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Neutralizing the Atmosphere

Shelley Welton
University of Pennsylvania Carey Law School

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SHELLEY WELTON

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ABSTRACT. "Net zero" has rapidly become the new organizing paradigm of climate change law. In the past few years, thousands of countries, companies, states, and cities have developed pledges that promise by a set date — typically around 2050 — that any carbon they emit will be counterbalanced by capturing an equal amount of carbon out of the atmosphere. Collectively, these pledges now cover more than 91% of the global economy.

This widespread adoption of scientifically aligned climate policy appears on its surface like a cause for celebration. However, concerns are mounting. To date, critiques of net zero have centered on what this Feature terms "accounting" risks: that is, risks that pledges in action will fail to live up to pledges on paper. This Feature argues that there are two broader normative and political risks with net zero that are underdiagnosed but may prove more intractable. First, the net-zero framework is agnostic regarding the manner in which to neutralize atmospheric emissions, leaving each participating entity — including both governments and corporations — to determine its own preferred strategy. But decisions around how to reach net-zero emissions are contested, impactful, and often politically explosive. As net zero has proliferated as a framing paradigm, there has been a marked shift in the climate change policy conversation towards recognizing climate as imbricated with racial and economic justice. These considerations are ignored in the net-zero framing, with its emphasis on pristine carbon balance sheets. The second risk this Feature identifies is the "collective-achievement challenge": if the world continues to pursue an atomized approach to net zero, it is likely that entities will overrely on certain cost-effective strategies — like tree planting — at scales that cannot be collectively achieved, at least not without substantial collateral social consequences. Disjunctive efforts toward net zero thus threaten to undermine the legal, political, and physical foundations of global decarbonization efforts. Understanding these risks counsels for restructuring the private sector's role away from individualized net-zero targets toward a "reduce and support" approach that would better collectivize and rationalize net-zero policy. For public pledges, these risks counsel for more attention to net zero's administering institutions and governance structures to foster more democratic, holistic decision-making about the shape and content of our decarbonized future.

AUTHOR. Presidential Distinguished Professor of Law & Energy Policy, University of Pennsylvania Carey Law School and the Kleinman Center for Energy Policy. Thanks to Cary Coglianese, Sharon Jacobs, Douglas Kysar, Albert Lin, Joshua Macey, Nina Mendelson, Jonas Monast, James Salzman, and participants in the University of Michigan Law School's Legal Theory Workshop, the Southeastern Environmental Law Scholars' Workshop, the Loyola-Chicago Starved Rock Environmental Law Scholars' Workshop, the University of Colorado Boulder Junior Energy Law

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FEATURE CONTENTS

INTRODUCTION

"The pursuit of a net-zero target is perhaps the most ambitious collective undertaking in human history."[1]

Almost all of a sudden, "net zero" has become the organizing paradigm of climate change law. In 2015, signatories to the Paris Climate Agreement committed to "achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases (GHGs) in the second half of this century."[2] Scientists widely agree that this global balancing effort will be critical for keeping planetary warming to noncatastrophic levels.[3] In the five years since the Paris Agreement, countries, states, cities, and companies have coalesced around a project of creating their own net-zero commitments. In these commitments, entities pledge to ensure by a set date—typically around 2050—that any remaining carbon they emit is counterbalanced by capturing an equal amount of carbon *out of* the atmosphere.[4] As of September 2022, net-zero commitments covered an impressive 91% of the global economy (as measured by gross domestic product (GDP)), up from only 16% as recently as 2019.[5]

It is stunning how quickly the climate change field—which has been rife with epistemological and methodological disagreement for decades—has accepted net

1. Kelly Levin, David Rich, Katie Ross, Taryn Fransen & Cynthia Elliot, Designing and Communicating Net Zero Targets 5 (July 2020) (unpublished manuscript), https://files.wri.org/d8/s3fs-public/designing-communicating-net-zero-targets.pdf [https://perma.cc/XBS8-JZHN].

2. *Rep. of the Conf. of the Parties on its Twenty-First Session*, U.N. Doc. FCCC/CP/2015/10/Add.1, at 22 (Jan. 29, 2016), https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/FCCC_CP_2015_10_Add.1.pdf [https://perma.cc/REE2-K46D] (adopting the Paris Agreement to the United Nations Framework Convention on Climate Change art. 4, Dec. 12, 2015, T.I.A.S. No. 16-1104).

3. *Summary for Policymakers*, *in* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, GLOBAL WARMING OF 1.5°C, at 1, 12 (Valérie Masson-Delmotte et al. eds., 2018) [hereinafter *2018 Summary for Policymakers*] (finding that to limit warming to 1.5°C, "global net anthropogenic CO_2 emissions [must] decline by about 45% from 2010 levels by 2030 . . . [to] reach[] net zero around 2050" (emphasis omitted)).

4. As explained *infra* note 53, many entities focus their pledges on carbon dioxide; others include additional greenhouse gases (GHGs). "Carbon" here is a shorthand for all GHGs that entities are looking to address through their pledges.

5. *See* NET ZERO TRACKER, https://zerotracker.net [https://perma.cc/H9EW-S3MD]; *Taking Stock: A Global Assessment of Net Zero Targets*, THE ENERGY & CLIMATE INTEL. UNIT & OXFORD NET ZERO 5, 8 (Mar. 2021) [hereinafter *Taking Stock*], https://ca1-eci.edcdn.com/reports/ECIU-Oxford_Taking_Stock.pdf [https://perma.cc/E49V-VSY4].

zero as the central goal of climate policy and the key metric for academic analysis.[6] But scientists' prescription of a global emissions-netting imperative is critically different from the net-zero project described in this Feature, which translates the collective scientific imperative into disjunctive, atomized pledges.[7] To be sure, these pledges represent substantial progress in climate change discourse with their clear framing, certain dates, and obviously widespread appeal. Yet scientific, political, and social concerns are mounting regarding the risks of framing our response to the climate crisis through a goal of net zero.[8] To date, critiques have centered on what this Feature terms "accounting" risks: that is, risks that pledges in action will fail to live up to pledges on paper, either because countries and companies are disingenuous in their commitments or because technological innovations fail to deliver reliable, long-term carbon-removal solutions at the scale and scope that these entities hope.[9]

Accounting risks are real and concerning, but they are not net zero's biggest challenge. This Feature diagnoses two deeper and broader normative risks with the net-zero project. The first, which it terms the "neutrality mirage," stems from the putative neutrality of the net-zero framework. Orienting climate policy

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6. *See, e.g.*, Eric Larson et al., *Net Zero America: Potential Pathways, Infrastructure, and Impacts*, PRINCETON UNIV. 5 (Dec. 2020), https://environmenthalfcentury.princeton.edu/sites/g/files/toruqf331/files/2020-12/Princeton_NZA_Interim_Report_15_Dec_2020_FINAL.pdf [https://perma.cc/RY88-2B67]; *Net Zero by 2050: A Roadmap for the Global Energy System*, INT'L ENERGY AGENCY (Oct. 2021), https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf [https://perma.cc/LHB6-B6Q7]; MAJORITY STAFF OF H. SELECT COMM. ON THE CLIMATE CRISIS, 116TH CONG., SOLVING THE CLIMATE CRISIS: THE CONGRESSIONAL ACTION PLAN FOR A CLEAN ENERGY ECONOMY AND A HEALTHY, RESILIENT, AND JUST AMERICA 3 (Comm. Print 2020) (presenting a plan to get the United States to zero emissions).

7. Accordingly, throughout the Feature, I use "global emissions-netting imperative" to refer to the effort to net greenhouse-gas emissions at a planetary scale, whereas "net-zero project" or "net-zero framework" refer to the current shape of this effort.

8. *See, e.g.*, James Dyke, Robert Watson & Wolfgang Knorr, *Climate Scientists: Concept of Net Zero Is a Dangerous Trap*, CONVERSATION (Apr. 22, 2021, 12:25 AM EDT), https://theconversation.com/climate-scientists-concept-of-net-zero-is-a-dangerous-trap-157368 [https://perma.cc/7DAX-YM7B]; Fred Pearce, *Net Zero Emissions: Winning Strategy or Destined for Failure?*, YALE ENV'T 360 (May 25, 2021), https://e360.yale.edu/features/net-zero-emissions-winning-strategy-or-destined-for-failure [https://perma.cc/L5N5-F9LR]; Albert C. Lin, *Carbon Dioxide Removal After Paris*, 45 ECOLOGY L.Q. 533, 533 (2018); Umair Irfan, *Are "Net Zero" Climate Targets Just Hot Air?*, VOX (Oct. 29, 2021, 10:30 AM EDT), https://www.vox.com/22737140/un-cop26-climate-change-net-zero-emissions-carbon-offsets [https://perma.cc/AV2V-SQ2V]; Ciara Nugent, *The World's Top Carbon Emitters now All Have Net Zero Pledges. Most of Them Are Too Vague*, TIME (Nov. 4, 2021, 11:34 AM EDT), https://time.com/6113845/net-zero-climate-pledge-impact [https://perma.cc/9M9G-ZQFS].

9. Three such accounting risks — greenwashing, self-serving optimism, and fungibility — are explored in more detail *infra* Part II.

around the overarching goal of neutralizing atmospheric emissions suggests indifference about the best pathway to net zero. But in reality, the details of *how* to net emissions are contested, consequential, and often politically explosive.[10] Indeed, at the same time net zero has proliferated as a framing device, policy conversations have shifted toward recognizing climate change as imbricated with racial and economic justice.[11] The net-zero paradigm, with its emphasis on pristine carbon balance sheets, largely ignores these social dimensions, which are critical for political legitimacy and durability.[12] By linking this challenge to analogous critiques of cost-benefit analysis in legal theory, this Feature illuminates the risks of a climate program that intentionally sidelines democratic and distributive considerations.[13]

The second risk this Feature identifies is what it terms the "collective-achievement challenge." Net-zero pledges, as currently structured, have a distinctly libertarian valence: each entity (of various scales—sometimes down to the individual[14]) voluntarily offers to zero out their own universe of carbon emissions in the way they see fit.[15] But the emissions-netting imperative is global: to avoid planetary catastrophe, the world collectively must balance all unavoidable emissions with negative emissions. To achieve this task, climate models suggest that *every feasible emission cut* that can be achieved anywhere must be pursued, even as the world also attempts to recapture carbon from the atmosphere for long-term storage.[16] The libertarian approach to net zero fails to reflect this scientific reality. Instead, it allows each pledging entity to plan for itself how it will neutralize its emissions—a strategy which may ultimately result in irreconcilable plans that exacerbate other development challenges while underachieving on a global scale.

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10. *See infra* Section III.A.

11. *See, e.g.*, SHALANDA BAKER, REVOLUTIONARY POWER: AN ACTIVIST'S GUIDE TO THE ENERGY TRANSITION 74 (2021) (excoriating "climate change fundamentalism" for its inattention to inequality and social justice); *infra* notes 204-206 and accompanying text (describing how the Green New Deal frames these issues as interrelated).

12. *See Accelerating Decarbonization of the U.S. Energy System*, NAT'L ACADS. SCIS., ENG'G & MED. 1 (2021), https://nap.nationalacademies.org/catalog/25932/accelerating-decarbonization-of-the-us-energy-system [https://perma.cc/7B4Z-FSA8] ("[T]he manner in which the U.S. economy produces and consumes energy impacts a host of other issues that people care deeply about. . . . Maintaining public support through a three-decade transition to net zero simply cannot be achieved without the development and maintenance of a strong social contract.").

13. *See infra* Section III.B.

14. *See* Michael P. Vandenbergh & Anne C. Steinemann, *The Carbon-Neutral Individual*, 82 N.Y.U. L. REV. 1673, 1705 (2007).

15. *Cf.* ROBERT NOZICK, ANARCHY, STATE, AND UTOPIA, at xi (1974) (making the case for a libertarian "minimal state" that does not require aid to others or prohibit self-harming activities).

16. *See infra* Section IV.A.

By way of illustration, imagine that forty developed countries each plan to invest substantially in developing-country reforestation as a method of counterbalancing emissions that prove costly to cut from their domestic economies. At the same time, those developing countries plan domestic reforestation initiatives to neutralize their own emissions, and hundreds of major corporations plan to rely on carbon-offset credits generated from reforestation projects to achieve their net-zero targets. On the whole, there simply may not be enough opportunities for reforestation initiatives to serve all these separate entities. This risk is not speculative: Shell Oil is already pushing a vision of how to limit warming that relies on reforesting an area the size of Brazil.[17] Although plausible in theory, such strategies face political and biophysical limits and are likely to have unintended collateral consequences: for example, overreliance on reforestation may contribute to food insecurity or plantation-style development at the expense of community livelihoods.[18]

For these reasons, disjunctive efforts toward net zero pose real risks for the critical global imperative of atmospheric neutralization. This risk is particularly acute given the legal structure of the Paris Agreement, which is premised upon country-driven pledges whose ambition is expected to strengthen over time as global trust is established. Under this legal order, a private marketplace might displace country-centered ambition, ultimately proving counterproductive to sustained global progress.[19]

Understanding these deeper risks with the net-zero framework does not wholly undermine its potential, but points to two critical lessons about how to structure it going forward.[20] The first lesson regards the private role in achieving net zero. Contrary to the predominant current approach of the United Nations and various other net-zero champions,[21] corporations should not be encouraged to develop, submit, and pursue net-zero pledges. The immense normative and political stakes of determining *how* to net emissions in a coordinated, democratic, and equitable fashion render this task ill suited for atomized corporate actors.

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17. Josh Gabbatiss, *Analysis: Shell Says New 'Brazil-Sized' Forest Would Be Needed to Meet 1.5C Climate Goal*, CarbonBrief (Feb. 12, 2021, 8:00 AM), https://www.carbonbrief.org/analysis-shell-says-new-brazil-sized-forest-would-be-needed-to-meet-1-5c-climate-goal [https://perma.cc/6RHR-8V5F]. In 2021, a Dutch court rebuked this plan. *See infra* note 145 and accompanying text.

18. *See infra* notes 219-221 and accompanying text.

19. *See infra* Section IV.C.

20. These suggestions go beyond the predominant solutions in the literature to date, which have focused on standard setting and target separation. *See infra* Section V.A. *See generally* Albert C. Lin, *Making Net Zero Matter*, 79 Wash. & Lee L. Rev. 679 (2022) (arguing that net-zero pledges should incorporate distinct targets for emissions reduction and carbon removal).

21. *See infra* Part II.

Though forceful, this conclusion is not an indictment of corporate action on climate change. To the contrary, this Feature offers a nuanced gloss on private net-zero governance, encouraging corporate standard setting with respect to emissions reductions but suggesting alternative means of engaging corporate actors in carbon removal.[22]

The second lesson regards public actors, most notably countries and subjurisdictions such as U.S. states. These democratic actors appropriately shoulder the normative burden of deciding how to structure their net-zero projects to help achieve the global emissions-netting imperative. This fact underscores what should be an obvious conclusion: institutional design is *central* to the project of net zero. When a jurisdiction sets the goal of neutralizing the emissions of an entire economy, the program administrator will have (at least) thousands of choices to make regarding how to achieve that ultimate balance, both temporally and substantively – choices with wide societal implications.[23] Yet there has been limited attention paid to decisions regarding who should hold this authority and under what oversight mechanisms. This Feature establishes an agenda for exploring institutional design and structural guardrails that could offer more democratic legitimacy and political durability to the net-zero project.

This Feature's analysis moves beyond the writing to date on net zero's accounting risks to situate the framework more broadly within the political economy and legal structure of climate change policy. In the process, it puts into conversation the legal literatures on climate change law, climate justice, cost-benefit analysis, private environmental governance, and corporate social responsibility. It also incorporates emerging social-science research into the often overly technocratic conversation on designing climate regulation.[24] This research is critical for clarifying how and why climate change mitigation is a normative project with widely reverberating consequences.

Understanding the implications of the net-zero turn in climate policy is a high-stakes, pressing endeavor. Countries, states, and corporations are beginning to shift from drafting and wordsmithing broad pledges and policies to determining how to implement them. Netting global emissions in politically and ecologically sustainable ways is likely to be a central challenge of global and domestic climate policy for the coming decades – and may well prove determinative of how many degrees of warming the planet will endure. This effort will require

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22. *See infra* Section V.A.

23. *See infra* Section II.B.

24. *See* Wim Carton, Adeniyi Asiyanbi, Silke Beck, Holly J. Buck & Jens F. Lund, *Negative Emissions and the Long History of Carbon Removal*, 11 WIREs CLIMATE CHANGE art. no. e671, at 15 (2020) (noting that social science is "included in the scientific conversation on climate change in limited and selective ways" and frequently "depoliticized").

thoughtful and creative policy design, advocacy, and, at times, litigation.[25] This Feature's contention is that careful, big-picture thinking about the shape of the net-zero project now—among academics, policymakers, and advocates alike—might be the difference between net zero as a constructive organizing principle, and net zero as a manipulable, destabilizing distraction.

This Feature proceeds in five Parts. Part I addresses the origins, appeal, and structure of net zero. Part II outlines the three accounting critiques often leveled at net-zero pledges. Part III develops the deeper normative critique of net zero's putative neutrality previewed above, while Part IV focuses on the collective-achievement challenge. Finally, Part V highlights the central lessons this analysis offers for climate governance, arguing for a cabined role for private actors and for centering the importance of public institutional design.

I. THE RISE OF NET ZERO

A. The Origins and Appeal of the Net-Zero Framing

There is a pretty story that places the origins of net zero with a group of climate "lionesses"—that is, powerful female players in the climate world. In 2013, approximately thirty women, "lawyers, diplomats, financiers and activists," including Christiana Figueres, then-head of the United Nations climate body, gathered at a Scottish country estate to talk through goals and strategies for the upcoming climate negotiations in Paris in 2015.[26] Several women in attendance credit this meeting with crystallizing the net-zero concept and creating key champions for its promotion.[27] While this may have been the meeting that cemented the strategic pursuit of net zero in Paris, the policy's conceptual origins have a longer lineage in climate-policy history that bears tracing.

Many scholars have suggested that net zero has conceptual underpinnings in the "Integrated Assessment Models" developed in the 1990s.[28] These models explore ways to address climate change by linking economic sectors, greenhouse-

25. *See infra* notes 141-144 and accompanying text.

26. *See* Megan Darby, *Net Zero: The Story of the Target that Will Shape Our Future*, CLIMATE HOME NEWS (Sept. 16, 2019, 5:30 AM), https://www.climatechangenews.com/2019/09/16/net-zero-story-target-will-shape-future [https://perma.cc/597M-DKQM].

27. *Id.*

28. *See* Silke Beck & Martin Mahony, *The Politics of Anticipation: The IPCC and the Negative Emissions Technologies Experience*, 1 GLOB. SUSTAINABILITY art. no. e8, at 2 (2018) [hereinafter Beck & Mahony, *Politics of Anticipation*]; Silke Beck & Martin Mahony, *The IPCC and the New Map of Science and Politics*, 9 WIREs CLIMATE CHANGE art. no. e547, at 8 (2018) [hereinafter Beck & Mahony, *Science and Politics*]; Duncan P. McLaren, David P. Tyfield, Rebecca Willis,

gas emissions, and their atmospheric consequences.[29] As these models became the dominant way of assessing climate-policy options, it became increasingly apparent how "sources" of greenhouse-gas emissions—including industry, electricity generation, and the transportation sector—might be counterbalanced by allowing countries to count investments in emissions "sinks," such as forests, in their overall carbon accounting.[30] Several forest-rich countries—including the United States—used this analysis to argue for the development of country-level accounting mechanisms that included both sources and sinks.[31] The United States also advocated vigorously during early climate negotiations for including "offsets"—steps taken to reduce emissions in other countries and across economic sectors—as a lower-cost method for countries to meet their greenhouse-gas-reduction commitments.[32] U.S. support for building offsets and other flexible instruments into the international climate regime followed two decades of domestic experimentation with more "market-based" environmental regulation—a shift championed by many conservatives and regulated industries.[33]

Bronislaw Szerszynski & Nils O. Markusson, *Beyond "Net-Zero": A Case for Separate Targets for Emissions Reduction and Negative Emissions*, 1 FRONTIERS CLIMATE art. no. 4, at 2 (2019); Dyke et al., *supra* note 8; Charlie Wilson, Elmar Kriegler, Detlef P. van Vuuren, Celine Guivarch, Dave Frame, Volker Krey, Timothy J. Osborn, Valeria Jana Schwanitz & Erica L. Thompson, *Evaluating Process-Based Integrated Assessment Models of Climate Change Mitigation* 1-3 (Int'l Inst. for Applied Sys. Analysis, Working Paper No. 17-007, 2017), http://pure.iiasa.ac.at/id/eprint/14502/1/WP-17-007.pdf [https://perma.cc/P69M-E25U].

29. Simon Evans & Zeke Hausfather, *Q&A: How 'Integrated Assessment Models' Are Used to Study Climate Change*, CARBONBRIEF (Oct. 2, 2018, 4:31 PM), https://www.carbonbrief.org/qa-how-integrated-assessment-models-are-used-to-study-climate-change [https://perma.cc/3T9E-EXJC].

30. *See* Beck & Mahony, *Politics of Anticipation*, *supra* note 28, at 2; Beck & Mahony, *Science and Politics*, *supra* note 28, at 8-9; McLaren et al., *supra* note 28, at 2-3. For more on sources and sinks, see *infra* Section I.B.

31. *See* Carton et al., *supra* note 24, at 5; Emily Boyd, Esteve Corbera & Manuel Estrada, *UNFCCC Negotiations (Pre-Kyoto to COP-9): What the Process Says About the Politics of CDM-Sinks*, 8 INT'L ENV'T AGREEMENTS 95, 96 (2008) ("One of the most contentious issues in the negotiations aimed at operationalizing the Kyoto Protocol was the treatment/inclusion of sinks.").

32. *See* Daniel Bodansky & Lavanya Rajamani, *The Evolution and Governance Architecture of the United Nations Climate Change Regime*, *in* GLOBAL CLIMATE POLICY: ACTORS, CONCEPTS AND ENDURING CHALLENGES 13, 23 (Urs Luterbacher & Detlef F. Sprinz eds., 2018) (explaining that in exchange for accepting a stronger target, the United States "succeeded in incorporating significant flexibility into the [Kyoto] Protocol").

33. On the politics and history of the domestic emergence of market mechanisms, see Tyler McNish, *Carbon Offsets Are a Bridge Too Far in the Tradable Property Rights Revolution*, 36 HARV. ENV'T L. REV. 387, 398-401 (2012); William Boyd, *The Poverty of Theory: Public Problems, Instrument Choice, and the Climate Emergency*, 46 COLUM. J. ENV'T. L. 399, 422-67 (2021); and Hugh S. Gorman & Barry D. Solomon, *The Origins and Practice of Emissions Trading*, 14 J. POL'Y HIST. 293, 293-96 (2002).

The United States's lobbying efforts were ultimately successful: the 1997 Kyoto Protocol, the world's first attempt at imposing concrete emissions-reductions limits on developed countries, included provisions allowing for both sinks and offsets to count toward countries' emissions targets.[34] Ironically, after intense and successful lobbying on this issue, domestic political constraints caused the United States to fail to sign the Protocol.[35] Nevertheless, these negotiations laid the conceptual groundwork for an eventual global coalescence around the heuristic of netting emissions.

Since these early days of climate change negotiations, scientists have greatly advanced understandings of both the causes and consequences of climate change. Established in 1988, the Intergovernmental Panel on Climate Change (IPCC) is the body of scientific experts charged with providing expert, peer-reviewed scientific background on climate change to inform international negotiations.[36] In the years since the Kyoto Protocol, the IPCC has published increasingly alarming findings about the importance of reversing the world's steadily increasing emissions trajectory.[37] These findings contributed to the Paris Agreement's commitment to hold the increase in the global average temperature "to well below 2°C above pre-industrial levels and pursu[e] efforts to limit the temperature increase to 1.5°C above pre-industrial levels."[38] This 2°C number is widely believed to represent a threshold above which the effects of climate change will tend toward the catastrophic.[39] But the difference between 1.5°C and 2°C is also stark: the IPCC has calculated that the 0.5° that separates these targets might cause 2.6 times as much extreme heat, two to three times as much species

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34. *See* Carton et al., *supra* note 24, at 5; McNish, *supra* note 33, at 399; Eva Lövbrand, *Bridging Political Expectations and Scientific Limitations in Climate Risk Management—On the Uncertain Effects of International Carbon Sink Policies*, 67 CLIMATIC CHANGE 449, 449-50 (2004); Kyoto Protocol to the United Nations Framework Convention on Climate Change art. 3.3, Dec. 11, 1997, 2303 U.N.T.S. 162 (adopted in 1997 and entered into force in 2005).

35. *See* Byrd-Hagel Resolution, S. Res. 98, 105th Cong. (1997) (declaring, by a 95-0 vote, that the United States should not sign any protocol that did not include binding targets for both developed and developing countries).

36. *See About the IPCC*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, https://www.ipcc.ch/about [https://perma.cc/92UF-HL5N].

37. *See, e.g.*, *Summary for Policymakers*, *in* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS 1, 3 (Valérie Masson-Delmotte et al. eds., 2021) [hereinafter *2021 Summary for Policymakers*].

38. Paris Agreement to the United Nations Framework Convention on Climate Change art. 2, Dec. 12, 2015, T.I.A.S. No. 16-1104 [hereinafter Paris Agreement].

39. *See* David Titley, *Why Is Climate Change's 2 Degrees Celsius of Warming Limit So Important?*, CONVERSATION (Aug. 22, 2017, 10:04 PM EDT), https://theconversation.com/why-is-climate-changes-2-degrees-celsius-of-warming-limit-so-important-82058 [https://perma.cc/UHB2-AYTP].

loss, 2.3 times as great a reduction in crop yields, and twice the decline in marine fisheries.[40]

As emissions have nevertheless continued to balloon, scientists have faced pressure to include a broader suite of methods for meeting global-emissions targets within integrated assessment models.[41] Notably, IPCC modeling during the early 2000s began to include more options for removing emissions from the atmosphere as a core strategy for keeping warming to noncatastrophic levels.[42] Models included these technologies, however, without assessing either their biophysical or political feasibility at scale.[43] Still, the inclusion of large-scale carbon-removal technologies in these models shaped policymakers' perceptions about "the fields of political possibility," as the models highlighted how carbon-removal technologies might — at least in theory — play a critical role in stabilizing atmospheric greenhouse-gas concentrations.[44]

The coalescence of these forces — collective modeling of sources and sinks, the inclusion of flexibility mechanisms in early climate regimes, and the mounting difficulty of keeping atmospheric carbon concentrations to manageable levels without significant carbon removal — all contributed to the emergence of the net-zero framework. It is now clear that all feasible paths to achieving global targets must embrace some amount of carbon removal in addition to emissions reductions. The IPCC's August 2021 assessment of climate change suggests that carbon emissions, largely driven by industrialization, have already warmed the

40. Kelly Levin, *Half a Degree and a World Apart: The Difference in Climate Impacts Between 1.5°C and 2°C of Warming*, WORLD RES. INST. (Oct. 7, 2018), https://www.wri.org/insights/half-degree-and-world-apart-difference-climate-impacts-between-15c-and-2c-warming [https://perma.cc/TN6F-U5RJ].

41. *See* Beck & Mahony, *Science and Politics*, *supra* note 28, at 6-7; Jan C. Minx, William F. Lamb, Max W. Callaghan, Lutz Bornmann & Sabine Fuss, *Fast Growing Research on Negative Emissions*, 12 ENV'T RSCH. LETTERS art. no. 035007, at 1-2 (2017).

42. See *infra* Section I.B for more on these technologies. On the history of the Intergovernmental Panel on Climate Change (IPCC) modeling, see Beck & Mahony, *Science and Politics*, *supra* note 28, at 7, which traces how changes in modeling techniques "created the space for more speculative technological futures to find their way into officially authorized scenarios."

43. *See* McLaren et al., *supra* note 28, at 2 ("[T]he absolute quantities of negative emissions deployed in the models . . . were much larger than could be practically or sustainably delivered."); *see also infra* Section IV.B (highlighting the incompatibility of various carbon-removal strategies at scale).

44. Lövbrand, *supra* note 34, at 456-57 (discussing the "political effect that the primarily positive scientific scenarios of terrestrial carbon storage have had in the climate negotiation process"); Beck & Mahony, *Science and Politics*, *supra* note 28, at 2, 8 (emphasizing "the 'performative' power of IPCC assessments to shape fields of political possibility" and showing how integrated assessment models "served to make [negative emissions technologies] politically legible and actionable").

planet more than one degree Celsius since around 1850.[45] The United Nations recently calculated that disasters induced by this warming caused two million deaths over the past fifty years, not to mention immeasurable suffering.[46] This suffering is now guaranteed to persist for some time: the IPCC explains that no matter what the global response is going forward, surface temperatures will continue to rise through at least the midcentury, and other consequences of climate change—including sea-level rise and increased natural disasters—will persist for decades to millennia.[47] The 2021 report thus concludes that the only way to stop this warming and its consequences is to limit "cumulative CO_2 emissions, reaching *at least net zero* CO_2 emissions, along with strong reductions in other greenhouse-gas emissions."[48]

With this background in place, one can see why the net-zero framework has been labeled both a scientific imperative and a political maneuver.[49] Science demands global-emissions netting to stabilize atmospheric carbon concentrations and thus limit warming. But a regime that focuses on encouraging entities to zero out their individual carbon emissions is not inexorable. Responsibility for carbon reduction and carbon removal could be parceled out in other ways. Yet net-zero pledges have emerged as the preferred way to conceptualize and pursue these two necessary components of climate response. Why?

One way to understand net zero is as a grand attempt at depoliticizing climate mitigation.[50] Net-zero targets can claim a basis in science, given consensus around the need to net global emissions. At the same time, net-zero targets help

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45. *2021 Summary for Policymakers*, *supra* note 37, at 6; *id.* at 4 n.2, 5 n.9 (explaining that emissions are measured against the preindustrial period and that early atmospheric data from the period 1850-1900 is used "as an approximation for pre-industrial conditions" to measure warming against); *see also Causes of Climate Change*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/climatechange-science/causes-climate-change [https://perma.cc/47YE-6QDF] ("Since the Industrial Revolution, human activities have released large amounts of carbon dioxide and other greenhouse gases into the atmosphere, which has changed the earth's climate.").

46. *See Climate and Weather Related Disasters Surge Five-Fold Over 50 Years, but Early Warnings Save Lives - WMO Report*, UN NEWS (Sept. 1, 2021), https://news.un.org/en/story/2021/09/1098662 [https://perma.cc/DJ4B-2FF5].

47. *2021 Summary for Policymakers*, *supra* note 37, at 17, 28, 35.

48. *Id.* at 36 (emphasis added); *see also* H. Damon Matthews & Ken Caldeira, *Stabilizing Climate Requires Near-Zero Emissions*, 35 GEOPHYSICAL RSCH. LETTERS art. no. L04705 (2008) (making an early case that stabilizing GHGs would not adequately address climate change and instead near-zero emissions would be necessary).

49. *See* Carton et al., *supra* note 24, at 6 (describing how carbon-removal strategies "emerged from mutual interactions between science and policy, where the demand from policy makers for policy-relevant solutions has motivated experts to produce pathways consistent with policy targets" (citations omitted)).

50. *Cf. id.* at 15 (discussing ways that social-science research on negative emissions gets "depoliticized" when brought into scientific conversations).

to make climate change "governable," giving the world a new metric by which to judge individual actors' progress that is more comprehensible than a collective target rendered in parts-per-million atmospheric carbon-dioxide concentration or average global temperature increase.[51] Yet as it concretizes and parcels out the end goal, net zero maintains maximum flexibility with respect to means, leaving the choice of how to "net" emissions entirely up to participating countries, subjurisdictions, and companies. The flexibility enabled by this neutrality is central to net zero's widespread appeal—even as it brings several downsides explored in this Feature.

B. A Technical Overview of Netting Emissions

Superficially, the net-zero concept is simple: as of the pledge date, a pledging entity must ensure that any carbon it emits is counterbalanced by an equal amount of carbon removed from the atmosphere. But emits from where? And counterbalanced how? This Section provides an overview of the technical aspects of net zero.

The phrase "net-zero emissions" implies that for a pledging entity,[52] total annual GHG emissions will equal total annual GHG removals.[53] It is worth spending a minute to understand each side of this balance. Sources of emissions are fairly intuitive: everything that emits carbon is a source. In the United States, the primary sectoral emitters are transportation (27%), electricity (25%), industry (24%), commercial and residential uses (13%), and agriculture (11%).[54] Often, a first step for a net-zero-pledging entity is to determine whether some of its emissions can be avoided or reduced through, for example, substituting renewable energy for fossil fuels, electrifying transportation, or streamlining industrial processes to make them more efficient.[55] One more controversial

51. *See* Eva Lövbrand & Johannes Stripple, *Making Climate Change Governable: Accounting for Carbon as Sinks, Credits and Personal Budgets*, 5 CRITICAL POL'Y STUD. 187, 187 (2011).

52. I use "entity" to include countries, states, provinces, cities, and corporations.

53. Nugent, *supra* note 8. Ideally, a net-zero pledge covers all of an entity's GHG emissions. Often, however, "net zero" applies only to carbon emissions. *See Taking Stock*, *supra* note 5, at 11. For ease of explanation—and because it is the largest and most critical source category—I focus here on carbon emissions; sources of other GHGs differ, but the same conceptual framework applies.

54. *Sources of Greenhouse Gas Emissions*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions [https://perma.cc/LE8S-MFCH] (sectoral statistics from the Environmental Protection Agency's (EPA's) 2020 inventory).

55. *See* Larson et al., *supra* note 6, at 9 (laying out six "pillar[]" strategies to support net zero).

method of reducing emissions comes in the form of "Carbon Capture and Storage" (CCS), in which technology is attached to a source to capture emitted carbon and inject it deep underground for storage.[56]

Although many entities plan to use CCS as an emissions-reduction strategy, high costs have impeded widespread deployment to date.[57] Whether these costs fall rapidly enough to make CCS commercialization a feasible decarbonization tool remains deeply uncertain and depends upon supportive government policies, public acceptance, and overcoming additional challenges such as carbon transportation and responsibility for the permanency of storage.[58] Even if these barriers can be overcome, most researchers agree that CCS deployment should be concentrated in "hard-to-abate sectors," including chemicals, cement, iron, and steel—making its widespread use in net-zero pledges questionable.[59]

One further nuance regarding sources of emissions comes in the "scope" of emissions an entity chooses to take responsibility for. Those in the field often characterize an organization's emissions as falling into three categories: scope 1 emissions, which occur directly on-site; scope 2 emissions, from energy generated off-site but consumed on-site (e.g., heat and electricity); and scope 3 emissions, a broader category which includes emissions that occur off-site as a result of an entity's activities ("e.g., employee travel, customer energy consumption as a result of using the company's products, etc.").[60] Companies making a pledge must determine which of these scopes to include. Countries and subjurisdictions

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56. Vincent Gonzales, Alan Krupnick & Lauren Dunlap, *Carbon Capture and Storage 101*, RES. FOR THE FUTURE 1 (2020), https://media.rff.org/documents/CCS_101.pdf [https://perma.cc/LN43-AMZU].

57. *See, e.g.*, S. Julio Friedmann, Alex Zapantis, Brad Page, Chris Consoli, Zhiyuan Fan, Ian Havercroft, Harry Liu, Emeka Ochu, Nabeela Raji, Dominic Rassool, Hadia Sheerazi & Alex Townsend, *Net Zero and Geospheric Return: Actions Today for 2030 and Beyond*, COLUM. CTR. ON GLOB. ENERGY POL'Y 25-26 (Sept. 2020), https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/NetZero2030_CGEP-Report_092120-5_0.pdf [https://perma.cc/JEQ5-J7EW].

58. *Id.* at 34-37; Gonzales et al., *supra* note 56, at 2-3.

59. Friedmann et al., *supra* note 57, at 26-27; *see* Damien Gayle, *Carbon Capture Is Not a Solution to Net Zero Emissions Plans, Report Says*, GUARDIAN (Sept. 1, 2022, 1:00 PM EDT), https://www.theguardian.com/environment/2022/sep/01/carbon-capture-is-not-a-solution-to-net-zero-emissions-plans-report-says [https://perma.cc/M2NY-VYVA].

60. Henry Lee & Abigail Mayer, *The Future of Carbon Offset Markets: Current Trends and Emerging Challenges*, BELFER CTR. FOR SCI. & INT'L AFFS. 3 (Oct. 2020), https://www.belfercenter.org/sites/default/files/files/publication/The%20Future%20of%20Carbon%20Offset%20Markets.pdf [https://perma.cc/XY8T-CFY2]; *see also From Ambition to Impact: How Companies Are Reducing Emissions at Scale with Science-Based Targets*, SCI. BASED TARGETS INITIATIVE 14 (Jan. 2021) [hereinafter *From Ambition to Impact*], https://sciencebasedtargets.org/resources/files/SBTiProgressReport2020.pdf [https://perma.cc/EJ8W-4WM8] (showing the breakdown of companies with approved targets).

face an analogous choice: they must decide whether to take responsibility only for territorial emissions (scope 1 and 2), or also to include consumption-related emissions embedded in goods and services used within the jurisdiction but produced outside of it (scope 3).[61]

The inverse strategy of reducing emissions *into* the atmosphere is removing carbon *from* the atmosphere.[62] Broadly speaking, carbon-removal strategies can be grouped into nature-based and technology-based solutions.[63] Nature-based solutions build from the fact that the natural carbon cycle removes some carbon from the atmosphere: oceans presently absorb almost a quarter of CO_2 emissions and land also absorbs carbon in varying amounts depending on its cover and management.[64] One carbon-removal strategy, then, is to undertake solutions that enhance the ability of these natural carbon sinks to absorb carbon from the atmosphere. Such solutions include planting or preserving trees and restoring other habitats to enhance their CO_2-withdrawal potential.[65] Scientists are also experimenting with strategies to speed up the carbon-uptake levels of other natural processes, such as through adding biochar (charcoal produced from biomass) to soils or adding nutrients to rocks or the ocean.[66]

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61. Thomas Day et al., *Navigating the Nuances of Net-Zero Targets*, NEWCLIMATE INST. & DATA-DRIVEN ENVIROLAB 9 (Oct. 2020), https://newclimate.org/wp-content/uploads/2020/10/NewClimate_NetZeroReport_October2020.pdf [https://perma.cc/7FS7-62U8].

62. Carbon removal also might allow for meeting targets, even in the case of emissions "overshoot," if emissions are inadequately curbed in the short term but ultimately brought back down through later technological developments. *See* Massimo Tavoni & Robert Socolow, *Modeling Meets Science and Technology: An Introduction to a Special Issue on Negative Emissions*, 118 CLIMATIC CHANGE 1, 2 (2013); Joeri Rogelj, Michiel Schaeffer, Malte Meinshausen, Reto Knutti, Joseph Alcamo, Keywan Riahi & William Hare, *Zero Emission Targets as Long-Term Global Goals for Climate Protection*, 10 ENV'T RSCH. LETTERS art. no. 105007, at 7 (2015) [hereinafter Rogelj et al., *Zero Emission Targets*].

63. Sara Budinis, *Going Carbon Negative: What Are the Technology Options?*, INT'L ENERGY AGENCY (Jan. 31, 2020), https://www.iea.org/commentaries/going-carbon-negative-what-are-the-technology-options [https://perma.cc/JF6B-FRRX].

64. *See* Katie Lebling, Mengpin Ge, Kelly Levin, Richard Waite, Johannes Friedrich, Cynthia Elliott, Christina Chan, Katherine Ross, Fred Stolle & Nancy Harris, *State of Climate Action: Assessing Progress Toward 2030 and 2050*, WORLD RES. INST. 25 (2020), https://files.wri.org/d8/s3fs-public/2021-09/state_climate_action.pdf [https://perma.cc/PUA8-26L6] (discussing ocean absorption of carbon dioxide); *id.* at 16-19 (discussing emissions associated with management of agricultural land and forests).

65. *See* Johan Rockström, Tim Beringer, David Hole, Bronson Griscom, Michael B. Mascia, Carl Folke & Felix Creutzig, Opinion, *We Need Biosphere Stewardship that Protects Carbon Sinks and Builds Resilience*, 118 PNAS art. no. e2115218118, at 1 (2021).

66. Budinis, *supra* note 63 (describing "enhanced weathering" and "ocean fertilisation" but cautioning that these techniques need further research to understand "their costs, risks and trade-offs.").

Technological solutions include both direct air capture (DAC) and bioenergy with carbon capture and storage (BECCS).[67] DAC technologies use chemical reactions to pull carbon out of the atmosphere for long-term storage—think, for example, of a mechanical "tree" that might capture carbon from the air and inject it deep underground.[68] BECCS involves growing organic matter (thus sequestering carbon), converting it into energy, and capturing and storing its waste carbon permanently.[69] Considerable debate surrounds the potential for these tools to form a robust part of the global response to climate change for reasons of both cost and political and social feasibility.[70] Yet IPCC models suggest it will be exceedingly difficult to keep planetary warming below 1.5°C without a sizeable amount of technological removal of carbon.[71]

Many entities also rely on offsetting in their net-zero commitments. When an entity uses offsets to meet its goal, it pays for emissions reductions or carbon removal *outside* the boundaries of its own emissions responsibilities and claims credit for these reductions or removals by dint of having funded them.[72] Entities tend to use offsetting when it proves a cheaper way to achieve emissions reductions or removals.[73] When seeking offsets, purchasing entities can either direct

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67. *Id.*

68. *See Lackner's Carbon-Capture Technology Moves to Commercialization*, ASU NEWS (Apr. 29, 2019), https://news.asu.edu/20190429-solutions-lackner-carbon-capture-technology-moves-commercialization [https://perma.cc/65NG-3KF8].

69. Budinis, *supra* note 63 ("BECCS [bioenergy with carbon capture and storage] enables carbon removal because biomass absorbs CO_2 as it grows, and this CO_2 is not re-released when it is burned. Instead, it is captured and injected into deep geological formations, removing it from the natural carbon cycle.").

70. *See* Sara Budinis, *Direct Air Capture*, INT'L ENERGY AGENCY (Sept. 2022), https://www.iea.org/reports/direct-air-capture [https://perma.cc/4YRL-6LYD] ("As the technology has yet to be demonstrated at large scale, the future cost of DAC is uncertain."); James H. Williams, Ryan A. Jones, Ben Haley, Gabe Kwok, Jeremy Hargreaves, Jamil Farbes & Margaret S. Torn, *Carbon-Neutral Pathways for the United States*, 2 AGU ADVANCES art. no. e2020AV000284, at 17 (2021) (finding "that the most economic form of BECCS" is in biorefineries); *see also infra* Section III.A. (discussing social and political feasibility).

71. *See* Joeri Rogelj et al., *Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development*, *in* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, GLOBAL WARMING OF 1.5°C, *supra* note 3, at 93, 96-97 [hereinafter *2018 Mitigation Pathways*] (discussing the role and feasibility of different carbon-dioxide removal (CDR) technologies in modeled emissions scenarios); *see also* Friedmann et al., *supra* note 57, at 9-10 (emphasizing the importance and scale of negative emissions technologies to a 1.5°C pathway).

72. *Taking Stock*, *supra* note 5, at 5.

73. Barbara Haya, Denny Cullenward, Aaron L. Strong, Emily Grubert, Robert Hellmayr, Deborah A. Sivas & Michael Wara, *Managing Uncertainty in Carbon Offsets: Insights from California's Standardized Approach*, 20 CLIMATE POL'Y 1112, 1113 (2020) ("Offsets have been widely used in cap-and-trade programmes to lower compliance costs and support reductions in regions and sectors outside of the cap.").

funding to selected offset projects or purchase offset credits from various exchanges developed to trade in carbon offsets.[74] In practice, two separate offsetting markets have emerged: a compliance market for entities that use offsets to comply with a legal requirement; and a voluntary market for corporations that undertake offsetting as a voluntary business decision.[75]

One final technical aspect of net-zero pledges is their timing. As noted in the introduction, most entities choose a date around 2050 as their target for achieving net zero.[76] This date stems in part from climate science: the IPCC has calculated that to have a 66% chance of keeping warming below 2°C, global CO_2 emissions must be net zero by around 2065; to keep warming below 1.5°C, the date is 2050.[77] These dates are not firm, however—they depend on how quickly emissions are reduced between now and midcentury.[78] As Joeri Rogelj and his coauthors explain, "[r]elatively higher emissions in the near term require more rapid reductions and lower emissions afterwards," such that slower progress toward net zero paradoxically implies that it must be reached sooner.[79] Moreover, because these dates represent timeframes for *global* achievement of net zero, many argue that developed countries—as a matter of equity—must achieve these targets sooner, so as to give developing countries more headroom.[80] But of course, no entity can know precisely how global progress will play out, making purely science-based targets impossible. Instead, choosing a target date is a politically infused decision.

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74. *See* Derik Broekhoff, Michael Gillenwater, Tani Colbert-Sangree & Patrick Cage, *Securing Climate Benefit: A Guide to Using Carbon Offsets*, GREENHOUSE GAS MGMT. INST. & STOCKHOLM ENV'T INST. 7-8 (Nov. 13, 2019), http://www.offsetguide.org/wp-content/uploads/2020/03/Carbon-Offset-Guide_3122020.pdf [https://perma.cc/Z75D-KCFC].

75. *See* Keith Hyams & Tina Fawcett, *The Ethics of Carbon Offsetting*, 4 WIREs CLIMATE CHANGE 91, 92 (2013).

76. *Accelerating Decarbonization of the U.S. Energy System*, *supra* note 12, at 4.

77. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE: CONTRIBUTION OF WORKING GROUP III TO THE FIFTH ASSESSMENT REPORT 1-33 (Ottmar Edenhofer et al. eds., 2014).

78. The IPCC's 2050 calculations assume an approximate halving of CO_2 emissions by 2030. *See 2018 Mitigation Pathways*, *supra* note 71, at 95.

79. Rogelj et al., *Zero Emission Targets*, *supra* note 62, at 9.

80. *See Taking Stock*, *supra* note 5, at 16; Emily Pontecorvo, *Why Developing Countries Say Net-Zero Is 'Against Climate Justice*,*'* GRIST (Oct. 25, 2021), https://grist.org/cop26/ahead-of-cop26-developing-countries-say-net-zero-is-against-climate-justice [https://perma.cc/7C9W-FKHA].

C. State of Net-Zero Targets

The landscape of net-zero targets continues to expand and shift rapidly. Several recent reports catalogue at least a snapshot of the project. As of early 2022, at least 120 countries as well as the European Union, 1,000 cities, and 5,000 businesses had committed to net zero.[81] Oxford University's Net Zero Project reports that, in total, net-zero commitments cover at least 77% of greenhouse-gas emissions, 91% of global GDP, and 80% of the world's population.[82] These pledges, however, vary in their legal form, scope, and strategies, as described below.

First and most obviously, net-zero pledges vary in terms of size and type of pledging entity, with countries being the largest pledging unit. Many countries committing to net zero have done so through their "Nationally Determined Contributions" (NDCs)—the documents they file every five years to demonstrate their progress and plans toward the global Paris Agreement goals.[83] However, these NDCs are nonbinding, such that the sincerity of country-level commitments to net zero is better assessed through corresponding domestic legal commitments. As of September 2020, eight countries had enacted net-zero legislation, and many more had legislative efforts underway.[84] Other major emitters are at earlier stages: China, the world's largest emitter, is just beginning to flesh out a plan to comply with its announced net zero by 2060 pledge.[85]

In the United States, the Biden Administration has announced its intention to pursue net zero by 2050 and an interim target of 50% reduction from 2005 levels by 2030.[86] After nearly a year of tense legislative negotiations, the United

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81. *See* Lebling et al., *supra* note 64, at 28; *Race to Zero Campaign*, UNITED NATIONS CLIMATE CHANGE, https://unfccc.int/climate-action/race-to-zero-campaign [https://perma.cc/X2ZA-QQLH]; *Taking Stock*, *supra* note 5, at 10.

82. NET ZERO TRACKER, *supra note* 5.

83. *See* Paris Agreement, *supra* note 38, art. 4; *see also infra* Section IV.C (describing challenges posed by the structure of the Paris Agreement).

84. Lebling et al., *supra* note 64, at 30. The eight countries are Denmark, France, Hungary, Marshall Islands, New Zealand, Portugal, Sweden, and the United Kingdom. *Id.*

85. Michal Meidan, *Unpacking China's 2060 Carbon Neutrality Pledge*, THE OXFORD INST. FOR ENERGY STUD. (Dec. 2020), https://a9w7k6q9.stackpathcdn.com/wpcms/wp-content/uploads/2020/12/Unpacking-Chinas-carbon-neutrality-pledge.pdf [https://perma.cc/B8PC-MPT7].

86. *See* Exec. Order No. 14008, 86 Fed. Reg. 7619, 7622 (Feb. 1, 2021) (expressing the intent to "put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050"); Press Release, White House, Fact Sheet: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies (Apr. 22, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies [https://perma.cc/3AYH-NN5B].

States achieved substantial progress towards this goal with the passage of the Inflation Reduction Act (IRA) in August 2022, which modelers predict will support around 40% national emissions reductions by 2030.[87] The Biden Administration also has numerous regulatory levers that it might use to accelerate progress—although the U.S. Supreme Court recently issued a decision that will make creative use of administrative capacity to tackle climate change more difficult.[88] At the subnational level in the United States, at least thirteen states have recently pledged to pursue net zero by midcentury. Seven have done so via legislation.[89] The remainder have executive orders committing to net zero.[90] A number of additional states have targets that approach net zero but are not framed in these terms: Colorado, for example, aims to reduce state GHG emissions 90% by 2050.[91]

Although a full exploration of various jurisdictions' net-zero laws is beyond the scope of this Feature, it may help readers to have a few examples of these commitments. Sweden is often held up as having the strongest country-level net-zero law, which enshrines a target of net zero by 2045 and "net negative emissions" after that date.[92] Sweden sets several "milestone targets" to meet along

87. *See* Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818 (signed Aug. 16, 2022); Shannon Osaka, *Why the Climate Bill's Impact Might Not Match What Many Expect*, WASH. POST (Aug. 18, 2022, 7:30 AM EDT), https://www.washingtonpost.com/climate-environment/2022/08/18/ira-inflation-reduction-act-climate-change [https://perma.cc/5TFR-PV5N] (explaining that 40% is a commonly agreed-upon estimate with results supported from three independent modeling teams). For further discussion of the Inflation Reduction Act (IRA), see *infra* notes 212-215 and accompanying text.

88. *See* West Virginia v. EPA, 142 S. Ct. 2587 (2022) (holding that EPA overstepped its authority in aggressively regulating power-plant GHG emissions because Congress did not explicitly provide EPA adequate authority under the statutory scheme at issue). That said, some commentators have pointed out that the IRA may make climate regulations easier, as "the bill's investments will change the baseline for rulemakings across several agencies as it brings down the cost of clean technologies so agencies can design rules that are both ambitious and legally durable." *See The Inflation Reduction Act's Implications for Biden's Climate and Environmental Justice Priorities*, HARV. ENV'T & ENERGY L. PROGRAM BLOG (Aug. 12, 2022), https://eelp.law.harvard.edu/2022/08/ira-implications-for-climate-ej-priorities [https://perma.cc/BV7Q-SHSD].

89. They are Hawaii (2018), Illinois (2021), Nevada (2019), New York (2019), Vermont (2020), Virginia (2021), and Washington (2019). *See* HAW. REV. STAT. § 225P-5 (2018); 20 ILL. COMP. STAT. ANN. 730/5-1 (West 2021); NEV. REV. STAT. § 445B.380 (2019); N.Y. ENV'T CONSERV. LAW § 75-0103(11) (Consol. 2019); VT. STAT. ANN. tit. 10, § 592 (West 2020); VA. CODE ANN. § 45.2-1706.1 (West 2021); WASH. REV. CODE ANN. § 19.405.040 (West 2019).

90. They are California (2018), Louisiana (2020), Maine (2019), Massachusetts (2020), Michigan (2020), and Montana (2019). *See* Larson et al., *supra* note 6, at 17.

91. COLO. REV. STAT. ANN. § 25-7-102(2)(g) (West 2022) (using the precatory language "shall strive").

92. *Taking Stock*, *supra* note 5, at 7.

the way to net zero: by 2030, emissions are to be 63% lower than 1990 and by 2040, 75% lower.[93] Sweden's Climate Act requires the government to publish a climate-policy action plan every four years that describes how targets will be met.[94] Uniquely among national laws, Sweden also places an 8% limit on the use of offsets to meet the 2030 target, and a 2% limit for the 2040 target.[95] A Climate Policy Council of interdisciplinary experts is tasked with helping to ensure the country meets its goals through yearly progress reports.[96] Early reports, however, are not rosy: although Sweden met its interim 2020 goal (which was always expected), the Council's 2021 report finds that the country's "pace of climate transition remains too slow, and current policy is insufficient for achieving the climate goals."[97] Even among climate leaders, then, laws on paper are no guarantee of achieving net zero.

Within the United States, New York has received praise for a strong and equitable net-zero bill.[98] The Climate Leadership and Community Protection Act (Climate Act), passed in 2019, requires the state to reach 40% emissions reductions below 1990 levels by 2030 and 85% total emissions reductions by 2050.[99] The remaining 15% of reductions can come from offsets, ideally located within twenty-five miles of the purchaser to ensure that benefits remain local.[100] And the Act commits that at least 35% "of the overall benefits of spending on clean energy and energy efficiency" shall go to "disadvantaged communities."[101]

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93. *Sweden's Climate Act and Climate Policy Framework*, NATURVÅRDSVERKET [SWEDISH ENVIRONMENTAL PROTECTION AGENCY], https://www.naturvardsverket.se/en/topics/climate-transition/sveriges-klimatarbete/swedens-climate-act-and-climate-policy-framework [https://perma.cc/8F8A-S9LV].

94. *Id.*

95. *Id.*; *see also Taking Stock*, *supra* note 5, at 7 (noting the uniqueness of this feature).

96. *See The Swedish Climate Policy Council*, KLIMATPOLITISKA RÅDET [SWEDISH CLIMATE POLICY COUNCIL], https://www.klimatpolitiskaradet.se/en/summary-in-english [https://perma.cc/UAT9-4YHM].

97. *2021 Report of the Swedish Climate Policy Council*, KLIMATPOLITISKA RÅDET 6 (Mar. 25, 2021), https://www.klimatpolitiskaradet.se/wp-content/uploads/2021/06/report2021swedishclimatepolicycouncil.pdf [https://perma.cc/9ZLN-WKUC].

98. *See, e.g.*, David Roberts, *New York Just Passed the Most Ambitious Climate Target in the Country*, VOX (July 22, 2019, 8:56 AM EDT), https://www.vox.com/energy-and-environment/2019/6/20/18691058/new-york-green-new-deal-climate-change-cuomo [https://perma.cc/SXN2-4TKF].

99. N.Y. ENV'T CONSERV. LAW § 75-0107(1) (Consol. 2019).

100. *Id.* § 75-0109(4)(h)(ii) (requiring this "to the extent practicable"). Moreover, electricity generators cannot use offsets – thereby protecting the disadvantaged communities in which they are frequently located. *Id.* § 75-0109(4)(f).

101. *Id.* § 75-0117.

New York delegates authority to a Climate Action Council, comprised of various state agency heads and other appointees, to create a "scoping plan" to specify emissions-reduction mechanisms.[102] The Council is assisted by sector-specific Advisory Councils, a Just Transition Working Group that advises the Council on labor considerations,[103] and a Climate Justice Working Group that offers counsel on "incorporating the needs of disadvantaged communities in the Scoping Plan."[104] In December 2021, New York released its first draft scoping plan for public comment.[105] As in the case of Sweden, critics suggest the state's pace of action does not yet align with its robust near-term or long-term goals.[106]

Many smaller jurisdictions are also taking steps towards net zero. Most notably, the number of cities with net-zero pledges is growing rapidly, although very few cities have enshrined net-zero commitments in law.[107] Moreover, only about half of pledging cities specify interim achievement dates, and fewer still set economy-wide targets.[108] One reason for this is that cities lack authority to control many aspects of their emissions. For example, cities whose residents are served by a private, investor-owned utility cannot order that utility to switch power sources — the state public-utilities commission controls those decisions.[109] Accordingly, many cities choose to focus on those emissions that city government can realistically address.[110]

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102. *Climate Action Council*, N.Y. STATE, https://climate.ny.gov/Our-Climate-Act/Climate-Action-Council [https://perma.cc/7V2U-LCVJ].

103. *DEC and NYSERDA Announce Members of "Just Transition" Working Group to Support Implementation of State's Nation-Leading Climate Law*, N.Y. STATE ENERGY RSCH. & DEV. AUTH. (Aug. 25, 2020), https://www.nyserda.ny.gov/About/Newsroom/2020-Announcements/2020-08-25-dec-and-nyserda-announce-members-of-just-transition-working-group-to-support-implementation-of-states-nation-leading-climate-law [https://perma.cc/25RK-CW2M].

104. *Climate Justice Working Group*, N.Y. STATE, https://climate.ny.gov/Our-Climate-Act/Climate-Justice-Working-Group [https://perma.cc/SWA9-NZTW].

105. *See Climate Action Council Draft Scoping Plan*, N.Y. STATE, https://climate.ny.gov/Our-Climate-Act/Draft-Scoping-Plan [https://perma.cc/ZX5M-9RRU].

106. *See* Lee Harris, *2 Years After Passing a Landmark Climate Law, New York Has No Plan to Fund It*, GRIST (Apr. 30, 2021), https://grist.org/politics/two-years-after-passing-a-landmark-climate-law-new-york-has-no-plan-to-fund-it [https://perma.cc/45MF-VD7S].

107. *See Taking Stock*, *supra* note 5, at 21 (identifying four cities with legal requirements).

108. *See* Day et al., *supra* note 61, at 21.

109. *See* Shelley Welton, *Public Energy*, 92 N.Y.U. L. REV. 267, 314 (2017) (explaining why certain cities are mounting efforts to reclaim public control of their utilities as a climate-mitigation strategy).

110. *See* Katrina M. Wyman & Danielle Spiegel-Feld, *The Urban Environmental Renaissance*, 108 CALIF. L. REV. 305, 340-42 (2020) (tracing cities' focus on the "demand" side of climate change).

Finally, there is the proliferation of corporate pledges. Companies committing to net zero range across sectors, with pledges particularly prominent in public-facing companies involved in businesses such as retail, apparel, food, beverage, agriculture, and household and personal products.[111] Utilities, too, have joined the effort: as of late 2020, a report found that twenty-two out of fifty-five parent investor-owned utilities in the United States have net-zero or carbon-free electricity targets.[112] The financial sector has also played a prominent role in driving net-zero pledges, both of their own and those of companies seeking financing. As Sarah E. Light and Christina P. Skinner document, all six major U.S. banks not only have internal net-zero targets but have also committed to ensuring that their lending portfolios are net-zero compliant or aid net-zero achievement.[113] Similarly, BlackRock and Vanguard Group, the world's largest asset managers, have joined a host of other investment firms pledging to target net-zero emissions across their holdings.[114] Indeed, several large investors have gone so far as to establish an "expectation that portfolio companies refrain from lobbying against carbon regulation"—a step that goes beyond net zero to address root political challenges to robust climate regulation.[115] In the face of shareholder activism, even hard-to-decarbonize sectors have at least nominally committed to net zero: for example, the major oil companies Shell and BP announced net-zero targets in 2020,[116] and the largest U.S. natural gas producer, EQT Corporation, announced a net-zero target in 2021.[117]

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111. *See From Ambition to Impact*, *supra* note 60, at 28.

112. Stanley Porter, Jim Thomson, Marlene Motyka, Christine LaCroix, Kate Hardin & Carolyn Amon, *Utility Decarbonization Strategies: Renew, Reshape, and Refuel to Zero*, Deloitte Insights 4 (2020), https://www2.deloitte.com/content/dam/insights/us/articles/6849_Utility-decarbonization-strategies/DI_Utility-decarbonization-strategies.pdf [https://perma.cc/24EK-RZLZ].

113. Sarah E. Light & Christina P. Skinner, *Banks and Climate Governance*, 121 Colum. L. Rev. 1895, 1896-97 (2021).

114. *See* Alastair Marsh & Jess Shankleman, *Vanguard, BlackRock Join Investors Pledging to Hit Net Zero*, Bloomberg (Mar. 29, 2021, 12:35 PM EDT), https://www.bloomberg.com/news/articles/2021-03-29/vanguard-blackrock-join-investors-pledging-net-zero-emissions [https://perma.cc/7X92-7CL7]; Nick Robins, *The Road to Net-Zero Finance*, UK Climate Change Comm. 3 (Dec. 2020), https://www.theccc.org.uk/wp-content/uploads/2020/12/Finance-Advisory-Group-Report-The-Road-to-Net-Zero-Finance.pdf [https://perma.cc/545N-JT3H].

115. Madison Condon, *Externalities and the Common Owner*, 95 Wash. L. Rev. 1, 7 (2020).

116. *Taking Stock*, *supra* note 5, at 18.

117. Ester Wells, *Biggest U.S. Natural Gas Driller Sets 2025 Net-Zero Goal*, E&E News (July 2, 2021, 7:16 AM EDT), https://www.eenews.net/energywire/2021/07/02/stories/1063736397 [https://perma.cc/KW3L-VTQJ].

A few key trends stand out across net-zero-pledging entities in terms of how they plan to achieve their goals. As one might imagine, pledges vary widely in scope, with many taking responsibility for some upstream and downstream emissions (scopes 2 and 3), but others focusing solely on eliminating emissions from core operations (scope 1).[118] Net-zero entities also vary in the ambition of their internal emissions reductions.[119] Some entities prioritize internal reductions by setting interim targets, or separate targets, that specify required emissions reductions. One recent study finds that 33% of subnational governments and 8% of companies provide clear interim-reduction targets.[120] Among entities pursuing internal reductions, common strategies include on-site renewable energy production or contracts to purchase renewable energy, either directly or through renewable energy credits.[121] Many entities also include negative emissions technologies—BECCS and DAC—in their net-zero plans, although with no firm commitment to their deployment.[122]

Offsetting is also a common approach across entities—and for some, it is the main strategy.[123] Costs of credits vary depending on the type of offset project, with voluntary carbon markets offering offsets priced in 2021 at an average of $1.71/ton for carbon-reduction projects and $7.98/ton for carbon-removal projects.[124] These low prices are unlikely to induce actors to reduce their own emissions given how cheap it is to outsource these efforts.[125] Recognizing this, some entities, including Sweden and New York, set limits on the permissible extent of offset usage as described above.[126] This practice, however, is rare: despite offsets'

118. Day et al., *supra* note 61, at 27 ("It is not necessarily realistic to assume that all actors will be able to obtain and act upon a complete and exhaustive overview of their scope 3 emission sources."); Alberto Carrillo Pineda, Andres Chang & Pedro Faria, *Foundations for Science-Based Net-Zero Target Setting in the Corporate Sector*, SCI. BASED TARGETS INITIATIVE 5, 15 (Sept. 2020), https://sciencebasedtargets.org/resources/legacy/2020/09/foundations-for-net-zero-full-paper.pdf [https://perma.cc/5TY8-YB5Z].

119. Pineda et al., *supra* note 118, at 13.

120. Day et al., *supra* note 61, at 3.

121. *Id.* at 35-38.

122. *See* discussion *infra* Section II.B.

123. Day et al., *supra* note 61, at 50.

124. *See* Stephen Donofrio, Patrick Maguire, Kim Myers, Christopher Daley & Katherine Lin, *Markets in Motion: State of the Voluntary Carbon Markets 2021*, ECOSYSTEM MARKETPLACE 15 (2021), https://www.forest-trends.org/publications/state-of-the-voluntary-carbon-markets-2021 [https://perma.cc/5C93-CVWF].

125. *See id.* at 49 (reporting that the carbon-price levels necessary to get us to the Paris Agreement 1.5°C temperature goal are on the order of $40-80/t$CO_2$e in 2020 and $50-100/$CO_2$e by 2030).

126. *See supra* text accompanying notes 95 and 100.

widespread use, entities are frequently unclear within their net-zero commitments as to the extent of offsets.[127] This opacity helps fuel the challenges with net zero discussed in the next Part.

II. THE ACCOUNTING RISKS

Amidst much celebration of net zero, scholars and policymakers have begun to express misgivings about the wisdom of centering climate policy around a take-all-comers net-zero program. To date, most of these concerns have regarded what this Feature calls "accounting risks"—that is, concerns that pledges on paper will not translate into atmospheric emissions changes in practice. This Part outlines three such accounting risks. It begins with the most familiar and obvious: greenwashing. It then describes two more nuanced sets of challenges that stem from the temporality of net zero and its presumed physical fungibility of carbon reduction and removal efforts.

A. Greenwashing

When an entity engages in greenwashing, it projects an image of environmental stewardship that is not backed up by actual changes in corporate behavior or strategy.[128] The practice is common enough that the term was added to the *Concise Oxford English Dictionary* in 1999.[129] The greenwashing worry with respect to net-zero pledges is straightforward: companies may make pledges now, when net zero is a buzzy concept in the media spotlight, with no attempts to actually change their emissions behavior going forward. Because they are largely pledging within a legal void, unconstrained by binding reductions requirements, there is nothing beyond norms and public pressure to hold them to their word.

A scan of the entities pursuing net zero validates greenwashing concerns. How, for example, is EQT Corporation, a natural-gas company whose entire purpose is to produce the GHG methane for consumptive use, planning to achieve this goal? The answer in this case is that the company is *not* claiming responsibility for "scope 3" emissions—that is, the emissions that come from consumers using its product—but rather, is focusing on reducing or offsetting

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127. Day et al., *supra* note 61, at 21-22, 50-51.

128. *Greenwashing*, CAMBRIDGE DICTIONARY, https://dictionary.cambridge.org/us/dictionary/english/greenwashing [https://perma.cc/65JQ-T98E] (defining greenwashing as "behavior or activities that make people believe that a company is doing more to protect the environment than it really is").

129. Andy Rowell, *Greenwash Goes Legit*, GUARDIAN (July 20, 1999, 8:17 PM EDT), https://www.theguardian.com/society/1999/jul/21/guardiansocietysupplement5 [https://perma.cc/LTC5-RKEE].

emissions directly associated with production.[130] Similarly, in two analyses of the U.S. electric-utility sector, researchers determined that most utilities that have committed to net zero have "significant gaps between decarbonization targets and the scheduled fossil-fuel plant retirements, renewable additions, and flexibility requirements needed to achieve full decarbonization. The math doesn't yet add up."[131] Albert C. Lin identifies yet another strategy for greenwashing that involves a company selling off its most polluting assets, such that the company appears to have cut emissions.[132] In fact, however, "emissions may even increase because the purchasers — often private companies not subject to investor pressure — are more likely to develop the asset and to operate with lower standards."[133]

In general, it is only possible to scrutinize the reliability of net-zero pledges through tedious digging or voluntary reporting. In recent years, efforts to police greenwashing have produced numerous standard-setting organizations that aim to separate the net-zero wheat from the chaff. For example, the United Nations's "Race to Zero" campaign aims to connect governments, businesses, investors, and higher education institutions committed to net zero.[134] Participating entities must meet a certain set of "process criteria" to join the initiative.[135] For cities, the Carbon Neutral Cities Alliance and C40 Cities Climate Leadership Group play important roles in establishing guidance and best practices.[136] Several organizations also exist to promote best practices for private-sector pledges, including the Science Based Targets initiative (SBTi) and Carbone 4's Net Zero Initiative.[137] In the financial sector, there is the United Nations-convened "Net Zero

130. Wells, *supra* note 117.

131. Porter et al., *supra* note 112, at 8; *see also* John Romankiewicz, Cara Bottorff & Leah C. Stokes, *The Dirty Truth About Utility Climate Pledges*, SIERRA CLUB 12 (Jan. 2021), https://www.sierraclub.org/sites/www.sierraclub.org/files/blog/Final%20Greenwashing%20Report%20%281.22.2021%29.pdf [https://perma.cc/AZR8-QWDD] (finding that utility net-zero pledges "are not leading to meaningful action on the ground this decade"); David Pomerantz & Matt Kasper, *Many U.S. Electric Utilities Plan Slow Decarbonization Over Next Decade, Out of Sync with Biden Plan*, ENERGY & POL'Y INST. (Dec. 1, 2020), https://www.energyandpolicy.org/utilities-carbon-goal-biden-climate-plan [https://perma.cc/X5UG-NNVS] (finding most utilities' plans incompatible with the Biden goal of a zero-emissions electricity sector by 2035).

132. Lin, *supra* note 20, at 708-09.

133. *Id.* at 708.

134. *Race to Zero Campaign*, *supra* note 81.

135. *Id.*

136. Day et al., *supra* note 61, at 11.

137. *See* César Dugast, *Net Zero Initiative — Diving into the Net Zero Initiative Guidelines*, CARBONE4, at 1-28 (Apr. 2020), https://www.carbone4.com/wp-content/uploads/2020/04/Carbone-4-

Asset Owner Alliance," a group of investors who have pledged to align portfolios with a 1.5° C scenario.[138] To join these initiatives, an entity must commit to meeting certain established criteria for their net-zero plans—criteria which provide a check against greenwashing.[139]

Government-mandated reporting requirements could strengthen visibility into companies' climate pledges. In March 2022, the U.S. Securities and Exchange Commission (SEC) issued a proposed rule that would require public companies to disclose carbon emissions, emissions-reduction plans and progress, and the effects of climate change on their business.[140] If finalized, such a rule might help pave the way for more serious legal liability for false representations in corporate net-zero plans.[141] The proposed rule, however, has received swift and fierce blowback, including criticisms that the agency is overreaching

NZI-Guidelines-april-2020-2.pdf [https://perma.cc/F5UM-5YUG]; Pineda et al., *supra* note 118, at 4.

138. *See The Net-Zero Asset Owner Alliance: FAQ*, United Nations Env't Programme Fin. Initiatie 1-8 (2019), https://www.unepfi.org/wordpress/wp-content/uploads/2019/09/AOA_FAQ.pdf [https://perma.cc/N9NK-94UA].

139. *See Interpretation Guide: Race to Zero Expert Peer Review Group*, United Nations Framework Convention on Climate Change 1-3 (Apr. 2021), https://racetozero.unfccc.int/wp-content/uploads/2021/04/Race-to-Zero-EPRG-Criteria-Interpretation-Guide-2.pdf [https://perma.cc/6GP3-2562]; Pineda et al., *supra* note 118, at 10; *Taking Stock*, *supra* note 5, at 12.

140. The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 Fed. Reg. 21334, 21337 (proposed Apr. 11, 2022); *see also Fact Sheet: Enhancement and Standardization of Climate-Related Disclosures*, U.S. Sec. & Exch. Comm'n 1-3 (Mar. 21, 2022), https://www.sec.gov/files/33-11042-fact-sheet.pdf [https://perma.cc/H9DQ-BTXQ] (providing an overview of the proposed rule).

141. Matthew Ferguson & Ariella Sparr, *Greenwashing, Climate Change Disclosures, and Financial Lines Risks*, JD Supra (May 26, 2022), https://www.jdsupra.com/legalnews/greenwashing-climate-change-disclosures-7624448 [https://perma.cc/PHR6-RX7C] ("The prospect of heightened SEC [Securities and Exchange Commission] environmental disclosures and regulation of sustainability claims may provide additional avenues for greenwashing claims by shareholders."). For a discussion of possible litigation against companies engaged in greenwashing, see Amanda Shanor & Sarah E. Light, *Greenwashing and the First Amendment*, 122 Colum. L. Rev. (forthcoming 2022), https://ssrn.com/abstract=4178318 [https://perma.cc/B4QL-EJAD].

its authority under the newly established Supreme Court precedent in *West Virginia v. Environmental Protection Agency*.[142] Thus, if finalized, the rule is likely to be locked in litigation for some time to come.[143]

Across the world, litigants are already experimenting with using courts to eliminate greenwashing and force entities into compliance with their pledges. Such cases have met some early success in the Netherlands: in 2019, the Supreme Court of the Netherlands upheld lower-court opinions finding that the Dutch government had a duty, grounded in human rights and constitutional law, to act faster to reduce emissions.[144] Building on this decision, in 2021, a lower Dutch court found Shell Oil's climate plans to be in violation of human rights and the standard of due care and ordered it to reduce its emissions more rapidly.[145] Whether additional jurisdictions, including U.S. courts, are likely to follow similar lines of reasoning remains deeply uncertain. For now, only voluntary affiliation with a standard-setting organization, public and consumer awareness, the outside possibility of a lawsuit, and the threat of media scrutiny place potential bounds on the practice of greenwashing in net-zero pledges.[146]

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142. 142 S. Ct. 2587 (2022); *see We Are Not the Securities and Environment Commission - At Least Not yet*, U.S. SEC. & EXCH. COMM'N (Mar. 21, 2022), https://www.sec.gov/news/statement/peirce-climate-disclosure-20220321 [https://perma.cc/24WH-GQCY]; Katanga Johnson, *U.S. Supreme Court Emissions Ruling May Stop SEC Drive for Disclosure*, REUTERS (July 1, 2022, 12:26 PM EDT), https://www.reuters.com/business/sustainable-business/supreme-court-ruling-carbon-emissions-bodes-badly-us-sec-climate-rule-2022-06-30 [https://perma.cc/Q3GQ-DYSV]. *But see* Jill E. Fisch, Comment Letter on Enhancement and Standardization of Climate-Related Disclosures for Investors (S7-10-22) (June 6, 2022), https://www.sec.gov/comments/s7-10-22/s71022-20130354-297375.pdf [https://perma.cc/T8NM-5KFM] (filed by thirty securities-law professors, arguing that the SEC has authority to undertake the proposed rule).

143. *See* Avery Ellfeldt, *Why the Supreme Court's Climate Ruling Matters to the SEC*, E&E NEWS (July 7, 2022, 6:55 AM EDT), https://www.eenews.net/articles/why-the-supreme-courts-climate-ruling-matters-to-the-sec [https://perma.cc/74AJ-UCEB] (sharing predictions that the rule may be struck down by the Supreme Court).

144. *See* HR 20 december 2019, NJ 2020, 41 m.nt. J. Spier (De Staat der Nederlanden/Stichting Urgenda) [The State of the Netherlands/Urgenda Foundation] (Neth.); *see also* Naomi Spoelman, *Urgenda: A How-to Guide for Enforcing Greenhouse Gas Emission Targets by Protecting Human Rights*, 47 ECOLOGY L.Q. 751, 751 (2020) ("*The State of the Netherlands v. Urgenda Foundation* establishes that the European Convention on Human Rights . . . requires the Netherlands to take adequate action to prevent the real and imminent risk of dangerous climate change.").

145. *See* Rb. Den Haag 26 mei 2021, JOR 2021, 208 m.nt. Biesmans, S.J.M. (Vereniging Milieudefensie/Royal Dutch Shell PLC) (Neth.).

146. *Cf.* Lin, *supra* note 20, at 707 (observing that "voluntary environmental programs in the United States have yielded limited environmental improvements").

B. Carbon Temporality and the Risk of Self-Serving Optimism

Another accounting risk of the net-zero framework stems from its temporal flexibility. To put it simply, 2050 is a long way away. The long-term nature of net-zero pledges enables entities not egregiously engaged in greenwashing to nevertheless display a problematic degree of self-serving optimism in their emissions planning. For example, many net-zero plans delay immediate action on the optimistic assumption that not-yet-commercially-viable technologies will be available in later decades to help meet neutrality commitments.[147] Self-serving optimism is thus like the older cousin of greenwashing—the cousin sophisticated enough to at least spin a plausible tale about why they missed curfew.

The easiest way to illustrate the challenge of overoptimism is, again, through examples. Consider Southern Company, a large utility in the U.S. Southeast. Southern Company set a goal in 2018 of net-zero carbon emissions by 2050, as well as "a 50% reduction in GHG emissions by 2030, as compared to 2007 levels."[148] The company has made rapid progress on this 50%-by-2030 goal predominantly by switching from older coal-fired generation to new gas plants.[149] However, its ability to meet the more ambitious 2050 target—with this new gas-generation fleet in place—will hinge entirely on the emergence of cost-effective carbon capture and storage technology.[150] As discussed above, the future of this technology is far from certain.[151]

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147. *See* McLaren et al., *supra* note 28, at 1-2 (describing this strategy as "risky"); *see also* Dave Elliott, *Net Losses: Why Net Zero Carbon Targets May Backfire*, PHYSICS WORLD (Oct. 16, 2019), https://physicsworld.com/a/net-losses-why-net-zero-carbon-targets-may-backfire [https://perma.cc/6JFV-VFX5] (describing self-serving optimism as the reason why net zero may "backfire"); Carton et al., *supra* note 24, at 6 ("[A] key concern has long been that a focus on carbon removal will provide the justification for business-as-usual and thereby risks undermining ambitious climate action.").

148. *Implementation and Action Toward Net Zero*, S. CO. 3 (Sept. 2020), https://www.southerncompany.com/content/dam/southern-company/pdf/public/Net-zero-report.pdf [https://perma.cc/E944-QDJ9].

149. *Id.* at 10-11.

150. The company's plans rely on carbon capture, use, and storage (CCUS); renewable natural gas; and next-generation nuclear, hydrogen, and "negative carbon concepts, such as natural solutions, biomass energy with CCUS and direct air capture." *Id.* at 7.

151. *See supra* notes 57-59 and accompanying text; *see also* Daniel Tait, *Southern Company Net-Zero Implementation Plan Filled with Loopholes for Continued Use of Fossil Fuels*, ENERGY & POL'Y INST. (Sept. 24, 2020), https://www.energyandpolicy.org/southern-company-net [https://perma.cc/96LT-WWLK] (discussing how Southern Company plans to reach net-zero omissions but "the plan remains scant on key details"); Lebling et al., *supra* note 64, at 6 (describing the risks of pursuing strategies that may "lock-in . . . carbon-intensive infrastructure, technologies, and behavior").

A second example highlights how offsets can substitute for ambitious climate-mitigation activity. The Mountain Valley Pipeline — currently under development along 300 miles between West Virginia and Virginia — will carry natural gas from the fracking-rich Marcellus Shale to customers along the East Coast.[152] In the summer of 2021, its developers announced plans to become one of the first carbon-neutral, natural-gas transmission pipelines in the United States by purchasing more than $150 million in carbon offsets — while announcing no internal emissions-reduction plans.[153] Given that the IPCC's latest report states unequivocally that there is no place for new fossil-fuel infrastructure in a 1.5°C world, Mountain Valley's plans appear optimistic to the point of absurdity.[154]

Additional examples abound. Equinor, Norway's partly state-owned oil company, plans to increase oil and gas sales as part of its net-zero strategy, while relying on offsets, DAC, and CCS to make up the difference.[155] A 2021 investigation found that Amazon, Apple, Unilever, and United also rely on large amounts of carbon removal in their net-zero plans.[156] Nor is self-serving optimism limited to companies: at the March 2019 United Nations Conference, U.S. and Saudi Arabian delegations reportedly "argued that negative emission techniques . . . will and should be an *alternative*, rather than an *addition*, to emissions reductions."[157] The United Kingdom's net-zero strategy relies heavily on BECCS investments.[158] New York State — despite having one of the most aggressive net-zero laws in the United States on the books — has no plan for how to finance this

152. Carlos Anchondo, *Pipeline Goes CO2 Neutral: Innovative or Green Washing?*, E&E NEWS (July 13, 2021, 6:53 AM EDT), https://www.eenews.net/stories/1063736995 [https://perma.cc/FER2-W8SS].

153. These offsets will cover ten years of emissions from pipeline "operations," but they do not account for downstream emissions when consumers burn purchased natural gas. *Id.*

154. *See* Minal Pathak et al., *Technical Summary*, *in* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE, at TS-1, TS-26, TS-46 to -47 (Priyadarshi R. Shukla et al. eds., 2022) [hereinafter *2022 Technical Summary*] (finding that existing fossil-fuel infrastructures already will push warming over global targets and that "[l]imiting warming requires shifting energy investments away from fossil-fuels and towards low-carbon technologies (*high confidence*)").

155. Ketan Joshi, *The Nordic Model: How Equinor Is Obscuring Its Fossil Expansion*, MEDIUM (July 10, 2021), https://medium.com/lobbywatch/the-nordic-model-how-equinor-is-obscuring-its-fossil-expansion-254fcc2b756d [https://perma.cc/ZGH5-QYWC].

156. James Temple, *Carbon Removal Hype Is Becoming a Dangerous Distraction*, MIT TECH. REV. (July 8, 2021), https://www.technologyreview.com/2021/07/08/1027908/carbon-removal-hype-is-a-dangerous-distraction-climate-change [https://perma.cc/RLE9-CB75].

157. McLaren et al., *supra* note 28, at 1 (citation omitted).

158. *See Net Zero: The UK's Contribution to Stopping Global Warming*, COMM. ON CLIMATE CHANGE 77 (May 2019), https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf [https://perma.cc/2GQG-BGF6].

legal commitment.[159] And California has drawn criticism for setting tepid emissions-reductions goals for the power sector through 2030, which climate activists—and, more notably, the state's grid operator—suggest will not be sufficient to drive change at the rate needed to meet the state's long-term, net-zero commitment.[160]

Among these many entities, Equinor at least deserves credit for the baldness of its self-serving optimism. In describing its methodology, it explains, "Should society's demands and technological innovation not shift in parallel with Equinor's pursuit of significant greenhouse gas emission reductions, Equinor's ability to meet its net zero and net carbon intensity ambitions will be impaired."[161] There is the rub of the self-serving optimism risk: full credit now for a net-zero pledge, and an easy long-term disclaimer if technology does not ultimately "shift" to make the pledge achievable. Note the relationship between the inherent technological flexibility of net zero, with its indifference as to whether emissions are reduced, removed, or offset, and the ability of entities to heel-drag their way towards eventual compliance. The expectation that easy offsets and removal technologies will be available in the future causes entities to forego near-term, in-house planning towards emissions reductions. Ultimately, the dilatory tactics enabled by net zero's long temporality have doubly pernicious effects: not only does it make achievement of global net zero challenging, but it also means that "emissions that could have been prevented between now and 2030 will remain in the atmosphere for hundreds of years," possibly equating "to extreme heat and sea level rise for hundreds of millions more people."[162]

Although the problem is pervasive,[163] not all entities rely heavily on delay coupled with unproven technologies. Many have set appropriate interim targets, have taken responsibility for a broad scope of emissions, and are pursuing steps

159. *See* Harris, *supra* note 106.

160. Sammy Roth, *Joe Biden Wants 100% Clean Energy. Will California Show that It's Possible?*, L.A. TIMES (Feb. 11, 2021, 2:30 PM PT), https://www.latimes.com/business/story/2021-02-09/joe-biden-wants-100-clean-energy-will-california-show-that-its-possible [https://perma.cc/VY8G-MLRK].

161. *NET-GHG Emission and Net Carbon Intensity Methodology*, EQUINOR 3-4 (Feb. 11, 2020), https://www.equinor.com/content/dam/statoil/documents/climate-and-sustainability/net-ghg-emissions-net-carbon-intensity-Methodology-november-2020.pdf [https://perma.cc/88H9-C8HF].

162. Pomerantz & Kasper, *supra* note 131.

163. *See, e.g.*, Pineda et al., *supra* note 118, at 113 (stating that some companies have "set targets that entail modest emissions reductions and heavier reliance on offsetting practices").

aligned with their plans.[164] Entities that are part of accountability efforts, such as SBTi and Race to Zero,[165] appear more likely to have rigorous plans—suggesting a useful role for private governance in this regard.[166]

C. Carbon Fungibility and the Risks of Additionality, Permanence, and Leakage

Even if an entity fully intends to meet its carbon pledges and relies entirely on near-term investments in proven technologies rather than self-serving optimism, there remains yet another set of accounting risks. These risks stem from the assumed physical fungibility of carbon resources embedded in net zero. This Section describes how measurement and monitoring challenges related to carbon's physical properties lead to three additional accounting risks: nonadditionality, impermanence, and leakage.

As noted above, many entities treat carbon removed from the atmosphere as fungible with carbon emitted into the atmosphere in their net-zero plans. This assumption forms a core premise of the net-zero strategies of both removal and offsetting, dependent as they are on swapping physical tons reduced in one place for physical tons removed in another. Consequently, if carbon removal cannot be relied upon to actually capture carbon and store it permanently, then much of the theoretical and practical basis for net zero will be undermined.[167] This challenge is a serious one for net-zero regimes in their current format—as Peter Healey, Robert Scholes, Penehuro Lefale, and Pius Yanda observe, "the 'net zero' concept loses much of its meaning and attraction unless there is a large measure

164. For example, consider Nestlé's net-zero plan. Nestlé has announced three interim targets: 20% emissions reduction by 2025, 50% emissions reduction by 2030, and 100% on-site renewable energy by 2025. *Accelerate, Transform, Regenerate: Nestlé's Net Zero Roadmap*, NESTLÉ 3-4 (Feb. 2021), https://www.nestle.com/sites/default/files/2020-12/nestle-net-zero-roadmap-en.pdf [https://perma.cc/8YRX-B6VD]. The Science Based Target initiative (SBTi) has assessed that Nestlé's targets are consistent with keeping warming to 1.5°C. *See SBTi Target Dashboard*, SCI. BASED TARGETS INITIATIVE, https://sciencebasedtargets.org/companies-taking-action#why-is-temperature-alignment-given-for-scope-1-and-2-targets-only-not-scope-3 [https://perma.cc/S9PP-A46Y]. More broadly, Henry Lee and Abigail Mayer report that "88 percent of companies who buy offsets have also formally adopted emissions reductions targets," suggesting at least an awareness that offsets should be paired with significant emissions reductions. Lee & Mayer, *supra* note 60, at 4.

165. *See supra* notes 134-139 and accompanying text.

166. *See Taking Stock*, *supra* note 5, at 23; *From Ambition to Impact*, *supra* note 60, at 19 ("[T]he typical SBTi company has reduced its emissions by 6.4% per year since setting its target.").

167. *See Taking Stock*, *supra* note 5, at 11 ("Crucially, the only form of net zero which stabilises global temperature is one in which any continued emissions of fossil CO_2 are balanced out by permanent removals of CO_2.").

of substitutability between emissions reductions and [carbon-dioxide removal] offsets."[168]

The topic of fungibility is a scientifically and legally complex one. An extensive literature already covers it, within and beyond the climate context.[169] For present purposes, a summary of the three key carbon-accounting concerns related to fungibility should suffice. The first is additionality, which refers to ensuring that a project awarded carbon offsets "would not have occurred in the absence of a market for offset credits."[170] Additionality is critical to the validity

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168. Peter Healey, Robert Scholes, Penehuro Lefale & Pius Yanda, *Governing Net Zero Carbon Removals to Avoid Entrenching Inequities*, 3 FRONTIERS CLIMATE art. no. 672357, at 2 (2021).

169. Much of the literature on fungibility focuses on contexts where the unit of measurement makes physical substitution particularly challenging, as in the case of biodiversity and wetlands offsets, where an acre of land preserved in one place may not have the same ecosystem services or biodiversity value as the acre destroyed in another. Carbon avoids these challenges, because "a ton is a ton"—but it presents its own complex set of considerations. *Cf.* James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607, 665 (2000) (referencing the analogous case of sulfur dioxide). On wetlands-mitigation banking, see, for example, *id.* at 611-12; Shelley Welton, Michela Biasutti & Michael Gerrard, *Legal & Scientific Integrity in Advancing a Land-Degradation Neutral World*, 40 COLUM. J. ENV'T L. 39, 62-69 (2015), which collects many critiques; Philip Gibbons & David B. Lindenmayer, *Offsets for Land Clearing: No Net Loss or the Tail Wagging the Dog?*, 8 ECOLOGICAL MGMT. & RESTORATION 26, 28-30 (2007), which notes that poor compliance track records in offsetting programs extend beyond wetlands-mitigation banking; James Salzman & J.B. Ruhl, *"No Net Loss": Instrument Choice in Wetlands Protection*, *in* MOVING TO MARKETS IN ENVIRONMENTAL REGULATION 323, 323-25 (Jody Freedman & Charles D. Kolstad eds., 2007); Philip Womble & Martin Doyle, *The Geography of Trading Ecosystem Services: A Case Study of Wetland and Stream Compensatory Mitigation Markets*, 36 HARV. ENV'T L. REV. 230, 245-48 (2012); Morgan M. Robertson, *The Neoliberalization of Ecosystem Services: Wetland Mitigation Banking and Problems in Environmental Governance*, 35 GEOFORUM 361, 362-64 (2004); and Royal C. Gardner, *Money for Nothing? The Rise of Wetland Fee Mitigation*, 19 VA. ENV'T L.J. 1, 2-4 (2000). On biodiversity offsetting programs, see, for example, Susan Walker, Ann L. Brower, R.T. Theo Stephens & William G. Lee, *Why Bartering Biodiversity Fails*, 2 CONSERVATION LETTERS 149, 149 (2009), which concludes that achievement of "no net loss" policies through offset regimes is "administratively improbable and technically unrealistic"; Shelley Burgin, *BioBanking: An Environmental Scientist's View of the Role of Biodiversity Banking Offsets in Conservation*, 17 BIODIVERSITY CONSERVATION 807, 814 (2008), which finds that the biodiversity offsets "concept is flawed, and decision making around offsets is largely conducted without an appropriate scientific underpinning"; Bruce A. McKenney & Joseph M. Kiesecker, *Policy Development for Biodiversity Offsets: A Review of Offset Frameworks*, 45 ENV'T MGMT. 165, 165 (2010); and Martine Maron, Richard J. Hobbs, Atte Moilanen, Jeffrey W. Matthews, Kimberly Christie, Toby A. Gardner, David A. Keith, David B. Lindenmayer & Clive A. McAlpine, *Faustian Bargains? Restoration Realities in the Context of Biodiversity Offset Policies*, 155 BIOLOGICAL CONSERVATION 141, 144 (2012), which finds that restoration projects do not have a high success rate.

170. Broekhoff et al., *supra* note 74, at 19. The additionality concept also includes "legal additionality," meaning a project should not be eligible for carbon finance if it is required by law. Brian Joseph McFarland, *Carbon Reduction Projects and the Concept of Additionality*, 11 SUSTAINABLE DEV. L. & POL'Y 15, 15 (2011).

of offsets because if an entity uses offsets from a project that would have happened anyway to justify its own continued emissions, it functionally makes climate change worse. Yet despite reams of methodologies developed across various domestic and international offset schemes, reliable verification methods for additionality have proven elusive.[171] In fact, studies have suggested that in the world's two largest carbon-offset programs, both administered by the United Nations as part of the Kyoto Protocol, as many as 60-70% of credits may not have represented valid GHG reductions.[172]

171. *See* Broekhoff et al., *supra* note 74, at 19-20; Jessica Campbella, Irene M. Herremans & Anne Kleffner, *Barriers to Achieving Additionality in Carbon Offsets: A Regulatory Risk Perspective*, 61 J. ENV'T PLAN. & MGMT. 2570, 2574 (2018) ("Jurisdictions with carbon-offset markets have faced a significant challenge in terms of providing a precise and well-grounded definition for additionality."); Axel Michaelowa, Lukas Hermwille, Wolfgang Obbergassel & Sonja Butzengeiger, *Additionality Revisited: Guarding the Integrity of Market Mechanisms Under the Paris Agreement*, 19 CLIMATE POL'Y 1211, 1214 (2019) ("As project developers have an incentive to game the parameters in order to gain more emission units, testing of 'project additionality' is generally difficult.").

172. *See* Broekhoff et al., *supra* note 74, at 17; *see also* Haya et al., *supra* note 73, at 1113 (describing three potential sources of overcrediting); Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. REV. 1759, 1764 (2008) ("The CDM is failing as a market because its rules, rather than producing real reductions, have accounting loopholes that allow participants to manufacture GHG credits at little or no cost beyond the payment of consultants necessary to surmount the necessary regulatory hurdles."). The additionality concern also encompasses critiques that project "baselines" may inflate the carbon savings of projects. For example, California's net-zero plan allows companies to offset some of their emissions with the purchase of out-of-state credits paid to landowners who agree to conserve forests on their property. But critics charge that California's system for assigning these credits artificially inflates some forests' carbon benefits by assigning value based on crude geographic groupings. *See* Grayson Badgley, Jeremy Freeman, Joseph Hamman, Barbara Haya, Anna Trugman, William R. L. Anderegg & Danny Cullenward, *Systematic Over-Crediting of Forest Offsets*, CARBONPLAN (Apr. 29, 2021), https://carbonplan.org/research/forest-offsets-explainer [https://perma.cc/F5LH-R8DY]; James Temple & Lisa Song, *The Climate Solution Actually Adding Millions of Tons of CO2 into the Atmosphere*, MIT TECH. REV. (Apr. 29, 2021), https://www.technologyreview.com/2021/04/29/1017811/california-climate-policy-carbon-credits-cause-co2-pollution [https://perma.cc/M5RH-45XM] (reporting estimates that "the state's program has generated between 20 million and 39 million credits that don't achieve real climate benefits . . . equal to the annual emissions of 8.5 million cars at the high end"); *see also* Haya et al., *supra* note 73, at 1113 (describing baseline-setting challenges under the Kyoto Protocol); David Takacs, *Forest Carbon (REDD+), Repairing International Trust, and Reciprocal Contractual Sovereignty*, 37 VT. L. REV. 653, 661-62 (2013) (collecting criticisms of forest-offsetting programs under international regimes); Rowena Maguire, *Opportunities for Forest Finance: Compliance and Voluntary Markets*, 2011 CARBON & CLIMATE L. REV. 100, 109 (describing crediting challenges for forests).

A second fungibility-related challenge that particularly plagues efforts at carbon removal is that of permanence. We need carbon removed from the atmosphere to stay out of the atmosphere, ideally *forever*.[173] If carbon removed from the atmosphere somehow "leaks" back in, then removal is a charade. Yet, ensuring the permanence of carbon removal is challenging, particularly in the case of nature-based solutions. Trees are susceptible to wildfires and human demand for timber products;[174] soil sequestration only works under continuous management.[175] In contrast, DAC and CCS—both of which anticipate storage of carbon in underground reservoirs—are generally perceived as less risky from a permanence perspective. But they still present uncertainties and require continuous monitoring, given that a carbon leak from a reservoir might undo substantial progress.[176] Various programs are experimenting with ways to boost confidence in the permanence of removals—from "buffer reserves,"[177] to credit bundling and securitization,[178] to liability regimes[179]—but their efficacy remains unclear.[180]

Carbon "leakage" presents the third fungibility-related challenge. Leakage here refers to the fact that when a carbon-removal project occurs, it may have

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173. *But see* Broekhoff et al., *supra* note 74, at 26 ("Most of the carbon in a tonne of CO_2 emitted today will—eventually—be removed from the atmosphere. However, around 25% remains in the atmosphere for hundreds to thousands of years.").

174. *See* Matthew D. Hurteau, Bruce A. Hungate & George W. Koch, *Accounting for Risk in Valuing Forest Carbon Offsets*, 4 CARBON BALANCE & MGMT. art. no. 1, at 1-2 (2009) ("[T]he value of forest carbon declines by as much as 99% when the risk of loss due to wildfire is considered.").

175. *See* Tas Thamo & David J. Pannell, *Challenges in Developing Effective Policy for Soil Carbon Sequestration: Perspectives on Additionality, Leakage, and Permanence*, 16 CLIMATE POL'Y 973, 976 (2016).

176. *See* Pineda et al., *supra* note 118, at 47 ("[E]ven geological carbon storage can be exposed to a number of physical conditions that could cause some of the carbon to be leaked back into the atmosphere.").

177. Many programs maintain a "buffer reserve" where credits are set aside as an insurance mechanism. Purchasers of credits from projects that suffer a reversal can then draw from this reserve to compensate for the reversed emissions. *See* Broekhoff et al., *supra* note 74, at 26.

178. *See* Larry Lohmann, *Regulatory Challenges for Financial and Carbon Markets*, 3 CARBON & CLIMATE L. REV. 161, 169-70 (2009).

179. The liability issue is a delicate one: too strict a liability regime might deter the development of underground storage, while too lenient a regime risks less faith in carbon removal as a climate strategy. *See* Friedmann et al., *supra* note 57, at 43.

180. *See* Tracy Hester, *Legal Pathways to Negative Emissions Technologies and Direct Air Capture of Greenhouse Gases*, 48 ENV'T L. REP. NEWS & ANALYSIS 10413, 10430-32 (2018) (suggesting the need for new federal legislation revising the current liability and damages regime for removal technologies); MoonSook Park, *The Government's Multi-Faceted Role in Resolving the Main Legal Issues Regarding Carbon Capture and Sequestration*, 94 N.D. L. REV. 481, 494 (2019) (finding liability regimes for leakage to be "ambiguous and conflicting").

indirect effects on carbon emissions both domestically and internationally in ways that often prove hard to discern.[181] As one report explains, "The classic example is a forest preservation project that avoids the emissions caused by clearing one parcel of forest, but ends up shifting the production of timber through deforestation to other areas."[182] Leakage amounts vary by project, but Tas Thamo and David J. Pannell report that some voluntary offset schemes may be subject to leakage of up to 90% of claimed emissions "savings."[183] Others suggest the leakage burden is typically much smaller.[184]

These fungibility-based concerns can never be entirely solved, but their risks can be mitigated through careful project monitoring and verification.[185] Of course, increased scrutiny creates increased transaction costs—none too popular in the case of entities seeking cheap offsets.[186] The intractability of these challenges has resulted in a long-standing, vociferous debate over the role that offsets should play in the international climate regime.[187] The net-zero framework—at least as implemented to date—clearly embraces offsets, although

181. *See* Andrei Marcu, Christian Egenhofer, Susanna Roth & Wijnand Stoefs, *Carbon Leakage: An Overview*, CTR. FOR EUR. POL'Y STUD. 3 (Dec. 2013), https://www.ceps.eu/wp-content/uploads/2013/12/Special%20Report%20No%2079%20Carbon%20Leakage_0.pdf [https://perma.cc/XFP6-SX32]. *See generally* Kevin Anderson, *The Inconvenient Truth of Carbon Offsets*, 484 NATURE 7 (2012) (discussing the many indirect effects that the purchase of carbon offsets might have).

182. *See* Broekhoff et al., *supra* note 74, at 23.

183. Thamo & Pannell, *supra* note 175, at 974; *see also* Brian C. Murray, Brent Sohngen & Martin T. Ross, *Economic Consequences of Consideration of Permanence, Leakage and Additionality for Soil Carbon Sequestration Projects*, 80 CLIMACTIC CHANGE 127, 132-33 (2007) (discussing variation in leakage rates).

184. *See* Larry Karp, Reflections on Carbon Leakage 2 (Oct. 13, 2010) (unpublished manuscript), https://www.researchgate.net/publication/229054146_Reflections_on_Carbon_Leakage [https://perma.cc/G8R9-93LU] (estimating country-to-country carbon leakage at around 20% in his models).

185. *See* Carton et al., *supra* note 24, at 5 (asserting that these concerns "cannot be resolved by science").

186. *See* Thamo & Pannell, *supra* note 175, at 974; McNish, *supra* note 33, at 419 ("There is a fundamental trade-off between effective evaluation procedures and administrative efficiency, and to date the efficiency goals have been ascendant.").

187. *See* Hyams & Fawcett, *supra* note 75, at 91 (describing offsets as having "divided the environmental movement").

various institutional actors champion their usage to different degrees.[188] As entities begin to make good on their pledges, most expect the offset market to balloon, for better or for worse.[189]

The accounting risks presented here provoke concerns that the net-zero project—though aligned with the best of climate science on paper—may amount to little more than a shell game in practice.[190] I share these concerns. But a focus on these risks in some ways misses the forest for the trees: as explored in the following Parts, it is not just the difficulty of ensuring individualized accountability that presents cause for concern over net zero—it is the overall nature of the enterprise that the regime sets into motion.

III. THE NEUTRALITY MIRAGE

It has been repeated frequently enough to almost become a mantra: when it comes to carbon reductions, "a ton is a ton."[191] Or in long form: "Because GHGs mix globally in the atmosphere, it does not matter where exactly they are reduced. From a climate change perspective, the effects are the same if an organization: (a) ceases an emission-causing activity; or (b) enables an equivalent emission-reducing activity somewhere else in the world."[192] The notion that a ton is a ton forms the central premise of net zero. One can embrace net zero's complete neutrality about the ways in which carbon is reduced only if those ways are all equally preferable.

This Part interrogates this mantra. It argues that the idea that all tons are equal is true only in the narrowest, most technocratic sense—and perhaps, not even then.[193] The imperative to globally transition to net zero will necessarily have transformative effects. It will change where we settle; how we live, work,

188. *See supra* notes 123-127 and accompanying text (explaining variations in the degree to which offsets form a part of various net-zero pledges).

189. *See* Lee & Mayer, *supra* note 60, at 11; Stephen Donofrio, Patrick Maguire, Steve Zwick & William Merry, *Voluntary Carbon and the Post-Pandemic Recovery: A Special Climate Week NYC 2020 Installment of Ecosystem Marketplace's* State of Voluntary Carbon Markets 2020 *Report*, FOREST TRENDS 1 (Sept. 21, 2020), https://www.forest-trends.org/publications/state-of-voluntary-carbon-markets-2020-voluntary-carbon-and-the-post-pandemic-recovery [https://perma.cc/N39D-E7RM] ("Corporate carbon-neutral pledges fueled a record transaction volume of at least 104 $MtCO_2e$ in 2019 . . . .").

190. *See, e.g.*, Dyke et al., *supra* note 8; McLaren et al., *supra* note 28, at 3.

191. *See* Matthew Paterson & Johannes Stripple, *Virtuous Carbon*, 21 ENV'T POL. 563, 575 (2012) (asserting the importance to offsetting regimes of creating assurance that "a tonne is a tonne").

192. Broekhoff et al., *supra* note 74, at 6.

193. *See infra* note 197 and accompanying text.

play, and travel; how our communities are structured; and how we understand the role and place of nature and the contours of affluence and want. The net-zero framing erases these considerations, reducing the project of decarbonizing society to a simple mathematical calculus, applicable at any scale by any entity. In this way, it embraces a strain of barebones liberalism that refuses to attach any moral or value judgments to various ways that one might reduce or remove carbon.[194] Purported neutrality may be useful from the standpoint of political economy,[195] but it presents a deep and enduring challenge to the program's legitimacy and durability. This Part develops a critique of neutrality in two stages, first articulating the myriad reasons we should not be agnostic among climate solutions, then highlighting the dangers of utilizing a netting framework for controlling emissions.

A. The Climate-Neutrality Myth

Is any ton of carbon really equal to any other ton? For corporate-compliance officers and government accountants, a ton may seem like a ton in the ledger. But from a wider set of vantage points, one ton of carbon is rarely equal to another.

To begin, a ton may not even be a ton from the perspective of the atmosphere. The risks of nonadditionality, impermanence, and leakage mean that a ton removed from the atmosphere is never as certain as a ton never released into it.[196] Moreover, new research suggests that there is not scientific parity between a ton of carbon emissions avoided and a ton of carbon emissions removed from the atmosphere because of the way that lands and oceans respond to changes in atmospheric carbon emissions.[197] But even temporarily assuming away these challenges, there are larger social concerns around ton equivalency.

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194. *See* KATRINA FORRESTER, IN THE SHADOW OF JUSTICE: POSTWAR LIBERALISM AND THE REMAKING OF POLITICAL PHILOSOPHY 17 (2019) (describing the mid-twentieth-century version of barebones liberalism as centered on an "anti-interventionist commitment to small government").

195. *See supra* Section I.A.

196. *See supra* Section II.C.

197. *See* Kirsten Zickfeld, Deven Azevedo, Sabine Mathesius & H. Damon Matthews, *Asymmetry in the Climate-Carbon Cycle Response to Positive and Negative CO_2 Emissions*, 11 NATURE CLIMATE CHANGE 613, 617 (2021) ("This study demonstrates that an emission of CO_2 into the atmosphere is more effective at raising atmospheric CO_2 than a CO_2 removal is at lowering atmospheric CO_2 . . . ."); *see also 2021 Summary for Policymakers*, *supra* note 37, at 30 ("The atmospheric CO_2 decrease from anthropogenic CO_2 removals could be up to 10% less than the atmospheric CO_2 increase from an equal amount of CO_2 emissions . . . .").

The first set of concerns has to do with climate justice and the decarbonization imperative domestically within the United States. Environmental justice research makes clear that communities of color have long borne the brunt of fossil-fuel combustion in the United States, with devastating health and community impacts.[198] These same communities are the least culpable for inducing such pollution through consumption of goods and services: a 2019 study of fine-particulate-matter air-pollution exposure—"the largest environmental health risk factor in the United States"—finds:

> On average, non-Hispanic whites experience a "pollution advantage": They experience ~17% less air pollution exposure than is caused by their consumption. Blacks and Hispanics on average bear a "pollution burden" of 56% and 63% excess exposure, respectively, relative to the exposure caused by their consumption.[199]

These inequities have created substantial resistance to net-zero policies that rely heavily on CCS—that is, the retrofitting of fossil-fuel combustion or other industrial processes with CO_2-capture devices—as a strategy for reducing emissions. Although CCS captures carbon emissions, it does not necessarily reduce accompanying air emissions with more pernicious, localized impacts; nor does

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198. *See, e.g.*, Ann E. Carlson, *The Clean Air Act's Blind Spot: Microclimates and Hotspot Pollution*, 65 UCLA L. Rev. 1036, 1047 (2018); Shalanda H. Baker, *Anti-Resilience: A Roadmap for Transformational Justice Within the Energy System*, 54 Harv. C.R.-C.L. L. Rev. 1, 6 (2019); Maninder P.S. Thind, Christopher W. Tessum, Inês L. Azevedo & Julian D. Marshall, *Fine Particulate Air Pollution from Electricity Generation in the US: Health Impacts by Race, Income, and Geography*, 53 Env't Sci. & Tech. 14010, 14015 (2019); Rachel Morello-Frosch, Miriam Zuk, Michael Jerrett, Bhavna Shamasunder & Amy D. Kyle, *Understanding the Cumulative Impacts of Inequalities in Environmental Health: Implications for Policy*, 30 Health Affs. 879, 881 (2011); Klara Zwickl, *The Demographics of Fracking: A Spatial Analysis for Four U.S. States*, 161 Ecological Econ. 202, 209 (2019); Bruce Bekkar, Susan Pacheco, Rupa Basu & Nathaniel DeNicola, *Association of Air Pollution and Heat Exposure with Preterm Birth, Low Birth Weight, and Stillbirth in the US: A Systematic Review*, 3 JAMA Network Open art. no. e208243, at 5, 8 (2020); Jeremy S. Hoffman, Vivek Shandas & Nicholas Pendleton, *The Effects of Historical Housing Policies on Resident Exposure to Intra-Urban Heat: A Study of 108 US Urban Areas*, 8 Climate art. no. 12, at 11 (2020); Jennifer Richmond-Bryant, Ihab Mikati, Adam F. Benson, Thomas J. Luben & Jason D. Sacks, *Disparities in Distribution of Particulate Matter Emissions from US Coal-Fired Power Plants by Race and Poverty Status After Accounting for Reductions in Operations Between 2015 and 2017*, 110 Am. J. Pub. Health 655, 659-61 (2020). For a longer historical lens on these issues, see Myles Lennon, *Decolonizing Energy: Black Lives Matter and Technoscientific Expertise amid Solar Transitions*, 30 Energy Rsch. & Soc. Sci. 18, 24-25 (2017), which compellingly traces the links between the transatlantic slave trade and fossil-fuel industrialization.

199. Christopher W. Tessum, Joshua S. Apte, Andrew L. Goodkind, Nicholas Z. Muller, Kimberly A. Mullins, David A. Paolella, Stephen Polasky, Nathaniel P. Springer, Sumil K. Thakrar, Julian D. Marshall & Jason D. Hill, *Inequity in Consumption of Goods and Services Adds to Racial-Ethnic Disparities in Air Pollution Exposure*, 116 Proc. Nat'l Acad. Scis. 6001, 6001 (2019).

it eliminate the environmental justice concerns associated with oil and gas extraction.[200] These same objections carry over to any net-zero strategy that relies heavily on offsets or DAC to the extent that these strategies displace or delay domestic emissions reductions.[201] For communities suffering the additional health and environmental burdens that accompany domestic carbon emissions, removing a ton of emissions elsewhere is decidedly not equivalent to emissions reductions close to home.[202]

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200. *See* Daniel A. Farber, *Pollution Markets and Social Equity: Analyzing the Fairness of Cap and Trade*, 39 ECOLOGY L.Q. 1, 6, 46 (2012) (observing that offsets require "fewer in-system emissions reductions than would otherwise be required and, therefore, result[] in correspondingly smaller reductions of in-system co-pollutants"); *Over 500 Organizations Call on Policymakers to Reject Carbon Capture and Storage as a False Solution*, CTR. FOR INT'L ENV'T L. (2021), https://www.ciel.org/organizations-demand-policymakers-reject-carbon-capture-and-storage [https://perma.cc/A365-H7XS] ("[I]nvesting in carbon capture delays the needed transition away from fossil fuels and other combustible energy sources. It poses significant new environmental, health, and safety risks, particularly to Black, Brown, and Indigenous communities already overburdened by industrial pollution, dispossession, and the impacts of climate change.").

201. Rachel Frazin, *White House Environmental Justice Advisers Express Opposition to Nuclear, Carbon Capture Projects*, HILL (May 17, 2021, 2:49 PM ET), https://thehill.com/policy/energy-environment/553927-white-house-environmental-justice-advisors-expresses-opposition-to [https://perma.cc/C8NN-XQ5T] (describing objections of the White House Environmental Justice Advisory Council to Carbon Capture and Storage and nuclear power).

202. *See* Letter from Alaska Clean Water Advoc. et al., to Mary D. Nichols, Chair, California Air Res. Bd. & Gavin McCabe, Compliance Offset Task Force Chair, California Air Res. Bd. (Nov. 6, 2020), https://cal.streetsblog.org/wp-content/uploads/sites/13/2021/02/Reject-Offsets-Taskforce-Recs-Letter-11-6-20.pdf [https://perma.cc/WKS8-6Z6G] (calling, "[o]n behalf of the undersigned environmental justice (EJ), Black, Indigenous, environmental, scientific and health organizations," for the rejection of offsetting programs because "[t]o date, CARB has allowed 200 million tons of offsets to be used by the biggest polluters in the state, such as the Chevron oil refinery and Pacific Gas & Electric," which is "200 million tons of climate pollution (carbon dioxide with co-pollutants) that was emitted into the atmosphere, polluted EJ communities, and choked the lungs of mostly Black and brown children living next to those industries"); *Accelerating Decarbonization of the U.S. Energy System*, *supra* note 12, at 4 (noting that fossil-fuel use "may be responsible for half a million premature deaths or more over the next decade—public health impacts that fall disproportionately on low-income communities and communities of color"); Vien Truong, *Addressing Poverty and Pollution: California's SB 535 Greenhouse Gas Reduction Fund*, 49 HARV. C.R.-C.L. L. REV. 493, 497-505 (2014) (examining the ways in which climate and air pollution disproportionately impact communities of color in California and the way that many environmental laws have "bypassed" these communities); Alice Kaswan, *Climate Change and Environmental Justice: Lessons from the California Lawsuits*, 5 SAN DIEGO J. CLIMATE & ENERGY L. 1, 2 (2014) (cataloguing California's experience with integrating environmental justice into climate policy and arguing for "the importance of a holistic approach to climate change policy that recognizes and integrates its multiple dimensions, including co-pollutant implications"); *The California Environmental Justice Movement's Declaration Against the Use of Carbon Trading Schemes to Address Climate Change*, https://www

Choices around carbon reductions and removals also have the potential to transform communities in broader ways. As the IPCC has made clear, "Pathways limiting global warming to 1.5°C with no or limited overshoot would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems."[203] Because decarbonization requires such pivotal transformations, many activists, politicians, and academics have come to view the challenge as an opportunity to dramatically reorient the relationship between infrastructure and social structure in the United States. For example, a resolution calling for a "Green New Deal," introduced by Representative Alexandria Ocasio-Cortez and Senator Ed Markey in the U.S. House and Senate in February 2019, demanded that net-zero strategies be accompanied by a robust social agenda, pairing decarbonization with community ownership of resources, a federal jobs guarantee, "high-quality health care," and "affordable, safe, and adequate housing" for all Americans.[204] In this way, the Green New Deal expresses an understanding of climate mitigation that is far from neutral. Instead, these efforts recognize that the road to net zero, paved as it is with numerous critical social-policy decisions, presents a key juncture for either addressing inequality and structural racism or shunting aside these concerns for another generation or more.[205] Proponents therefore celebrate the Green New Deal for reframing climate change away from being a scientific

.envirorights.org/archives/Climate%20Change/2008-02-15_Climate_Change_Declaration.pdf [https://perma.cc/33XJ-QUZA] (opposing the use of an offset scheme in California because "it will support and enrich the state's worst polluters, it will fail to address the existing and future inequitable burden of pollution, [and] it will deprive communities of the ability to protect and enhance their communities").

203. 2018 *Summary for Policymakers*, *supra* note 3, at 15.

204. H.R. Res. 109, 116th Cong. (2019) (calling for a ten-year mobilization to reach net-zero emissions).

205. *See* Frank W. Geels, Benjamin K. Sovacool, Tim Schwanen & Steve Sorrell, *Sociotechnical Transitions for Deep Decarbonization*, 357 SCI. 1242, 1242 (2017) ("Rapid and deep decarbonization requires transformation of sociotechnical systems—the interlinked mix of technologies, infrastructures, organizations, markets, regulations, and user practices that together deliver societal functions . . . ."); Dale W. Jamieson & Marcello Di Paola, *Political Theory for the Anthropocene*, *in* GLOBAL POLITICAL THEORY 254, 270 (David Held & Pietro Maffettone eds., 2016) ("[C]limate change remains a multidimensional problem that concerns ecology, demography, development, production, consumption, resource use, trade rules, health, security, urban planning, mobility, migration, and more."); *Accelerating Decarbonization of the U.S. Energy System*, *supra* note 12, at 1 ("Net-zero policy is about more than non-emitting energy technologies, because the manner in which the U.S. economy produces and consumes energy impacts a host of other issues that people care deeply about.").

problem that must be dealt with, and into an opportunity for real, durable change for the many Americans losing out in the current economic ordering.[206]

The Green New Deal represents just one approach to climate politics. Another related movement—the "just transition" movement—emphasizes the importance of supporting workers and communities left behind during the clean-energy transition.[207] Other approaches prioritize biodiversity preservation in the transition,[208] or emphasize the potential that climate change mitigation has to reinvigorate domestic manufacturing.[209] Even carbon-tax proponents—who often cast such a tax as the most "neutral" solution to climate change—frequently design and defend the policy with reference to distributional concerns.[210] Opponents of action on climate change also rarely display neutrality in their opposition, highlighting, for example, the deep threat that climate policy might present to Americans' hamburger consumption, large automobiles, or the aesthetic character of the country's seashores and rolling hills.[211]

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206. *See, e.g.*, MATTHEW T. HUBER, CLIMATE CHANGE AS CLASS WAR: BUILDING SOCIALISM ON A WARMING PLANET 179 (2022) (noting that Rhiana Gunn-Wright has suggested that "a key strategy of the Green New Deal is to appeal to basic material interests in building popular support"); *cf.* Leah C. Stokes & Matto Mildenberger, *The Trouble with Carbon Pricing*, BOS. REV. (Sept. 24, 2020), http://bostonreview.net/science-nature-politics/matto-mildenberger-leah-c-stokes-trouble-carbon-pricing [https://perma.cc/Z4D6-D8HE] (explaining that carbon-pricing policies have failed politically because they do not highlight the "the long-term benefits of addressing climate change—for the environment, public health, and the economy").

207. *See, e.g.*, Ann M. Eisenberg, *Just Transitions*, 92 S. CAL. L. REV. 273, 275-76 (2019).

208. *See, e.g.*, *Discover Half-Earth*, HALF-EARTH PROJECT, https://www.half-earthproject.org/discover-half-earth [https://perma.cc/7PYN-787U].

209. *See, e.g.*, Joel Jaeger & Devashree Saha, *12 Reasons Climate Action Is Good for the United States Economy*, WORLD RES. INST. (Nov. 25, 2019), https://www.wri.org/insights/12-reasons-climate-action-good-united-states-economy [https://perma.cc/ZN32-4DYF].

210. *See, e.g.*, *Building Democratic Support for Equitable Carbon Pricing*, SCHOLARS STRATEGY NETWORK 1-5 (2016), https://scholars.org/sites/scholars/files/carbon-equity-forum-1.pdf [https://perma.cc/8D46-DURD]; Sarah Shemkus, *Massachusetts Groups Back Expanded Carbon Tax with Focus on Equity*, ENERGY NEWS NETWORK (Mar. 2, 2021), https://energynews.us/2021/03/02/massachusetts-groups-back-expanded-carbon-tax-with-focus-on-equity [https://perma.cc/Q5PW-UU9T]; Gilbert Metcalf, *Can a Carbon Tax Cut Emissions Without Hurting the Poor?*, ECONOFACT (Sept. 10, 2020), https://econofact.org/can-a-carbon-tax-cut-emissions-without-hurting-the-poor [https://perma.cc/62VY-E3ZA].

211. *See* Emily Atkin, *The Potency of Republicans' Hamburger Lie*, NEW REPUBLIC (Mar. 4, 2019), https://newrepublic.com/article/153187/potency-republicans-hamburger-lie [https://perma.cc/HJ63-PS4L] (describing the effectiveness of the hamburger critique); Emma Newburger, *Republican Infrastructure Counteroffer Slashes Biden's Electric Vehicle and Climate Spending*, CNBC (May 27, 2021, 1:24 PM EDT), https://www.cnbc.com/2021/05/27/republican-infrastructure-offer-slashes-biden-electric-vehicle-spending.html [https://perma.cc/FP76-W37E] (reporting partisan wrangling on electric vehicles); David R. Baker & Millicent Dent,

In August 2022, the United States passed legislation—the IRA—that many have lauded as the greatest climate action in its history.[212] The fraught politics of decarbonization are on full display in the IRA's structure, starting with the fact that the Act's title emphasizes its role in addressing a different problem altogether: inflation. Almost every position previewed above can point to something in the IRA to celebrate: the Act dedicates a significant amount of funding—an estimated $60 billion out of $370 billion in total climate-related spending—to environmental justice initiatives, although it falls short of many of the larger aspirations of the Green New Deal.[213] It imposes numerous labor-related conditions, including tying eligibility for many of its incentives to prevailing wage and domestic-manufacturing requirements.[214] The Act appeases fans of nuclear power and carbon capture and storage with separate provisions specifically devoted to their promotion.[215] And, angering many, the Act also props up the fossil-fuel industry by approving previously stalled drilling projects and creating a one-for-one leasing requirement that ensures that for every acre of federal land

NIMBYs Shoot Down Green Projects Next Door While Planet Burns, BLOOMBERG (Sept. 17, 2019, 6:00 AM EDT), https://www.bloomberg.com/news/features/2019-09-17/nimbys-shoot-down-green-projects-next-door-while-planet-burns [https://perma.cc/CFW5-FFL4] (arguing that "hostility toward clean power is largely driven by aesthetics and property values").

212. Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818; *see, e.g.*, Rebecca Leber, *The US Finally Has a Law to Tackle Climate Change*, VOX (Aug. 16, 2022, 4:46 PM EDT), https://www.vox.com/policy-and-politics/2022/7/28/23281757/whats-in-climate-bill-inflation-reduction-act [https://perma.cc/V8DN-VTJF] (quoting President Biden at the bill signing as saying, "This bill is the biggest step forward on climate ever").

213. *See* Erik Ortiz, *Inflation Reduction Act Puts $60B Focus on a Biden Priority: Environmental Justice*, NBC NEWS (Aug. 12, 2022, 5:50 PM EDT), https://www.nbcnews.com/politics/politics-news/inflation-reduction-act-puts-60b-focus-biden-priority-environmental-ju-rcna42891 [https://perma.cc/D5GV-H4H4]. *But see The Inflation Reduction Act Is Not a Climate Justice Bill*, CLIMATE JUST. ALL. (Aug. 6, 2022), https://climatejusticealliance.org/the-inflation-reduction-act-is-not-a-climate-justice-bill [https://perma.cc/9SNQ-LJ97] ("After careful study of the language of the Inflation Reduction Act of 2022, Climate Justice Alliance concludes that the harms of the bill as it is currently written outweigh its benefits.").

214. *See, e.g.*, Inflation Reduction Act of 2022 § 13101(f)(7) (enhancing credits for renewable energy produced from certain renewable sources to facilities paying laborers and mechanics "wages at rates not less than the prevailing rates for construction, alteration, or repair of a similar character in the locality in which such facility is located"); *id.* § 13104 (similar requirements for carbon-dioxide sequestration projects); *id.* § 13105 (similar requirements for nuclear projects); *id.* § 13101(g) (providing bonus credits for "domestic content" of "steel, iron, or manufactured product" included in a facility); *id.* § 13401 (placing domestic requirements on critical minerals used in clean vehicles eligible for credits).

215. *See id.* §§ 13104-13105.

made available for renewables development, an acre is also made available for oil and gas drilling.[216]

This messy yet historic climate legislation exemplifies the fact that there is, in fact, no neutrality when it comes to climate solutions.[217] One ton is not equivalent to another, when contextualized as part of the broader climate change mitigation effort. Nor should we pretend at neutrality: the solutions to this challenge are complex and worthy of democratic debate and compromise.

A similar set of contests animates debates at the global level. Particularly when it comes to land-intensive carbon-removal options—including afforestation, soil management, and BECCS—concerns are mounting regarding their effects on land use and associated livelihoods.[218] Early international efforts at afforestation, undertaken predominantly through the United Nations's "Reduced Emissions Through Avoided Deforestation and Forest Degradation" (REDD+) initiative, have highlighted the risks that commoditizing forest carbon presents to Indigenous communities, especially under conditions of insecure land tenure.[219] Similarly, research on biofuels, reforestation, and afforestation policies

216. *See id.* §§ 50264-50265. For reactions against these provisions, see, for example, *Manchin Poison Pills Buried in Inflation Reduction Act Will Destroy Livable Climate*, CTR. FOR BIOLOGICAL DIVERSITY (July 28, 2022), https://biologicaldiversity.org/w/news/press-releases/manchin-poison-pills-buried-in-inflation-reduction-act-will-destroy-a-livable-climate-2022-07-28 [https://perma.cc/R2ND-GDPN].

217. *Cf.* Carton et al., *supra* note 24, at 13 ("[T]he long history of carbon removal shows that there are no neutral positions in this conversation.").

218. *See id.* at 5 (cataloguing a large history of experimentation and research on negative emissions).

219. *See* Emma Jane Lord, *Displacement, Power and REDD+: A Forest History of Carbonized Exclusion*, *in* GLOBAL FOREST GOVERNANCE AND CLIMATE CHANGE: INTERROGATING REPRESENTATION, PARTICIPATION, AND DECENTRALIZATION 115, 118 (Emmanuel O. Nuesiri ed., 2018); Alexander Dunlap & Sian Sullivan, *A Faultline in Neoliberal Environmental Governance Scholarship? Or, Why Accumulation-by-Alienation Matters*, 3 NATURE & SPACE 552, 558-60 (2020) (collecting extensive research on the impacts of Reduced Emissions Through Avoided Deforestation and Forest Degradation (REDD+) and finding widespread land grabbing and expropriation); Robert Fletcher, Wolfram Dressler, Bram Büscher & Zachary R. Anderson, *Questioning REDD+ and the Future of Market-Based Conservation*, 30 CONSERVATION BIOLOGY 673, 674 (2016); Adeniyi Asiyanbi & Jens Friis Lund, *Policy Persistence: REDD+ Between Stabilization and Contestation*, 27 J. POL. ECOLOGY 378, 378-80 (2020) (noting "poor outcomes" in terms of both preventing deforestation and creating promised "co-benefits" for communities).

has shown that they can create perverse incentives toward plantation-style monocultures, with negative impacts on local communities and biodiversity.[220] Efforts to design governance arrangements to safeguard communities from these kinds of exploitation have had mixed results, at best.[221]

There is a deeper critique of carbon-removal strategies that focuses not on particularized negative consequences, but on the colonial nature of the project in general. The Indigenous Environmental Network argues that international offset schemes "continue colonialism by perpetuating theft of Indigenous Peoples' lands and territories, especially in the global South where Indigenous Peoples have been protecting lands and forests for thousands of years."[222] Given that "most of the lands and territories targeted for greenhouse gas [] mitigation action overlap with areas customarily held by Indigenous Peoples, local communi-

220. *See* Nathalie Seddon, Alexandre Chausson, Pam Berry, Cécile A. J. Girardin, Alison Smith & Beth Turner, *Understanding the Value and Limits of Nature-Based Solutions to Climate Change and Other Global Challenges*, 375 PHIL. TRANSACTIONS ROYAL SOC'Y B art. no. 20190120, at 4 (2020) (finding that "45% of the 350 Mha currently pledged for reforestation is set to become commercial plantations, usually involving single species (i.e. monocultures)"); Abrahm Lustgarten, *Palm Oil Was Supposed to Help Save the Planet. Instead It Unleashed a Catastrophe.*, N.Y. TIMES MAG. (Nov. 20, 2018), https://www.nytimes.com/2018/11/20/magazine/palm-oil-borneo-climate-catastrophe.html [https://perma.cc/W5T4-LCKU] (tracing how U.S.-biofuels policy fueled the rise of foreign palm plantations); Juliana Nnoko-Mewanu, *"When We Lost the Forest, We Lost Everything": Oil Palm Plantations and Rights Violations in Indonesia*, HUM. RTS. WATCH (Sept. 22, 2019), https://www.hrw.org/report/2019/09/23/when-we-lost-forest-we-lost-everything/oil-palm-plantations-and-rights-violations [https://perma.cc/R4U6-DYWM].

221. *See* Asiyanbi & Lund, *supra* note 219, at 380; Katherine Lofts, Alain Frechette & Kundan Kumar, *Status of Legal Recognition of Indigenous Peoples', Local Communities' and Afro-Descendant Peoples' Rights to Carbon Stored in Tropical Lands and Forests*, RTS. & RES. INITIATIVE 3 (Aug. 2021), https://rightsandresources.org/wp-content/uploads/CarbonRightsReport_v10.pdf [https://perma.cc/X83F-FZ7H] ("While many voluntary carbon certification standards include provisions relating to human rights and the recognition of communities' land tenure and resource rights, engagement and participation, benefit sharing, and channels for feedback and grievance redress, they largely fail to provide robust and effective mechanisms for monitoring, reporting, and verifying these elements.").

222. *Carbon Pricing Is a False Solution to Climate Chaos*, INDIGENOUS ENV'T NETWORK, https://www.ienearth.org/carbon-pricing [https://perma.cc/AD9A-SABU]; *see also* Tamra Gilbertson, *Carbon Pricing: A Critical Perspective for Community Resistance*, CLIMATE JUST. ALL. & INDIGENOUS ENV'T NETWORK 35-42 (Oct. 2017), https://www.ienearth.org/wp-content/uploads/2017/11/Carbon-Pricing-A-Critical-Perspective-for-Community-Resistance-Online-Version.pdf [https://perma.cc/6AE8-NN4S] (arguing that carbon pricing is a faulty solution that would exacerbate environmental injustice).

ties, and Afro-descendant Peoples," a potential future of carbon colonialism concerns many environmental justice groups in the Global South and beyond.[223] More broadly, as Maxine Burkett has argued, the Western approach to climate diplomacy — which favors "low-hanging fruit" like cheap offsets — perpetuates "a dangerously cabined view of the environment and a political economy that has relied on sacrificing land and people in furtherance of myopic understandings of 'progress.'"[224]

There are important solidarities between domestic and international critics of net-zero strategies. Synthesizing these concerns, research from the National Association for the Advancement of Colored People concludes that "these [net-zero] systems can often play out as what amounts to sophisticated international shell games, where little net decline in emissions occurs because the measures simply serve to transfer pollution from one location or one country to another, depending on who can afford to pollute."[225] These solidarities underscore the key point of this Section: for people on the ground living with the physical consequences of net-zero strategies, a ton is never just a ton.

The fact that every method of reducing or removing emissions has collateral consequences is not an argument for slowing action. There is widespread agreement that *not* acting on climate will create far more suffering and injustice than rapid action will.[226] Nor does it mean that strategies with drawbacks should not be pursued; we will need a wide range of solutions to tackle climate change at scale, and few of them are perfect.[227] But it is an argument for acknowledging and shaping institutions around the contested and consequential nature of the net-zero project, rather than erecting a mirage of neutrality.

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223. Lofts et al., *supra* note 221, at 2 (footnotes omitted); *Indigenous Kichwa Community Take Peruvian State and National Park to Court*, FOREST PEOPLES PROGRAMME (July 1, 2021), https://www.forestpeoples.org/en/press-release/kichwa-take-Peru-state-PNAZ-court [https://perma.cc/EN9T-A87Y] (announcing a lawsuit over the creation of a carbon-credits preserve without Indigenous consent or involvement).

224. Maxine Burkett, *Root and Branch: Climate Catastrophe, Racial Crises, and the History and Future of Climate Justice*, 134 HARV. L. REV. F. 326, 326 (2021).

225. Jacqueline Patterson, Lorah Steichen, Katherine Egland, Saleem Chapman, Mandy Lee & Zoe Lee-Park, *Nuts, Bolts, and Pitfalls of Carbon Pricing: An Equity-Based Primer on Paying to Pollute*, NAACP ENV'T & CLIMATE JUST. PROGRAM 8-9 (July 2021), https://naacp.org/sites/default/files/documents/Carbon%20Pricing%20Primer.pdf [https://perma.cc/57V2-B963].

226. *See, e.g.*, Oriana Tannenbaum & Rushad Nanavatty, *Our Climate as an Infrastructure Asset*, ROCKY MOUNTAIN INST. (Jan. 16, 2020), https://rmi.org/our-climate-as-an-infrastructure-asset [https://perma.cc/2P9M-Z94T] (gathering evidence to this effect). For more on this tension, see *infra* Section V.B.

227. *See supra* notes 41-44 and accompanying text.

B. The Dangers of Pretending at Neutrality

There are times when the end goal of the law is to promote neutrality. For example, many antidiscrimination laws aim to have state and private actors treat all comers alike, whether in public accommodations, net neutrality, or public-utility provisioning.[228] This is not the case with the net-zero framework. The atmosphere does not actually care whether any particular actor is carbon neutral. Instead, the carbon neutrality of individual actors is a *framing device*; the end goal is to stabilize atmospheric emissions and collectively achieve a livable planet. Yet we have an overarching global framework, replicated in thousands of subjurisdictional and private pledges, that embraces atomized carbon neutrality as the central aim.

This Section discusses the dangers of this neutrality mirage. To do so, it turns to a debate that has become central in U.S. administrative law over the role of cost-benefit analysis (CBA) in the regulatory state.[229] The contention of this Section is that the robust scholarly conversation about the risks of CBA helps illuminate analogous, underappreciated risks presented by the net-zero framework. It builds this case by considering two flaws shared by CBA and net zero: 1) their democratic deficit and 2) their inattention to equity concerns.

1. The Democratic Deficit

CBA and net zero share a commitment to neutral decision-making that risks either obscuring or disregarding citizens' collective values, desires, and demands. As I argue in this Section, however, net zero's failings in this regard are far more severe than CBA's.

CBA seeks to rationalize agency decision-making through a weighing of costs and benefits.[230] If the costs of a proposed regulation are greater than the benefits, CBA says do not proceed. If benefits exceed costs, regulate. Since it was

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228. *See* 42 U.S.C. § 2000a (2018) (prohibiting discrimination and segregation in public accommodations); Exec. Order No. 14036, 86 Fed. Reg. 36987, 36987 (July 9, 2021) (calling for the Federal Communications Commission to restore net-neutrality rules to create a "fair, open, and competitive marketplace"); 16 U.S.C. § 824d(b) (2018) (prohibiting public utilities from making or granting "undue preference or advantage").

229. *See* Cass R. Sunstein, *The Arithmetic of Arsenic*, 90 GEO. L.J. 2255, 2256 (2002) ("Within the past two decades, cost-benefit analysis (CBA) has become one of the most widely discussed topics in all of regulatory law.").

230. *See* RICHARD L. REVESZ & MICHAEL A. LIVERMORE, RETAKING RATIONALITY: HOW COST-BENEFIT ANALYSIS CAN BETTER PROTECT THE ENVIRONMENT AND OUR HEALTH 10 (2008) (describing how CBA aims to "maximize the net benefits of regulation" and arguing that CBA can be a "powerful tool for neutral policy analysis" if done correctly).

first mandated in a Reagan-era executive order,[231] CBA has endured through numerous administrations to become a central decision-making tool within the U.S. administrative state—a hoop through which nearly all major regulations must jump before promulgation.[232]

Proponents of CBA champion its capacity to provide a neutral, transparent, and expert method of determining the value of regulation—a method that overcomes mere interest-group politics.[233] CBA's critics level numerous charges against its purported neutrality, ranging from the technical to the fundamental. One central line of criticism argues that CBA is antidemocratic. These critics point out how CBA becomes totalizing: although CBA proponents claim it is only one regulatory tool, its rationalizing calculus overwhelms outside moral or ethical considerations that might bear on the wisdom of regulation.[234] At the same time, people acting together *as a polity* may arrive at different goals and projects than are reflected in CBA's addition exercise, which merely sums agglomerated, individualized interests, as measured largely through willingness to pay.[235]

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231. *See* Exec. Order No. 12291, 3 C.F.R. § 127 (1981), *reprinted in* 5 U.S.C. § 601 app. at 473-76 (1988).

232. *See* CASS R. SUNSTEIN, THE COST-BENEFIT STATE: THE FUTURE OF REGULATORY PROTECTION 19-20 (2002); REVESZ & LIVERMORE, *supra* note 230, at 11 ("[CBA] has enormous currency in the federal policy making apparatus."); Nicholas Bagley & Richard L. Revesz, *Centralized Oversight of the Regulatory State*, 106 COLUM. L. REV. 1260, 1262 (2006) (observing an enduring, cross-partisan embrace of CBA). Only statutes that expressly forbid CBA now escape its application as a regulation-informing tool. *See, e.g.*, Whitman v. Am. Trucking Ass'ns, 531 U.S. 457, 465 (2001) (reading Section 109 of the Clean Air Act to exclude considerations of cost).

233. *See, e.g.*, MATTHEW D. ADLER & ERIC A. POSNER, NEW FOUNDATIONS OF COST-BENEFIT ANALYSIS 8 (2006) (defending CBA as a "workable proxy for something that is part of the moral bedrock—overall welfare"); John J. Donohue III, *Why We Should Discount the Views of Those Who Discount Discounting*, 108 YALE L.J. 1901, 1903 (1999) ("Requiring agencies to set forth the relevant costs and benefits carefully helps them to rationalize their regulatory agenda and enables independent analysts to evaluate the soundness of particular regulations.").

234. *See* DOUGLAS A. KYSAR, REGULATING FROM NOWHERE: ENVIRONMENTAL LAW AND THE SEARCH FOR OBJECTIVITY 100-01 (2010); WENDY BROWN, EDGEWORK: CRITICAL ESSAYS ON KNOWLEDGE AND POLITICS 42 (2006) ("[A] generalized calculation of cost and benefit becomes the measure of all state practices. Political discourse on all matters is framed in entrepreneurial terms . . . ."); Frank Ackerman & Lisa Heinzerling, *Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection*, 150 U. PA. L. REV. 1553, 1575 (2002) (discussing how CBA omits "rights and morality principles that are not reducible to monetary terms"). *See generally* Alexander Volokh, *Rationality of Rationalism? The Positive and Normative Flaws of Cost-Benefit Analysis*, 48 HOUS. L. REV. 79 (2011) (highlighting the shortcomings of the cost-benefit framework from a libertarian perspective).

235. *See* Ronald M. Dworkin, *Is Wealth a Value?*, 9 J. LEGAL STUD. 191, 200 (1980); KYSAR, *supra* note 234, at 48-49; BROWN, *supra* note 234, at 44 (describing how this neoliberal approach to

These critics conclude that CBA suffers from a challenge of democratic legitimacy because its results do not appropriately reflect citizens' collective moral and political commitments.[236] It pretends to be neutral, but it actually vaunts an economic conception of the good through its focus on willingness-to-pay as a central measure of preferences.[237] Moreover, CBA has frequently been strategically deployed as a deregulatory tool, only to be abandoned by its previous champions when its economics counsel in favor of regulation.[238]

As severe as CBA's democratic-legitimacy crisis may be, net zero's is worse. CBA requires state actors to measure myopically citizen preferences for state action through summed willingness to pay. Net zero, in contrast, frequently fails to measure citizen preferences *at all*. It is a project that takes all institutional comers — countries, states, cities, and companies — and offers value-laden decision-making authority to each entity that takes up the task.

There is nothing neutral about a decision to allow uncoordinated and in many instances undemocratic entities to decide the trajectory of climate change policy. Corporations, for instance, are likely to shape their net-zero policies in accordance with reputational and profit motives with limited concern for collective social priorities. Most corporate pledges ignore the collateral costs or benefits of particular net-zero strategies. Only careful watchdogging by standard-setting organizations or nonprofits — coupled with whatever market-based pressure activists can bring to bear — might serve to constrain net-zero actions.[239] But because net zero is playing out in the corporate context as an atomized project of

policymaking has the "effect of radically transforming and narrowing the criteria for good social policy"); Mark Sagoff, *Can Environmentalists Be Liberals? Jurisprudential Foundations of Environmentalism*, 16 ENV'T L. 775, 778 (1986); Ackerman & Heinzerling, *supra* note 234, at 1557.

236. *See* Dworkin, *supra* note 235, at 200; KYSAR, *supra* note 234, at 48-49; BROWN, *supra* note 234, at 44; Sagoff, *supra* note 235, at 778; Ackerman & Heinzerling, *supra* note 234, at 1557; *see also* James Goodwin, *A Post-Neoliberal Regulatory Analysis for a Post-Neoliberal World*, LPE PROJECT (Oct. 14, 2021), https://lpeproject.org/blog/a-post-neoliberal-regulatory-analysis-for-a-post-neoliberal-world [https://perma.cc/FV8Y-HR2N] (pointing out that "recent polling confirms that large majorities of voters across the political spectrum oppose using the goal of wealth maximization to guide regulatory decision-making").

237. *See* Ackerman & Heinzerling, *supra* note 234, at 1566-67 ("It is often impossible to arrive at a meaningful social valuation by adding up the willingness to pay expressed by individuals.").

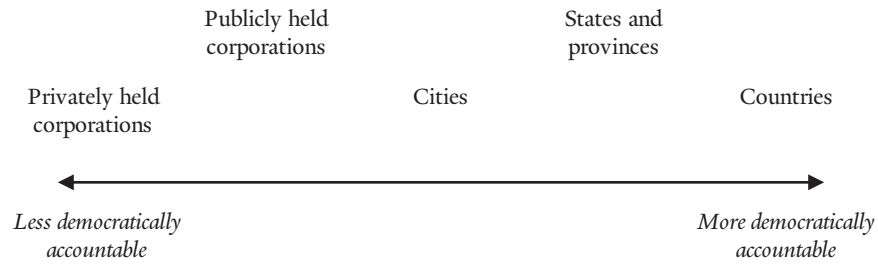
238. *See* Elizabeth Popp Berman, *Let's Politicize Cost-Benefit Analysis*, LPE PROJECT (Oct. 5, 2021), https://lpeproject.org/blog/lets-politicize-cost-benefit-analysis [https://perma.cc/AK6H-VF65].

239. *See* Karin Bäckstrand, Fariborz Zelli & Philip Schleifer, *Legitimacy and Accountability in Polycentric Climate Governance*, *in* GOVERNING CLIMATE CHANGE: POLYCENTRICITY IN ACTION? 338, 346 (Andrew Jordan, Dave Huitema, Harro van Asselt & Johanna Forster eds., 2018) ("In the transnational realm, private governors are typically self-selected, and there is no demos available to hold them to account.").

thousands of bespoke pledges, this kind of private-citizen monitoring is a particularly tall task. I return in Part V to interrogate the implications of this gaping democratic gap with respect to private actors.

Of course, not all entities pursuing net zero suffer equally from this democratic deficit. One way to theorize entities making net-zero pledges is to place them along a democratic continuum, with those entities most responsive to democratic pressure being the least dangerous actors to execute the net-zero agenda from a democratic-legitimacy perspective (see Figure 1).

FIGURE 1. A DEMOCRATIC CONTINUUM OF NET-ZERO PLEDGERS



In the case where a democratically elected government pursues a net-zero target, democratic pressure can act as a shaping force.[240] Moreover, larger democratically constituted jurisdictions—for example, states and countries—have more emissions which fall within their responsibility and control. This larger sphere of control creates more possibility for democratic contestation and discussion over the best ways to reach net zero. For this reason, cities fall along the middle of the democratic continuum, between corporations and larger govern-

240. Democratic contestation can play the same role in the CBA context, as when Congress forbids CBA in a certain statute. *See, e.g.*, Tenn. Valley Auth. v. Hill, 437 U.S. 153, 184-85 (1978) (interpreting the Endangered Species Act); Whitman v. Am. Trucking Ass'ns, 531 U.S. 457, 470-71 (2001) (interpreting Section 109 of the Clean Air Act).

ments. Although cities' governments are democratically elected, cities lack control over several major causes of their emissions—including, in most cases, their electricity grids.[241]

Notably absent from the taxonomy above are international institutions, for the simple reason that none exist that have made or can make credible net-zero commitments.[242] Our consent-based international legal system has no world government that can bind its member countries—a fact particularly salient for climate change diplomacy, where consensus has long ruled as the required threshold of agreement.[243] Nor have most countries been willing to accede to binding targets or meaningful enforcement mechanisms within climate accords.[244] These stark facts help explain the United Nations's embrace of net zero as a calculated framing device, designed to get a maximum number of countries to submit serious climate pledges in the absence of any formal repercussions for nonparticipation.[245]

Even within countries, it bears acknowledging that democratic pressure is far from a panacea for rapid action on climate. It took thirty years from the world's first major climate treaty for the United States—the world's largest historic emitter—to pass meaningful domestic climate legislation.[246] Even with the IRA in place, it remains to be seen whether the United States can maintain a plausible trajectory toward net zero. The IRA's projected 40% emissions cuts by 2030 are a critical first step.[247] However, its successful implementation will depend largely on state cooperation and rapid infrastructure expansion, as well as accelerated

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241. For an overview of cities' role in climate policy, see Welton, *supra* note 109, at 285-94 (contrasting municipal ownership models with the typical state public-utility commission model); Wyman & Spiegel-Feld, *supra* note 110, at 325 (describing cities' modern environmental focus as "reducing demand for pollution by targeting groups such as land and building owners and consumers").

242. Beyond, of course, pledging to neutralize their own internal organizational emissions, over which they have control analogous to that of a corporation.

243. *See* Antto Vihma, *How to Reform the UN Climate Negotiations? Perspectives from the Past, Present and Neighbour Negotiations* 11 (Finnish Inst. of Int'l Affs., Working Paper No. 82, 2014), https://www.files.ethz.ch/isn/184844/wp82.pdf [https://perma.cc/JL6C-SP2Y] (describing the consensus requirements in climate negotiations, and asserting that "[t]he consensus requirement for 195 countries is problematic" because "[i]t gives undue weight to parties with obstructive tendencies").

244. *See* Daniel Bodansky, *The Legal Character of the Paris Agreement*, 25 Rev. Eur. Cmty. & Int'l Env't L. 142, 142 (2016) ("Whether or not the Paris Agreement is legally binding, it lacks enforcement machinery and is not necessarily justiciable, at least in some countries.").

245. *See supra* Section I.A on the origins of net zero.

246. The first major international agreement on climate change was the United Nations Framework Convention on Climate Change, ratified in 1992. *See* United Nations Framework Convention on Climate Change, May 29, 1992, 1771 U.N.T.S. 165.

247. *See* Osaka, *supra* note 87.

progress in transitioning away from fossil fuels post-2030.[248] On this point, many lament the Act's significant reliance on "carrots" instead of "sticks"—that is to say, its deployment of numerous clean-energy incentives without hard caps on the future use of fossil fuels.[249] Yet in its very imperfections and necessary compromises, the IRA reveals the deeply political nature of real-world decarbonization. Its passage thus reinforces this Part's key point: there is no neutrality about how to get to net zero and we should not design a system that pretends that there is.

If we are not neutral about the pathways to net zero, then it is important to keep front of mind the question of *who* is making decisions about the paths we choose and what the consequences of putting this power in various actors' hands are likely to be. Moreover, we must not discount the importance of democratic politics to building the kind of sustained, deep response to climate change that science shows is imperative. As I have argued elsewhere, decarbonization is at root a "social project," because "[d]iscussions around its trajectory implicate choices and values that extend far beyond what technologies are available at what costs."[250] The kinds of radical emissions cuts necessary will implicate many community-level and household-level decisions and preferences concerning things like housing size and type, work patterns, modes of individualized or collective transportation, and diet and food-waste considerations.[251] Of course, helping

248. *See* Alexander C. Kaufman, *States Will Decide How Much Democrats' Historic Climate Deal Actually Cuts Emissions*, HUFFINGTON POST (Aug. 13, 2022, 8:00 AM EDT), https://www.huffpost.com/entry/ira-climate-states_n_62f54317e4b045e6f6abb444 [https://perma.cc/V5VV-CLBN]; Osaka, *supra* note 87 (observing the difficulties of predicting how much the IRA will cut emissions).

249. *See* James Goodwin & Alexandra Rogan, *With the Inflation Reduction Act, the Clean Energy Revolution Will Be Subsidized*, CTR. FOR PROGRESSIVE REFORM BLOG (Aug. 18, 2022), https://progressivereform.org/cpr-blog/inflation-reduction-act-part-i [https://perma.cc/9LTW-GRLE]; Daniel Cohan, *Big New Incentives for Clean Energy Aren't Enough – the Inflation Reduction Act Was Just the First Step, Now the Hard Work Begins*, CONVERSATION (Aug. 19, 2022, 3:31 AM EDT), https://theconversation.com/big-new-incentives-for-clean-energy-arent-enough-the-inflation-reduction-act-was-just-the-first-step-now-the-hard-work-begins-188693 [https://perma.cc/Z4UQ-KWWQ].

250. Shelley Welton, *Electricity Markets and the Social Project of Decarbonization*, 118 COLUM. L. REV. 1067, 1096 (2018); *see also* Sheila Jasanoff & Sang-Hyun Kim, *Sociotechnical Imaginaries and National Energy Policies*, 22 SCI. AS CULTURE 189, 189 (2013) ("[R]adical changes in the fuel supply are likely to transform social infrastructures, changing established patterns of life and work and allocating benefits and burdens differently from before.").

251. The IPCC's April 2022 report from Working Group III, focused on climate mitigation, was the first to include a full chapter on the role of demand. *See* Amy Westervelt, *Debunking Demand (IPCC Mitigation Report, Part I)*, DRILLED NEWS (Apr. 5, 2022), https://www.drilledpodcast.com/debunking-demand-ipcc-mitigation-report-part-1 [https://perma.cc/5GSV-DGRT]. That chapter finds that Avoid-Shift-Improve options for managing demand

families to make these shifts will require considerable structural change, not just a message of personal responsibility.[252] Moreover, the latest IPCC findings emphasize that not everyone needs to shift equally: "Wealthy individuals contribute disproportionately to higher emissions and have a high potential for emissions reductions while maintaining decent living standards and well-being . . . ."[253]

All these findings highlight the need for democratic processes that can channel citizen needs and preferences into climate policy, and thereby build sustained support for the decades-long, experimental, iterative project to come. As one IPCC cochair of the most recent working-group report observes: "Many governments are struggling with the question whether people would support changes. This report shows that public acceptability is higher when cost and benefits are distributed in a fair way."[254] The next Section turns more pointedly to this challenge: how "fairness" enters — or fails to enter — into the net-zero project.

2. *Inattention to Equity Concerns*

The democracy critique is not the only one uniting CBA and net zero. A second prominent criticism of CBA focuses on its equity implications. CBA, critics

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could contribute to 40-70% reductions by 2050, particularly by shifting transportation modalities, switching to plant-based diets, and improving building efficiency. *See Summary for Policymakers*, *in* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 154, at SPM-44 to -45; *see also Draft Scoping Plan Overview*, N.Y. CLIMATE ACTION COUNCIL 12 (Jan. 2022), https://climate.ny.gov/Our-Climate-Act/Draft-Scoping-Plan [https://perma.cc/6ZPU-V6V4] ("Consumer and community decision-making is key, and especially important for the purchase of new passenger vehicles and heating systems for homes and businesses through the next decade.").

252. *See* JEDEDIAH PURDY, THIS LAND IS OUR LAND: THE STRUGGLE FOR A NEW COMMONWEALTH 86-87 (2019) (framing the problem as one of institutions rather than errors in personal preferences); Matthew Huber, *Theorizing Energy Geographies*, 9 GEOGRAPHY COMPASS 327, 328 (2015) ("[A]ny energy transition toward a low-carbon energy system . . . require[s] . . . new spatial imaginations."); Damian Carrington, *It's Over for Fossil Fuels: IPCC Spells Out What's Needed to Avert Climate Disaster*, GUARDIAN (Apr. 4, 2022, 11:01 EDT), https://www.theguardian.com/environment/2022/apr/04/its-over-for-fossil-fuels-ipcc-spells-out-whats-needed-to-avert-climate-disaster [https://perma.cc/C8H7-NVVZ] (quoting IPCC cochair Professor Priyadarshi Shukla as stating that "[h]aving the right policies, infrastructure and technology in place to enable changes to our lifestyles and behaviour can result in a 40-70% reduction in greenhouse gas emissions by 2050 — significant untapped potential"). For an international example, see Lucia A. Reisch, Corinna Fischer, Rainer Grießhammer, Viola Muster, Ulf Schrader, Christian Thorun & Franziska Wolff, Sustainable Consumption Now! The German National Programme for Sustainable Consumption on the Test Bed 2 (Sept. 25, 2020) (unpublished manuscript), https://ssrn.com/abstract=3679773 [https://perma.cc/8DEG-UR9V].

253. *2022 Technical Summary*, *supra* note 154, at TS-103.

254. Carrington, *supra* note 252 (quoting Linda Steg).

charge, not only underregulates but unfairly regulates. Because in practice, CBA is better at pricing costs than valuing benefits, it consistently overstates the costs of regulation—thus harming regulations' intended beneficiaries.[255] Moreover, CBA's methodologies pay no attention to distributional concerns—that is, who benefits and who is burdened by a regulation—even though these questions are of central relevance to those affected and implicate citizens' more general commitments to fairness and justice.[256] The real-world consequences of this sidelining are predictable: recent research confirms that the framework cumulatively benefits the rich at the expense of the less affluent, given its use of willingness-to-pay as a measure of utility enhancement.[257] In a country with severe wealth gaps across race, these metrics also have discriminatory effects on Black Americans and other people of color.[258]

Net zero's mechanical means of emissions netting similarly sidelines equity and racial justice. By relying on entity-driven pledges, net zero eschews any commitment to—or even tracking of—the distributional implications of the program's effects. At the same time, because these pledges are frequently made in the context of either overall corporate strategies or tight governmental budgets, efficiency is likely to emerge as the dominant criterion of net-zero strategies.[259] Net zero's ambivalence to distributional impacts is not only a moral issue; it also runs counter to equity commitments embedded in global climate policy. The Paris Agreement, in addition to enshrining the principle of net-zero carbon, offers a clear moral boundary on its implementation: this netting exercise is supposed to occur "on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty."[260] Yet only 10% of corporate net-zero

255. *See, e.g.*, Ackerman & Heinzerling, *supra* note 234, at 1578; David M. Driesen, *Is Cost-Benefit Analysis Neutral?*, 77 U. COLO. L. REV. 335, 339-42 (2006) (noting that benefits can be "extraordinarily difficult" to quantify and monetize); Frank Ackerman & Lisa Heinzerling, PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING 37-40 (2004).

256. *See* Ackerman & Heinzerling, *supra* note 234, at 1574 ("In our society, concerns about equity frequently do, and should, enter into debates over public policy.").

257. *See* Zachary Liscow, *Is Efficiency Biased?*, 85 U. CHI. L. REV. 1649, 1652, 1656 (2018).

258. *See* Lisa Heinzerling, *Climate Change, Racial Justice, and Cost-Benefit Analysis*, LPE PROJECT (Sept. 28, 2021), https://lpeproject.org/blog/climate-change-racial-justice-and-cost-benefit-analysis [https://perma.cc/N3WD-YKWU]; Melissa J. Luttrell & Jorge Roman-Romero, *Regulatory (In)Justice: Racism and CBA Review*, YALE. J. ON REGUL.: NOTICE & COMMENT BLOG (Oct. 27, 2020), https://www.yalejreg.com/nc/regulatory-injustice-racism-and-cba-review-by-melissa-j-luttrell-and-jorge-roman-romero [https://perma.cc/2YPG-8M8H].

259. One can already see how corporations and many governments are prizing efficiency through plans to use offsets and future, noncommercialized technologies. *See supra* Part II.

260. Paris Agreement, *supra* note 38, art. 4(1).

pledge-makers report taking equity into consideration when setting their net-zero strategy.[261]

This lack of attention to equity within the net-zero framework renders it vulnerable to the same critiques that have dogged CBA. The standard answer to these CBA critiques has been to dismiss their relevance to the field of regulation by arguing that the tax system can handle any perverse distributive consequences of efficient regulation.[262] However, more recently, the CBA discourse—if not practice[263]—has matured considerably. Enduring proponents of CBA have refined their analyses to look for ways to improve its proregulatory potential and to contextualize the exercise.[264] Scholars have also begun to reconsider in earnest the previously well-accepted conclusion that redistribution is best ignored within regulatory policy.[265] For example, Zachary Liscow has championed a

261. *See Taking Stock*, *supra* note 5, at 23.

262. *See* Louis Kaplow & Steven Shavell, *Why the Legal System Is Less Efficient than the Income Tax in Redistributing Income*, 23 J. LEGAL STUD. 667, 674-75 (1994); Richard L. Revesz, *Regulation and Distribution*, 93 N.Y.U. L. REV. 1489, 1489 (2018) (analyzing the origins and wisdom of the widely accepted view that "distributional concerns should be moved out of the regulatory domain and into Congress's tax policy portfolio").

263. *See* Revesz, *supra* note 262, at 1491 (noting that although the CBA regime crafted by a Clinton executive order "states that distribution must be taken into account," it has "never been an important component of the administration of this order"). Obama Administration updates that were intended to promote "equity, human dignity, fairness and distributive impacts," alongside CBA in regulatory review, similarly "did not change [agency] behavior." *Id.* at 1541-42.

264. *See generally* REVESZ & LIVERMORE, *supra* note 230 (discussing ways of debiasing the cost-benefit methodology and better aligning it with proregulatory interests); Cass R. Sunstein, *The Limits of Quantification*, 102 CALIF. L. REV. 1369, 1369 (2014) (arguing for "breakeven analysis" to highlight the benefits of regulation when regulators are not able to monetize them); Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165, 194-97 (1999) (arguing for a cabined use of CBA as a "welfarist decision procedure" alongside other considerations); Richard L. Revesz, *Quantifying Regulatory Benefits*, 102 CALIF. L. REV. 1423, 1423 (2014) (pushing for quantification of more benefits); Amy Sinden, Douglas A. Kysar & David M. Driesen, *Cost-Benefit Analysis: New Foundations on Shifting Sand*, 3 REGUL. & GOVERNANCE 48, 51 (2009) (reviewing ADLER & POSNER, *supra* note 233, and commending its approach to CBA for being "not imperialistic").

265. For example, Richard L. Revesz has moved from a conventional dismissal of distributional issues as better suited for tax-and-transfer regimes to a full-throated embrace of embedding distributional considerations in regulatory design. *Compare* REVESZ & LIVERMORE, *supra* note 230, at 14 ("It is generally thought that the best way to improve overall well-being is to maximize wealth by managing the economy effectively, and then redistributing wealth through the tax-and-transfer system."), *with* Revesz, *supra* note 262, at 1489 ("The time has come to make distributional consequences a core concern of the regulatory state."). *See also* Zachary Liscow, *Redistribution for Realists*, 107 IOWA L. REV. 495, 495 (2022) (arguing that the ortho-

"'thousand points of equity' approach" to redistribution throughout the regulatory state as the best way to "make substantial inroads on inequality while doing the most good at the least cost."[266] Taking a different approach, Richard L. Revesz argues for creating a new interagency working group to redistribute resources to groups disproportionately burdened by regulatory actions.[267]

These advances in CBA are commendable, even if not completely responsive to critics.[268] However, integrating equity considerations is not even *possible* in the atomized world of net-zero pledges. As discussed above, in the current design of the net-zero program, there is simply no one in charge — and thus no one to pursue a coordinated goal of either efficiency or equity. To be sure, there are a limited number of governmental net-zero pledges that are accompanied by explicit equity requirements. For example, the states of Washington and New York have committed resources to ensure investment in overburdened communities and tribal nations.[269] If institutionalized appropriately, these substantive commitments to equity may help ensure a just net-zero strategy.[270]

But more often, when equity is considered at all within net-zero pledges, it is commodified. Net-zero standard-setting organizations have sought to turn equity and sustainability into monetizable assets. For example, in 2003, a suite of international nongovernmental organizations, including the World Wildlife

doxy amounts to a "prescription for widespread inequality" because the public prefers redistribution through field-specific policies rather than taxes and transfers); Sunstein, *supra* note 229, at 2257 (championing distributional analysis for agencies); Liscow, *supra* note 257, at 1655-57 (drawing attention to the distributional impacts of efficient policies and providing guidance on how redistribution concerns should factor in); Lee Anne Fennell & Richard H. McAdams, *The Distributive Deficit in Law and Economics*, 100 MINN. L. REV. 1051, 1085-89 (2016) (discussing distributive entrenchment in policies).

266. Liscow, *supra* note 265, at 495.

267. Revesz, *supra* note 262, at 1555-56. This proposal does not address the reverse challenge — when disadvantaged groups might be inordinately benefitted by a regulation that fails conventional CBA but is nevertheless justifiable on distributional grounds — but it is a start.

268. *See id.*; *see also* Lisa Heinzerling, *Quality Control: A Reply to Professor Sunstein*, 102 CALIF. L. REV. 1457, 1459 (2014) (considering the limitations of Sunstein's breakeven-analysis proposal); Sinden et al., *supra* note 264, at 53-55 (suggesting that the political economy of CBA is still likely to lead to the vaunting or abuse of the instrument in practice); Amy Sinden, *Cass Sunstein's Cost-Benefit Lite: Economics for Liberals*, 29 COLUM. J. ENV'T L. 191, 200 (2004) (rejecting Sunstein's attempt to make CBA "palatable").

269. *See* WASH. REV. CODE ANN. § 70A.65.030 (West 2022) (requiring state climate funding to be directed to vulnerable populations and overburdened communities); N.Y. ENV'T CONSERV. LAW § 75-0117 (Consol. 2019) (instructing state agencies to direct resources in a manner such that "disadvantaged communities [are] to receive forty percent of overall benefits of spending on clean energy").

270. *See infra* Section V.B.

Fund, established the "Gold Standard" to ensure that "projects that reduced carbon emissions featured the highest levels of environmental integrity and also contributed to sustainable development."[271] This project attempts to quantify and assure the achievement of potential positive impacts from carbon-offset projects beyond simply carbon removal, such as improved health, reduced hunger, and enhanced gender equality.[272] As corporate or government demand grows for offsets that meet this standard, these multibenefit offsets — dubbed "Boutique Carbon" by political scientists Matthew Paterson and Johannes Stripple — can fetch a higher price than plain-old "Walmart" offsets.[273]

The creation of bespoke carbon commodities is a bizarre and disturbing way to accomplish the aim of an equitable global climate change strategy. It puts critical choices into the hands of myriad offset-project developers, who by design will base their sustainability and equity initiatives around whatever quantifiable objectives will fetch the highest price from corporate and governmental offset purchasers.[274] At the same time, it deprives governments and localities of the funding and the power to establish their own equity-related goals and priorities. Behind the neutrality mirage, then, lies a giant transfer of political and social control from the state to the market, with an attendant loss of opportunities for democratically shaping the outcomes and consequences of net zero.[275]

For this reason, anyone troubled by CBA's distributional and democratic challenges should be even more disturbed by net zero's eschewal of responsibility for its well-catalogued equity implications. This point alone should be enough to force the kind of reexamination of net zero's structure advocated for in Part V. But there is another challenge that must first be explored: as the next Part describes, net zero's corporatized, atomized approach to climate policy may well

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271. GOLD STANDARD, https://www.goldstandard.org/about-us/vision-and-mission [https://perma.cc/F89T-MSFB].

272. *See Guidance for the Identification of Impacts and Indicators for Activity Level SDG Impact Reporting*, GOLD STANDARD 12 (Aug. 2019), https://www.goldstandard.org/sites/default/files/2019_sdg_tool_guidance_briefing.pdf [https://perma.cc/TYA4-VS6G]; Lee & Mayer, *supra* note 60, at 7 (describing this emerging category of certification groups).

273. Paterson & Stripple, *supra* note 191, at 570 (describing Boutique Carbon as attached to "[s]tories told about the benefits (poverty, development, local empowerment, gender) of the particular carbon unit," whereas Walmart carbon is "[c]arbon as an 'empty' unit, detached from climate mitigation as ethical duty"); *see also* Donofrio et al., *supra* note 189, at 6 (noting that offsets that claim to support sustainability goals often fetch "much higher" prices).

274. *See* Seddon et al., *supra* note 220, at 7 (describing the difficulty of finding appropriate metrics for "social-ecological effectiveness of nature-based interventions").

275. *Cf.* Boyd, *supra* note 33, at 401 (arguing that a focus on "emissions trading and other forms of carbon pricing over the last three decades has worked to diminish our understanding of climate change as a broad *public* problem and has undermined our ability to mobilize the power of government to respond").

impede the ultimate goal of limiting planetary warming to noncatastrophic levels.

IV. THE COLLECTIVE-ACHIEVEMENT CHALLENGE

The previous Part described the limitations of framing climate policy as presumptively neutral. Whereas that critique focused on the moral and political shortcomings of pursuing atomized net-zero pledges, this Part focuses on the challenges likely to emerge as these pledges accrete and interact over time. The net-zero framework presents a multipronged collective-achievement challenge, in which pledges are likely to underachieve necessary emissions reductions, overrely on technologies and strategies that cannot be supported globally at the necessary scale, and create perverse incentives under the legal structure of the Paris Agreement.

A. Collective Underachievement of Emissions Reductions

There is now scientific consensus that, at the global level, achieving net-zero carbon emissions is imperative to stemming the climate crisis.[276] This conclusion has provoked a range of models seeking to understand potential pathways to move national economies to net-zero emissions. These models converge on the following conclusion: "Achieving this goal requires eliminating nearly all sources of anthropogenic GHG emissions and neutralizing hard-to-abate emissions with an appropriate amount of CO_2 removals."[277] In other words, every ton of carbon that *can* be eliminated, *must* be eliminated. Carbon-removal technologies should be reserved for counterbalancing emissions in those essential sectors where reducing emissions is particularly difficult or expensive, including chemicals, steel, hydrogen production, and aviation.[278]

Under the current net-zero framework, as described above, any company or city that makes a net-zero pledge is free to determine its own balance of emissions reductions and carbon removal (with the latter typically accomplished through purchasing offsets). This strategy creates a disturbing risk of collective underachievement: any entity that opts to purchase offsets to cover emissions that could be eliminated jeopardizes the broader global project. Given early in-

276. *See supra* Section I.A.

277. Pineda et al., *supra* note 118, at 24; *see* Williams et al., *supra* note 70, at 4 (noting widespread agreement in U.S. models on key pathways to net zero).

278. Of course, which of these sectors is "essential" is a political judgment—for example, much aviation may be far from essential.

dications of the number of companies that intend to use offsets—and the magnitude of their use in many cases where viable technical substitutes exist[279]—our present approach to net zero fails to incentivize emissions reductions at the scale necessary to achieve atmospheric stability over a noncalamitous time frame.[280] In other words, the sanctioning of offsets as an individualized strategy for accomplishing net zero leads to "mitigation deterrence," where offsets substitute for needed carbon-emissions actions rather than complement them.[281]

Recognizing this challenge, some standard-setting organizations require entities to demonstrate that they are eliminating all emissions deemed feasible. For example, the SBTi requires participants to reduce emissions at a rate compatible with the Paris Agreement's 1.5°C goal.[282] I return in Part V to consider the prospects for eliminating the collective-underachievement challenge through private-governance initiatives, after considering two more facets of the challenge.

B. Incompatible Carbon-Removal Strategies at Scale

The second risk is a corollary to the first: if entities are underachieving emissions reductions by overrelying on offsets, we must consider the likely consequences of this overreliance. Researchers project that demand for carbon offsets—particularly for carbon-removal projects—is likely to increase substantially as entities ramp up their net-zero pledges and seek low-cost ways to achieve them.[283]

An examination of IPCC models might give the impression of enormous potential for carbon-removal offsets. As the IPCC explains, its models demonstrate

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279. For example, the natural-gas industry is fighting vociferously to block attempts to transition heating and cooking to electricity, even though electricity presents an excellent substitute for gas in these domains. *See* Jeff Brady & Dan Charles, *As Cities Grapple with Climate Change, Gas Utilities Fight to Stay in Business*, NPR (Feb. 22, 2021, 4:19 PM ET), https://www.npr.org/2021/02/22/967439914/as-cities-grapple-with-climate-change-gas-utilities-fight-to-stay-in-business [https://perma.cc/H83S-6NU6]; Emily Holden, *Revealed: How the Gas Industry Is Waging War Against Climate Action*, GUARDIAN (Aug. 20, 2020, 5:00 AM EDT), https://www.theguardian.com/environment/2020/aug/20/gas-industry-waging-war-against-climate-action [https://perma.cc/676X-H57M].

280. *See* Lee & Mayer, *supra* note 60, at 11 ("As caps on carbon emissions tighten, companies will aggressively search for low-priced offsets, many of which do not result in additional removal or mitigation.").

281. Carton et al., *supra* note 24, at 9; *see* McLaren et al., *supra* note 28, at 1 ("[W]e see clear evidence that emissions reductions can be deterred or delayed by efforts and suggestions to use [negative emissions technologies] to sustain fossil fuel use.").

282. Pineda et al., *supra* note 118, at 19-20.

283. *See* Lee & Mayer, *supra* note 60, at 11.

that "[a]ll pathways that limit global warming to 1.5°C with limited or no overshoot project the use of carbon-dioxide removal (CDR) on the order of 100-1000 [gigatons] CO_2 over the 21st century."[284] To understand the enormity of this enterprise, consider that all the people on earth, *combined*, weigh approximately half a gigaton.[285]

However, it is important to understand that these models essentially back into their calculation of the amount of carbon removal necessary by beginning with a given emissions limitation (for example, 1.5°C), subtracting all feasible emissions reductions, and then assuming that any residual emissions will be compensated for through carbon removal.[286] In other words, IPCC models should not be interpreted as a plausible assessment of how much carbon removal is economically, technologically, or politically feasible.[287] Indeed, the IPCC takes pains to say as much, explaining that "CDR deployment of several hundreds of $GtCO_2$ is subject to multiple feasibility and sustainability constraints."[288]

Some of these constraints are economic and technological. DAC, for example, is still considered too immature to include in most models, as are the experimental technologies of enhanced mineral weathering and ocean alkalinization.[289] Of course, assumptions about DAC and these other technologies could shift as they mature. Other limits, however, are more intractable: BECCS and afforestation—the two most mature and frequently modeled technologies—face the very physical constraint of land.[290] Beyond physical and technological constraints lies the host of concerns, outlined above, about the effects of carbon removal on indigenous communities, economic inequality, and biodiversity.[291] These concerns combine to create at least a moral—but perhaps also a political—

284. *2018 Summary for Policy Makers*, *supra* note 3, at 17.

285. *See* Friedmann et al., *supra* note 57, at 15.

286. *See* McLaren et al., *supra* note 28, at 2; *see also* Andrew Bergman & Anatoly Rinberg, *The Case for Carbon Dioxide Removal: From Science to Justice*, *in* CARBON DIOXIDE REMOVAL PRIMER, ch. 1 (Jennifer Wilcox, Ben Kolosz & Jeremy Freeman eds., 2021), https://cdrprimer.org/read/chapter-1 [https://perma.cc/4UDV-5SYR] ("The assumed large scale of potential future CDR may also reflect both unreasonable technological optimism and hubris in our ability to control complex natural systems.").

287. *See* Healey et al., *supra* note 168, at 2 (describing how these modeled technologies "fill the gap between overall carbon budgets and what could be achieved in a particular timeframe through emissions reductions"); Beck & Mahony, *Politics of Anticipation*, *supra* note 28, at 2.

288. *2018 Summary for Policymakers*, *supra* note 3, at 17.

289. *See id.*

290. *See id.*

291. *See supra* notes 221-223, 255-275 and accompanying text.

constraint on the amount of carbon removal that host countries (predominantly developing countries) will tolerate.[292]

Up against this wall of challenges butts the enormous appetite of net-zero pledgers for carbon-removal offsets. At present, the system for directing carbon removal essentially amounts to first come, first served, with a veneer of sustainability imposed through optional Boutique Carbon offerings.[293] Collectively, it seems unlikely that the world is even capable of delivering the total amount of offsets that the net-zero community appears poised to demand. But, if it is capable, this delivery is likely to be accompanied by severe collateral consequences. If not entirely incompatible in the aggregate, then, net-zero pledgers' carbon-removal strategies are at least likely to be irresponsible and politically explosive.

To be sure, trade-offs are inevitable. Our models make clear that carbon removal is an essential component of keeping planetary warming within limits that the international community, guided by science, has deemed acceptable.[294] But, as Wim Carton and coauthors suggest, "How such trade-offs are negotiated and addressed will be crucial to the local and global societal legitimacy of negative emission policies."[295] The present free-for-all, largely unregulated market for carbon-removal offsets presents a growing crisis of legitimacy for the project of net zero.[296] Although small enough in scale at present to avoid significant political fallout, a massive market-driven land grab of the type we can expect if we leave net zero in its current form is precisely the kind of challenge that might undermine the project in its entirety.[297]

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292. *See* Healey et al., *supra* note 168, at 1 (describing the tensions likely to arise as big-emitter countries rely on developing countries for CDR, with attendant pressures on their domestic food and energy supplies); Revesz, *supra* note 262, at 1492-98 (observing how distributional issues have impeded U.S. climate policy and concluding that "[i]gnoring the pleas of communities that disproportionately suffer serious harms is likely, in the future, to derail important welfare-enhancing regulations").

293. *See supra* note 273 and accompanying text.

294. *See* James Temple & Casey Crownhart, *UN Climate Report: Carbon Removal Is Now "Essential,"* MIT TECH. REV. (Apr. 4, 2022), https://www.technologyreview.com/2022/04/04/1048832/un-climate-report-carbon-removal-is-now-essential [https://perma.cc/79FN-4M99].

295. Carton et al., *supra* note 24, at 13.

296. *See* Seddon et al., *supra* note 220, at 1 (asserting that current regimes do a poor job of accounting for synergies and trade-offs among various sustainability goals).

297. *See 2018 Summary for Policymakers*, *supra* note 3, at 16 ("Such large transitions pose profound challenges for sustainable management of the various demands on land for human settlements, food, livestock feed, fibre, bioenergy, carbon storage, biodiversity and other ecosystem services . . . ."); Walter V. Reid, Mariam K. Ali & Christopher B. Field, *The Future of Bioenergy*, 26 GLOB. CHANGE BIOLOGY 274, 274 (2020) ("Land-intensive bioenergy makes a meaningful contribution to the global energy system only at a spatial scale of hundreds of millions of

C. Perverse Legal Incentives

A final challenge of the net-zero framework stems from its interactions with the structure of the Paris Agreement. The Paris Agreement takes a different legal approach than previous climate treaties, which divided the world into developed and developing countries and only imposed emissions-reductions targets on developed countries.[298] Instead, the Paris Agreement relies on a universal "pledge and review" process, in which each country submits an NDC every five years, committing to a self-determined level of emissions reductions.[299] Although countries have no legal obligation to achieve these NDC goals, they do commit to "pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions."[300] The theory behind the Paris Agreement is that in crafting and executing these NDCs, countries will ratchet up their level of ambition as collective trust builds in the process.[301]

The Paris Agreement's structure was born largely of legal necessity. The United States knew it could not get a new climate treaty ratified in the U.S. Senate in 2015, and thus convinced the world to structure the agreement as a subsidiary agreement of the already-ratified 1992 United Nations Framework Convention on Climate Change.[302] Beyond legal constraints, many also viewed Paris's novel structure as a constructive way to overcome the developed/developing country divide that had long dominated climate negotiations.

Whatever wisdom may lie in its structure, the Paris Agreement's NDC system also creates serious incentive challenges for the net-zero project. The main challenge, in brief, is this: the Paris Agreement relies on country-centered action. The net-zero framework focuses largely upon inducing private-sector investment based on net-zero commitments. But what is the relationship between public and private action in a regime based on territorial emissions?[303] When a

hectares or larger, large enough to have significant trade-offs with food production and biodiversity conservation."); Friedmann et al., *supra* note 57, at 23 ("Land-use changes (LUC) associated with biomass have led locally to severe environmental damage, affecting biodiversity, water quality, and environmental justice for indigenous peoples.").

298. *See* Kyoto Protocol to the United Nations Framework Convention on Climate Change arts. 2-3, Dec. 11, 1997, 2303 U.N.T.S. 162 (establishing targets for "Annex 1" countries).

299. *See* Paris Agreement, *supra* note 38, art. 4.

300. *Id.* art. 4.2.

301. *See id.* art. 4.3 (requiring "progression" and "highest possible ambition" in Nationally Determined Contributions (NDCs)).

302. *See* Bodansky, *supra* note 244, at 149-50.

303. *See* Michaelowa et al., *supra* note 171, at 1216; Simon Evans & Josh Gabbatiss, *In-Depth Q&A: How 'Article 6' Carbon Markets Could 'Make or Break' the Paris Agreement*, CARBONBRIEF (Nov.

corporation voluntarily buys an offset from a country, who gets to "count" it or claim credit for it? The corporation? The host country? Both?

The Paris Agreement's Article 6 tries to meet this challenge by requiring any offsets exchanged to "allow for higher ambition" and "promote sustainable development and environmental integrity."[304] However, the Agreement itself is vague as to how voluntary carbon markets will interact with the NDC-based structure of the agreement.[305] Although considerable progress was made on fleshing out country accounting requirements at the 2021 international climate negotiations, the topic of how to manage the voluntary market remains a thorny one.[306] In brief, it remains unclear whether or not a country must make a "corresponding adjustment" in its claimed emissions reductions when credits are awarded for sale in the voluntary market.[307] Although the answer to this ques-

29, 2019, 8:00 AM), https://www.carbonbrief.org/in-depth-q-and-a-how-article-6-carbon-markets-could-make-or-break-the-paris-agreement [https://perma.cc/P9YA-P9DV] (observing the risk that countries "could deliberately exclude parts of their economies from their NDCs, so as to be able to sell any related emissions reductions on the global market instead"); Michael W. Wara & David G. Victor, *A Realistic Policy on International Carbon Offsets* 5-6 (Program on Energy & Sustainable Dev., Working Paper No. 74, 2008) https://law.stanford.edu/publications/a-realistic-policy-on-international-carbon-offsets [https://perma.cc/5T63-GTXB] (charting similar challenges in earlier climate-offset programs).

304. *See* Paris Agreement, *supra* note 38, arts. 6.1, 6.2 & 6.4 (creating two markets for "internationally transferred mitigation outcomes").

305. *See* Lee & Mayer, *supra* note 60, at 7; Andrei Marcu, *Governance of Article 6 of the Paris Agreement and Lessons Learned from the Kyoto Protocol*, CTR. FOR INT'L GOVERNANCE INNOVATION 1 (May 2017), https://www.cigionline.org/documents/1182/Fixing%20Climate%20Governance%20Paper%20no.4%20WEB.pdf [https://perma.cc/83MM-6MZW]; David A. Wirth & Lisa Benjamin, *From Marrakesh to Glasgow: Looking Backward to Move Forward on Emissions Trading*, 11 CLIMATE L. 245, 260 (2021) ("The oft-lauded flexibility of the Paris Agreement . . . has provided rather too much flexibility for reaching agreement on ambitious Article 6 rules around carbon trading.").

306. *See* Charles E. Di Leva & Scott Vaughan, *The Paris Agreement's New Article 6 Rules*, INT'L INST. FOR SUSTAINABLE DEV. (Dec. 13, 2021), https://www.iisd.org/articles/paris-agreement-article-6-rules [https://perma.cc/7FY6-UTL5] ("A big question coming out of Glasgow is to what extent will purely private sector, voluntary carbon markets conform with the new Article 6 rules.").

307. *See* Kasia Klaczynska Lewis & Malwina Burzec, *After COP26: The Interplay Between Article 6 of the Paris Agreement and the Voluntary Carbon Market*, ERNST & YOUNG (Dec. 27, 2021), https://www.ey.com/en_pl/law/after-cop26-the-interplay-between-paris-agreement-and-the-voluntary-carbon-market [https://perma.cc/NN3F-TDHC] ("[I]t has not yet been decided how voluntary use of carbon credits will be accounted for the purpose of a corresponding adjustment in a situation when credits acquired are not used to meet the buyer country's Nationally Determined Contributions."); *see also* Jonathan Crook & Gilles Dufrasne, *FAQ: Deciphering Article 6 of the Paris Agreement*, CARBON MKT. WATCH (Dec. 10, 2021, 10:08 AM),

tion largely determines the integrity of voluntary offsets, it appears that no conclusive decision is forthcoming. Instead, as one commentator suggests, "Ultimately, governments or courts may start regulating what claims companies can truthfully make in association to carbon credits that are not backed by corresponding adjustments."[308]

This creates a difficult tension not only for those concerned about the integrity of carbon markets, but also for developing countries, for which the consequences of encouraging private climate investment are unclear.[309] In the long run, countries engaging heavily with carbon markets may risk ceding many of the cheapest, easiest cuts within their borders to other countries and companies—potentially making their own eventual pathways to net zero more expensive and complex than they otherwise would have been.

In sum, there are real difficulties to combining a self-directed net-zero bonanza with a global climate agreement premised on country-level responsibility for emissions reductions. These difficulties are not insurmountable, but as the next and final Part discusses, they do highlight several important lessons for the future of the net-zero project.

V. THE FUTURE OF NET ZERO: THE PRIVATE AND PUBLIC ROLE

This Feature has articulated two broad risks of the net-zero project that go beyond more-often-identified "accounting risks": the neutrality mirage and the collective-achievement challenge. Collectively, these risks underscore the importance of carefully governing the project of net zero to ensure it is achieved in politically, morally, and ecologically sustainable ways. In this final Part, the Feature turns to consider the implications of these conclusions for both private- and

https://carbonmarketwatch.org/2021/12/10/faq-deciphering-article-6-of-the-paris-agreement [https://perma.cc/3EJN-M4ZN] (describing how remaining vagueness in the Article 6 rulebook could be exploited).

308. Lambert Schneider, *#COP26 in Glasgow Delivered Rules for International Carbon Markets – How Good or Bad Are They?*, BEITRÄGE UND STANDPUNKTE AUS DEM ÖKO-INSTITUT [CONTRIBUTIONS & STANDPOINTS FROM ECO-INST. (Nov. 15, 2021), https://blog.oeko.de/glasgow-delivered-rules-for-international-carbon-markets-how-good-or-bad-are-they-cop26 [https://perma.cc/XSX7-RXPW]. For more on how potential enforcement of net-zero claims might function, see Lin, *supra* note 20, at 719-34.

309. *Cf.* James Edmonds, Sha Yu, Haewon McJeon, Dirk Forrister, Joseph Aldy, Nathan Hultman, Ryna Cui, Stephanie Waldhoff, Leon Clarke, Stefano De Clara & Clayton Munnings, *How Much Could Article 6 Enhance Nationally Determined Contribution Ambition Toward Paris Agreement Goals Through Economic Efficiency?*, 12 CLIMATE CHANGE ECON. art. no. 2150007, at 7 (2021) (reporting that Article 6 trading is likely to shift emissions mitigation toward "non-OECD"—that is, developing—countries).

public-sector pursuit of net zero. Although supportive of global-emissions netting and well-designed public net-zero regimes, this Part insists that there are fairer and more productive ways to harness corporations in the pursuit of these collective aims.

A. Redesigning the Private Role

In an ideal climate regime, corporations would not set their own targets, timetables, and strategies for climate action. Instead, governments would legislatively establish appropriate binding targets and accompanying policy goals (be those equity-, labor-, or innovation-focused) and would dictate the roles of various sectors in helping to achieve those targets through emissions reductions. Instruments deployed might include carbon pricing or cap-and-trade mechanisms, mandatory ("command and control") limits, or green industrial policy. These details would be open for democratic debate and iterative experimentation.[310]

Needless to say, this is not the world we live in. The United States has failed to produce binding economy-wide targets for over thirty years, and even sector-specific progress has been halting.[311] Across the world, corporations' transnational reach and economic and political power allow them to define and often defy national efforts to regulate climate change.[312] Accordingly, there has been an explosion of interest in the private sector's *own* ability to address climate change in recent years.[313] Legal academic circles are abuzz with debates about

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310. There is growing scholarly recognition that carbon-pricing mechanisms are unlikely to drive the structural change necessary for deep and rapid decarbonization on their own—but that is not to say that they might not play a role in well-designed climate policy. *See* Boyd, *supra* note 33, at 402-03 & nn.4-5 (gathering literature on this point). *See generally* DANNY CULLENWARD & DAVID G. VICTOR, MAKING CLIMATE POLICY WORK (2020) (arguing that we must look beyond market mechanisms to regulations and industrial policy to achieve the scope and scale of the necessary transition).

311. *See, e.g.*, West Virginia v. EPA, 142 S. Ct. 2587 (2022) (rejecting one form of EPA's ability to regulate greenhouse-gas emissions from power plants under the Clean Air Act).

312. *See* Christopher M. Bruner, *Corporate Governance Reform and the Sustainability Imperative*, 131 YALE L.J. 1217, 1251 (2022) (arguing that corporations likely cannot be regulated fully into compliance given "the extraordinary influence that major corporations exert upon the political processes generating the regulations purportedly constraining them").

313. *See* Sarah E. Light, *The Law of the Corporation as Environmental Law*, 71 STAN. L. REV. 137, 139 (2019) (asserting that "[t]he corporation is ascendant" as an actor in environmental law).

corporate purpose and the best ways to structure and enforce burgeoning corporate "environmental, social, and governance" (ESG) initiatives.[314] As these scholars document, the private sector is approaching climate change mitigation with a newfound zeal that combines beneficence and opportunism. For example, one investment firm proclaims that net zero creates a "historic investment opportunity."[315] Similarly, Larry Fink, chief executive officer of the behemoth, ESG-focused investment firm BlackRock, has predicted that "[o]ne of the biggest opportunities of this generation will be helping our clients navigate the transition to a net-zero economy."[316]

For these mixed reasons, net-zero pledges and attendant voluntary carbon markets are poised for a meteoric rise in the coming decade.[317] Particularly given the challenges that have plagued attempts to raise public funds for international

314. *See, e.g.*, Light & Skinner, *supra* note 113, at 1895 (arguing that banks will be at the center of the transition to a low-carbon economy); Susan S. Kuo & Benjamin Means, *Climate Change Compliance*, 107 IOWA L. REV. 2135, 2138 (2022) (arguing that climate change should be viewed as a matter of corporate compliance); Jill E. Fisch & Steven Davidoff Solomon, *Should Corporations Have a Purpose?*, 99 TEX. L. REV. 1309, 1309 (2021) (arguing that corporate purpose is best conceptualized as a precommitment device "to facilitate the goals of corporate participants"); Lynn M. LoPucki, *Repurposing the Corporation Through Stakeholder Markets*, 55 U.C. DAVIS L. REV. 1445, 1448 (2022) (asserting the importance of "credible, publicly available ESG [environmental, social, and governance] information" for potential stakeholders); MICHAEL P. VANDENBERGH & JONATHAN M. GILLIGAN, BEYOND POLITICS: THE PRIVATE GOVERNANCE RESPONSE TO CLIMATE CHANGE 145-47 (2017).

315. Jean-Pierre Durante & Malik Zetchi, *The Global Journey to Net-Zero Could Create a Historic Investment Opportunity*, PICTET WEALTH MGMT. (Apr. 23, 2021), https://perspectives.group.pictet/sustainability/the-global-journey-to-net-zero-could-create-a-historic-investmen [https://perma.cc/HL97-Q22A].

316. *BlackRock's Sustainable Investment Funds Surge to $509B*, E&E NEWS (Jan. 18, 2022, 7:58 AM EST), https://subscriber.politicopro.com/article/eenews/2022/01/18/blackrocks-sustainable-investment-funds-surge-to-509b-285263 [https://perma.cc/9W89-DF9D].

317. *See* Chloé Farand, *Mark Carney Oversees Blueprint for Scaling Up Carbon Market as Offset Demand Soars*, CLIMATE HOME NEWS (Oct. 11, 2020, 6:05 PM), https://www.climatechangenews.com/2020/11/10/mark-carney-oversees-blueprint-scaling-carbon-market-offset-demand-soars [https://perma.cc/5SZX-8XHG] (observing a doubling of the volume of claimed emissions reduction between 2017 and 2020 and noting that "[i]t is expected to continue to soar in the near future as companies look for ways to meet their newly set goals"); Press Release, Ecosystem Marketplace, Voluntary Carbon Markets Rocket in 2021, on Track to Break $1B for First Time (Sept. 15, 2021), https://www.ecosystemmarketplace.com/articles/press-release-voluntary-carbon-markets-rocket-in-2021-on-track-to-break-1b-for-first-time [https://perma.cc/W33V-TNVZ] (reporting record value for voluntary carbon markets).

climate efforts, private capital has an obvious role to play in both mitigating corporate emissions and funding carbon-removal efforts and innovations.[318] Even for skeptics of corporate climate commitments, it would be difficult to leave this money on the table. But as catalogued in this Feature, a massive and uncoordinated deployment of private capital toward individualized net-zero targets presents real risks.

Two solutions to these risks predominate the literature to date. Both focus on increasing the transparency and integrity of entities' net-zero pledges. The first approach is to enhance net-zero standard setting.[319] As discussed in Part I, several standard-setting organizations already attempt to assure the environmental integrity of both net-zero pledges and the offsets used to achieve them.[320] In fall 2021, the "Taskforce on Scaling Voluntary Carbon Markets" announced the creation of a new governance body to improve these oversight mechanisms in order to build confidence in carbon markets.[321] At the same time, banks' and private-equity firms' steps to police their portfolios for net-zero compliance also render them net-zero standard-setting organizations of sorts, and they too are

318. *See Operationalising Article 6 of the Paris Agreement*, EUR. BANK FOR RECONSTRUCTION & DEV. 12 (May 2017), https://www.ieta.org/resources/International_WG/Article6/Portal/operationalising-article-6-of-the-paris-agreement.pdf [https://perma.cc/6TV8-PB42] ("The current levels of public funding committed under the Paris Agreement are far from sufficient to reach its objective. Achievement of the 2°C target will only be possible if significant levels of private finance can be leveraged." (emphasis omitted) (footnote omitted)); *2022 Technical Summary*, *supra* note 154, at TS-122 ("Progress on the alignment of financial flows with low GHG emissions pathways remains slow. There is a climate financing gap which reflects a persistent misallocation of global capital . . . .").

319. *See* Lee & Mayer, *supra* note 60, at 11; *Expert Peer Review Group*, RACE TO ZERO, https://climatechampions.unfccc.int/expert-peer-review-group [https://perma.cc/X4FR-CUHL]; Patrick Bolton, Stefan Reichelstein, Marcin Kacperczyk, Christian Leuz, Gaizka Ormazabal & Dirk Schoenmaker, *Mandatory Corporate Carbon Disclosures and the Path to Net Zero*, CTR. FOR ECON. POL'Y RSCH. 2 (Oct. 2021), https://cepr.org/system/files/2022-08/PolicyInsight111.pdf [https://perma.cc/C46V-FWML] (outlining the important role of carbon disclosure in net zero); Lin, *supra* note 20, at 683.

320. *See supra* Part I. "*The Oxford Principles for Net Zero Aligned Carbon Offsetting* suggests that offsetting . . . should be restricted to the use of high quality credits with a low-risk of non-additionality, and only after prioritising the reduction of one's own emissions and the scaling up of removals." Day et al., *supra* note 61, at 49.

321. *New Governing Body Formed to Oversee Voluntary Carbon Markets*, EDIE (Sept. 21, 2021), https://www.edie.net/news/9/New-governing-body-formed-to-oversee-voluntary-carbon-markets [https://perma.cc/3TPH-X5AX]; *see also* Farand, *supra* note 317 ("With more and more businesses setting net zero emissions targets, the voluntary carbon market needs stronger quality control to scale up . . . .").

taking steps to improve their track records in complying with their commitments.[322] Whether such standard setting occurs via financial institutions or through net-zero-focused certification schemes, the basic idea is the same: enhanced monitoring should help ensure high-quality net-zero pledges.[323]

The SEC's ongoing initiative to enhance climate-related disclosures might add legal teeth to such schemes.[324] The chief of the SEC enforcement division, Gurbir Grewal, has explained that if its proposed rule is finalized, it would enhance the agency's antifraud enforcement by putting climate disclosures "in a consistent, comparable format that would allow [the SEC] to more easily further [its] investigations."[325] Such disclosures might similarly assist private litigants pursuing climate-related fraud, tort, or human-rights claims against corporations. Nevertheless, company-by-company litigation will prove a piecemeal, expensive, and cumbersome way to monitor net-zero pledges—causing some to advocate for a more dramatic shift.

The second approach is to restructure the nature of net-zero pledges themselves. Most prominently, several academics have called for splitting net-zero pledges into two components—one focused on internal emissions reductions and the other on offsets and removals.[326] Others have suggested that pledges should also be temporally separated, with an emphasis on near-term reductions over long-term promises.[327] Proponents of these strategies hope that the trans-

322. *See* Light & Skinner, *supra* note 113, at 1898 (describing these trends as "significant new forms of private environmental governance"); *see also* Rory Van Loo, *The New Gatekeepers: Private Firms as Public Enforcers*, 106 VA. L. REV. 467, 496, 499-502 (2020) (noting that firms have increasingly assumed a rulemaking role).

323. A full exploration of the reasons why banks and private-equity firms are playing this standard-setting role is beyond the scope of this Feature. For more, see Light & Skinner, *supra* note 113, at 1912; and Condon, *supra* note 115, at 4, which traces and explains "the growing trend of institutional investor activism related to climate change."

324. For discussion of the proposed rule, see *supra* notes 140-143 and accompanying text.

325. Avery Ellfeldt, *'Greenwashing Is Occurring,' SEC Official Tells House Panel*, E&E NEWS (July 20, 2022, 7:10 AM EDT), https://subscriber.politicopro.com/article/eenews/2022/07/20/greenwashing-is-occurring-sec-official-tells-house-panel-00046649 [https://perma.cc/AYQ9-YCS3].

326. *See, e.g.*, Myles Allen, Kaya Axelsson, Ben Caldecott, Thomas Hale, Cameron Hepburn, Conor Hickey, Eli Mitchell-Larson, Yadvinder Malhi, Friederike Otto, Nathalie Seddon & Steve Smith, *The Oxford Principles for Net Zero Aligned Carbon Offsetting*, UNIV. OF OXFORD 1 (Sept. 2020), https://ocm.iccrom.org/documents/oxford-principles-net-zero-aligned-carbon-offsetting [https://perma.cc/RLQ7-RU26]; Lin, *supra* note 20, at 758-59; McLaren et al., *supra* note 28, at 1.

327. *See, e.g.*, Sam Fankhauser et al., *The Meaning of Net Zero and How to Get It Right*, 12 NATURE CLIMATE CHANGE 15, 17 (2022); Rahul Tongia, *Net Zero Carbon Pledges Have Good Intentions*.

parency of bifurcated pledges might discipline entities' net-zero strategies, creating a greater focus on rapid emissions reductions and less emphasis on offsets and removals.[328]

These strategies can function in tandem, as standard-setting organizations can (and in some cases do) require split reduction/removal pledges.[329] If well-implemented and adopted at scale, these reforms might make real inroads into policing abuses of the net-zero format. That said, some critics reasonably doubt the ability of standard-setting organizations to accomplish this task, which would "entail a radical transformation of the offsetting market."[330] The central concern is that greenwashing and self-serving optimism may be features, not bugs, of net zero. For example, Wim Carton and coauthors suggest that "the use of sinks to substitute for more near-term mitigation actions is not incidental to the removal discussion, but a key reason for why carbon removal was put on the political agenda in the first place."[331] If so, it will be difficult for voluntary certification schemes — or even investor pressure — to penetrate large, hard-to-decarbonize sectors such as fossil-fuel production.[332]

But They Are Not Enough, BROOKINGS INST. (Oct. 25, 2021), https://www.brookings.edu/blog/planetpolicy/2021/10/25/net-zero-carbon-pledges-have-good-intentions-but-they-are-not-enough [https://perma.cc/QN6M-CGLQ] (suggesting a focus on the "area under the curve" of net-zero trajectories).

328. *See* Day et al., *supra* note 61, at 4 ("Given the ambiguity of net-zero claims, separate targets can provide actors pursuing ambitious emission reduction targets with the opportunity to stand out and better demonstrate the depth of their ambition."); Stephen Treloar & Lars Erik Taraldsen, *Mark Carney Says Carbon Offsets Must Be Limited to Residual Emissions*, FIN. POST (Nov. 23, 2021), https://financialpost.com/commodities/energy/oil-gas/mark-carney-says-carbon-offsets-must-be-limited-to-residual-emissions [https://perma.cc/4JZV-2YXG] (describing Global Financial Alliance for Net Zero cochair Mark Carney's view that the "use of carbon offsets should be a last resort to cover only a small fraction of emissions").

329. *See, e.g.*, *Interpretation Guide: Race to Zero Expert Peer Review Group*, *supra* note 139, at 6 (explaining that an entity would not meet the "Race to Zero leadership practice" in cases "[w]here sinks or credits are relied on in lieu of decarbonization").

330. Day et al., *supra* note 61, at 49; *see also* Lee & Mayer, *supra* note 60, at 2 (suggesting that achieving a high-quality offset market will be "very difficult"); *cf.* Bruner, *supra* note 312, at 1228 (expressing skepticism about the efficacy of disclosure regimes in driving change).

331. Carton et al., *supra* note 24, at 9.

332. *See Net Zero by 2050: A Roadmap for the Global Energy System*, *supra* note 6, at 21 (finding "no need for investment in new fossil fuel supply in our net zero pathway"); Simon Dietz, Dan Gardiner, Valentin Jahn & Jolien Noels, *How Ambitious Are Oil and Gas Companies' Climate Goals?*, 374 SCI. 405, 405 (describing the incompatibility of oil and gas net-zero pledges with planetary reality); Marsh & Shankleman, *supra* note 114 (noting controversy over Brookfield Asset Management describing itself as net zero while continuing to invest in fossil fuels); *cf.* Brett McDonnell, Hari M. Osofsky, Jacqueline Peel & Anita Foerster, *Green Boardrooms?*, 53 CONN. L. REV. 335, 339 (2021) ("[C]orporate and financial law initiatives have not yet had a significant impact on underlying corporate behavior in ways that substantively affect the allocation of resources and capital to address climate change.").

Beyond these well-articulated concerns, however, lies the core of this Feature's argument. Although standard-setting organizations, litigation, and target separation might alleviate many of the *accounting* risks discussed in Part II, they are unlikely to address the larger risks that form the focus of this Feature. Standardizing disclosures to make it easier to sue firms not in compliance with their professed net-zero commitments may help tackle greenwashing. Requiring robust internal reductions as a component of standard setting is likely to help avoid greenwashing and self-serving optimism by limiting the extent to which compliant companies can lean on unproven technologies or overemploy offsets. Similarly, carefully vetting claimed offsets' validity will reduce — though never eliminate — fungibility-related concerns about whether purchased removals are real and permanent. But these checks provide no coordinating function regarding the *cumulative* impacts of offsets purchased by net-zero pledgers.[333] In other words, these reforms still treat approved offsets as neutral, fungible tokens — with no effort to understand or control their collective impacts. Nor do these programs induce companies to buy anything other than the cheapest offset that complies with the standards they have pledged to follow.[334] These reforms thus fall short of the efforts needed to advance carbon-removal technologies while controlling for their negative social and ecological effects.[335]

Thus, we arrive at the crux of the private-sector challenge that this Feature's analysis exposes: how might corporate action on climate mitigation be achieved under real-world political constraints without acquiescing to the risks that a marketized net-zero project presents? I contend that the answer is for global leaders in corporate standard setting to stop celebrating the private-netting side of net zero, which is poised to do much harm and questionable good. Instead, an understanding of the larger risks of atomized climate policy lends substantial credence and exigency to proposals to shift private climate action to a "reduce

333. Cumulative-impacts analysis is a mainstay of U.S. environmental law, required of all major federal actions that significantly affect the environment by the National Environmental Policy Act. *See* 32 C.F.R. § 651.16 (2021). Environmental justice scholars have also highlighted how cumulative-impacts analysis brings to light a community's total pollution burden and vulnerability. *See, e.g.*, Charles Lee, *Another Game Changer in the Making? Lessons from States Advancing Environmental Justice Through Mapping and Cumulative Impact Strategies*, 51 ENV'T L. REP. 10676, 10677 (2021); Morello-Frosch et al., *supra* note 198, at 879.

334. *Cf.* Asiyanbi & Lund, *supra* note 219, at 391 (noting the tension between cost-effective offset programs and ones that deliver on multiple goals).

335. *See* Holly Jean Buck, *How to Decolonize the Atmosphere*, PROGRESSIVE INT'L (June 22, 2020), https://progressive.international/blueprint/46253391-5b3d-4e68-bd3f-d53dc5418ofd-holly-jean-buck-how-to-decolonize-the-atmosphere [https://perma.cc/X9WZ-DZZJ] (arguing for the need for more coordinated investment into developing carbon-removal technologies); Healey et al., *supra* note 168, at 3 ("[I]t is asking []too much of voluntary codes such as these to create a consistent, fair, and widely observed set of standards to be applied to processes and outcomes.").

and support" strategy, or fund-based model.[336] Under such a model, private corporations would *not* promise to "net" their emissions, but instead would commit to (1) establish and obtain an emissions-reduction goal; (2) declare any residual emissions; and (3) contribute to a global fund at a level commensurate with nonabateable emissions.

The benefit of this proposal is that it parses largely laudable corporate behavior from socially risky behavior. There is limited risk to companies aiming to reduce their internal emissions, provided they use a reasonable timescale and reasonable technological assumptions. Indeed, companies likely have significant expertise to contribute to internal reduction efforts that might allow them to pursue efficient, tailored reduction strategies.[337] To be sure, there may still be certain collateral consequences to these choices—for example, a company might choose to reduce its scope 2 emissions by supporting either nuclear or solar power, with significantly different attendant social and ecological risks.[338] But these consequences can at least be partially managed through related federal or state policies, such as incentives for particular clean-energy sources.[339] And the benefits of encouraging private emissions reductions are clear and straightforward: any reductions that companies accomplish help bring down country-level emissions, ultimately helping countries achieve and ratchet up their NDCs toward collective achievement of the global emissions-netting target.

Conversely, as this Feature has demonstrated, there are significant risks to a global corporate dash for carbon-removal offsets—risks that are not mitigated by merely having companies separate their reduction and removal goals or avoid purchasing fraudulent offsets. Instead, these risks counsel for more coordinated efforts to achieve the scale of carbon removal necessary to neutralize the atmos-

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336. My proposal draws substantially from Day et al., *supra* note 61, at 48, which describes a "contribution claim" model in which companies and subnational actors contribute to progress elsewhere, without claiming to themselves net emissions. McNish, *supra* note 33, at 391, 433-34; Dugast, *supra* note 137. Michael Wara also proposed replacing an earlier carbon-offsetting model with a global fund, albeit one that "invest[ed] in projects with the lowest marginal abatement cost until its resources were exhausted"—a cost-only strategy that runs counter to my aims. Wara, *supra* note 172, at 1801.

337. *See* Amanda C. Leiter, *Fracking, Federalism, and Private Governance*, 39 HARV. ENV'T L. REV. 107, 141 (2015) ("[P]rivate entities may have better access to high quality information about the workings of the industry.").

338. Scope 2 emissions are those associated with energy consumption. *See supra* note 60 and accompanying text.

339. For example, thirty states have "renewable portfolio standards" that specify that an increasing percentage of their energy each year must come from renewable energy sources. *See Renewable Portfolio Standards & Clean Energy Standards Summary Map*, DSIRE (Sept. 2020), https://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2020/09/RPS-CES-Sept2020.pdf [https://perma.cc/PX6E-S67M].

phere while not lapsing into an approach that treats all tons of carbon as fungible.[340] Corporations that cannot fully eliminate emissions might still contribute valuable capital to this goal but should not direct how it is accomplished. A "support" approach facilitates collaborative rather than atomized efforts to achieve a globally appropriate carbon-removal strategy.

The key challenge here would be convincing corporations to relinquish control over offsetting and instead direct their resources to a global fund. I suggested above that they contribute at a level "commensurate" with their remaining emissions, but what counts as "commensurate" is likely to create considerable debate. However, such a figure need not be predetermined. Instead, corporations could choose the level at which they wish to contribute to "offset" their unabated emissions, be it $3, or $30, or $300 per ton. This information would be easily accessible and understandable for naming-and-shaming or praising purposes.

The fund that these contributions would support could then use this capital to coordinate socially, politically, and ecologically sound carbon-removal strategies across the planet.[341] Such investments might include putting money into promising private initiatives to remove carbon—just not in the uncoordinated, atomized way that the current net-zero offsets market does.[342] The fund could also use a portion of its capital to invest in critical research, development, and commercialization activities necessary to create the next generation of carbon-removal technologies. Ideally, this fund might be under some sort of public, democratic oversight—perhaps functioning as an arm or extension of existing global funding mechanisms. But a second-best solution, in which a fund—or even several funds—remained under private control but coordinated efforts to fund global carbon removal, would be an improvement over uncoordinated company-by-company netting efforts.[343]

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340. *Cf.* Jamieson & Di Paola, *supra* note 205, at 277 ("Governance in the Anthropocene is cooperation-hungry at every level. Never has there been less of a role for 'rugged individualists,' whether as individual people or countries.").

341. *See* Jamie Rickman, Sumit Kothari, Francesca Larosa & Nadia Ameli, The Unequal Distribution of International Climate Finance Flows and Its Underlying Drivers (Feb. 9, 2022) (unpublished manuscript), https://assets.researchsquare.com/files/rs-1188981/v1_covered.pdf [https://perma.cc/BR8X-CLZR] ("Only a small amount of funds are directed by centralised UN institutions such as the Green Climate Fund, whereby developing countries' representation ensures that funding is aligned with countries' priorities and is distributed more equitably. In contrast, developing countries have limited agency over bilateral, multilateral and private finance flows." (footnotes omitted)).

342. *See, e.g.*, Carton et al., *supra* note 24, at 9 (observing that projects such as halting deforestation require "long-term thinking" that "belies the simplified understandings of social change embedded in" payments-based schemes (quoting Esteve Corbera & Heike Schroeder, *REDD+ Crossroads Post Paris: Politics, Lessons and Interplays*, 8 FORESTS 1, 2 (2017))).

343. *Cf.* Light & Skinner, *supra* note 113, at 1916 (suggesting that banks have a special need for public trust that makes them better stewards than other corporations).

Although not without its challenges, this proposal fares far better than the current net-zero model in addressing the neutrality mirage and the collective-achievement challenge. The reduce-and-support model embeds recognition that not all tons of carbon are equal and channels private investment toward those deemed most verifiable and sustainable by an entity with global public legitimacy—rather than funneling money into the cheapest offset projects available.[344] Because companies' support to such a fund would not correspond to a specific "netting" number for purposes of meeting an internal net-zero pledge, there would be no need for complex accounting rules detailing whether the corporation was allowed to "count" the reduction. Correspondingly, this strategy would eliminate concerns over countries potentially manipulating their baselines or NDCs to attract private mitigation funding.[345] Instead, the fund could target countries based on both climate need and climate effort. This last point is particularly important, given findings that climate finance is currently maldistributed from an equity perspective.[346]

Would corporations accept and participate in this "public option" for netting global emissions?[347] Probably not at the same rate that they have net zero, but only because there is less room for obfuscation in it. Corporations with robust emissions-reduction commitments and a desire to affect meaningful progress on climate change would stand to gain from participation; corporations milking net zero for all its greenwashing potential or its bargain-basement price tag would hesitate. In this way, a pledge-and-support model could help separate high-quality pledges from dubious ones, which would be a net gain for the planet even if it resulted in fewer companies rushing to join.

There are many details to be worked out about a pledge-and-support model—most glaringly, details about how the fund's governance might function

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344. *See* Seddon et al., *supra* note 220, at 8 (finding that collaborative public-private "consortia" have been the most successful drivers of "large scale, long-term investments in ecosystems"); Healey et al., *supra* note 168, at 4 (insisting that any net-zero strategy must "ensure that those countries whose natural and social resources are targeted by others for large-scale CDR possess the capacities required to make them equal partners in their scientific assessment and governance of all options"); *cf. About GCF*, GREEN CLIMATE FUND, https://www.greenclimate.fund/about [https://perma.cc/BR5Q-9CMN] (describing a major United Nations climate fund and its embrace of a "country-driven approach").

345. *See* Day et al., *supra* note 61, at 48 ("[I]f the financial support from voluntary action results in emission reductions that are owned by the host country, this action will not conflict with the host country's GHG emission reduction target, but rather provide support for reaching and ratcheting up those targets."). On these concerns, *see supra* notes 306-309 and accompanying text.

346. *See* Rickman et al., *supra* note 341, tbl.1 (finding that around 80% of international private clean-energy finance goes to upper-middle-income and lower-middle-income countries, with only 20% flowing to low-income countries).

347. McNish, *supra* note 33, at 433.

and how it might collaborate with country-level partners in funding carbon-removal strategies. Such a fund might, for example, be structured as a component of the United Nations's existing Green Climate Fund, which has not yet drawn in private-sector financing.[348] Or, as others have suggested, it might be modeled off of the Montreal Protocol's Global Environment Facility.[349] Ironing out these details will be important to advancing the model politically but will have to involve discussion among key relevant players. Ultimately, if adequate buy-in can be achieved, the model holds considerable potential to both improve the global collaborative effort at mitigating climate change *and* enhance consideration and support for communities who suffer the collateral damage from these efforts. The model would not, however, serve those private interests that are using net zero as a cover for delay or inaction. It thus remains uncertain whether it would flourish in the same way that net zero has. But even if this particular model does not stick, the challenges this Feature highlights counsel for injecting more collaboration, public guidance, and holistic thinking into the netting of carbon emissions wherever possible.[350]

B. The Public Net-Zero Project

Governments clearly and appropriately have a lead role to play in the net-zero project. Under the Paris Agreement's structure, the success of international climate change mitigation through global-emissions netting depends upon their actions and choices.[351] So too does the political legitimacy of this endeavor, given that governments (at various levels) are the democratic arbiters of the many contested issues raised by net zero.[352]

Like many corporate pledges, country-level net-zero pledges often leave much to be desired. Recent analysis by the Climate Action Tracker finds that "with current actions global emissions will be at roughly today's level in 2030,"

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348. *See* Megan Bowman & Stephen Minas, *Resilience Through Interlinkage: The Green Climate Fund and Climate Finance Governance*, 19 CLIMATE POL'Y 342, 343, 347-48 (2019) (celebrating the Green Climate Fund's equitable governance structure).

349. *See* McNish, *supra* note 33, at 433-34; Wara, *supra* note 172, at 1765. *But see* Kristina Daugirdas, *Funding Global Governance*, 29 N.Y.U. ENV'T L.J. 639, 642-43 (2021) (observing that voluntary funds can come with problematic attached conditions and power dynamics).

350. *See, e.g.*, *Operationalising Article 6 of the Paris Agreement*, *supra* note 318, at 24 (suggesting that countries could, "on a voluntary basis," engage more thoroughly with the carbon-offset marketplace "to guide and promote the selection of activities on its territory in accordance with it[s] sustainable development priorities").

351. *See supra* notes 303-304 and accompanying text.

352. Litigation, too, might be a tool to help enforce government net-zero pledges—although the plausibility and viability of this strategy differs among jurisdictions. *See* Lin, *supra* note 20, at 730-34.

which amounts to "twice as much as required for the 1.5°C limit."[353] Yet the news is not entirely grim. The same report found that

> global warming by 2100 could be limited to 2.0°C if all 131 net zero targets announced or under consideration (but not yet submitted to the UNFCCC) were to be achieved. While this is still far from 1.5°C, it stands in stark contrast to the expected global warming levels under submitted Paris Agreement targets and pledges (2.4°C) and currently implemented policies (2.9°C) . . . . [However], there is a risk that poorly backed up net zero claims could render these targets meaningless.[354]

This quote hammers home both the potential and the challenges of a country-driven net-zero program: so much depends upon successful governance and administration.[355] And yet, in the literature to date, there has been strikingly little attention paid to the bureaucracy of net zero. Within this mundane topic lies the heart of the program, which faces a fundamental tension.

Administering a net-zero target requires two distinct approaches and skill sets, and few institutional actors excel at both. Certain aspects of administering net-zero laws require considerable technical expertise to understand the technologies, strategies, and scientific assurances needed to reduce maximum amounts of GHGs and permanently remove them from the atmosphere. At the same time, as this Feature has demonstrated, net zero also implicates a range of social and ecological concerns, bound up inextricably with legacies of racism, colonialism,

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353. *Climate Action Tracker Global Update: Climate Target Updates Slow as Science Ramps up Need for Action*, CLIMATE ANALYTICS & NEWCLIMATE INST., at iii (Sept. 2021), https://climateactiontracker.org/documents/871/CAT_2021-09_Briefing_GlobalUpdate.pdf [https://perma.cc/58GZ-ZHKH].

354. *Id.* at 4.

355. *See* Alina Averchenkova, Sam Fankhauser & Jared J. Finnegan, *The Influence of Climate Change Advisory Bodies on Political Debates: Evidence from the UK Committee on Climate Change*, 21 CLIMATE POL'Y 1218, 1218 (2021) ("Climate change action needs better governance."); Thomas Hale, *Governing Net Zero: The Conveyor Belt*, BLAVATNIK SCH. GOV'T 1 (Nov. 2021), https://www.bsg.ox.ac.uk/sites/default/files/2021-11/2021-11%20Hale%20Net%20Zero%20Policy%20Memo.pdf [https://perma.cc/ZPH7-QLMP] ("The next phase of net zero therefore requires building political power to shift rules and institutions that drive change; it requires governance.").

and inequality that have accompanied the fossil-fuel era.[356] Net-zero administration thus also requires capacious thinking, sensitivity, openness to public input, and responsiveness.[357]

One possible answer to these tensions is for lawmakers to craft deeply prescriptive net-zero laws to provide guardrails for administering agencies. However, given that net zero is a thirty-year project unfolding in a rapidly evolving technological and political space, overly prescriptive delegations seem ill advised.[358] Yet delegations without guardrails leave program administrators in the challenging position of balancing these social and technological tradeoffs without guiding legal parameters, under what is likely to be considerable pressure from powerful groups and industries. Given these inherent tensions, more energy and creativity need to be applied to the design of net-zero delegations and administering institutions to equip them to address the range of sociotechnical challenges these pledges present.

Early adopters of net-zero legal regimes offer a window into the structural and practical decisions that net zero presents. Many countries and states are structuring their net-zero laws through a combination of broad targets and timetables coupled with the creation of an expert advisory panel to direct further decision-making.[359] In the United States, several states couple this panel with additional, goal-specific groups that are given a consultancy role — such as New

356. *See* Shelley Welton, *The Bounds of Energy Law*, 62 B.C. L. REV. 2339, 2373-82 (2021); Lennon, *supra* note 198, at 18, 24.

357. *See Accelerating Decarbonization of the U.S. Energy System*, *supra* note 12, at 10-11 ("Net zero policy must include regular opportunities for, and responses to, community input, as well as ensure fair access to benefits and fair sharing of costs, for the pragmatic reason that public support must be maintained for decades to complete a successful net-zero transition."); *cf.* K. SABEEL RAHMAN, DEMOCRACY AGAINST DOMINATION 98 (2017) (highlighting the importance of democratic institutional design in rebalancing political power).

358. *See* Jonas Meckling & Jonas Nahm, *The Power of Process: State Capacity and Climate Policy*, 31 GOVERNANCE 741, 742 (2018) (arguing that bureaucratic climate-policy design is preferable to legislative climate-policy design because "bureaucracies are more insulated from interest group pressure . . . [and] less vulnerable to regulatory capture when addressing the distributional questions of policy design").

359. *See supra* notes 92-106 and accompanying text (discussing Sweden's and New York's net-zero structures); *see also* Averchenkova et al., *supra* note 355, at 1219 (noting that advisory bodies now exist in over forty countries, comprised mostly of experts "with some degree of independence from electoral politics").

York's Climate Justice Working Group.[360] There is an emerging trend of dedicating some percentage of public spending—often 35-40%—to clean-energy investments in disadvantaged communities.[361]

This legal structure offers a compromise between the need for clear and binding short- and long-term targets and the flexibility to implement such targets in an evolving political and technological landscape. And it creates opportunities for ongoing democratic engagement with the advisory panel and additional working groups—though the devil will be in the details of how public consultation actually plays out. Both features could, if well-implemented, lend democratic legitimacy to public net-zero efforts in ways that counteract the neutrality mirage. That said, there remains a balance to be struck. Many are frustrated with instances in which laws designed to facilitate democratic engagement have at times blocked rapid progress on clean energy.[362] Net-zero institutions will have to balance the need for rapid action with that for meaningful consultation—and will need help in understanding the best ways to do so.

Dedicated funding streams for disadvantaged communities also have promise as part of an equitable path to net zero. It remains too soon, however, to know whether they will prove a successful and politically popular strategy, even among those they are intended to benefit. The idea has its skeptics—for example, the Climate Justice Alliance argues that "[t]oken revenues distributed to environmental justice communities from carbon trading or carbon pricing can never compensate for the destruction wrought by the extraction and pollution that is the source of that revenue."[363]

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360. *See supra* note 104 and accompanying text.

361. *See, e.g.*, N.Y. ENV'T CONSERV. LAW § 75-0107(1) (Consol. 2019); Justice40, WHITE HOUSE, https://www.whitehouse.gov/environmentaljustice/justice40 [https://perma.cc/PJ5X-6GHL] (describing the Biden Administration's commitment to ensuring that 40% of environmental and energy investments "flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution"). *See generally* Collen Callahan, Daniel Coffee, J.R. DeShazo & Silvia R. González, *Making Justice40 a Reality for Frontline Communities: Lessons from State Approaches to Climate and Clean Energy Investments*, UCLA LUSKIN CTR. FOR INNOVATION (Sept. 2021), https://innovation.luskin.ucla.edu/wp-content/uploads/2021/10/luskin-justice40-final-web-1.pdf [https://perma.cc/9G4M-9Q2E] (distilling lessons from many states' efforts to tackle climate justice through distributing benefits or limiting disparate impacts).

362. *See generally* Michael B. Gerrard, *Legal Pathways for a Massive Increase in Utility-Scale Renewable Generation Capacity*, 47 ENV'T L. REP. 10591 (2017) (suggesting reforms to the National Environmental Policy Act to accelerate clean-energy development); J.B. Ruhl & James Salzman, *What Happens When the Green New Deal Meets the Old Green Laws?*, 44 VT. L. REV. 693, 697 (2020) (tracing how existing environmental laws stand as an impediment to rapid infrastructure transformation).

363. Gilbertson, *supra* note 222, at 4.

A final important feature of a successful public net-zero commitment will be the ability of citizens to hold their state's feet to the fire and ensure targets are actually achieved.[364] On this point, the advisory-committee model flounders.[365] Others have suggested that a more powerful institutional structure, with the ability to control financing flows and not merely make recommendations, may be superior.[366] Still others have suggested shifting toward more direct public provisioning and ownership of key transformational infrastructure.[367] These are interesting suggestions for a more robust net-zero governance model, but whether they can gain adequate political traction remains to be seen. In the meantime, a scholarly focus on what works and falters within emerging net-zero governance praxis might strengthen the case for more creative and capacious reforms.

It also will be important for scholars to pay attention to the ways in which net-zero commitments may develop in more accretive and less directive terms. The United States's current climate trajectory is a case in point: its President supports net zero and its Congress has adopted legislation that puts the country on a potential pathway to achieve it, but the country still lacks a fulsome net-zero legal framework.[368] The implementation of the IRA—who wins and who loses, what works and what fails, who gains power and who is sidelined—may determine the next stage of climate progress or retrenchment in the country. Questions of administration will thus also be key in this type of less fully formed net-zero regime.

A full evaluation of these issues will have to be saved for later work. My aim here has been to make the case that we should think of net zero as a collective

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364. *See* Simon Matti, Christer Petersson & Charlotta Söderberg, *The Swedish Climate Policy Framework as a Means for Climate Policy Integration: An Assessment*, 21 CLIMATE POL'Y 1146, 1148 (2021) (observing the challenge that exists when "no sanctions are built into the system if the executive[s] fail to adhere to its provisions").

365. *See* Averchenkova et al., *supra* note 355, at 1219, 1225-27 (conducting "the first assessment of any climate advisory body" and finding that the United Kingdom's version is "an effective knowledge broker" but "has also had difficulty getting its broader advice accepted"); *see also supra* text accompanying notes 92-106 (explaining Sweden's and New York's early struggles).

366. *See, e.g.*, Saule T. Omarova, *The Climate Case for a National Investment Authority*, DATA FOR PROGRESS 2 (Aug. 2020), https://www.filesforprogress.org/memos/white-paper-nia.pdf [https://perma.cc/834A-GLYF] (proposing the creation of a federal National Investment Authority that would "use innovative financing tools to mobilize and boost the flow of public and private capital into socially beneficial 'green' infrastructures").

367. *See, e.g.*, Matt Huber & Fred Stafford, *In Defense of the Tennessee Valley Authority*, JACOBIN (Apr. 4, 2022), https://jacobinmag.com/2022/04/new-deal-tennessee-valley-authority-electricity-public-utilities-renewables-green-power [https://perma.cc/A69D-M4HE] (making the case for "big public power" in the clean-energy transition).

368. *See supra* notes 246-249 and accompanying text.

project. Strong, public institutions, which are responsive to collective needs and values, will be critical to the success and legitimacy of the project.[369] Countries, states, and cities pursuing net zero need tools and models that allow them to institutionalize the net-zero effort in ways that balance economic, social, and ecological considerations. Thus, I conclude here with a collective invitation to a new research agenda around net zero. Both researchers that celebrate the project in its current form and those that doubt it might usefully look beyond the substance of pledges to more mechanistic concerns: How are net-zero pledges institutionalized? To whom are design and implementation delegated, and under what terms and conditions? What mechanisms are included for public participation? For public ownership and control? What's working about these structures, and what needs to change? Getting the answers to these questions right may ultimately determine whether the net-zero project can bear the weight that the world has placed upon it.

CONCLUSION

The net-zero climate paradigm has arrived, but its success in reducing atmospheric concentrations of GHGs is far from certain. As critic Adrienne Buller has pithily phrased it: "Not all climate policy is good climate policy."[370] Whether the wholehearted embrace of net zero will turn out to have been wise depends on how the program matures. This Feature has highlighted underappreciated risks of the atomized, market-dependent model that has emerged in net zero's early days. And it has charted a path forward, centered on a recognition that netting global emissions is a collective aim, with collective consequences, that might save or sink us all.

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369. *See* Revesz, *supra* note 262, at 1499 (charting the many challenges of redistributional efforts in the United States and finding that "[o]ne significant reason for the failure of distributional efforts is institutional"); Adrienne Buller, *The Limits of Privatized Climate Policy*, DISSENT MAG. (Winter 2022), https://www.dissentmagazine.org/article/the-limits-of-privatized-climate-policy [https://perma.cc/T8YS-29BM] ("Decarbonization is not an abstract, disembodied process. At every stage, green infrastructure development will come up against the material constraints of resource throughput and labor and have significant effects on the environment. Resolving our overlapping crises on a global scale is fundamentally a question of inequalities of wealth, power, energy and resource consumption, and waste.").

370. Buller, *supra* note 369.