles and Columbuses. These are the types of cities that most Americans have moved to in recent years, and all evidence is that, after the pandemic, they will grow even more rapidly.

These cities already represent a future that is more environmentally sound and economically affordable than the dense metropolises of the past. But we can keep working to improve them, by accelerating the move to electric vehicles, by improving energy efficiency in homes, and by changing our energy mix. Scientists, engineers, and entrepreneurs have been engaged in this task for decades and will continue doing so. Instead of destroying the sprawling city, they are improving it.

Increasingly irrelevant attempts by environmentalists to fight these sprawling cities and the cars that allow them to exist are counterproductive. Instead, environmentalists should embrace the same future that most Americans have already chosen. //

TECH TALKS / 01

# GET NEGATIVE ABOUT THE CLIMATE

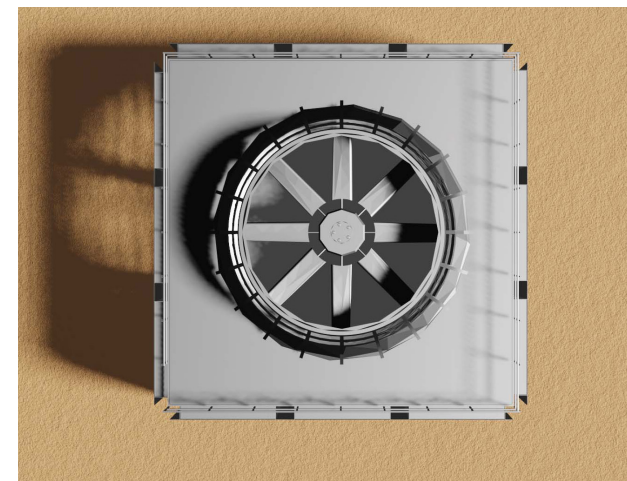
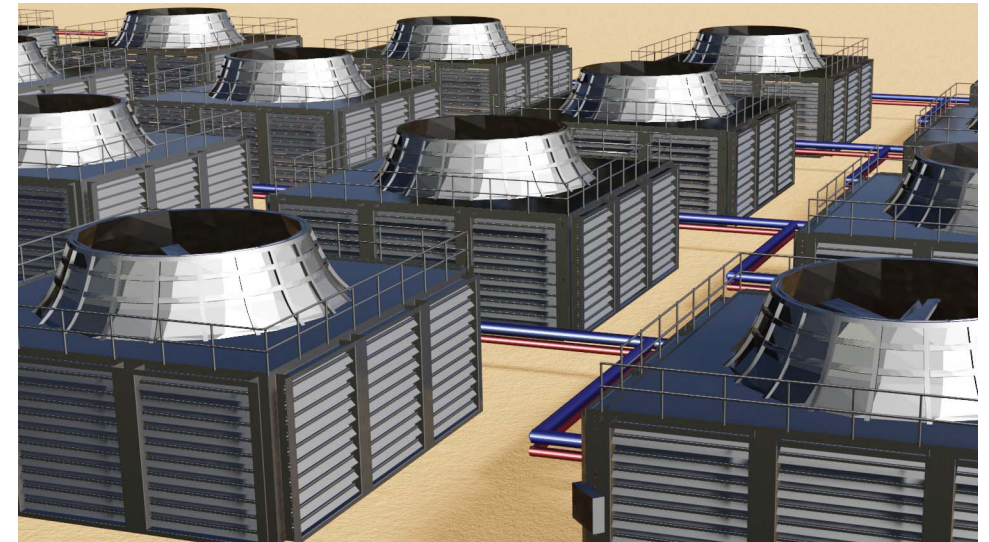
*SUSTAERA AND THE FUTURE OF  
DIRECT AIR CAPTURE*

SUDARSHAN GUPTA

**A**ccording to the most recent report from the Intergovernmental Panel on Climate Change (IPCC), temperatures around the world are destined to rise by 1.5°C within the next decade and are on track to hit 2°C by 2050—based on the current global policies and pledges.

To have any chance of staying under 2°C, then, reducing emissions will have to work alongside efforts to subtract them from the environment. But how? Plenty of technologies have been developed to capture CO<sub>2</sub> emissions from power plants and industrial sources, but those won't make enough of a dent in reducing carbon emissions.

Additional approaches are needed, and one that has been growing in both research and application is direct air capture,



(Above) Direct air capture sand unit.

(Left) Direct air capture sand array.

Images: Sustera

otherwise known as DAC. In its most basic form, DAC technology focuses on capturing CO<sub>2</sub> from ambient air. This CO<sub>2</sub> can be stored permanently, either underground or in certain products (such as cement). Or it can be utilized as a feedstock for other products, such as carbon-neutral jet fuel. Imagine multistory air purifiers set up in fields with ample access to sunlight and wind that suck in air, separate the CO<sub>2</sub>, store it underground, and release the CO<sub>2</sub>-free air back into the atmosphere.

Although promising in theory, there have been myriad challenges to DAC in practice.

First, although there are several companies pursuing it, the technology is still in its early stages. The first DAC plant, built by Climeworks, just went live in Iceland. It has the ability to capture up to 4,000 tons of CO<sub>2</sub> per year—about the amount emitted by 870 passenger vehicles in one year. More facilities will go live within the next decade.

Second, DAC machines are energy intensive. The CO<sub>2</sub> concentration in ambient air is 0.04 percent (400 ppm), which means that capturing 1 ton of carbon requires moving almost 3,000 tons of air through the system. That takes power. Utilizing fossil fuels as an energy source is counterintuitive and limits the net carbon one can capture. Although renewable energy technology continues to expand, the intermittency of renewables still presents challenges. DAC companies that can find ways to utilize renewables will be the most cost effective and capture efficient.

Third, there's the question of what you do with the CO<sub>2</sub> once you capture it. There are a limited number of wells that are permitted for sequestration. This will need to grow significantly for DAC to be a viable approach. Beside sequestration, companies are in various stages of utilizing captured CO<sub>2</sub> for manufacturing construction materials, aviation fuel, plastics, and other products.

Lastly, there is a lack of incentives for DAC companies to scale up. An idea popular among most economists is a carbon tax that puts a price on each ton of carbon emitted. Such schemes are mainly intended to reduce emissions, but a side benefit is that they would give DAC companies a way to monetize their processes. Although carbon credits exist today, significant ambiguity exists in the market, particularly around how offsets work, since most carbon captured by afforestation and the use of renewable feedstocks such as biomass can end up back in the atmosphere. With DAC, though, CO<sub>2</sub> is stored forever or reused—ensuring a real subtraction of emissions.

Despite the obstacles, there is a lot of optimism around DAC. Around the world, multiple companies, such as Climeworks, Carbon Engineering, Sustaera (where we work), and Global Thermostat, have been working tirelessly to develop solutions to subtract CO<sub>2</sub> from the air. Each has their own approach to addressing the problem. Some have developed their technologies based on membranes or solid sorbents; others on cryogenic freezing, liquid solvents, ocean capture, or carbon mineralization.

In every case, the key ingredient for success will be optimizing cost, leveraging existing supply chains, and scalability. That's why, for its part, Sustaera, a spin out from Susteon, (which develops technology solutions centered around CO<sub>2</sub> and hydrogen), uses an abundantly available, low-cost capture agent and tries to keep energy costs low with an innovative chemical reaction pathway. It also relies on existing supply chain infrastructure and makes use of energy provided by renewable sources (solar, wind) and carbon-free nuclear energy.

At scale, Sustaera aims to capture 1 million tons per year per facility with a targeted cost of less than \$100 per ton by 2027. By 2040, with multiple facilities around the world, it aims to have captured 500 million tons of CO<sub>2</sub>. Already, Sustaera has proven the technology at lab scale and plans to build a 1 ton/day pilot plant in 2022. Nevertheless, for companies like Sustaera and others to succeed in limiting global temperatures, an improved regulatory framework across the globe is required.

We can restore the carbon balance, but we need all hands on deck. //

*Sudarshan Gupta is vice president of commercialization at Sustaera.*

ESSAYS / 04

# DEREGULATION IS NOT THE ENEMY

*IT CAN BE GOOD FOR THE ECONOMY—  
AND THE ENVIRONMENT TOO*

SHIRAN VICTORIA SHEN

**B**y the late 20th century, the book on the regulatory state seemed to have been closed. On the economic side, it was deemed to be inefficient, prone to regulatory capture. To further economic growth, neoliberal politicians agreed, it was time to deregulate.

On the environmental side, meanwhile, nearly the opposite held true. Advocates accused deregulatory processes of leading to vast environmental destruction. And so, they maintained, more regulation would be good. With strong rules usually come more stringent enforcement of controls on emissions, pollution, and resource usage, at least in advanced economies where the implementation gaps are relatively small.

Those ideas are evident in President Joe Biden's approach to environmental protection; on taking office, he ordered a review of more than 100 environmental regulations that his predecessor, Donald Trump, had ended. The new administration's progress in reinstating these protections has been closely tracked by environmental analysts and criticized by pro-business ones.

But that is not always how the trade-off works. To see why, it is worth comparing deregulation of the power sectors in the United States and China—the two largest carbon-emitting countries in the world, with power sectors that are each country's second-largest overall source of emissions. Both countries' experiences show that to reach a net zero-carbon world, deregulation, if steered in the right direction, can be good for the economy and the environment, too.

## What Deregulation Is For

In general terms, deregulation refers to the reduction or elimination of government regulations in a particular industry. The process is thought to be good for the economy in several ways. First, it is believed to reduce inefficiencies associated with coercive government policy instruments. For example, in 1978, the US Airline Deregulation Act phased out government control over prices and entry to the air travel market. In a market with price competition, consumers are estimated to have saved over \$19 billion dollars per year on airfares ever since.

Second, deregulation is also thought by some to prevent the regulated from manipulating policy to advance their own interests at the expense of consumers. For example, the Trump administration alleged that regulations requiring occupational licenses for hairdressers and interior designers merely served to increase professionals' wages without providing commensurate health, safety, or quality benefits to consumers.

Third, deregulation is meant to directly lead to greater competition. For the power industry, for example, deregulation typically allows retail customers

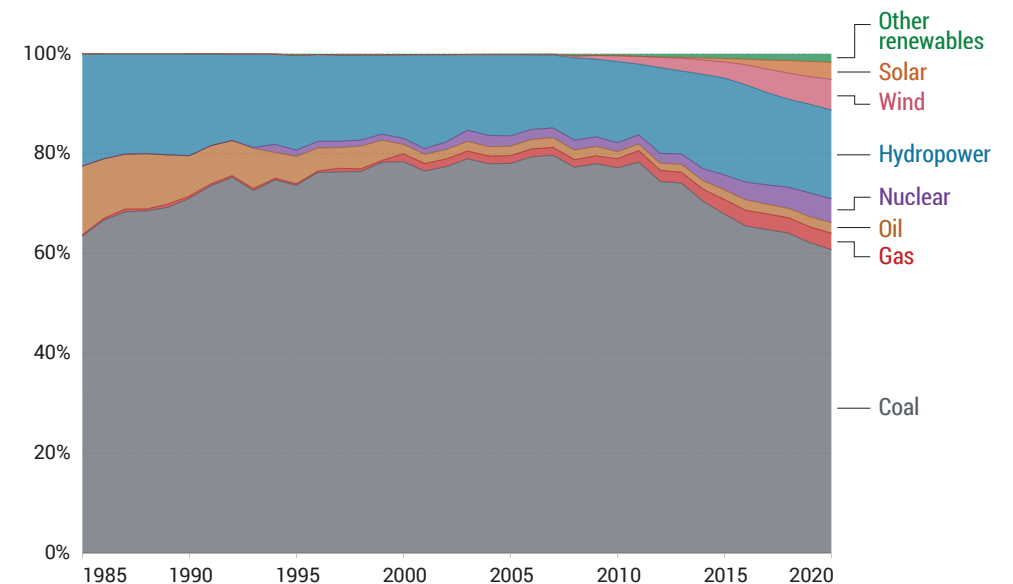
to receive their electricity from the supplier of their choice, which leads electric utilities to set their prices in competition with rival utilities.

At least that was the stated goal of attempts at deregulation in the United States in the 1990s. As in most Western countries, the US electricity sector has long been a monopoly owned by investors and regulated by state-level public utilities commissions. Those state commissions have made pricing decisions and approved new facilities, among other actions. Over them, the Federal Energy Regulatory Commission (FERC) has dealt with interstate issues. While FERC regulations have been aimed at ensuring fairness, they have also, if misapplied, enabled rent-seeking behavior by utilities, as when the commission based price controls for California utilities on the least-efficient producers' costs in 2001.

To help reduce US dependence on imported oil, the 1992 federal Energy Policy Act ended many regulations that had prevented open market competition in transmission lines. The measure invited into the energy mix previously excluded suppliers, especially clean energy suppliers, and opened up the possibility for a restructuring of the power sector. Many states responded to this possibility by passing their own legislation aimed at providing consumers with more choice in electricity provider. For example, Texas began to seriously assess the possibility of restructuring its electricity generation and consumption patterns for the long term, which ultimately culminated in a deregulation program launched in 1999 that included goals for steadily increasing the amount of electricity from renewable sources in the state's energy basket.

In China, the electricity sector has always been owned and operated by the government, with little independent regulatory oversight. What is commonly considered the deregulation of the national grid took place around 2000. The existing centralized power system had proved unable to weather market volatility in the late 1990s, when state-owned enterprises, including those in the power sector, began to incur mounting losses and show greater inefficiencies. As a result, the central government corporatized the power sector.

### ELECTRICITY PRODUCTION BY SOURCE, CHINA



Source: Our World in Data based on BP Statistical Review of World Energy & Ember (2021)  
 OurWorldInData.org/energy  
 Note: 'Other renewables' includes biomass and waste, geothermal, wave and tidal.

Beijing created the State Power Corporation and a national regulator known as the State Electricity Regulatory Commission. The regulatory commission was never granted the authority to approve, plan, or set rates, however. And key strategic decisions for the electricity sector, including electricity pricing, still rest in the hands of the National Development and Reform Commission (NDRC), China's main policy planning agency.

Significant subsequent reforms took place in 2002 and 2015. In 2002, the power corporation was split into several generation, grid, and service companies with the aim of further improving efficiency through competition. And the 2015 reforms provided guidelines for enhancing market-based competition, improving regulation of monopolies, and decreasing retail electricity prices while stressing the importance of environmental protection.

Over the past decade, according to the BP Statistical Review of World Energy, an increasing percentage of China's electricity has been generated from renewable sources such as hydro, wind, nuclear, and solar. Between 2010 and 2020, renewables' contribution to electricity generation increased from about 20 percent to about 27 percent. Wind saw the most significant increase among renewables.

### **Texas's Boom; California's Bust**

Despite the differences in structure and oversight, deregulation of the power sectors in the United States and China achieved many similar goals. Namely, by opening the sectors to some competition, the processes laid the foundation for the integration of renewables into electricity generation. Meanwhile, they made adoption of previously untenable renewable-friendly policies much more possible.

For example, studies have shown that US state governments saw bundling environmental and renewable policy with power sector deregulation as an effective way to pass legislation. The linking of two related issues allowed state legislators to cater to a wider set of constituencies, including pro-market groups and environmental groups pushing for greater adoption of renewables into the grid.

One need look no further than Texas to see how deregulation of the power industry went hand in hand with uplifting renewables—in this case, explicitly, as a way to secure political support from environmentally minded constituencies. The “Restructuring of Electric Utility Industry” Chapter of the 1999 Public Utility Regulatory Act in Texas included provisions for a renewable portfolio standard (RPS)—requirements for a certain percentage of electricity sold by utilities to be generated from renewable sources—and emissions reductions for pollutants such as sulfur dioxide and nitrogen oxides, while also promoting competition and low consumer prices.

To many observers, Texas's apparent yearning for renewables and environmental improvement came as a surprise. It stood in stark contrast to the state's long-standing image as big oil country, with a “captured” public utility commission that had shown minimal concern for input from citizens and environmental groups. Yet environmental organizations and citizen groups, with support from some utilities that were already using renewable sources, were able to bundle RPS provisions with deregulatory legislation more popular on the right.

Since the legislation's passage, Texas has grown to be a national leader in wind energy: in 2020, the state produced 28 percent of all US wind power electricity. According to the US Energy Information Administration, electricity prices across the residential, commercial, and industrial sectors in Texas rose above the national average from 2003 to 2009; but from 2010 to 2020, rates in Texas have been consistently below the national average.

The question remains, though, whether deregulation is anything more than a one-time opportunity for promoting better climate policies. On the one hand, as one study documents, while only 17 US states (34 percent) have pursued deregulation, those states accounted for 61 percent of states that would later adopt an RPS and 89 percent of states that would later adopt cap-and-trade carbon schemes. On the other hand, another study found US states that deregulated their electricity sectors were no more likely than others to adopt a number of other renewable-friendly policies later on.

More well studied is the direct link between energy market deregulation and greater adoption of renewable energy into the grid. One common feature of deregulatory policy packages in the United States is the introduction of retail electricity choice, which allows end-use consumers greater freedom to choose among competing power suppliers. And as energy consumers, including households and corporate clients, have become more attuned to the reality of climate change—be it through personal experience with extreme weather events or education—consumer demand for renewables-based retail electricity has grown.



In fact, in a 2018 Deloitte survey of businesses in the United States, seven out of ten reported that their customers had started demanding greater adoption of renewables in business operations. The same survey also found that only 14 percent of households said they had been offered the option of purchasing renewable energy, meaning there is room for the sector to grow. In an open retail electricity market, power suppliers can take advantage of rising demand by adjusting their portfolios accordingly. Such actions add up. In 2015, out of the 77.9 terawatt-hours (TWh) of renewable power sold to consumers, 15.4 was purchased directly through retail electricity choice.

To be sure, deregulation can go terribly wrong, too. A chilling example is California's 2000–01 energy crisis when supply and market disruptions caused prolonged rolling blackouts, including the state's largest planned blackout since World War II. In June 2000, over 100,000 Bay Area commercial and residential customers were left in the dark, and offices of businesses were forced to close. An even larger blackout was ordered months later, affecting 1.5 million consumers across the state. By conservative estimate, the crisis cost California around \$40–45 billion, or 3.5 percent of its total annual economic output.

Frank Wolak at Stanford is one of the scholars who diagnosed California's misadventure as a failure of deregulation without backstops. Factors such as FERC's ex ante evaluation of whether producers possessed unacceptable market power, an overreliance on short- and medium-term contracts that prohibited stable long-term planning, and a lack of coordination between state and federal regulators led to a prolonged crisis featuring widespread blackouts and collapse of the energy market.

Large energy companies—including, infamously, Enron—took advantage of the weak regulatory environment to engage in market manipulation to the detriment of the state and retail consumers. Several Enron employees were convicted for their activities in California, and Enron collapsed several years later, but not before California paid dearly.

To avoid similar crises in future deregulated markets, policy makers should institutionalize and empower independent regulators to proactively investigate and sanction providers who attempt to “game the system” for their own benefit; they should also conduct thorough reviews to prevent setting rates in excess of established market caps. More broadly, California's example shows that even if deregulated markets hold the promise of greater efficiency and stronger adoption of renewables into the grid, new guardrails are still needed to ensure that bad actors cannot exploit weaknesses in the system.

### **Initiatives In China**

China's experience with power sector regulation in the past several decades is distinct from the American approach in several ways, but it offers useful lessons as well. Crucially, rather than the subnational initiatives seen in the United States, where individual states took leading roles in regulating the power sector within their jurisdictions, China has followed a top-down approach. The late 1990s–early 2000s market-based power sector reforms, for example, were spearheaded by central government agencies such as the State Council and the NDRC.

Deregulation facilitated entry into the electricity generation and transmission industries of multiple firms, especially producers overseen by provincial governments, opening up greater opportunities for experimentation and innovation. From 2002 to 2006, the national government pursued the development of regional electricity generation markets. And beginning in 2004, China reformed its retail electricity market, implementing direct transactions between customers and power companies. Arguably, this and other adjustments to the rules opened political room for later reforms in support of market mechanisms for pollution abatement and the deployment of renewable energy.

Thanks to a more deregulated electricity sector, Beijing has also made extensive use of cap-and-trade, a form of regulation relatively new to China, to

help steer carbon control in the right direction. In principle, this market-based emissions control mechanism—less coercive than a blanket emissions standard—allows firms to more efficiently distribute the costs of carbon abatement. The current cap-and-trade scheme began as an initiative promoted by the NDRC, which selected several cities and provinces—Beijing, Chongqing, Guangdong, Hubei, Shanghai, Shenzhen, and Tianjin—as sites for pilot carbon markets in 2011. Building upon experience accumulated in those areas, China’s national government then expanded the scope of the carbon market. Today, the country is the world’s largest national carbon market. This approach would likely not have been possible without the space opened by prior deregulatory efforts.

Another new scheme is the adoption of RPS on a national scale, beginning with the 2005 enactment of China’s Renewable Energy Law. While the initial law lacked details, later amendments definitively granted the State Council the authority to devise and implement renewable energy minimums for power-generating entities, with penalties for noncompliance.

Over time, China raised its RPS standards: in 2019, it set a goal to have renewables account for 20 percent of total energy consumption by 2030. In late 2020, President Xi Jinping further raised the bar, pledging to have non-fossil fuel energy sources make up 25 percent of China’s total consumption by 2030. Earlier this year, government documents seen by Reuters indicated that the National Energy Administration plans to increase renewables to 40 percent by 2030, mandating that local grid firms increase their renewable uptake. Arguably, without the reform spirit engendered by the initial wave of power sector deregulation, which disrupted the long-standing status quo in China’s energy sector, the political will to pursue further reforms and regulations to encourage greater adoption of renewables would never have solidified.

Just as in the United States, while deregulation and related new guidance in China can lead to good, they may also lead to undesirable and unintended consequences if implemented without sufficient oversight. Take carbon

cap-and-trade as an example. Ahead of the launch of China’s nationwide emissions trading scheme in July 2021, a local environmental protection bureau in Erdos, Inner Mongolia, disclosed a case of false reporting of carbon emissions data. The offending company, Inner Mongolia High-Tech Materials Co., is a power plant and aluminum maker that reportedly tampered with its emissions data for 2019. Upon further disclosure of information related to the case, while the company did not doctor reporting of the carbon content of coal it used, it did change the testing, verification, and reporting dates, possibly to avoid hitting the upper limit of carbon emissions for accounting.

What’s needed, indeed, is institutionalized procedures and standards, so that policy instruments aimed at decarbonization can have their intended consequences. According to Xiao Jianping, the head of the carbon management department at the China Energy Investment Group Co., standards in carbon accounting have been neither precise nor fixed. For instance, the official carbon oxidation rate—the rate at which carbon gets oxidized into carbon dioxide during combustion—has been adjusted three times in just the past three years. That’s a problem. As a reporter summarized Xiao’s explanation, “if the length of the ruler is constantly changing then it is not worth talking about the accuracy of the measurement. If the length of the ruler is fixed and the procedure and standard of measurement are set, then data discrepancy can be minimized.”

China’s experience suggests that earlier deregulatory efforts opened up the political space for reform, too, including adoption of innovative new regulations to more efficiently bring down carbon emissions and encourage more renewable energy within the power grid. The similarity with the American experience, where politicians combined strong renewable incentives with power sector deregulation, suggests that the world’s two largest emitters of carbon dioxide may have far more in common than many realize. While each nation has worked through its own policy making context, their common goal of gaining efficiency through deregulation while simultaneously mitigating climate change through renewables suggests that deregulation can go hand in hand with a net zero-carbon world.

## Old Laws Out, New Ones In

To be sure, regulations are still necessary for environmental protection. Their existence and enforcement serve to restrain exploitative behavior and help guard against the worst harm to the commons in a race to the bottom.

But it is also true that deregulation should not always be seen as the enemy. The cases of China and the United States shine a light on the conditions under which deregulation can open the space for environmental progress. When deregulation is coupled with smart new regulations and adequate oversight, it can be a boon to these efforts. Indeed, it appears that deregulation may help clear out unhelpful rules to make room for new ones. As the world comes together to consider new approaches to tackling climate change, then, those most concerned shouldn't dismiss deregulation out of hand. //

*Acknowledgments: The author thanks Rand Perry for his outstanding research assistance.*

# GREENFLATION IS REAL

## CORPORATE SUSTAINABILITY HAS A PRICE, AND ENVIRONMENTALISTS MUST TAKE IT SERIOUSLY

MICHAEL MORAN

**L**ike the cicadas that plague the Atlantic seaboard of the United States every 17 years, inflation has awoken from its most recent hibernation. The hike from about 2 percent in a typical year in the United States to 5.3 percent in the third quarter of this year marked roughly a decade since the last time economists took to op-ed pages and talking head circuits to warn of an uncontrollable rise in prices.

Many familiar causes lie behind this recent bout of inflation. And many familiar motives exist among those raising the alarm, from genuine economic analysis to ideological campaigns to stop further stimulus spending. But this time, beyond the COVID-19 pandemic, there's another new wrinkle in the old tale: green policy initiatives and the broad Environmental, Social, and Governance (ESG) movement for socially responsible investing.

For proponents, the use of ESG criteria amounts to an attempt to harness market forces in service of sustainability and other values. By rating companies' performance on the three key indicators, the thinking goes, the movement mobilizes investor pressure for better practices and greater transparency regarding the impact of operations on the environment, race and gender issues, and human and worker rights, as well as promoting good corporate governance.

ESG has been embraced by investors, government regulators, and corporations with increasing frequency, and an ESG ratings industry that applies complex algorithms and methodologies to a company's performance has grown up around the movement. Firms like Trucost (owned by financial ratings firm S&P Dow Jones Indices), MSCI (owned by Morgan Stanley), Refinitiv (owned by the London Stock Exchange Group), and Sustainalytics (owned by the financial analysis firm Morningstar) conduct detailed surveys of corporate operations, scouring everything from the carbon footprint of a company's real estate portfolio and the gender and racial makeup of its staff and executive suite to its supply chain and third-party labor practices.

Such work has, indeed, produced some standout cases, in which corporate brand and share prices have both benefited from good ratings. BlackRock, the world's largest asset manager, has been a vocal and pioneering advocate of designing investment funds that steer clear of carbon-intensive companies. Patagonia, the global sports apparel giant, has led the charge in removing from its supply chain cotton that originates in Uzbekistan, or China's western province of Xinjiang, where forced and child labor is endemic.

Skeptics of ESG, meanwhile, have argued that focusing corporate leadership and investor sentiment on such "non-material" indicators will raise the cost of everything a company does, which in turn will be passed on to consumers in the form of higher prices for heating a home, buying a down vest, or filling a weekly grocery basket. They also dislike the inconsistent methodologies applied to corporate performance. It's devilishly hard to be empirical about

questions like whether water is being wasted somewhere deep in your supply chain or if your company's compensation scheme advances the causes of women, racial minorities, or income equity. On a more fundamental level, meanwhile, supply-side purists resent any attempt to stay the invisible hand of the market.

By and large, such critiques haven't captured much public attention. But the reemergence of inflation has provided opponents of ESG and other green initiatives with a weapon. If the cost of living will shoot up for the great mass of humanity, whose "buy-in" is critical to secure the sacrifices and innovations needed to move the planet toward a net zero-carbon economy, then inflation is a godsend for those who see such pursuits as futile or even quixotic.

Whom to believe? Pro-ESG types do have some history on their side. In retrospect, the last round of panicky rhetoric about hyperinflation—after the 2008–2009 financial crisis—was itself inflated. The economy was damaged, but it continued to do what it does best: make rich people richer. "Inflation bugs," as the harbingers of doom were known, had a host of motives: softening new banking regulations, increasing or decreasing stimulus spending on infrastructure or other pet projects, preventing "socialism." In the end, the inflation hawks (or "chicken hawks," as the economist Nouriel Roubini described them to me in 2012), ranging from Nobel laureate economists like John Taylor of Stanford to presidential candidate Mitt Romney right down to the Tea Party movement, all wound up looking silly. Inflation dropped below 3 percent in 2011. The financial community has largely dismissed it as a non-issue in the decade since.

However, while last round's "Cassandras have been proven wrong," Columbia University economist Adam Tooze told me in September, "it's not as though . . . the rest of us have a very strong theory about why." Given the massive increase in the money supply driven by bond-buying sprees in the Federal Reserve and other central banks since the 2009 crisis, Tooze finds the fact that interest rates are still historically low "frankly mystifying." This is evidence, he believes, that this time we are "really in a moment of rupture."

When classical economists and economic historians—both Keynesians like Tooze and Milton Friedman acolytes like Taylor—are both confused, it is worth noting. And therein lies the real lesson for ESG. Dismissing outright the likelihood of disruption or inflation as the world transitions away from carbon is just not credible. What’s worse, it stores up problems for critics to pick apart later. Far better, then, to concede inflation up front as part of the cost accrued in the last several decades when the West fueled growth by borrowing from the future.

### **The Panic This Time**

Among those who foresee a coming inflationary rupture is Lawrence Summers, a former Clinton Treasury secretary, who wrote a much-discussed piece in the *Washington Post* claiming that the consumer price index had risen by 7.5 percent in the first quarter of 2021. (Other economists, including James Galbraith, have put the figure closer to 3–4 percent.)

But as with love and charity, inflation is its own reward. Summers’s warning kicked off a new round of jitters and predictable calls by right-leaning politicians in Europe and North America for central banks to hike interest rates and for governments to halt stimulus spending. The opposition focused in particular on spending meant to address various ESG tenets: subsidies for climate change mitigation, childcare programs, and tax incentives for the renewable energy industry. For example, R. Glenn Hubbard, a Columbia economics professor and advisor to several Republican administrations, dismissed Biden’s key legislation on infrastructure investment as “social spending.”

Right on cue, Michael Burry, a much-followed investor who became rich by shorting the markets just ahead of the 2008 crash, tweeted about this point last spring. Burry argued that the Biden administration’s attempts to include in infrastructure spending some projects that go well beyond bridges, ports, and highways show that America is on the road to becoming Weimar

Germany, the interwar republic notorious for inflation so virulent that people went to market with wheelbarrows full of currency. Burry wrote that “Germany [the US] started by not paying adequately for its war [on COVID and the Global Financial Crisis fallout] out of the sacrifices of its people—taxes—but covered its deficits with war loans [Treasuries] and issues of new paper Reichsmarks [dollars]. #doomedtorepeat!”

In early June, former US president Donald Trump chimed in, emerging from his own hibernation to warn on Fox Business News of “massive inflation” and gas prices that would soon be pushing \$8 a gallon. Stuart Varney, his interviewer, later asserted that the new Biden administration’s determination to rein in the petroleum industry will boost—you guessed it—inflation.

And so, in some circles, this round of inflation panic has come to have one villain: environmentalism. From the Biden administration’s green subsidies for electric vehicles, wind farms, and solar power to proposals before the Securities and Exchange Commission (SEC) to require US corporations to report on their ESG performance, opponents are piling on and warning of the long-term disaster that beckons as the costs of making good on these pledges are passed on to consumers.

### **Even a Stopped Clock . . .**

To be sure, slamming anticarbon policies on Fox is a lot like chumming for fish off the back of a trawler: you don’t much care what you’re dumping in the ocean as long as the fish show up. Mercenary though he may be, however, Varney is onto something. A growing body of evidence does suggest there will be a price—a “greenflation” as some on Wall Street have labeled it—to making the sweeping transformations that climate and ESG activists desire.

Will Nash, an influential blogger and tech entrepreneur, sees a couple of main drivers for inflation. For example, decreased capital investment in oil

and gas, spurred by lower investor appetite, will raise energy prices during a transition to renewable sources. Wages may also rise, in part to meet social commitments and tackle income inequality, a major goal of ESG's social component. Finally, competition for green raw materials like cobalt, nickel, and lithium—all components of the latest generation of batteries and of everything from aircraft to plumbing fixtures to electric vehicles—could push their prices skyward.

And while no serious proponent of green policies claims the process will be either easy or free, there has been a tendency to dismiss the possibility of inflation as incidental. For example, Ann Pettifor, the much-quoted author of 2019's *The Case for the Green New Deal*, argues that all this green progress will “pay for itself.” Bernie Sanders, Alexandria Ocasio-Cortez, and other left-wing pols make similar assertions. And then there are those like Dave Levitan, author of *Not a Scientist: How Politicians Mistake, Misrepresent, and Utterly Mangle Science*, who points out that the Green New Deal may be expensive, but, as the title of his *New Republic* article says, it “costs less than doing nothing.” True, but who is arguing that we do nothing?

In the long run, one could make the case that any expense is worth the cost of avoiding human extinction. But such attitudes store up great trouble for later by providing easy “gotchas” for opponents of a comprehensive approach to climate policy. The minute there is any inflation, after all, Republican lawmakers could redouble efforts to dismiss climate change remediation as a liberal hoax, led by brokers and financial players who still see profits to be wrung from industries like conventional oil, coal mining, and fracking.

Hedge funds, after all, are already jumping on this particular bandwagon. While asset managers like BlackRock or State Street and global banks like Goldman Sachs, J.P. Morgan, or Citicorp cannot ignore the momentum for ESG among investors (and, increasingly, regulators), hedge funds remain somewhat immune. Their focus on raising money from large, independent investors has created an opening for anti-ESG investment opportunities, especially in the oil and gas industry.

“It’s such a great and easy idea,” Crispin Odey, founder of London-based hedge fund Odey Asset Management, told the *Financial Times*. “They [big institutional investors] are all so keen to get rid of oil assets, they’re leaving fantastic returns on the table,” he said. The article noted that Odey’s European fund “is up more than 100 percent so far this year.”

Besides denial, there’s also the problem of rose-colored glasses. Countless studies claim to provide empirical evidence that the costs of addressing climate ills will be temporary and negligible.

Take the ESG-friendly trend of local and state jurisdictions’ beginning to require climate-related disclosures from large commercial buildings, now the law in New York City, Berkeley, Austin, and other cities—and being debated by the SEC. In Europe, the Sustainable Finance Disclosure Regulation has regulators policing the claims that fund managers make about the sustainability of their investments, an approach that quickly trickles down in the form of more expensive credit and even divestment.

All perhaps fine. But who will take the hit? Will investors absorb the compliance costs in the form of lower margins? Or will owners just pass the trouble on to renters—already facing increasing difficulties finding affordable housing?

Good green job creation—a tenet of the social and environmental components of ESG—is another area where the dart board might as well substitute for science. For instance, a 2017 study by Boston University economist Heidi Garrett-Peltier arrived at a formula for calculating the net gain in shifting from “brown” carbon-based energy jobs to “green” renewable industry employment. Her model found a net increase of five jobs for every \$1 million in investment (or subsidies) shifted from oil, gas, and coal to wind, solar, and geothermal.

Sounds great. But the rub is that the net gain she posited will be in “synthetic” industries—namely clean energy industries that do not currently exist” in

her model. The calculation may end up being correct, but it invites the kind of scrutiny that can derail serious progress.

There are also significant problems of definition. A December 2019 report by the Century Foundation argued for broadening the definition of green jobs beyond the standard established by the Bureau of Labor Statistics (BLS) in 2010. But even with a broader definition, we may ask, does a park ranger count? Probably (it does in both the Century Foundation and BLS definitions). An ESG fund manager? A bit less certain. What about the driver of a bus running on natural gas? Or a nuclear plant operator? Adding or removing a broad category like passenger vehicle jobs (which includes bus and taxi drivers), of which the BLS reported over 872,000 in the United States alone in 2020, can entirely invalidate the conclusions of any given assessment. Even narrowed to bus drivers writ large (162,850 in 2020, according to the BLS), the uncertain impact that their individual vehicles may have breeds imprecision.

In September, Brookings released a paper with a team of analysts' assessment of green jobs creation. The paper addressed the uncertainty surrounding green jobs forecasts by examining what the American Recovery and Reinvestment Act (ARRA), also known as the 2009 Obama stimulus, accomplished in employment with its green subsidies and other environmental initiatives. "Overall, we find that the effect of green ARRA on total employment emerges only in the long-run," the paper reported. "[T]he effect on total employment is often imprecisely estimated" because of this timing of the program's impact. The team found reasons to be hopeful about the jobs created by the act's green subsidies because it assumed future government policy would use tax incentives and other policy devices to buffer negative distributional effects.

It may well be that optimists' wildest dreams are fulfilled, and the ESG boom represents all upsides and none down. But more realistically, even those who like formulations like the Green New Deal should understand that the road ahead will be very bumpy, a lot of workers in carbon-intensive industries will be bounced off the back of the truck along the way, and the price

of almost everything that has been produced, delivered, or enabled by the carbon economy is likely to rise. And here lie real dangers.

### **Don't Dumb It Down**

Of course, some experts do warn that both inflation and labor displacement during the energy transition may be worse than expected. Take renewable jobs.

Here, dueling green jobs analyses abound. Consider an October 2020 *Forbes* article noting the "slightly different conclusions" of two studies comparing renewable energy and fossil fuel jobs. In a North America's Building Trades Unions survey, skilled workers in energy-related construction reported that oil and gas construction jobs had better wages and benefits, longer duration, and more job security and project consistency than those in clean energy. By contrast, a coalition of clean energy groups, using wage data from the BLS and the 2020 U.S. Energy and Employment Report, found that green jobs had better benefits than other private sector jobs and paid as well or slightly better than fossil fuel jobs.

These green jobs could turn out to be well paid, of course, but that assumes renewable energy winds up costing a good deal more than current trends suggest. It's simple math: high prices allow for high-paying jobs. And if the government wants to buffer the public against those high prices, it will mean higher taxes. There's really no other way to square the circle.

In terms of inflation, green price hikes are already being "priced in," as investors say, by many market professionals. The Man Group, for instance, a London-based brokerage, sees this inflation as such a certainty that it has stood up an investment vehicle to make money by hedging the performance of companies affected by these green price fluctuations. A recent note to investors from TwentyFour Asset Management, another denizen of the City of London, confirms the sentiment: "The pressure exerted on corporates to

make significant reductions to their environmental footprints is unlikely to abate, and the number of companies committing to net zero-carbon pledges is rapidly increasing. While generating a positive outcome, such a policy is guaranteed to engender higher costs.”

This is not an argument against pursuing such policies, merely one for being honest about the downsides. If this were a typical political initiative—a proposal to lower taxes, for instance, or to provide a new benefit to a specific industry—downplaying the difficulties wouldn’t matter as much. In democracies, at least, by the time the true impact can be measured, the politician behind it has moved on.

But even a casual look at an initiative like ESG, which seeks to reveal and tame the behavior of large corporations for the rest of time, should suggest this is no transitory issue. ESG disclosure not only aims to spotlight environmental impact (carbon footprint, water, and waste), but also social (labor rights, racial and gender pay equity, worker safety) and governance (transparency, executive pay, board and staff diversity, and more).

This is all going to cost money, and history suggests neither shareholders nor the owners of commercial real estate nor the C-suite of senior executives will suffer. Academic studies routinely demonstrate that companies that perform well on ESG metrics tend to outperform their lagging peers. But that is better news for company owners than customers. To take just one example, imagine the cost of refusing, for instance, to source garments from Southeast Asia because a firm discovers abusive labor and environmental practices hidden in its supply chains. Shifting production from, say, Bangladesh or Myanmar to Mexico or Brazil will entail major increases in the price of each commodity and a lot of economic dislocation in those places. Multiply that effect by millions, and perhaps tens of millions of instances, and the effect on prices will be inevitable—even as the C-suite grows richer.

It may be tempting to elide that reality in service of the ultimate goal, whether climate resilience or income equity. No medals are awarded for being

blunt about these things. Recent history throws up the case of Hillary Clinton, who spoke of putting coal mines and the miners who work them out of business. It went down very badly for her. But those leading the fight to mitigate and reverse climate change must nonetheless be comfortable with the downsides of what they propose, because failing to do so could bring even worse trouble.

So, the basics:

ESG-driven investment could be a start to plans that will require trillions and trillions of dollars, which will in turn require tax hikes to fund enormous increases in government research and development, international climate mitigation and resettlement, and new regulatory enforcement mechanisms.

There also will be mass displacement of some types of workers, particularly those in carbon-intensive industries—and they are unlikely to find comparable work in renewables, at least without moving to a different location and undergoing extensive training. That will make ghost towns out of some petro-reliant communities and could lead to failed states in some parts of sub-Saharan Africa and the Middle East that cannot transition away from their reliance on oil and gas.

And there will be inflation, which, at the moment, has come to be one of the most politically salient and serious short-term threats to the success of global climate efforts.

Acknowledging all of this with empathy and an active plan to remediate the worst pain has to be a big part of these efforts. McKinsey & Company found in a 2020 survey that 60 to 70 percent of participating US consumers said they were willing to pay more for consumer goods that were sustainably packaged. People may also tolerate increases in prices during the transition period away from carbon-based fuels. But they will lose patience if today’s happy talk proves too easy to ridicule when the going gets tough.



The ESG movement will remain subject to criticism, and the lack of standard, agreed-upon ways to rank and rate company behavior will provide ample ammunition to its enemies. It may be that regulators, spurred by activist jurisdictions like the European Union and California, will eventually standardize how such judgments are reached.

In the meantime, though, those who genuinely hope that the world's nations will meet their climate commitments need to insist on a clear-eyed message about the costs of getting to net zero, including the higher prices that are inevitable during the transition period. The truth, they say, will set you free. Let's make sure we start telling it fully soon. //

## THE COMING “MEAT VORTEX”

*MEAT IS THE THIRD RAIL OF CLIMATE POLITICS;  
HERE'S HOW TO BREAK THE CYCLE*

ALEX SMITH

**M**eat is a touchy topic.

At the beginning of 2021, right-wing media jumped on a rumor that President Joe Biden would force American consumers to reduce their red meat intake. The rumor was false, but the backlash was nonetheless swift. Conservative politicians, pundits, and organizations immediately denounced meat reduction as “un-American.”

Their reaction echoed the outcry two years earlier when a leaked document about “green new deal” legislation suggested that, to address climate change, Americans would need to eat far less beef. Public anger was so strong that climate advocates had to spend the next two years ensuring that the real Green New Deal would leave hamburgers alone.

But serious environmental policy can't do that. Agriculture is responsible for approximately 10 percent of US greenhouse gas emissions and as much as 25 percent of emissions globally. Meat is responsible for a plurality of agricultural emissions, as well as serious water and air pollution, increased morbidity from overconsumption, deforestation due to high land use, and biodiversity loss. Not all meat is equal in its environmental harms: beef production is the largest user of land and produces emissions four times that of pork and 14 times that of chicken per unit of final product in the United States. But the sector as a whole has a long track record of deplorable labor conditions, anti-social-ecological behavior, and grotesque animal treatment.

And yet animal protein remains enduringly popular, and any policies that suggest a personal responsibility to avoid it or that would result in an increase in its price are largely dead on arrival, as the leaked "green new deal" document showed. Meanwhile, systemic reform of the meat industry consistently bumps up against the fact that extremely profitable producers hold outsized political power in agricultural states. Meat, in short, may well be the third rail of climate politics.

But there are lessons that can be learned from the relative success of other climate policies. The United States needs to replicate, for meat, the politics that have allowed clean energy to get cheaper and opened political space for further innovation—in short, what journalist Robinson Meyer dubbed the "green vortex." As Meyer explains in *The Atlantic*, the "green vortex" is a virtuous cycle: as green "technologies develop, they get cheaper. As they get cheaper, more companies adopt them. As more companies adopt them, their leaders grow more comfortable with climate policy generally—and more supportive of pro-technology policy in particular. As more corporate leaders support climate policy, coalitions change, governments can pass more aggressive measures, and the cycle expands and begins again."

We need a "meat vortex."

## The Limits of Meat Politics

American meat politics have always been hard, and new regulations have consistently focused on getting Americans to eat more rather than making the industry more sustainable. Even the most important pieces of meat regulation in US history—the Federal Meat Inspection Act of 1906 (FMIA) and the Packers and Stockyards Act of 1921 (PSA)—were about protecting consumers' access to meat rather than limiting it.

Inspired in part by Upton Sinclair's *The Jungle*, the FMIA sought to protect consumers from tainted meat products by setting standards for sanitation and mandating that livestock be inspected prior to and after slaughter. But FMIA's scope did not match the critique that Sinclair had lobbed at the meat industry. Sinclair had hoped that his portrayal of the brutal labor conditions and stomach-turning filth of the Chicago meatpackers would inspire a shift in cultural attitudes about meat and, more importantly, capitalism.

Although *The Jungle* was immediately influential—and has remained relevant as an artifact of early 20th-century Progressive muckraking in the decades since—it did not inspire the US public or lawmakers to rethink their reliance on meat or on highly exploited, often immigrant, low-wage laborers. Instead, they saw it as a call to make sure that the meat they still wanted to consume wouldn't make them sick. As Sinclair famously quipped, "I aimed at the public's heart, and by accident I hit it in the stomach."

The PSA was another piece of legislation aimed at protecting consumers' access to meat rather than diminishing their demand for it. The PSA is sometimes seen as a product of Progressive Era antitrust attitudes, but it was just as much about the meat price shocks associated with the United States' entering World War I. The act established rules and regulations to limit corruption among the major meat-packers of the time, making sure that they couldn't control both the stockyards that held livestock and the processing facilities that purchased the animals. In that way, the PSA curbed

the power of the major meat-packers not to reduce meat consumption, but rather to keep meat prices low.

Although American meat politics has mostly centered on greater and safer consumption, there have been exceptions. In 1958, President Dwight Eisenhower signed the Humane Methods of Slaughter Act into law. The act required slaughterhouses to anesthetize or stun animals prior to slaughter to minimize their suffering. The bill was one of the first successes for the animal rights movement, which catalyzed popular support for the act by framing American consumers as moral actors, who ought to live up to their conception of the United States as an inherently principled place.

While the act required some shifts in the process of slaughtering animals, it sidestepped many problems (notably, poultry has never been included under the act's legal protections) and produced little change in terms of consumption, price, or convenience because it solely addressed the practices of slaughter rather than questioning the act of slaughtering itself and thus drew little ire. As a result, it sits comfortably with the pieces of legislation that came before it. Since each bill was passed, they have been amended, but never to the extent that the average meat consumer could tell the difference. And that was perhaps the point.

Today, meat might as well be synonymous with unsustainability. High emissions, degraded and unhealthy public waterways, foul-smelling and lung-damaging air pollution from manure pits, and COVID-19 outbreaks at processing facilities are all part and parcel of the cheap meat many love. Animal agriculture is in dire need of real reform.

### **Stuck in the Middle, Today**

Recognizing the many harms associated with animal agriculture, activists have recently called for real political action. From environmental and family farm advocacy groups taking aim at agribusinesses they deem responsible

for the ecological and economic degradation of rural America, to animal welfare activists seeking to improve the lives of the billions of animals that are raised and slaughtered for food, to labor advocates who organize to improve the brutal practices and poor working conditions at livestock facilities and meat-processing plants, and, finally, to consumer welfare advocates and antitrust groups that are concerned with price-fixing and other anti-competitive and anticonsumer activities from meat companies—all these groups hope to put the kibosh on big meat and curtail the excesses of the industry.

But those looking to regulate meat today find themselves in the same trap as their FMIA- and PSA-era predecessors: they're caught between the price that consumers pay; the costs of production levied on workers, animals, land, water, and air; and a powerful meat industry. In a recent essay, journalist Jenny Splitter summed up this problem well, writing, "there really isn't a set of solutions where consumers can just avoid thinking about the food system and not make any changes at all." Everything in meat is a trade-off, and most ways to deal with the problems associated with meat's production entail raising consumer prices.

Three recent efforts to regulate the industry highlight these meaty tensions and trade-offs. The first is California's Proposition 12, passed by public referendum in 2018, which bans meat produced with the use of gestation crates. The second is US Senator Cory Booker (of New Jersey) and US Representative Ro Khanna (of California)'s recently reintroduced Farm System Reform Act. This legislation aims to limit and, in the future, ban concentrated animal feeding operations (CAFOs), otherwise known as factory farms, and make meat companies internalize their externalized costs—pay for their emissions, local pollution, the healthcare and welfare of their workers, and the rest of the costs borne by the public for its addiction to cheap meat. The third is the Biden administration's apparent intent to put antitrust pressure on meat companies through new rules at the Grain Inspection, Packers and Stockyards Administration (GIPSA) to keep meat prices low.

These are all products of the recent acceleration in meat politics, yet they will do little to address the industry's real problems. Proposition 12 is a small win for animal welfare that may create more animosity toward the animal welfare movement. The Farm System Reform Act is a performative national bill that will not pass in Booker's wildest dreams. And the new GIPSA rules may benefit smaller producers but will allow systemic problems to persist. Not only are all three at odds with each other, but none can do much to mitigate the problems associated with meat production.

Take California's Prop 12. Despite pushback from the pork industry, banning gestation crates for the production of meat sold in California does little to actually alleviate the suffering and environmental harms of the industry. Gestation crates, which limit the movement of and prevent jostling among pregnant animals, are just one of many practices that diminish the welfare of animals that go through factory farms and other animal agricultural facilities. Of course, banning them in one market is a start. The animal welfare movement ought to be happy with the success of Prop 12, but it is a win in one small battle in a larger war that will rage on as long as the American demand for meat remains high. And it is a victory that will come with a cost: cultural backlash to increased prices that may contain the seeds of future opposition to similar incremental reforms.

Meanwhile, it is worth noting that Prop 12 passed as a referendum. Thus, while it does show that at least some people are willing to sacrifice a bit of money for the welfare of animals, it also reveals the limits of lawmaking. At the national level, where there's no possibility of a referendum, measures are even more watered down. Just look at the Farm System Reform Act. In the unlikely event it passes, the act would not have the radical environmental or welfare benefits that its proponents may hope. By focusing on farm size, and not on the most harmful practices of farms, the Farm System Reform Act will do little to improve the environmental impact or labor welfare of meat production. After all, getting rid of the largest CAFOs will simply disperse the harms of animal agriculture, not reduce them. If highly lucrative meat giants are forced to shutter their largest facilities, they will surely open

lots of smaller ones rather than closing down entirely. There's little reason to think that such a reshuffling of the industry will somehow be better for animals, workers, or the environment.

Take the relatively straightforward problem of hog manure. CAFO facilities across the American South and Midwest produce more manure than can be used as fertilizer on nearby farmland. That issue isn't going away, even if the CAFO facilities grind to a halt. If a single hog CAFO in northern Iowa is replaced with five smaller facilities in the same general area, there still would not be enough cropland to safely spread the manure, and water and air pollution would continue unabated. Enforcement of existing regulations might even prove more difficult in a less centralized production system.

No matter its potential impact, the Farm System Reform Act is unlikely to pass in its current form. When Booker originally proposed it in 2019, it received little support and ultimately flailed into oblivion. Even under a new president, the pathway to passing the law today is as winding as it was the first time around.

It is telling, moreover, that none of these three efforts has much to say about the demand side of the meat equation. For much of the past century, per capita meat consumption (using the US Department of Agriculture's proxy measure) has steadily risen. While beef reached its peak in the 1970s and has declined fairly significantly since, and pork consumption has remained flat since the 1960s, per capita chicken consumption has increased dramatically from the 1940s to today—now at a level higher than both pork and beef. That means that the total amount of meat consumers are eating is staying steady or is slightly on the rise—and that despite a concurrent rise of veganism in the United States from around 1 percent of the population to between 3 and 6 percent over the last decade. Indeed, American consumers are blasting their way through chicken wings at a faster pace than poultry producers can supply—especially with COVID 19-related production lulls. It is such high demand for meat products that gives large meat firms—with their long history of questionable practices, political savvy, and ruthlessness—outsized power to begin with.

And so the meat conversation is stuck in the same place it has been for a century. The Right has no interest in touching it, and the Left can't, unless it is to tinker at the margins in ways that don't affect prices or consumption. On that score, the content of the Biden administration's first foray into meat politics should have come as no surprise. In early September, the White House released a blog post decrying market concentration in meat processing. But unlike most activists focused on animal agriculture, the blog called for action from the federal government to make sure that meat prices remain low and that consolidation in the meat industry does not harm consumers' interests.

### Technology and Meat Politics

In *The Poverty of Philosophy*, Karl Marx wrote, “The hand-mill gives you society with the feudal lord; the steam-mill[,] society with the industrial capitalist.” Marx understood that technological systems helped create the political and economic realities of a given time.

And it is undoubtedly true that the technologies defining modern animal agriculture have shaped the structure of our food system—and the stuck politics surrounding it. The tools that have enabled mass-produced cheap meat have also been central to arranging a cultural-political obsession with that very same product. In *Red Meat Republic*, historian Joshua Specht shows how the meatpackers were able to combine technological progress—railroads, early refrigeration, and the modern corporation—with local, regional, and national politicking to become the industry giants that Upton Sinclair exposed in *The Jungle* and bring cheap beef to markets throughout the country.

In the years after World War II, the poultry and hog industries also took advantage of new technologies to scale production and drive the price of chicken and pork down. Incredibly low-cost chicken—and to a lesser extent its “other white meat” counterpart, pork—has reshaped the consumption patterns of the average American. While beef is still often what's for dinner, chicken and pork show up in many American meals now, too.

That counts as progress compared to a counterfactual in which the American appetite for high-emissions and high-land-use beef grew unchecked. But less so if the goal is for total beef—and meat—consumption to fall. Rather, meat has become yet another mass-produced consumer good. New cheap antibiotics allowed large, confined hog and chicken populations to avoid disease outbreaks, while also boosting animal growth rates. Improved breeding, biosecurity measures to keep both herds and humans safe from communicable diseases, and increasing standardization of breeding, management, and logistical practices turned live animals into widgets on an assembly line.

But technology can also break the United States' meat cycle today. That's been one of the promises of meat alternatives, like popular plant-based burgers from Impossible Foods and Beyond Meat, and the more futuristic cultivated—also known as lab-grown—meat that has yet to reach commercial markets other than in Singapore. Meat alternatives, especially cultivated meat, have a high potential to change how Americans consume and think about meat.

Critics are quick to point out that meat alternatives have so far been slow to reduce meat consumption, arguing that they are likely to displace already existing vegetable alternatives rather than animal meat to the benefit of a few tech investors and start-up founders. But if cultivated and plant-based meats eventually become as cheap or cheaper than conventional meat products—all while keeping quality and convenience high—it could prompt a meaningful shift in the production of animal meat. As political economist Jan Dutkiewicz and historian Gabriel Rosenberg recently argued, broad adoption of meat alternatives could have major implications for politics around agricultural land use in the United States. They argue, for example, that land no longer needed for meat production could be used towards progressive ends, such as the creation of worker-owned farms, returning land to Indigenous nations and peoples, rewilding, and other conservation uses. In turn, the way American consumers weigh animal ethics in their choices between meat and its alternatives could also change.

Even beyond that, though, it could be the start of a meat vortex. Meat alternatives have largely been a private venture, but the success of the industry—and, arguably, the ability of the United States to abate the environmental harms stemming from agriculture—is dependent on federal government support for the technological innovation and industrial production that can bring plant-based and cultivated meat to the masses. Pursuing the innovation and industrial policy that can make meat alternatives tasty and affordable would potentially overcome both the political barriers and consumer fears that have blocked or limited other meat politics. It would also quickly expand what is possible technologically. With each new innovation happily adopted by consumers and producers, new space would open up for further changes. And so a cycle would start: high-quality cultivated meats and plant-based alternatives alleviate the fears of more consumers, who then demand more of the products, so producers build more capacity and benefit from economies of scale, which lowers prices, which results in more consumers giving the products a try, and a reduction in animal meat consumption.

Like Meyer's green vortex for renewable technologies, triggering a green vortex for meat could move slowly and then all at once as existing meat alternatives are quickly improved using better industrial practices, ingredients, and technologies.

A world in which plant-based and cultivated meat is tasty, nearly universally available, and as cheap or cheaper than conventional meat is also a world with vastly different political and cultural possibilities. More than changing the politics of land use, the ethics of eating animals, and the technological capacity of alternative meat firms, a reduction in animal meat consumption in favor of alternatives could create the political opportunity for stricter regulation of meat production and agriculture-related climate action, without the risk of consumer pushback. With new technologies come new political economies. To butcher the phrase: the meat technologies of the 20th century give us a society with a meat lobby; alternative meat gives us a society with environmental protections.

On the industry side, there would also be change. Facing real competition from cheap meat alternatives, producers of meat from animals would either have to pivot themselves or find other technological solutions to reduce greenhouse gas emissions. Here, incentives for technological innovation could, too, lead to a cycle of greater change. But, for almost all of this to work, alternatives must actually replace meat consumption, reducing the power of the meat industry and enabling the kind of regulatory oversight that could force meat producers to toe the line without making regressive price hikes.

All of this is to say that, instead of pursuing marquee legislation that has slim to no chance of passing, those interested in curbing the meat industry's power should seek out the spaces and corners through which policies can slip. This would amount to a kind of *quiet meat politics*—that is, a politics that avoids political partisanship and culture warring in favor of creating a technological and infrastructural environment that can achieve long-term sustainable change—centered around public R&D investment, industrial policy, and subsidizing the good, rather than taxing the bad.

Over the past several decades, public investment in innovation and infrastructure has reduced the cost of low-carbon alternatives to fossil fuels and other existing technologies and allowed for modest, yet decisively important, emissions reductions. For meat, such a strategy could likewise drive cost reductions for cleaner, more ethical alternatives to animal meat, potentially reducing its consumption, making the remaining meat cleaner, and shifting the balance of political power away from meat production, all the while resisting the pitfalls of increasing prices and consumer culture war.

To be sure, a "meat vortex" may do little in terms of nonenvironmental concerns. It is unclear that labor practices would be better simply because consumers ate more meat alternatives, for example. Meat, like much else in American politics, is full of trade-offs. No single policy strategy can solve all the problems of animal agriculture in the short term, but breaking free of today's stuck meat politics is a necessary first step for any kind of reform. //

TECH TALKS / 02

## UNDER THE SEA

*FOR THE METALS COMPANY,  
THE FUTURE OF BATTERIES IS BLUE*

GERARD BARRON

**T**he future is green, the saying goes, but few realize that a green future is metallic. For example, according to the International Energy Agency, an offshore wind farm requires nine times more critical metals to build than a coal-fired plant, an electric car five times more compared to a gas-guzzling one. To solve climate change, then, the world will have to mine more critical metals than it has in all of human history.

The good news is that metals are recyclable, and once the world has built up sufficient stock, it should be able to largely rely on those and stop taking metal from the planet. The bad news is that it will take until the latter part of this century to get there. In the meantime, we all will have to contend with the global impacts of a rapidly growing extractive metal and mining industry.

First, geopolitically, China dominates the supply chain of critical battery materials, which means that any green transition could entail many countries trading hard-won energy independence for mineral dependence and supply chain insecurity. Second, with the whole world transitioning to clean energy at the same time, supply shortages and price hikes are expected in several key metals such as copper and nickel, with both recently hitting several year price highs. Third, add in the hard-to-compress environmental and social costs of mining abroad—social displacement, child labor, human rights violations, landscape disfigurement and deforestation in some of the most biodiverse places in the planet, destruction of carbon sinks, and the generation of absurd amounts of toxic waste—and we have an issue that leaves many politicians and environmental activists either in denial or deeply conflicted.

Witness, for example, proposed US mining permits being denied or subjected to protests because of impacts on biodiversity and indigenous people (for example, Pebble, Resolution, Twin Metals, Thacker Pass) even as US automakers have announced gigafactory plans with sufficient battery cell manufacturing capacity to meet the goal that 50 percent of all cars sold are electric vehicles by 2030. But where else will the corresponding supply of critical battery materials come from besides new mines?

While all metal extraction causes damage, developing an unconventional source of critical battery metals could help solve many of the challenges. A solution The Metals Company has put forward is seafloor polymetallic nodules—loose potato-sized rocks covering the seafloor in the Clarion-Cliperton Zone (CCZ), located ~1,300 nautical miles from San Diego, between Hawaii and Mexico. These may represent the largest and highest-grade source of four battery metals (nickel, copper, cobalt, manganese) on the planet.

These nodules offer four strategic advantages. First, they are a large and scalable source of materials. Already, The Metals Company's two exploration areas alone contain in situ metal equivalent to the requirements of 280 million cars, the entire US passenger fleet. Second, since the exploration

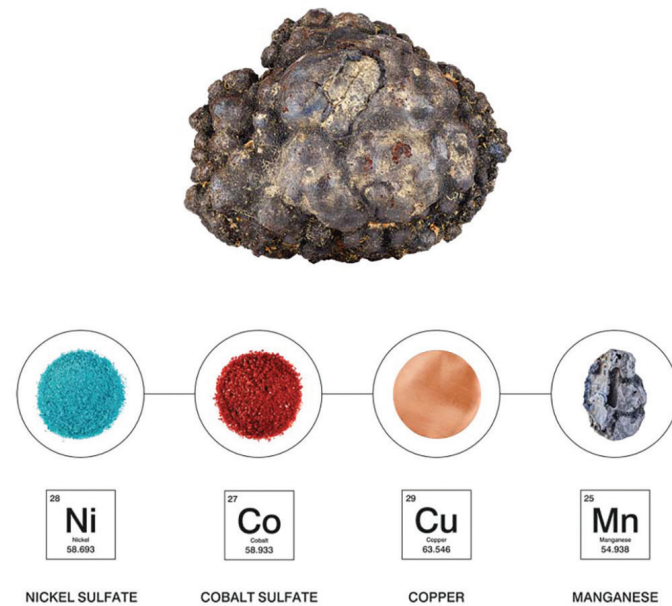


Image: The Metals Company/ 2021

grounds are located off the US West Coast, they can be easily transported stateside, recapturing upstream steps in the battery supply chain from China, which processes and refines 80% of battery metals today. Third, producing battery components from nodules in the United States would reduce the current supply chain from 50,000 miles to approximately 1,500 miles, reducing the possibility of shortages and logistics delays. Finally, tapping these fields will increase the ability of US suppliers to meet their environmental, social, and governance (ESG) goals, since their use can eliminate solid processing waste, compress CO<sub>2</sub> emissions by 70-90%, requires no deforestation, no social displacement, and no child or forced labor, since they will be collected by seafloor robots and surface production vessels.

Over 20 countries sponsor nodule exploration contracts in the CCZ today, including China (largest holder) and France (ramping up investment as part of the France 2030 Investment Plan).

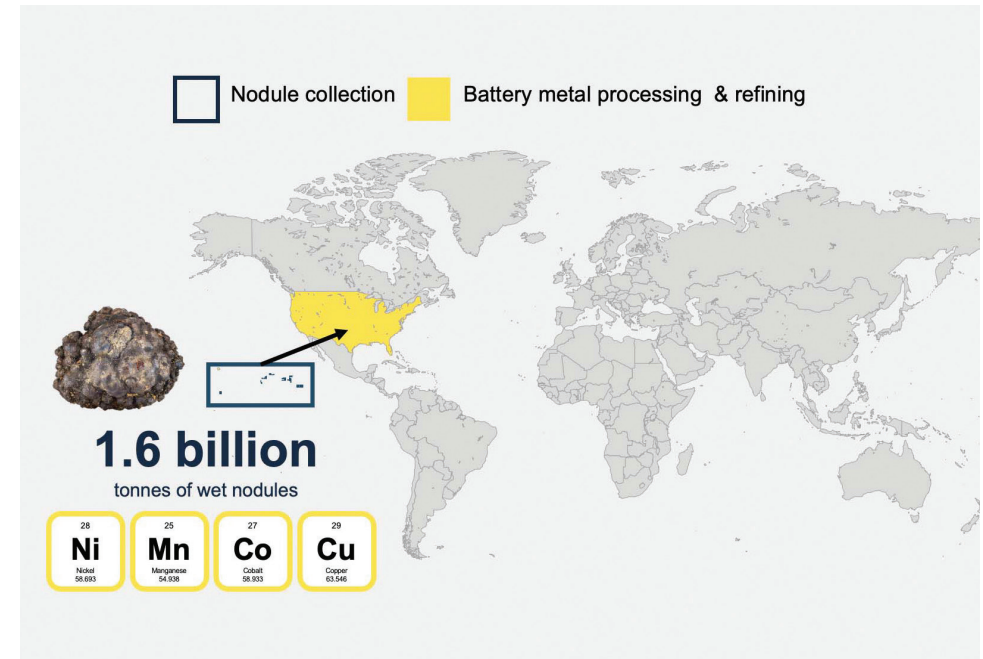


Image: The Metals Company/ 2021

The industry is still in the exploration phase and regulations to enable commercial production are being finalized by the International Seabed Authority (ISA), an intergovernmental organization established pursuant to the United Nations Convention on the Law of the Sea. This nascent industry has also attracted well-organized and effective opposition from ocean conservation NGOs, who advocate for a moratorium on what would be a new extractive industry in the deep sea. A comprehensive assessment of the environmental impact of nodule collection on the deep-sea environment is a prerequisite for being able to secure an ISA exploitation contract, and these studies are still ongoing. If the ISA is satisfied that nodule collection operations would not cause serious harm on regional scales, then commercial production could start as early as 2024. //

*Gerard Barron is chairman and CEO of The Metals Company*



ESSAYS / 07

# GREEN GROWTH WON'T KILL THE PLANET

*NOW WE HAVE THE DATA TO PROVE IT*

FRED PEARCE

**T**he solutions for the 21st century's two biggest challenges—fixing climate change and securing a decent standard of living for the billions suffering from widening income disparities and resource depletion—have often seemed at odds.

Environmental pessimists have long claimed that fixing climate change would require sacrificing ambitions to level up the lives of the world's poor—certainly in a world with a population expected to approach 11 billion people by century's end. Meanwhile, those focused more on development have pointed out that, to improve the lives of the world's worst off, consumption and emissions will necessarily have to rise.

Ecomodernism stepped into the fray to dispute both premises. The 2015 Ecomodernist Manifesto proclaimed “the belief that both human prosperity and an ecologically vibrant planet are . . .

possible,” through a decoupling of “human well-being from environmental destruction.” Indeed, it says, they are “inseparable.”

But, as the old adage has it, you can only manage what you can measure. And if the optimistic instincts of ecomodernism are to hold sway in public discourse and policy making, they need better metrics to make the case. For while the world has myriad means of assessing progress towards fixing climate change—and teams of scientists permanently focused on the task—it has long lacked an agreed statistical measure of what securing a decent standard of living for all might entail. Does it, for instance, require adequate food, shelter, and health care? What about microwaves? Efficient transport? Internet access and cellphones?

Without a working definition, there has also been no clear understanding of what actual trade-offs—or synergies—might be entailed in achieving decent living standards while fixing the climate.

At least until now.

In recent research, Indian-born technologist Narasimha Rao, with a widening circle of collaborators in Europe and the United States, has developed the first working definition of a decent living standard in the 21st century. The bad news is that his analysis leaves many more of the world's citizens below the poverty line than estimates derived from income or other indices, such as health or education, have previously suggested.

But the great news, outlined in the group's latest analysis, published in September in the journal *Environmental Research Letters*, is that it would “not, in itself, pose a threat to mitigating climate change at a global scale” for the entire world to clear his bar. It may be that not all such needs can be met in the same way they have been in the rich world—at least not sustainably. Mobility, for instance, may mean a bus or motorbike rather than a private automobile.

But at a fundamental level, decency is not incompatible with sustainability. And that should be welcome news.

### Hard Material Needs

Rao's findings ought to have a profound impact on the divisive discourse on climate change, which continues to pit the attempts of developing countries to eliminate poverty by mimicking Western modes of development against many in the West who see this path as ruinous for the planet and ultimately self-defeating for the poor. They are both wrong. In truth, there need be no incompatibility. Ecomodernists are right: humanity can have its cake and eat it, too.

Rao, who grew up in a middle-class family in Mumbai but with poverty around him, is now at Yale University and the International Institute for Applied Systems Analysis (IIASA), an Austria-based intergovernmental think tank. He has spent years as what he calls an "interdisciplinary scholar," addressing both technological advances and social equity and how they might interact. He says that, until recently, little climate-change analysis, social research, or futurology has seriously addressed whether climate and living standards can be fixed together. Ecomodernists stepped in with strong belief in the power of transformative technology to both deliver abundant energy and break the umbilical cord linking prosperity to pollution. But theirs is a predominantly supply-side and top-down perspective, which can lead to a presumption that the benefits of prosperity and abundant energy will trickle down to deliver decent living standards for all.

Critics like Anna Walnycki and Tucker Landesman at the International Institute for Environment and Development say a top-down perspective risks increasing social and economic inequality unless "policies are shaped around the needs of ordinary citizens," especially those in low-income urban communities. Moreover, as Rao points out, energy inequality around the world is even greater than income inequality. And by some measures, more income seems



**Narasimha Rao**

Image: Yale

to only increase energy inequalities, according to analysis by researchers at the University of Leeds.

To grapple with such issues, Rao's work, centered in the Decent Living Energy project, takes a bottom-up approach. It starts with an assessment of the hard material needs for eliminating poverty—particularly for the billion-plus people living in informal urban settlements without decent housing, sanitation, water, and other basic services—and does the work of separating out the energy needs for eradicating poverty from those to meet the demands of affluence.

In this way, Rao has added real numbers to the idea of a decent living, upending past global measures of poverty, which were removed from the real lives and material needs of the poor. The most widely used is based on the single metric of daily income per head. Once a dollar a day, the cutoff has now become \$1.90 per day for extreme poverty, with a higher threshold of \$5.50 per day used by the World Bank for upper-middle-income countries. Almost half the world's population does not achieve this standard. But what you can buy with those dollars varies vastly round the world, as does what you need to purchase to achieve a decent standard of living. Other measures have looked to well-being outcomes, most influential among them

being the UN's Human Development Index, which is based on life expectancy, years of schooling, and income. But it does not set a threshold level, or measure what material requirements are needed to get to an "acceptable" (different from "good") outcome.

Rao, with his colleague Jihoon Min, attempts to do better by identifying a shopping bag of material requirements, or "satisfiers," that are as near as possible universal prerequisites for a decent modern life. They call these requirements "material conditions that people everywhere ought to have, no matter what their intentions or conception of a good life, or what other rights they may claim."

Those material needs fit into 10 broad indicators of basic human well-being: nutrition, shelter, living conditions, clothing, health care, air quality, education, access to information and communication services, mobility, and freedom to gather and dissent. A person who achieves them does not necessarily have a life that a wealthy person in the West would recognize as comfortable. But they would have a life that could be called decent and dignified.

Many of these requirements derive from widely accepted benchmarks, but others go further. For instance, nutrition requires not just sufficient calories, but also vitamins and minerals and a refrigerator to store food safely. There's also the need for a cooker that does not fill the home with smoke, part of the air-quality category.

Shelter and adequate living conditions require not just a roof over your head, but also sufficient floor space (depending on household size, typically 30 square meters per person), durable home construction, and sufficient heating and cooling equipment for "thermal comfort." Also required is "sufficient clothing to achieve basic comfort" and access to a washing machine.

Health care and living conditions requirements include on-premises sanitation and water supplies (50 liters per head per day), plus access to adequate health care facilities and a minimum of one physician per 1,000 people.

The social well-being criteria include not just nine years of education, but also access to communication networks including one phone and one television or computer per household. These new needs, Rao and Min say, may not appear essential to life, but are "globally desired by an overwhelming majority of people," so not to have them risks social disengagement and ostracism. The electronics need not be personally owned, they note, but access is vital.

The same holds for mobility, which they regard as necessary for social engagement and employment or selling wares. The decent living requirement is set at access to motorized transport, such as a bus or motorbike, sufficient for an average of around 25 kilometres per person per day.

Rao and his colleagues' analysis of needs is often surprisingly granular. Current thinking holds that households of a similar income level around the world generally want the same appliances. His household surveys nuance that. While most people in most places do want a TV, cellphone, and refrigerator, his study with Kevin Ummel found washing machines are less universally desired, and ovens and tumble driers even less so. Race, culture, and religion are all factors. Patterns also differ depending on whether people live in urban areas and on the status of women; urbanity and greater equality both drive up demand for appliances connected with cooking and washing. People who consume a lot of milk products—such as Sikhs in India—want a refrigerator more than those who do not.

White people, Rao and Ummel note, are more fixated on white goods—that is, large electrical appliances. But they care less about motorbikes and some cooking equipment such as rice cookers, which are much more widespread in Asia.

It is impossible to say what proportion of the world's population meets all Rao's standards—or none. Some places far outstrip the basics. The average American has almost six times the "decent" level of floor space and consumes almost seven times as much water. Germans average four and 2.5

times those “decent” levels, respectively. But Rao’s estimates suggest that only two-thirds of people have attained half of them, with nutrition the most achieved and mobility the least. In fact, “the majority of the global population does not currently have decent levels of motorized transport,” coauthor Jar-mo Kikstra of Imperial College London, has pointed out.

All this confirms findings from Rao and his colleagues’ analysis published in the September *Environmental Research Letters* that “more people are deprived of DLS [decent living standards] than are income-poor.” Worldwide, more than three billion people lack access to clean cooking options, space cooling, sanitation, and transport, and more than two billion lack cold storage, decent housing, and proper access to clean water.

In sub-Saharan Africa, over 60 percent of people do not have access to eight of the requirements for a decent standard of living, with deficits for cooling, sanitation, transport, water access, cold storage, housing, television, and clean cooking. In South Asia, over half the population lacks adequate sanitation, transport, cooling, clean cooking, water access, and cold storage.

Most standards are almost universally met in rich nations. Yet the data also show that a third of North Americans and 44 percent of Western Europeans miss out on transport needed for mobility, while in both regions about a tenth miss out on decent sanitation. This means that, around the world, in every corner of it, hundreds of millions of people need more, and no green transition that denies it to them could be considered sustainable or just.

### **The Cost of Decency**

But can the gaps in access around the world be filled—and without crashing the climate?

To be sure, creating a world where everyone can have a decent living standard will require new public infrastructure and more private energy use. As

Rao points out, much of the progress will only be achievable collectively—through public water supply and sanitation services, clinics, schools, public transit, cellphone networks, and so on. Much else will be best secured—and with lowest energy needs—collectively as well, with better public transport rather than an automobile in front of every house, for instance.

But the great takeaway is that truly essential needs are, as Rao says, mostly “cheap in terms of energy.” Doing some calculations based on the information in Rao and his coauthors’ *Environmental Research Letters* article, the infrastructure needed to meet decent living standards worldwide by 2040 will add less than 4 percent to current consumer energy demand. Half of that will be for improved housing, a quarter for public transit systems. Annual requirements to sustain those living standards would add a further 17 percent, making a total increase in energy needs to meet decent living standards of the world of just around 20 percent. That compares with an expected increase in energy demand, without ensuring decent living standards for all, of around 50 percent.

Put another way, these authors say, “essential energy needs to meet everyone’s basic needs . . . could constitute a small share of projected energy growth, namely, around an order of magnitude lower than current US energy demand.” And their analysis, the authors point out, assumes “only modest efficiency improvements, rather than relying on an ideal, high-tech future.”

The energy needed, in other words, may be even less than the headline figures suggest. For the poorest billion or so on the planet, reductions in deprivation will often come with reductions in energy use and environmental impact. Marta Baltrusiewicz and her coauthors at the University of Leeds have recently shown from studies in Nepal, Vietnam, and Zambia that the households with higher well-being indicators used more energy than households with lower well-being. Without access to electricity or gas, the researchers found, low well-being households burned more firewood and charcoal than their higher well-being neighbors, resulting in more pollution and deforestation. And lacking clean drinking water, they were forced to constantly boil

dirty water to make it safe. Overall, the study found that “households achieving well-being have 60%–80% lower energy footprint of residential fuel use” than the average in those countries.

The bottom line, according to Rao’s coauthor Alessio Mastrucci of IIASA, is that “we do not have to limit energy access to basic services. . . . even under very ambitious poverty eradication and climate mitigation scenarios, there is quite a lot of energy still available for affluence.”

Just how much, of course, matters a great deal for those of us in the rich world with energy-intensive lifestyles and a social conscience. But even before considering any energy technology transformation that can provide more power with fewer emissions, there is hopeful news.

The affluent still consume most of the planet’s resources, with the wealthiest tenth of the planet’s population consuming 20 times more energy than the poorest tenth. But there has been increasing discussion about whether some rich nations are reaching “peak stuff,” a tipping point beyond which material needs no longer rise with wealth—and may even fall. For example, Jesse Ausubel of Rockefeller University has long argued that Western societies in general are starting to dematerialize.

And the evidence is growing, as studies increasingly call into question the presumed ratchet linking wealth and energy demands. For example, Europeans consumed 18 percent fewer raw materials in 2020 than they did in 2008, according to the European Commission. The British government’s Office for National Statistics calculated that the personal materials footprint of the average Brit—in food, textiles, construction materials, metals, fossil fuels, and so on—fell from 24.2 metric tons in 2001 to 13.4 metric tons in 2020.

Some of this decoupling is due to long-standing trends in improved technological efficiency, combined with more recent digital innovation. A single smartphone replaces a computer, a compass, a newspaper, and an alarm clock—not to mention a radio, a camera, a magnifying glass, a flashlight,

and a music player. One optical fiber can do the work of a thousand copper phone wires. Global digital camera sales have declined by 87 percent in the past decade, as cameras in phones take their place.

Both public and private consumption patterns are changing in other ways, too. In the public domain, the assembly of infrastructure tends to peak as economies rapidly industrialize, and then falls. (That is why China has, in recent years, consumed 20 times more cement than America, and around eight times more steel too.) Even US president Joe Biden’s trillion-dollar infrastructure plans may not reverse this, since those appear to have less to do with cement and steel structures than broadband connectivity and power grids.

And American consumers are increasingly spending their money on experiences rather than on disposable material goods, according to McKinsey & Company analysts. Their findings suggest that, whereas prior generations defined themselves through their possessions, we now define ourselves more through our experiences, both real and virtual. The new car in the driveway matters less than the vacation you take with it. We don’t eat more, but instead go to more and better restaurants. We don’t buy ever more cheap furniture; we buy quality. Other modern lifestyle choices may also drive down material and energy requirements: eating less meat, going to the gym, and meeting up remotely rather than in person, for instance. People were driving less even before the COVID-19 lockdown.

If such trends continue, and if energy becomes less carbon-intensive, it would not be a stretch to imagine a world that can achieve decent living standards for all with few environmental tradeoffs.

### **A Case for Optimism**

None of this is to say the future is easy. But Rao believes he has at least cleared up one question. His team, he says, wanted to know, “Can we reduce energy use to meet the ambitions of the Paris climate agreement without

compromising peoples' basic needs?" And the answer, he says, is that there are "significant opportunities . . . for growing sustainably, with less emissions." Even he was surprised by the finding. "We didn't expect that energy needs for a minimally decent life would be so modest, even for countries like India," he said elsewhere.

His work, of course, does not show *how* we can attain decent living standards for all. Julia Steinberger, at the University of Leeds, says, "in our current economic system, all countries that achieve decent living standards use much more energy than what can be sustained if we are to avert dangerous climate breakdown." Ecomodernists will see the potential lying at least as much in a massive technological transformation towards cheap and abundant low-carbon sources of energy. But either way, it does ease the path dramatically if everyone knows more clearly than before what is actually required and what is possible.

Since Rao began publishing his findings, the World Bank and Intergovernmental Panel on Climate Change have been among those to have called on him to help them integrate his ideas into their strategies for climate and development. "The World Bank sees it as a way to develop concrete strategies to align poverty eradication efforts with climate mitigation, because we highlight synergies between the two sustainability goals," he says. He identifies three investment measures of global applicability that "are pro-poor and can reduce greenhouse gas emissions: support for urban public transit, quality public housing based on local materials, and encouraging diverse diets."

To be sure, this new analysis raises as many questions as it answers. While it suggests collective public endeavors will be as important as individual wealth, it doesn't say how the world can best go about achieving decent living standards for all. Nor how best to reconcile them with meeting the aspirations of those who already have decent living standards. Still, Rao's work dramatically changes some of the math, and creates a more optimistic vision of the possibilities for meeting basic human needs without wrecking the climate on which we all depend. //

## THE BLUE-GREEN DREAM

*IN PREPARING FOR FLOODS,  
COPENHAGEN REALIZED THE VALUE OF  
AESTHETICS. BUT WILL IT BE ENOUGH?*

ELISABETH BRAW

In 2009, the Copenhagen City Council decided that climate change was real. About time: the same year, close to 115 world leaders gathered there as part of the United Nations Climate Change Conference to say as much—and to sign the Copenhagen Accord, which set a worldwide goal of limiting rising temperatures to 2 degrees Celsius above preindustrial levels. For the city, climate change was also becoming more personal; faced with the prospect of extreme flooding burying low-lying cities like the densely populated Danish capital, Copenhageners decided that it was time to preempt Mother Nature.

Denmark is distinctly flat. Its highest point is a mere 171 meters above sea level. That never much seemed like a problem; for centuries, Danes had managed to build an increasingly

prosperous society despite occasional flooding. But suddenly, low elevation mattered a great deal.

That's why the Copenhagen City Council decided that unless they started adapting their city for a rising sea level and regular extreme-weather events, it would become uninhabitable. As the European Commission noted in a 2010 report, "precipitation in Copenhagen is expected to increase by 30 to 40% by 2100, while water levels around the city are likely to rise by 33 to 61 cm over the next decade." With each flooding would come impassable streets, ruined houses, and a disabled underground system. And every time, after the weather crisis had passed, all those things would have to be repaired at great expense. And so the city's climate-change adaptation plan was developed, with the aim of making the city livable for the long term—and carbon neutral to boot.

"Drainage systems will be significantly improved," the planners promised, "so that they are capable of coping with major downpours." A range of new infrastructure would be created "for better rainwater management—such as rain and sewage reservoirs, and sustainable urban drainage systems. Contaminated run-off from the city's roads will also be treated." The council went further to promise "pocket parks," green roofs, and green walls.

It sounded nice. But in 2011, before these projects had even gotten off the ground, a catastrophic cloudburst—extreme flooding—hit the city; it drowned large parts of Copenhagen under a meter of water and left the nation with one billion dollars in expenses. For the planners, the lesson was that new drain systems and walls wouldn't be enough. They would have to work with nature rather than against it, and so to the plans were added the creation of new meadows, miniature hills and valleys, and parks that could also serve as rain basins—call it "blue-green" development for the combination of water and vegetation, as opposed to the usual gray.

It was all going to be expensive, but city decision makers and officials compared it to the cost of doing nothing: 60–90 million dollars each year for

the rest of this century. They also knew that creating appealing solutions, not merely functional ones, would be necessary; policy makers believed that taxpayers would be happier paying for climate change adaptation—and CO<sub>2</sub> reduction—if doing so also resulted in a more habitable city.

Finally, some five years later, in 2016 the plans came to fruition. The city was building its first climate change-adapted neighborhood. St. Kjeld, as the neighborhood is called, saw much of its omnipresent asphalt torn up and replaced with pocket parks—hilly meadows separated by elevated walking paths—and so-called cloudburst boulevards lined by elevated sidewalks. The blue-green solution was not just more attractive than the massive sewers that would otherwise have been needed; it also cost less. In adopting this solution, the architects and city planners went against decades of urban design practice by not removing little elevations to create a perfectly level area on which concrete could be poured, but by instead creating, with natural means, little hills and valleys. "It's a huge amount of water that we'll have to redirect when the next cloudburst hits," Flemming Rafn Thomsen of Tredje Natur, the Danish architecture firm chosen for the project, told me at



**Raised walkway and stormwater storage system in Scandiagade, Copenhagen, 2021.**

Image: Øystein Leonardsen/  
Copenhagen municipality.



Rainwater channel in Copenhagen's Enghaveparken, 2021.

Image: Øystein Leonardsen/Copenhagen municipality.

the time. "We looked at St. Kjeld and thought, 'That's a lot of asphalt with no function. We can use some of that space for water.'" And so the boulevards were designed to collect rainfall and lead it to parks or the harbor while allowing locals to safely move around on elevated sidewalks.

Nearby, in the Copenhagen neighborhood of Sydhavnen, South Harbor, city planners likewise decided to kill two birds with one stone by beautifying a large dead-end street while turning it into an emergency water reservoir. "We created a raised boardwalk and eight sunken gardens, each with their own theme," Lykke Leonardsen, Copenhagen's head of resilient and sustainable city solutions, told me in September. "One is, for example, a butterfly garden. Each of these gardens can be filled with rain, but the gardens have also turned the street into an inviting place when it isn't pouring out. You always see people walking on the elevated sidewalks. And you never see any garbage! You might think that eight big holes would invite garbage. But people appreciate this space."



Sports arena and water storage system in Copenhagen's Enghaveparken, 2021.

Image: Øystein Leonardsen/Copenhagen municipality.

In Vesterbro, a third Copenhagen neighborhood, the city turned a depressing former sports field in a park into a sunken area—now attractive-looking and suitable for sports—surrounded amphitheater-style by rows of seating areas and strips of grass. When Copenhagen next floods, the area will function as a reservoir. The water will be kept and used for municipal purposes, including fountains and watering plants in city parks. "But the good thing is, if you're walking in the park, you can't tell that you're walking in a water reservoir," Leonardsen said to me. "You're just walking in a nice park. We want to create places that also work when they're dry and make these neighborhoods attractive and livable."

So what's not to like?



## Cities Opt for Nature

October 2021 brought not just fearful messages out of COP26 in Glasgow, but yet another reminder of why climate change adaptation is an urgent task—especially for cities. Early that month, 29.2 inches of rain fell on the Italian town of Rossiglione within 12 hours, the heaviest rainfall ever recorded in Europe. The rain fell so violently that it was easy to see where the word “cloudburst” comes from: it was as if the clouds had exploded and emptied their contents on the town, where streets and sidewalks quickly became unusable. Indeed, even the bottom floors of some homes became deadly traps. A similar tragedy had played out in the northeast United States the month before, when more than 45 had died, some trapped in basement apartments and others in cars, during intense flooding.

The deluges seemed to bear out what an international team of scientists predicted in the respected academic journal *The Lancet Planetary Health* over the summer: “extreme precipitation patterns are increasing both urban drought and flood risk. Rising sea levels, coupled with other environmental issues in coastal cities, have triggered environmental and social change with no historical parallel.” “Cities in Europe, South America, and Africa face stronger and more frequent droughts,” the scientists warned.

Half the world’s population already lives in cities, and that level is predicted to rise to over 70 percent by 2070. “Cities are where the action needs to take place because most people live there,” Pernille Jægerfelt Mouritsen of Nordic Sustainability, a Danish sustainability consultancy, told me in a telephone conversation this October. “As we saw in Germany this summer,” she warned, “climate change is coming closer.”

What happened in Germany in July was similar to what befell Rossiglione or New York, but multiplied. Within 24 hours, more water fell on the German states of Rhineland-Palatinate and North Rhine-Westphalia than would ordinarily fall during the whole month of July, practically burying the district of Ahrweiler under water. To date, 180 people are recorded as having died

in the flooding, but the real figure is likely to be higher, as dozens are still missing months later. For days, Ahrweiler was sealed off from the rest of the world; it could only receive deliveries of food and other vital items thanks to the Bundeswehr, which built a temporary bridge.

All this makes clear that cities do need to prepare for extreme weather, but if they do it in ways that make the city less appealing, they’ll fail. In New York City, the city administration found a flood barrier made of sand bags at South Street Seaport unacceptably ugly and invited local artists to apply to decorate it. What’s more, flood walls may no longer be able to withstand the water coming their way. This September, Hurricane Ida broke through a 22-foot tall and 18-inch thick flood barrier in Pennsylvania.

Perhaps in response to such realizations, as Mouritsen explained to me, “more and more cities are moving away from concrete adaptation to nature-based ones. It’s obviously the right thing to do for the environment, but cities also have to adapt to climate change to make sure they’re beautiful places where people want to live.” Indeed, cities that can combine adaptation with beautification may be ensuring their survival in two ways: staving off environmental destruction, while also making themselves attractive to existing and prospective residents. To be sure, global knowledge workers are not (yet) being polled on cities’ climate change adaptation efforts, but in a 2020 report the real estate company JLL and the consulting firm The Business of Cities pointed out that the factors deciding a city’s success are no longer purely economic ones, but also include aspects such as urban experiences, innovation, and sustainability. As JLL’s research director notes, “cities that are most successful in addressing these areas and embracing new economic models—the innovation economy, the experience economy, the sharing economy, and the circular economy—will be the most future-proof.” There’s a side benefit as well, as Copenhagen’s leaders surmised: even though city planners, politicians, and the public are increasingly aware of the enormous cost of doing nothing, allocating the money for overarching climate change adaptation is a struggle. That’s why the kind of climate mitigation plans that can actually pass the political process must combine

both needed infrastructure and aesthetic improvements that taxpayers like. While no individual climate change measures have been put to a vote in a referendum in Denmark or elsewhere, Copenhageners seem to approve of their city's handling of climate change and other matters: the same party has led the city since 1938.

And so cities around the world have launched a colorful range of initiatives. Barcelona's "superblocks," areas of some 400 by 400 meters that are pedestrian-only, reduce traffic (cars are routed around the blocks) and increase and enhance space for local residents. They have become so popular with the residents that other cities are adopting the concept. Paris, for instance, is reclaiming city life for pedestrians by pioneering the "15-minute city" concept, which aims to allow residents to find everything they need in local shops.

Meanwhile, Amsterdam has begun recycling construction waste, which it anticipates will lead to a 2.5 percent reduction in CO<sub>2</sub> emissions, and Houston is recycling building materials for the same reason. When COVID-19 hit, metropolises including Berlin, Paris, and Mexico City expanded bike lanes or opened new ones to allow more people to travel safely—a move that, of course, both reduces CO<sub>2</sub> emissions and may increase the cities' attractiveness.

Rotterdam—home to Europe's busiest port, where dozens of megafreighters arrive and depart every day of the week—is another climate-adapting pioneer. The port has begun funneling some of the heat its operations generate to nearby homes and other buildings. It is also starting to use more energy produced at offshore wind farms, and plans to make itself a hub of CO<sub>2</sub>-neutral hydrogen production. The port is jointly owned by the city of Rotterdam and the Dutch government, and they too consider climate change adaptation not just a burden but an opportunity to increase the attractiveness of their city and country.

Indeed, steps taken by the city of Rotterdam itself go even further. Rotterdam is surrounded by bodies of water and faces submersion, with large parts

being below sea level. It hopes to "climate-proof" itself by 2025. To do that, the city is reinforcing dikes and flood-proofing buildings and public spaces. But like Copenhagen, Rotterdam is also trying to embrace its water-filled future. In concrete (forgive the pun) terms, this means parks-cum-reservoirs like the Benthemplein water plaza. Previously a nondescript and usually empty square, the Benthemplein plaza now looks like an amphitheater (and can be used as one) and doubles as a basketball court and skateboard park. In case of a deluge, the plaza becomes a gigantic water-storage bowl.

Last year, Rotterdam also completed its first floating street, featuring rows of houses built on barges. "The houses are well insulated, produce their own energy through solar panels, generate heat via a biomass installation, and clean their own wastewater," the city reports. And since the projects are classed as residential real estate, "banks are prepared to extend regular mortgages to future residents." Indeed, the floating homes' architects see considerable potential for more such streets in former industrial areas.

To date, there's no regular opinion polling on key cities' climate change adaptation efforts. Positive headlines are, however, a good indicator. Google Rotterdam and climate change, or Copenhagen and climate change, and you'll get stories describing their impressive initiatives. Google a city like Los Angeles and climate change, and you'll conclude that living there won't be very enjoyable as climate change takes hold. Of course, people busy trying to make ends meet will not be googling cities to find the ones with the most attractive climate change adaptation design. Even within the Western world, climate change could thus create yet another have-have not divide, where poorer cities lose high-income workers—who are geographically flexible—to already wealthy cities that can invest in innovative climate change solutions, while residents who can't move are left behind with only the most rudimentary, visually unattractive, and less livable solutions.

## Beyond Beauty

Of course, climate change adaptation and climate change mitigation can be more utilitarian too, as shown in other efforts by Copenhagen, which has pledged to be carbon neutral by 2025. Jørgen Abildgaard, Copenhagen's executive climate project director, has the bewildering task of rolling out a broad array of new initiatives at the same time. The city is developing carbon-capture installations and is trying to turn more of its waste into energy. Converting waste into energy will, city planners calculate, cut Copenhagen's CO<sub>2</sub> emissions by 300,000 tons per year—only a small share of its total, but a reduction nonetheless. (Copenhagen has asked the European Union for funding.) "Using waste for energy has a double benefit: it reduces CO<sub>2</sub> emissions and reduces waste," Abildgaard told me in September. "We already have a new incinerator plant in place for this energy. It's absolutely critical for us to become CO<sub>2</sub> neutral by 2025."

Even though Copenhagen has reduced its carbon emissions by more than 57 percent between 2005 and 2018, there is a big chunk left. Both new offshore wind installation and the waste-to-energy plant are scheduled to be completed by 2025. "We're also planning a 400 megawatt windpower installation in Oresund [the strait between Sweden and Denmark], which will be completed by 2025," Abildgaard said to me. "Together with onshore wind turbines, it will power Copenhagen. It's not a radical reduction in CO<sub>2</sub> but it's an important signal." Meanwhile, to better dispose of carbon dioxide, Copenhagen plans to install capture facilities—another expense. "But not as expensive as other activities that will be required if we don't act now," Abildgaard is quick to emphasize. "Carbon capture is a known technology. The challenge is scaling it. It's important to have cooperation with the right partners—partners who also want to be on the forefront and be standard-bearers of innovation."

As with its pocket parks attracting new residents, Copenhagen is trying to turn CO<sub>2</sub> capture into an asset by recycling the calamitous emissions—for example, as fuel for ships and aircraft. And the Denmark-headquartered pharmaceutical giant Novo Nordisk has teamed up with Danish universities

to launch a biosustainability research center outside Copenhagen. "Copenhagen is obviously only a small part of global reduction, but we're an important facilitator of solutions," Abildgaard noted.

The problem, of course, comes when needed solutions offer no added beauty or convenience to residents. Consider the devastating effect should a subway system like the New York City Subway, London's Tube, or Copenhagen's Metro be flooded. The potential damage from such disastrous events illustrates how the effects of climate change can't be conjured away merely through innovative city design. To prevent catastrophic subway flooding—which would quickly cause a modern city to grind to a halt—massive amounts of rainwater must be channeled under the ground, out to the harbor. Such pipelines don't make a city look prettier. And without national legislation, it's not obvious who should pay. It isn't obvious either how to get such legislation passed, especially when improvements cost cities and countries a lot of money. Then again, if residents and prospective residents are won over with visually appealing solutions, they may be more amenable to accepting the less glamorous ones that are indispensable if cities are to have a chance of preventing constant disruption and destruction.

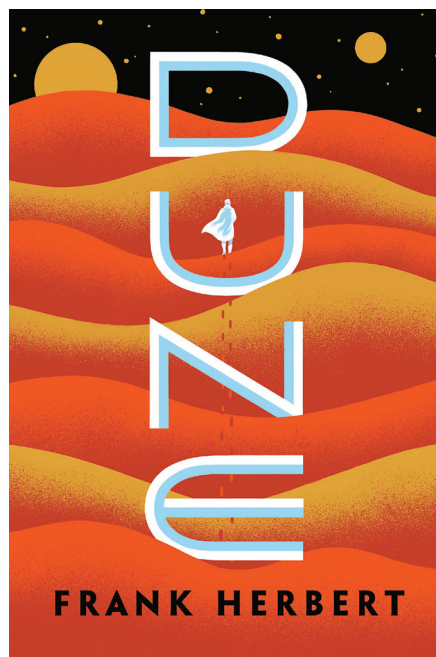
We are, of course, in today's mess because previous generations failed to take precisely such collective and expensive measures. In her speech to the COP26 delegates, Queen Elizabeth II noted that 52 years ago Prince Philip "told an academic gathering, 'if the world pollution situation is not critical at the moment, it is as certain as anything can be that the situation will become increasingly intolerable within a very short time. If we fail to cope with this challenge, all the other problems will pale into insignificance.'" That is happening, and pretending cities can adapt to climate change through pretty measures alone would be naïve. Fortunately, pioneering cities such as Copenhagen are far beyond that stage. The fact that they began their efforts years ago means other cities can now use their ideas and insights when getting serious about climate change adaptation and mitigation. And that's a good thing, because they have to hurry up. //

ESSAYS / 09

# ENVIRONMENTALISM AT SWORDPOINT

ECOMODERNISM AND DUNE

MICHAEL PECK



*Beyond a critical point within a finite space, freedom diminishes as numbers increase. This is as true of humans in the finite space of a planetary ecosystem as it is of gas molecules in a sealed flask. The human question is not how many can possibly survive within the system, but what kind of existence is possible for those who do survive. - Dune*

*Dune*, 1999 Hardcover Edition

Image: Ace

**E**nvironmentalism and war purport to be polar opposites: one focuses on protecting nature, the other often ends up destroying it. But armies of environmentalists armed with lasers and spaceships? Ecology at the point of a sword?

Welcome to *Dune*, Frank Herbert's classic 1965 science fiction novel.

In *Dune* and the many sequels he wrote, Herbert created a universe where the environment was not just a backdrop to a story—like mountains and forests in a movie—but a protagonist every bit as important as the human actors. Reflecting Herbert's deep interest in ecology, *Dune* has come to be considered one of the inspirations for modern environmentalism, as well as spawning numerous novels, TV shows, video games, and movies. The *Dune* phenomenon (including the 18 and growing subsequent novels coauthored by Herbert's son) will doubtless be revived by the latest film version—from director Denis Villeneuve—out in theaters now. Many fans hope the movie, which covers only the first book, will be an improvement over the famously bad 1984 take, with its endless internal monologues and zany weapons. Whether it ends up disappointing or not, though, it will certainly bring a new wave of attention to the original novel and its emphasis on ecology.

To be sure, *Dune* is not a story of vegan tree-huggers who worry about their carbon footprint. It is an essentially violent tale rooted in classic science fiction: a galactic empire, exotic creatures, and a cast of heroes and villains—sci-fi themes found in everything from Edgar Rice Burroughs's *John Carter of Mars* books to George Lucas's *Star Wars* movies. But in mixing sci-fi and ecology, *Dune* presented something new. As 21st-century Earth grapples with what seems an endless stream of environmental issues, from pollution to climate change, *Dune* raises an important question: when is violence justified in the name of ecology?

## Spice World

The *Dune* saga begins with humanity at war with nature and with itself. The tale follows the journey of Paul Atreides, scion of a royal house in a feudalistic galactic empire 20,000 years in the future. The Imperium and its ruling elites are riven by unceasing and bloody jockeying for power among a bewildering array of actors: the Emperor; the noble Houses of the Landsraad parliament; the Spacing Guild, which controls space travel; the East India Company-like CHOAM that controls commerce; and the Bene Gesserit, a powerful witch-like female secret society skilled in martial arts and manipulation.

At the start of the story, House Atreides is sent to rule the desert planet Arrakis, the only source of spice, a mystical narcotic that enables interstellar travel, increases longevity, and even offers some users a glimpse into the future. Until that point, Arrakis had been ruled by the Atreides's mortal enemies and the ultimate anti-environmentalists: the brutal House Harkonnen, which had ruthlessly plundered the planet and its human inhabitants—including the Bedouin-like tribes known as the Fremen.

Fearing that Duke Leto, Paul's father, will become too popular, the Emperor and his dreaded Sardaukar janissaries ally with House Harkonnen to kill the duke and wipe out his family and troops. Fleeing to the Arrakis desert with Jessica, Paul's mother and the now-deceased duke's concubine, Paul becomes the charismatic prophet-warlord Maud'Dib, who leads the Fremen in an uprising.

In these twists and turns, it becomes clear that what oil is to 21st-century Earth, spice is to the *Dune* universe. Remove either commodity, and the ties that bind human civilization as it exists—commerce, travel, government—are severed. And as on Old Earth, the environment, local population, and even emperors and dukes are expendable as long as spice flows.

## The Failure of Technowands

So why didn't *Dune* become yet another hackneyed sci-fi story of an exiled prince regaining his throne? Or a feel-good tale of the weak defeating the mighty, like the cloyingly cute Ewoks overcoming Imperial stormtroopers in *Star Wars*?

In part, that's because Herbert avoided one of the genre's biggest traps. Technology doesn't instantly fix every problem, like the technobabble that afflicted many of the later *Star Trek* shows. *Dune* is a quasi-technological universe with the obligatory spaceships and lasers, but no computers or artificial intelligence, which were banned after some *Terminator*-like revolt. Thinking machines have been replaced by mentally enhanced humans who think like machines. Personal force fields have turned battles into medieval-style brawls between sword-equipped armies.

In this future, humanity cannot rely on techno-wands to provide solutions. In some ways, the books cut off the very possibility of ecomodernism; without good technological solutions to environmental challenges, humans have to rely only on their innate powers—that spark of inspiration and judgment—to shape their environment. Yet that doesn't work so well, either: human computers in *Dune* prove no wiser than electronic models. The problem, as Herbert so adroitly depicts, is still predicting the results of our actions. Whether it's following messianic leaders, damming rivers, or strip-mining mountains (or planets), humans have a poor track record of foreseeing consequences.

And what is most striking about *Dune* is Herbert's painstakingly constructed ecology against which these consequences play out. Arrakis has an intricate ecosystem, a biological chain that comprises tiny underground sandtrout that consume water (which is why the planet became a desert) and secrete a substance that eventually becomes spice. A few sandtrout become sandworms, enormous and nearly indestructible creatures that travel underneath the sand like whales through water. Sandworms can wreak enormous damage, although water is lethal to them (humans are 70 percent water, so they

leave an unpleasant aftertaste in sandworm mouths). In its natural state—without human intervention—the ecology of Arrakis is lethal to people. The Fremen survive only by adjusting themselves to their environment, conscious that depleting water and other resources will doom their descendants.

Where other groups fail to recognize that logic, they perish. For example, like 19th-century imperialists trusting that machine guns will subdue the natives (“whatever happens, we have got / the Maxim gun, and they have not”), the Harkonnens had tried to use violence and mining equipment to subdue the planet. But they discovered that the environment had a veto. Spice can be extracted, but the hostile climate, quarter-mile-long worms, and fierce tribesmen devour manpower and machinery.

Paul Atreides has a better idea: weaponize the environment by treating the ecology of Arrakis as an ally instead of enemy. Yet to call Atreides a heroic environmentalist is a stretch. He is a warlord, an autocrat, a killer, and a mystic who himself fears that he will end up unleashing a galactic jihad—a word that appears frequently in *Dune*—and one that will kill billions. But reduced to a powerless exile wandering the sandy wastelands, he finds the only resources he can obtain are from the desert. So Atreides becomes the charismatic leader of the Fremen, who are master swordsmen and know how to ride atop the sandworms. By exquisitely combining these forces, he storms the bastion of the Harkonnen and Imperial forces on the planet, captures the Emperor, and becomes the most powerful leader in the galaxy.

Such utilitarianism toward one’s environment permeates *Dune*. Much like Paul Atreides—an aristocrat who became a popular messiah—Herbert is an odd choice to be an environmental crusader, as he came to think of himself in later years. He was a libertarian suspicious of big government. His vision of environmentalism was not preserving nature for the sake of itself. Rather, it was to protect nature for the benefit of civilization: so that Arrakis could serve people. That may raise visions of greedy corporations looting natural wonders. But what alternative would have been better? On Earth as in *Dune*, practical or even selfish motivations often get more results than does idealism.

## The Useful Environment

*Dune* has been cited by military theorists as a textbook example of asymmetric warfare, in which the weaker power successfully exploits the vulnerabilities of the stronger. The plausibility of that take depends on whether you believe that 20,000 years from now, wars will be won by whatever side can employ the best swordsmen and giant killer worms. Indeed, although *Dune* was published in 1965—just as US troops began active fighting in Vietnam—it revealed no great truths about warfare. Climate and terrain can negate the advantages enjoyed by a superior military force? British redcoats marching through dark New England forests, Napoleon’s Imperial Guard shivering in Russian blizzards, and French paratroopers and US Marines slogging through the Indochinese jungle could have attested to that.

More interesting examinations look to the tale’s other messages. The *Dune* universe suggests that Earth has become a dead world; in 1965, many feared that would literally happen. Humanity lived under the constant threat of annihilation as US and Soviet nuclear arsenals reached their peak. Authors such as Rachel Carson warned that Earth was choking to death on its pollution, while others offered dark visions of an overcrowded planet as global population soared 20 percent between 1960 and 1970. That fear of humanity on the precipice permeates the series.

Yet while *Dune* was clearly a product of the 1960s, its message in some ways seems more appropriate for 2021. The most troubling parallel is how much humanity depends on the environment. Despite 20,000 years of technological advances and humans endowed with superhuman powers, civilization still depends on a natural resource derived from a fragile ecosystem. If that ecosystem is disrupted—if spice does not flow—then interstellar trade and communications are severed, and civilization will lapse into barbarism.

Keeping the balance, though, requires violence, too. After all, *Dune* is a story of bloodshed in the name of ecology. The combatants don’t wage war out of love of nature, but rather of keen appreciation that the environment is what

makes their goals possible. Without preserving their complex biological and environmental web, there is no spice, and Arrakis is just a desolate rock. Without spice, Atrides cannot succeed in his quest to restore his House and lead humanity into a new future. Without his victory, the Fremen may never achieve their dream of a green Arrakis. And none of these missions is possible without control of territory, and that means defeat the Harkonnens and their Imperial allies in battle. And so, in a quest to turn Arrakis green, the Fremen march to war shouting not “Save the trees!” but “Jihad!”

This is not conservation in the literal sense of preserving the environment. It’s a military crusade to make the environment more useful to humans. In pursuit of that goal, nothing is sacred. That may resonate today, with Earth’s ecosystem under stress, and institutions tasked with preparing for future crises are getting nervous. As with the Imperial forces preparing to defend their control of Arrakis, the US military, for example, has plans for climate change to become a major factor in future warfare. Melting icefields will create new shipping lanes and maritime flashpoints, while competition for resources such as water, arable land, and energy will intensify. A disrupted ecosystem will stress political systems—and stressed political systems often generate populist demagogues like Atrides.

On 21st-century Earth, control over the environment—and benefit from the environment—will probably belong to the strongest in some ways; yet as the Harkonnens discovered in Dune, military power still pales before the power of Earth. The ecosystem of Arrakis defines how the war is fought. Indeed, the environment itself becomes a combatant when the sandworms are unleashed against the Harkonnen-Imperial forces. The armies of today’s Earth are likewise sophisticated but fragile: stealth fighters and hypersonic missiles might not work so well in a world of extreme temperatures, frequent storms, and shortages of water, food, and fuel. Drought and hurricane may prove more powerful than the sword.

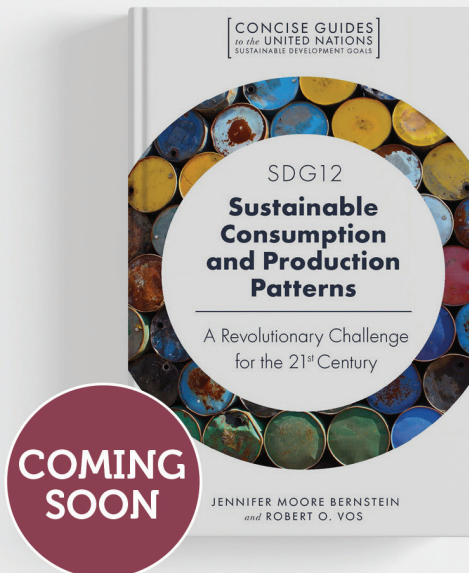
## Green and Red

Dune thus raises a disturbing question: is war justified in the name of one’s environment? It’s not hard to envision a future where military force is seen as a potential—or perhaps the preferred—solution to ecological problems. What to do with nations that refuse to curb their pollution or carbon emissions, or consume too much water? Temptation there will be to use force to punish transgressors.

Already in many places, competition over water resources triggers conflict. And while the environmentalist movement has tended to be nonviolent, militant environmental groups such as the Earth Liberation Front have conducted minor arson and bomb attacks. As Earth becomes more polarized, it’s not hard to imagine more bloodshed.

Some people today would probably agree that, to save the environment, the use of force is justified. But one of Dune’s messages is that our actions often result in unintended consequences. Dune portrays a universe of militant environmentalism, but it is a brutal, violent universe where lofty goals count more than human life. Environmentalism by the sword is possible, but it may not create the world that we want to live in. //

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