

An Abundance of Risk: Federal Under-Regulation of Carbon Capture

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Carbon capture use and storage (CCS) infrastructure has been touted as a necessary and inevitable technology for a decarbonized future. It is one of few “transition” technologies that the Biden and Trump administrations have both supported, and generous federal subsidies have created a boom in demand for carbon capture infrastructure. With hundreds of proposed projects and billions of dollars in promised investment, the emitters are “holding the gold.” But in the rush to monetize the capture of emissions from our rapacious production of carbon dioxide, federal regulatory regimes governing permitting, siting, safety, and long-term risk have not kept pace. The under-regulation of carbon capture pipeline and well infrastructure runs counter to the usual refrain from critics of the American regulatory regime who assert that there is too much “red tape.” If made available in other areas of green infrastructure development, this well-funded investment environment and expeditious regulatory landscape might be lauded as easing the path to “energy abundance.” However, CCS infrastructure presents a unique set of near- and long-term risks for local communities and broader climate goals. It therefore demands more regulation—and less abundance.

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This Article will assess the nascent deployment of CCS infrastructure in the United States and evaluate how federal regulatory gaps prioritize the rapid and large-scale deployment of projects without simultaneously prioritizing public safety. It will explore how instead of serving as a climate “solution” and a bridge technology for reaching net zero, CCS will extend reliance on fossil fuels. Using the framework of “slow violence,” this Article will assess how the federal regulatory regimes governing the carbon dioxide pipeline and Class VI Underground Injection Control (UIC) well infrastructure incentivize reckless development in the short term and bury long-term risk, facilitating the preservation of fossil fuel dominance at the expense of real transition. This Article will posit an “anti-abundance” approach to carbon capture and suggest several specific regulatory reforms that would require carbon capture projects to be assessed on an individualized basis with a thorough accounting of risk. The stakes are high for the planet, and especially high for those communities living in the shadow of these invisible infrastructure networks. Only by rendering CCS infrastructure visible, honestly grappling with its costs and benefits, and allowing directly impacted communities to weigh in can we begin to assess whether this infrastructure is really worth it.

Introduction	67
I. Carbon Capture’s Risks and Potential for Slow Violence.....	76
A. An Urgent Problem Met with a Tool of Delay.....	77
1. The IPCC Report Sounds the Alarm and Proposes Potential Pathways	78
2. The Complicated Role of CCS as a Potential Decarbonization Tool	81
B. Carbon Capture as a “Solution”.....	84
C. Slow Violence	92
II. The Federal Regulatory Regimes Governing CO ₂ Pipelines and Wells	95
A. Laws Governing Pipelines Transporting CO ₂	97
1. Environmental Regulations under the Clean Water Act..	99
2. Safety Permitting through PHMSA Regulations	107
B. Class VI UIC Wells and Liability Release Provisions.....	110
III. “Who is Dying for All This Progress?”: Community Impacts and Potential Solutions	116
A. The Potential for Harms from the Current Regulatory Regime	116
A. A Critical Approach to Abundance: Real Solutions to Counter the False	120
IV. Conclusion.....	126

INTRODUCTION

On February 22, 2020, an invisible force overcame the residents of Satartia, Mississippi, leaving them dizzy, gasping for air, and disoriented.¹ Some were even foaming at the mouth.² Motorists, enveloped by a green fog, had to stop their cars in the middle of the road, and some began to shake uncontrollably.³ As first responders rushed to help, their vehicles would not start.⁴ And when they arrived on the scene, they reported feeling like they had “[j]ust ran a mile as fast as [they] could. [Their] ears were popping. [Their] face[s] w[ere] burning like a sunburn.”⁵ They encountered drivers unconscious at the wheel, cowering in the fetal position with foam coming out of their noses and mouths, “walking in circles,” and with “blank look[s] on their face[s].”⁶ “It was almost like something you’d see in a zombie movie.”⁷

The culprit? Carbon dioxide (CO₂)—the ubiquitous gas found in everything from the air we breathe to the sodas we drink. But in higher concentrations, CO₂ is a potent asphyxiant and potentially lethal.⁸ When companies transport CO₂ by pipeline, they compress it to its supercritical state, which is neither a liquid nor a gas but has some properties of both.⁹ If released, it vaporizes into a gas that is heavier than oxygen, settles into low-lying areas, and replaces the oxygen in the air, harming plants, animals, and people if they are unfortunate enough to be in the plume.¹⁰ Worse still, it makes the operation of emergency response vehicles reliant on combustion engines impossible.¹¹

1. Dan Zegart, *The Gassing of Satartia*, HUFFINGTON POST (Aug. 26, 2021), https://www.huffpost.com/entry/gassing-satartia-mississippi-co2pipeline_n_60ddea9fe4b0ddef8b0ddc8f [https://perma.cc/9X4R-GDDK].

2. *Id.*

3. *Id.*

4. *Id.*

5. *Id.*

6. *Id.*

7. *Id.*

8. *Carbon Dioxide*, U.S. CTRS. FOR DISEASE CONTROL & PREVENTION, <https://www.cdc.gov/niosh/idlh/124389.html> (last updated Dec. 4, 2014) [https://perma.cc/HS8D-XW5Z].

9. PIPELINE SAFETY TR., CO₂ PIPELINES—DANGEROUS AND UNDER-REGULATED 3 (2022), <https://pstrust.org/wp-content/uploads/2022/03/CO2-Pipeline-Backgrounder-Final.pdf> [https://perma.cc/95G9-XNA3] (describing the differences between CO₂ in its gaseous, liquid, and supercritical states). Supercritical CO₂ is in a “state” above its supercritical temperature and pressure, which contributes to its unique properties. Nediljko Budisa & Dirk Schulze-Makuch, *Supercritical Carbon Dioxide and Its Potential as a Life-Sustaining Solvent in a Planetary Environment*, 4 LIFE 331, 332–33 (2014) (explaining the properties of supercritical CO₂).

10. See Kris Permentier et al., *Carbon Dioxide Poisoning: A Literature Review of an Often Forgotten Cause of Intoxication in the Emergency Department*, 10 INT’L J. EMERG. MED. 1, 2 (2017) (noting the risks of CO₂ exposure and that CO₂ is heavier than oxygen); Alison Cagle, *A Leaking CO2 Pipeline Can Cause Suffocation Within a Minute. The Government Needs to Regulate Them, Fast*, EARTHJUSTICE (Sept. 4, 2024), <https://earthjustice.org/article/a-leaking-co2-pipeline-can-cause-suffocation-within-a-minute-the-government-needs-to-regulate-them-fast> [https://perma.cc/J2C5-S9UC] (noting that CO₂ can sink into low-lying areas and cause vehicles to stop working).

11. Cagle, *supra* note 10.

In Satartia, the source of the CO₂ was a ruptured pipeline operated by Denbury Gulf Coast Pipelines, LLC (now a subsidiary of Exxon Mobil).¹² On that fateful day in 2020, weeks of heavy rains and a landslide had strained the pipeline's welds to their breaking point, leaving supercritical CO₂ to rush out and into the atmosphere.¹³ Satartia is a rural area, and the closest people were about a half mile from the rupture.¹⁴ Although forty-five people were hospitalized, thankfully—and miraculously—nobody was killed.¹⁵ Perhaps most striking about what happened in Satartia: The people in the community had no idea this sort of accident could materialize from the pipeline under their feet, and many had no idea the pipeline was even there at all.¹⁶

This story is familiar to those who have been watching the proposed deployment of carbon capture and storage or sequestration infrastructure.¹⁷ Although the Satartia incident was a moment of spectacular and horrifying danger, the worst effects of the accident were avoided only by the pipeline's remote location. But this explosive, highly visible event belies a broader threat: the rapidly expanding but still largely invisible networks of CO₂ pipelines snaking through communities and injection wells dug miles-deep under the Earth. Why this sudden expansion?

12. OFFICE OF PIPELINE SAFETY, U.S. DEPT. OF TRANSP., FAILURE INVESTIGATION REPORT - DENBURY GULF COAST PIPELINES, LLC – PIPELINE RUPTURE/NATURAL FORCE DAMAGE 2 (2022), <https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2022-05/Failure%20Investigation%20Report%20-%20Denbury%20Gulf%20Coast%20Pipeline.pdf> [<https://perma.cc/VW7G-VTF4>]; *ExxonMobil Completes Acquisition of Denbury*, EXXONMOBIL, https://corporate.exxonmobil.com/news/news-releases/2023/1102_exxonmobil-completes-acquisition-of-denbury (last updated Nov. 2, 2023) [<https://perma.cc/59Y9-QLMZ>].

13. *Id.*

14. *Id.* at 1 (describing the area of rupture as rural). However, some residents who lived as much as a half mile away were impacted. Zegart, *supra* note 1.

15. FAILURE INVESTIGATION REPORT, *supra* note 12, at 2.

16. Emma Schmit, *Dangerous: Here's What Iowans Need to Know About Carbon Pipeline Ruptures*, FOOD & WATER WATCH (Oct. 12, 2022), <https://www.foodandwaterwatch.org/2022/10/13/iowa-carbon-pipelines-dan-zegart-satartia> [<https://perma.cc/VVX4-CNPR>].

17. Carbon capture broadly refers to the process of capturing CO₂ from the point of emission or directly from the atmosphere, converting it into a supercritical or liquid state, and either transporting it via pipeline for storage in underground injection sites, called Class VI wells (carbon capture storage or CCS), or recycling it for use in manufacturing processes like enhanced oil recovery (EOR) (carbon capture use and storage or CCUS). There are several different technologies labeled carbon capture, but generally they fall into two categories: CO₂ removal via direct air capture (DAC), which pulls CO₂ directly from the atmosphere, and industrial point source carbon capture, which captures CO₂ produced during industrial processes before it is emitted into the atmosphere. This Article focuses primarily on industrial carbon capture and sequestration and does not offer an assessment of the viability of DAC. It will refer to this industrial process as “carbon capture” or “CCS” throughout, though this acronym is intended to encompass both CO₂ that is captured for permanent storage, and CO₂ that is captured for use further downstream in industrial processes, like EOR. See *Carbon Capture, Utilization, and Storage*, DEP'T OF ENERGY, <https://www.energy.gov/carbon-capture-utilization-storage> [<https://perma.cc/Y545-ZE59>] (last visited Mar. 10, 2026); *Enhanced Oil Recovery*, DEP'T OF ENERGY, <https://www.energy.gov/hgeo/enhanced-oil-recovery> [<https://perma.cc/YA8X-JT47>] (last visited June 13, 2026); *DOE Explains . . . Direct Air Capture*, DEP'T OF ENERGY, <https://www.energy.gov/science/doe-explainsdirect-air-capture> [<https://perma.cc/4QXC-TJRG>] (last visited June 13, 2026).

Policy makers at every level of government are starting to respond to the scientific community's urgent calls to decarbonize.¹⁸ But the question of how to facilitate a transition away from CO₂ in a country that has long relied on fossil fuels to provide most of its fuel, electricity, and chemical products is a tremendously challenging one. A suite of technologies has been proposed to pave the way toward a net-zero future, with most pathways to net zero including a mix of renewable energy technologies like solar, wind, and geothermal, as well as nuclear energy and carbon capture or removal technologies.¹⁹ This Article focuses on the final of these—carbon capture.

Carbon capture refers to the process whereby CO₂ is either captured at the point of emission or removed directly from the atmosphere.²⁰ The former, referred to in this Article as carbon capture and sequestration, carbon capture use and sequestration, or just carbon capture (CCS), is most commonly used to capture emissions at the point sources of industrial facilities.²¹ CCS is more technologically advanced and scalable than the latter, called carbon dioxide removal (CDR), which often utilizes direct air capture (DAC) to remove ambient CO₂ from the atmosphere but lags behind CCS in terms of feasibility at scale.²² Both technologies rely on CO₂ pipelines to transport the captured product in its supercritical form.²³ The pipelines send CO₂ either to be injected deep into underground wells and sequestered into perpetuity or to be used for other

18. See, e.g., *DOE Releases First Ever Blueprint to Decarbonize America's Buildings Sector*, DEP'T OF ENERGY (Apr. 2, 2024), <https://www.energy.gov/articles/doe-releases-first-ever-federal-blueprint-decarbonize-americas-buildings-sector> [https://perma.cc/XQ39-FWAB]; STATE OF LA., LOUISIANA CLIMATE ACTION PLAN 52–64 (2022), <https://gov.louisiana.gov/assets/docs/CCI-Task-force/CAP/ClimateActionPlanFinal.pdf> [https://perma.cc/KG8R-ZQ2D]; CITY OF AUSTIN, TX, AUSTIN CLIMATE EQUITY PLAN (2021), https://www.austintexas.gov/sites/default/files/files/Sustainability/Climate%20Equity%20Plan/Climate%20Equity%20Plan%20Full%20Document_FINAL.pdf [https://perma.cc/2Y2V-V4JY]; CITY OF BOSTON, MA, BOSTON'S 2030 CLIMATE ACTION PLAN DRAFT (2025), <https://drive.google.com/file/d/1cgs7ByFPVwCNfHzj9Uod5322wEaBNriy/view> [https://perma.cc/8TWA-NQ9X].

19. See, e.g., KEYWAN RIAHI ET AL., IPCC, MITIGATION PATHWAYS COMPATIBLE WITH LONG-TERM GOALS (2022), https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter03.pdf [https://perma.cc/Y2WX-Y38N].

20. More specifically, “Point-source carbon capture traps emissions at the site of production, preventing release into the atmosphere. Carbon dioxide removal (CDR), on the other hand, pulls out carbon dioxide that is already in the atmosphere.” *Carbon Management Projects: What is the State of the Carbon Management Market in the US?*, DEP'T OF ENERGY, <https://www.energy.gov/lpo/carbon-management-projects> [https://perma.cc/G6BT-J98X] (last visited Aug. 3, 2025); see also *Carbon Capture vs. Direct Air Capture*, LIBR. OF CONG., <https://www.congress.gov/crs-product/IF11501> [https://perma.cc/H3HW-9TMJ] (last visited Aug. 4, 2025).

21. *Carbon Management Projects*, *supra* note 20.

22. See *Direct Air Capture*, INT'L ENERGY AGENCY, <https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage/direct-air-capture> [https://perma.cc/XKL4-PMJ9] (last visited Aug. 4, 2025) (noting barriers to DAC deployment, including cost).

23. See PIPELINE SAFETY TR., *supra* note 9, at 3 (discussing what it means for CO₂ to be in its supercritical state).

industrial purposes such as enhanced oil recovery (EOR).²⁴ This Article uses “CCS” to refer to both of these processes.²⁵

But it is far from certain that CCS projects will work as promised. On the front end, many CCS projects have failed to capture as much carbon as projected.²⁶ On the back end, there are few existing carbon sequestration wells—of those, some are already leaking.²⁷ Further, the CCS projects proposed thus far mostly capture carbon from points of emission at existing or new industrial facilities—facilities that are largely fueled by, and support continued reliance on, carbon-intensive fossil energy like natural gas.²⁸ Those facilities also often have high emissions of other non-CO₂ greenhouse gases, like methane and nitrogen oxides, which have deleterious effects not just to the climate but especially to fenceline communities.²⁹ Indeed, in the short term, methane is a far more potent greenhouse gas than CO₂, so a “solution” that focuses only on CO₂ to the exclusion of other equally or more potent warming emissions perpetuates the dangers of the status quo.³⁰ By enabling these facilities to continue operating and, in some instances, to even expand, CCS may delay the needed energy

24. *What is a Class VI Well?*, EPA, <https://www.epa.gov/uic/class-vi-wells-used-geologic-sequestration-carbon-dioxide> (last updated Dec. 16, 2025) [<https://perma.cc/URG3-STD8>] (discussing storage wells used to “permanently” sequester CO₂); *Commercial Carbon Dioxide Uses: Carbon Dioxide Enhanced Oil Recovery*, NAT’L ENERGY TECH. LAB’Y, U.S. DEP’T OF ENERGY, <https://netl.doe.gov/research/coal/energy-systems/gasification/gasifiedia/eor> [<https://perma.cc/SH94-F87L>] (last visited Mar. 10, 2026) (discussing EOR).

25. *See supra* note 17.

26. Michael Buchsbaum & Edward Donnelly, *Fossil Fuel Companies Made Bold Promises to Capture Carbon. Here’s What Actually Happened*, DESMOG (Sept. 25, 2023), <https://www.desmog.com/2023/09/25/fossil-fuel-companies-made-bold-promises-to-capture-carbon-heres-what-actually-happened> [<https://perma.cc/V2HQ-CPKX>] (evaluating different carbon capture projects and noting that many significantly failed to meet capture promises).

27. *EPA Announces Proposed Order Requiring Archer Daniels Midland Co. to Take Actions to Ensure Safe Operations of Its Carbon Sequestration Well in Decatur, Illinois*, EPA (Sept. 19, 2024), <https://www.epa.gov/newsreleases/epa-announces-proposed-order-requiring-archer-daniels-midland-co-take-actions-ensure> [<https://perma.cc/5UBF-V5R3>]; *The Poster Child for Carbon Capture Plants Has Leaked... Twice.*, CURE (Oct. 8, 2024), <https://curemn.org/blog/the-poster-child-for-carbon-capture-plants-has-leaked-twice> [<https://perma.cc/PGS6-2EX9>].

28. *See, e.g., Tracking Carbon Capture, Utilization and Storage*, INT’L ENERGY AGENCY, <https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage> [<https://perma.cc/9WDC-VF6Z>] (last visited Mar. 10, 2026); Pam Radtke, *Capturing CO₂, Sold as Climate Solution, Rebranded as Oil Industry Boost*, FLOODLIGHT (Feb. 27, 2025), <https://floodlightnews.org/capturing-co2-sold-as-climate-solution-rebranded-as-oil-industry-boost/> [<https://perma.cc/3MEV-QVG9>]; *Carbon Capture: The Fossil Fuel Industry’s False Climate Solution*, EARTHJUSTICE (Sept. 19, 2023), <https://earthjustice.org/article/carbon-capture-the-fossil-fuel-industrys-false-climate-solution> [<https://perma.cc/8BAE-MZD9>].

29. Devin A. Lowell, *Uncaptured: The CCUS Boom, Environmental Justice, and Cancer Alley*, 74 WASH. U. J.L. & POL’Y 88, 101, 113 (2024) (discussing the non-CO₂ emissions uncaptured by CCS).

30. *See, e.g.,* DAVID SCHLISSEL & DENNIS WAMSTED, INST. FOR ENERGY ECON. AND FIN. ANALYSIS, CARBON CAPTURE’S METHANE PROBLEM: LIFE CYCLE ANALYSIS OF PROPOSED NEW MEXICO CARBON CAPTURE AND SEQUESTRATION PROJECT SHOWS 90% HIGHER CAPTURE IS A MYTH (2022), https://ieefa.org/sites/default/files/2022-08/Carbon%20Captures%20Methane%20Problem_August%202022.pdf [<https://perma.cc/P3H6-T73Q>] (finding that CO₂ capture rates of proposed CCS at a San Juan power plant were undercut by accompanying methane emissions).

transition to lower-emissions technologies and continue to harm overburdened communities. Thus, the risk of CCS infrastructure is twofold: (1) Overinvestment in CCS could extend the life of fossil fuel infrastructure and slow true decarbonization efforts, imperiling already-strained climate goals, and (2) CCS infrastructure requires the buildout of extremely dangerous pipelines and wells that will be in close proximity to people and critical environmental resources. Although CCS infrastructure is proposed across the country, these projects will disproportionately impact communities already burdened because of their proximity to existing pipelines and industrial infrastructure that will deploy CCS to capture existing emissions.

And yet, CCS often plays a prominent role in the mix of transition “solutions” touted for decarbonization. In fact, it was one of the few decarbonization technologies subsidized by the Inflation Reduction Act (IRA) that saw *increased* support in the One Big Beautiful Bill Act (OBBBA), even though subsidies to renewables like wind and solar were cut significantly.³¹ This decision is no accident: Carbon capture will allow the continued operation of fossil fuel-driven industries around the country, providing them with a veneer of “green,” and it will further allow the expanded extraction of oil deposits through EOR, discussed later in this Article.³² CCS is therefore a favorite of oil and gas industry actors.³³

But if the United States relies on CCS as a core pillar of its energy transition, it will have to build a lot more pipelines and wells. Currently, there are only about five thousand miles of CO₂ pipelines in the country. We would need between thirty thousand and ninety-six thousand miles of pipelines to meet a 2050 net-zero emissions goal.³⁴ Already, carbon capture infrastructure has generated a frantic boom in project development and permitting applications. Project developers have targeted the Southeast and Midwest of the United States in particular, perhaps in part because of existing industrial infrastructure and

31. One Big Beautiful Bill Act of 2025, Pub. L. No. 119-21, §70524, 139 Stat. 281 (2025); see also Paul Blackburn, *Impacts of the Increase in 45Q Tax Credits for Enhanced Oil Recovery in the OBBA Bill*, PIPELINE FIGHTERS HUB (July 24, 2025), https://pipelinefighters.org/news/impacts-of-the-increase-in-45q-tax-credits-for-enhanced-oil-recovery-in-the-obba-bill/?utm_source=substack&utm_medium=email [https://perma.cc/9C6R-QRE9].

32. See *infra* Carbon Capture as a “Solution”
Indeed, most carbon capture to date has been used for EOR. CTR. FOR INT’L ENV’T L., CONFRONTING THE MYTH OF CARBON-FREE FOSSIL FUELS; WHY CARBON CAPTURE IS NOT A CLIMATE SOLUTION 8 (2021) [hereinafter CIEL Report], <https://www.ciel.org/wp-content/uploads/2021/07/Confronting-the-Myth-of-Carbon-Free-Fossil-Fuels.pdf> [https://perma.cc/SV5B-YMKJ].

33. Jonathan Foley, *Don’t Fall for Big Oil’s Carbon Capture Deceptions*, SCI. AM. (Dec. 4, 2023), <https://www.scientificamerican.com/article/dont-fall-for-big-oils-carbon-capture-deceptions> [https://perma.cc/J4CV-3KRF].

34. *Carbon Management Projects*, *supra* note 20.

point sources for CCS deployment.³⁵ The Gulf Coast region has an especially high volume of proposed projects.³⁶ If current proposals are to be believed, CO₂ pipelines just like the one in Satartia will soon be ubiquitous in residential areas across the country. But since the pipeline rupture in Satartia, little has been done to make this infrastructure safer for the communities bearing it. To the contrary, uniform regulations that grapple with the short- and long-term risks of carbon capture are scant.³⁷

This Article develops the idea that CCS projects are made financially possible by generous federal incentives on the front end but are not governed by sufficient, uniform federal regulation once permitting and construction begin. Although recent critiques of environmental permitting regimes suggest that permitting creates unnecessary red tape that can be a hindrance to “abundant” green energy,³⁸ permitting can also serve the critical function of forcing project applicants to calculate and articulate risk. And importantly, it provides impacted communities with notice and an opportunity to be heard. But the extant federal regulatory apparatuses governing CCS pipeline and well infrastructure are not concomitant with the infrastructure’s risks, near- and long-term, localized and global. Instead, the federal legal frameworks slow the urgency of a real transition away from greenhouse gas-intensive infrastructure by fast-tracking the decarbonization technology that most maintains the fossil fuel-driven status quo. Paired with generous federal subsidies, one observer wryly noted, “[T]he emitters are holding the gold.”³⁹ Centering CCS as a climate solution would thus extend current reliance on fossil fuel infrastructure that must be urgently and permanently abandoned. It could also create a secondary market for fossil fuel emissions, creating perverse incentives for emitters to generate additional CO₂. Even in scenarios where captured CO₂ is buried underground rather than resold at market, existing storage efforts portend the potential for disastrous confrontation with our buried emissions in coming decades.⁴⁰

35. Deepika Nagabhushan, *Interactive Map of CCUS Projects in Development in the U.S.*, CLEAN AIR TASK FORCE (July 27, 2020), <https://www.catf.us/2020/07/ccus-interactive-map> [<https://perma.cc/Q3CE-A2LU>].

36. ERIC LARSON ET AL., PRINCETON UNIV., NET-ZERO AMERICA: POTENTIAL PATHWAYS, INFRASTRUCTURE, AND IMPACTS 210 (2021), <https://www.dropbox.com/scl/fi/ol7ivcso5t2k3wux2r5bk/Princeton-NZA-FINAL-REPORT-29Oct2021.pdf?rlkey=zmh0gryurzlyfo0faac036v6&e=2&dl=0> [<https://perma.cc/VX8H-BEBS>].

37. See *infra* The Federal Regulatory Regimes Governing CO₂ Pipelines and Wells

38. Alexandra B. Klass & Matthew Appel, *The Law of Energy Abundance*, 104 N.C. L. REV. 63, 69–70, 94–95, 100 (2025).

39. The current subsidy is \$85 per cubic ton of captured carbon. Michael Levien, *Reactionary Decarbonization: On Carbon Capture and Techno-Utopianism*, SPECTRE J. (Jan. 21, 2025), <https://spectrejournal.com/reactionary-decarbonization> [<https://perma.cc/7UJW-MC4R>].

40. CTR. FOR BIOLOGICAL DIVERSITY, PETITION TO HALT THE APPROVAL OF CARBON DIOXIDE PIPELINES UNDER NATIONWIDE PERMIT 58 AS CONTRARY TO THE PUBLIC INTEREST 3 (2023) [hereinafter CBD Petition] (citing IPCC, *Summary for Policymakers*, in SPECIAL REPORT: GLOBAL

Although the extensive buildout of CCS infrastructure will intersect with many different laws and regulations at the federal, state, and local levels, this Article will focus on the lax federal regulatory landscape. To be sure, there have been important state and local laws passed to govern CCS infrastructure,⁴¹ and ongoing litigation highlights the possibilities for, and the potential limits of, non-federal legal constraints on this infrastructure.⁴² However, this Article will not focus on this patchwork of non-federal laws, but rather on the uniquely thin federal regulations governing CCS, especially given the robust federal incentives driving CCS buildout, and that CCS infrastructure often crosses state lines, carries out a function of great importance to the national energy transition, and intersects with federal lands. Indeed, it is the federal under-regulation of CCS pipelines and Class VI wells that has the power to rapidly create vast but invisible networks of high-risk infrastructure.

Part I of this Article will discuss calls for decarbonization and the possible suite of energy solutions that could be deployed to answer those calls. It will briefly acknowledge the barriers to deployment of these solutions, including regulatory hurdles, and introduce current debates around overcoming these practical barriers through an abundance approach. It will then discuss why CCS is not a real solution to the climate crisis, arguing that rather than meeting the urgent call for a true transition away from fossil fuels, carbon capture is actually being employed to slow the transition and extend the use of fossil fuel infrastructure, even incentivizing the creation of new infrastructure with high warming potential like “blue” hydrogen, which relies on natural gas as a feedstock. This Part will then introduce “slow violence,” as first defined by geographer Robert Nixon in his seminal text *Slow Violence and the Environmentalism of the Poor*,⁴³ and as later developed by geographer Thom Davies in his assessment of the interplay between slow and structural violence in Louisiana’s “Cancer Alley.”⁴⁴ These geographical interventions help render visible what is obscured by current legal regimes, and give lawyers, advocates,

WARMING OF 1.5° C (Masson-Delmotte et al. eds., 2018), https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM_version_report_LR.pdf [<https://perma.cc/WJU4-3AAL>], https://www.biologicaldiversity.org/programs/climate_law_institute/pdfs/23-11-06-NWP-58-Petition.pdf?_gl=1*1w3cigd*_gcl_au*NTk3MjcyMjkwLjE3MTYzMjQwMzg [<https://perma.cc/E7TN-97FN>].

41. See generally Keith B. Hall, *Local Government Regulation of CCS*, 24 WYO. L. REV. 2 (2024) (discussing local government ordinances that attempt to prohibit or regulate CCS).

42. A notable example is the fight around the proposed Summit CO₂ Pipeline. The pipeline was proposed to run over 2,500 miles spanning five states—Iowa, Nebraska, South Dakota, North Dakota, and Minnesota. One of those states, South Dakota, passed a law prohibiting the use of eminent domain for CO₂ pipelines, imposing a significant barrier to the pipeline’s expansion into that state. In Iowa, several counties passed ordinances to limit the pathway of the pipeline through restrictions on siting. But subsequent litigation in the Eighth Circuit held that state and federal law preempted those restrictions. See *Couser v. Shelby Cnty., Iowa*, 139 F.4th 664 (8th Cir. 2025).

43. ROBERT NIXON, *SLOW VIOLENCE AND THE ENVIRONMENTALISM OF THE POOR* (2011).

44. See, e.g., Thom Davies, *Toxic Space and Time: Slow Violence, Necropolitics, and Petrochemical Pollution*, 108 ANNALS OF AM. ASS’N OF GEOGRAPHERS 1537 (2018).

and communities fighting the impacts of CCS buildout a means for reconceptualizing the insidiousness of this infrastructure.

Next, Part II will define the scope of proposed CCS projects with a particular focus on the pipeline and Class VI well infrastructure they require. As previously stated, estimates suggest that thirty thousand to ninety-six thousand miles of pipeline will need to be built to meet net-zero goals by 2050.⁴⁵ Additionally, there are currently few operational Class VI wells intended for the permanent sequestration of CO₂ in the United States.⁴⁶ Many hundreds more would be required to meet the demands of currently proposed facilities looking for sites to bury their CO₂.⁴⁷

This Part will look at the federal regulatory frameworks governing the massive CCS infrastructure buildout to highlight how they expedite development without sufficient oversight or community input, and how they are opening the door to disastrous longer-term consequences for communities in the vicinity of this infrastructure. Specifically, this Part will review: (1) how the Army Corps of Engineers intends to use a general permit, Nationwide Permit (NWP) 58, to permit large sections of CO₂ pipeline without any individualized review of project risk, cumulative impacts, or public interest analysis, and without any project-specific public participation; (2) how the Pipeline and Hazardous Materials Safety Administration (PHMSA) is vastly under-protective of human health and safety, especially in rural areas that are not considered “high consequence;”⁴⁸ and (3) how the Environmental Protection Agency (EPA) has

45. Currently, there are only five thousand miles of CO₂ pipelines in the United States. See Niall Mac Dowell et al., *The Role of CO₂ Capture and Utilization in Mitigating Climate Change*, 7 NAT. CLIMATE CHANGE 243, 243–44 (2017); *Carbon Management Projects*, *supra* note 20. This is, in part, because existing industrial facilities were not sited with carbon capture storage in mind and many are not close to areas suitable for Class VI wells for permanent CO₂ sequestration. See CIEL Report, *supra* note 32, at 6–7.

46. As of June 2024, there were four federally permitted and eleven state-permitted Class VI wells in the United States. See ANGELA C. JONES, CONG. RSCH. SERV., R48033, CLASS VI CARBON SEQUESTRATION WELLS: PERMITTING AND STATE PROGRAM PRIMACY (2024). However, this figure is subject to change as there are many pending applications for Class VI wells, both at the federal level and in states with primacy over Class VI permitting. See, e.g., *Underground Injection Control (UIC) Class VI Permit Tracker*, EPA, <https://awsedap.epa.gov/public/single/?appid=8c074297-7f9e-4217-82f0-fb05f54f28e7&sheet=51312158-636f-48d5-8fe6-a21703ca33a9&theme=horizon&bookmark=6218ffed-bb6e-42e4-a4f1-52d87e036a1b&opt=ctxmenu> (last updated Mar. 13, 2026) [<https://perma.cc/Y2SW-QDYC>].

47. See, e.g., Yuting Zhang et al., *The Feasibility of Reaching Gigatonne Scale CO₂ Storage by Mid-Century*, 15 NAT. COMM’NS 6913 (2024) (describing how many gigatons of CO₂ storage are needed by mid-century); Jonika Rath & Spencer Nelson, *Need for Speed: Removing Roadblocks for CO₂ Pipelines and Wells*, CLEARPATH (Apr. 13, 2023), <https://clearpath.org/our-take/need-for-speed-removing-roadblocks-for-co2-pipelines-and-wells> [<https://perma.cc/JXM7-9ZRF>] (suggesting that a minimum of 650 Class VI wells will be needed by 2050 to accomplish net-zero modeling that requires annual storage of over one gigaton of CO₂).

48. See *Fact Sheet: High Consequence Areas*, PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMIN., <https://primis.phmsa.dot.gov/comm/factsheets/fshca.htm> (last updated Dec. 1, 2011) [<https://perma.cc/Q7CF-3UXE>]; see also *PHMSA Advances CO₂ Pipeline Safety Regulations*, SABIN

allowed long-term liability release provisions in state regulatory regimes under the Safe Drinking Water Act rules governing Class VI injection wells. These liability release statutes incentivize well owners and operators to build to short-term risk timelines rather than prepare for the indefinite storage required to protect drinking water and serve climate goals.

Part III will then discuss community impacts and posit a range of potential reforms. It will evaluate how the combined effect of these policies works to remove individualized risk determinations and the opportunity for public notice and comment, enabling streamlined consideration on the front end—far faster than other “decarbonization” projects might receive. While on the back end, after projects are complete, local communities will have little legal recourse if things go wrong. This dynamic tees up the quintessential conditions for slow violence, both locally and globally.⁴⁹

Finally, this Part will propose some potential recommendations for reform by advancing an “anti-abundance” agenda for CCS. Specifically, it will posit that CCS should only be employed as a technology of last resort and for projects that do not extend the lifespan of fossil fuel infrastructure—for instance, for DAC projects, if in the future they are affordable, effective, and scalable—and where it is not placing already-overburdened communities at greater risk. Even then, CCS should be subject to rigorous regulatory requirements given the attendant risks of CO₂ pipelines and wells, including fulsome articulation of project feasibility, need, and risk, as well as extensive community notice and input. To achieve this, the Article will suggest several concrete, minimum reforms, including: (1) removing CO₂ pipelines from the Army Corps’ NWP 58 and requiring these permits to undergo individual permit processes under Section 404 of the Clean Water Act; (2) revising the risk assessment analysis in PHMSA regulations, including incorporating community impact concerns; (3) banning liability release provisions for Class VI wells; and (4) requiring extensive cumulative impacts review for both pipelines and wells. If an abundance framework is applied to decarbonization without a clear-eyed assessment of where power currently lies—namely with the fossil fuel industry and not with impacted communities—and therefore why certain projects are being advanced to the exclusion of others, it will proliferate only an abundance of risk and slow

CTR., <https://climate.law.columbia.edu/content/phmsa-advances-co2-pipeline-safety-regulations> [https://perma.cc/ND27-YWJD] (last visited Mar. 10, 2026).

49. At the local level, a review by the New School’s Tishman Environment and Design Center suggests currently proposed CCS infrastructure will be overwhelmingly co-located with environmental justice communities. See YUKYAN LAM ET AL., TISHMAN ENV’T AND DESIGN CTR, ANALYSIS OF PROPOSED CARBON CAPTURE PROJECTS IN THE US POWER SECTOR AND CO-LOCATION WITH ENVIRONMENTAL JUSTICE COMMUNITIES (2023), https://static1.squarespace.com/static/5d14dab43967cc000179f3d2/t/64f9df23792cce775bf32100/1694097188142/Map_Proposed+CCS+Projects+-+Two+Pager_CURRENT.pdf [https://perma.cc/H8SK-UBV3].

violence. The current regime does just this, squandering precious time that must be directed at a true, just transition.⁵⁰

I. CARBON CAPTURE’S RISKS AND POTENTIAL FOR SLOW VIOLENCE

Carbon capture is booming. In the past few years it has gone from a relatively underdeveloped technology—the first Class VI well⁵¹ for CO₂ sequestration was constructed in 2009⁵² and the first power plant with CCS was completed in 2017⁵³—to a major force in the energy sector, with over 270 publicly announced carbon capture projects in the United States as of June 2025.⁵⁴ Indeed, on Earth Day 2025, President Trump announced support for carbon capture as a “cutting-edge technolog[y]” that will “ensur[e] America leads in both energy production and environmental innovation—producing the cleanest energy in the world.”⁵⁵ Why has carbon capture been sold, and increasingly bought, as a necessary decarbonization technology for the energy transition? Is it truly a solution to the climate crisis? And what would be the impacts of widescale uptake of this technology, globally and locally?

This Part will explore what climate modeling actually says about pathways to achieving net zero in the United States and the mix of technologies that might be used to get there. It will acknowledge the barriers to rapid deployment of these technologies but suggest that there is growing political will to remove some of these barriers. This Part will then discuss whether CCS really works as it

50. See, e.g., Angela P. Harris & Caroline Parker, *Building the New: Just Transitions & LPE*, L. & POL. ECON. PROJECT (Dec. 13, 2021), <https://lpeproject.org/blog/building-the-new-just-transitions-lpe> [<https://perma.cc/YQ83-7BCQ>] (discussing potential environmental and political aspects of a “just transition”).

51. The label “Class VI” refers to EPA’s designation for UIC wells used for the sequestration and storage of CO₂. See *What Is a Class VI Well?*, *supra* note 24. Class I-V wells store different materials. See *Underground Injection Control Well Classes*, EPA, <https://www.epa.gov/uic/underground-injection-control-well-classes> (last updated Feb. 18, 2026) [<https://perma.cc/G5W6-CXZS>].

52. *First U.S. Large-Scale CO₂ Storage Project Advances*, DEP’T OF ENERGY, (Apr. 6, 2009), <https://www.energy.gov/fecm/articles/first-us-large-scale-co2-storage-project-advances> [<https://perma.cc/YMQ2-K8HR>].

53. *The First Carbon-Capture Coal Plant in the U.S. is Now Fully Operational*, YALE ENV’T 360 (Jan. 11, 2017), https://e360.yale.edu/digest/first_carbon_capture_coal_plant_in_us_now_fully_operational_petra_nova [<https://perma.cc/EZ6Z-XDLJ>].

54. John Thompson & Sam Bowers, *Carbon Capture and Storage: Opportunities for Federal Action Support Domestic Energy Production and Industrial Innovation*, CLEAN AIR TASK FORCE (June 12, 2025), <https://www.catf.us/2025/06/carbon-capture-storage-opportunities-federal-action-support-domestic-energy-production-industrial-innovation> [<https://perma.cc/Z44J-FX2P>]; see also *US Carbon Capture Activity and Project Map*, CLEAN AIR TASK FORCE, <https://www.catf.us/ccsmapus> [<https://perma.cc/S2CE-Y64A>] (last visited Apr. 1, 2026).

55. *On Earth Day, We Finally Have a President Who Follows Science*, THE WHITE HOUSE (Apr. 22, 2025), <https://www.whitehouse.gov/articles/2025/04/on-earth-day-we-finally-have-a-president-who-follows-science> [<https://perma.cc/AH2X-SDAY>].

promises to and the material risks associated with it, globally and locally. At the global level, overreliance on CCS as a transition technology could subvert climate goals. Rather than expediting the attainment of climate transition goals, many of the currently proposed projects employing CCS will actually ossify fossil fuel reliance and potentially exacerbate current warming trends. Indeed, almost all paths toward decarbonization that rely heavily on CCS infrastructure involve embracing some sort of “overshoot” mentality: shooting past 2°C only to, hopefully, recalibrate back down at some point in the future.⁵⁶ And at the local level, CCS introduces extreme near- and long-term risk to the communities that must live next to CO₂ pipelines and wells.

This Part will then posit a reason why, despite these risks, carbon capture has emerged as one of the central solutions to decarbonization, one for which once-substantial barriers to deployment have been removed. It will discuss how fossil fuel industry uptake—aided by generous federal subsidies—has prompted a boom in proposed CCS projects.

Finally, this Part will conclude by introducing the concept of slow violence to explore the types of environmental harms that might be engendered by CCS: harms that happen in slow, unspectacular, and often-unseen ways but might be rendered visible by additional regulation.

A. *An Urgent Problem Met with a Tool of Delay*

Anthropogenic warming, caused by human beings’ unrelenting consumption of fossil fuels, is an urgent problem.⁵⁷ And with increased warming comes the potential for the world to reach several crucial “tipping points,” after which we may be in a place of no return, where human intervention to stabilize global climate systems is no longer possible and instead the climate will respond in unprecedented, unpredictable, and dangerous ways.⁵⁸ The problem is also how to respond. If there is widespread consensus (or quasi-consensus) that we need to act on global warming, the question is how. What combination of policy responses and changes to our energy system will get us to net zero, and quickly?

56. WIM CARTON & ANDREAS MALM, *OVERSHOOT: HOW THE WORLD SURRENDERED TO CLIMATE BREAKDOWN* (2024). This is why some advocates characterize CCS as “false solutions,” because they may ultimately not solve, and indeed could exacerbate, current warming trends. See generally CTR. FOR BIOLOGICAL DIVERSITY, *CARBON CAPTURE AND STORAGE IS A FALSE SOLUTION FOR THE CLIMATE AND OUR COMMUNITIES* (2022) <https://biologicaldiversity.org/campaigns/carbon-capture-and-storage/pdfs/CCS-explainer.pdf> [<https://perma.cc/E95C-FXHS>] (discussing CCS as a delay tactic by fossil fuel interests); EARTHJUSTICE, *supra* note 28.

57. See generally, IPCC, *CLIMATE CHANGE 2022, IMPACTS, ADAPTATION AND VULNERABILITY, SUMMARY FOR POLICYMAKERS* (2022), https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf [<https://perma.cc/93AA-U5BU>] (describing anthropogenic warming’s contributions to human mortality, ecosystems, wildfire, and other negative impacts).

58. Will Steffen et al., *Trajectories of the Earth System in the Anthropocene*, 115 PNAS 8252, 8252–54 (2018).

Before discussing the possible technologies that might be deployed to respond in the following Subpart, it bears mentioning that to realistically chart out any of those pathways in the United States requires navigating a complex web of market and regulatory factors. Indeed, there is a substantial literature—beyond the scope of this Article—about the significant regulatory barriers in the United States that pose challenges to the implementation of any of these pathways.⁵⁹ For purposes of this Article, which will ultimately argue for increased federal regulatory oversight and permitting requirements, it is important to note that many critics view regulatory red tape and delay as one of the most significant barriers to the energy transition. Indeed, this is at the core of recent “abundance” debates.⁶⁰ Parts II and III will delve deeper into this debate.

1. *The IPCC Report Sounds the Alarm and Proposes Potential Pathways*

In 2021, the Intergovernmental Panel on Climate Change (IPCC) sounded a grave alarm for the world.⁶¹ Its Sixth Assessment Report warned that without immediate and coordinated global action to keep warming below 1.5°C, the world would be headed for climate and social catastrophe.⁶² It urged that communities around the world would start to radically change in ways outside the realm of human control, with “vulnerable communities who have historically contributed the least [to climate change] . . . disproportionately affected.”⁶³ Although the goal of 1.5°C appears increasingly unrealistic⁶⁴—if not already

59. See generally David E. Adelman, *Permitting Reform's False Choice*, 51 *ECOLOGY L.Q.* 129 (2024) (discussing this debate).

60. “Abundance” is a term that has been most recently popularized by a book of the same name written by Ezra Klein and Derek Thompson. Though what constitutes true abundance has been hotly contested—both before and after the publication of the book—in Klein and Thompson’s own words, it is defined as “the state in which there is enough of what we need to create lives better than we have had.” This explicitly includes energy as “a building block of the future.” EZRA KLEIN & DEREK THOMPSON, *ABUNDANCE* 20 (2025).

61. The author acknowledges that the IPCC and its climate reports are the subject of valid critique, especially because they prioritize the views of American and Western European researchers and rely heavily on integrated assessment modeling to the exclusion of other models. See, e.g., Ema Gusheva et al., *Past Peak Prominence: The Changing Role of Integrated Assessment Modeling in the IPCC*, 27 *ISCIENCE* (Nov. 2024). But for purposes of this Article, the IPCC reports are relied on for normative claims about climate change because their methods and proposed pathways are broadly utilized by policy makers. See generally *Summaries for Policymakers*, IPCC; see also Courtney Lindwall, *IPCC Climate Change Reports: Why They Matter to Everyone on the Planet*, NAT. RES. DEF. COUNCIL (Apr. 14, 2023), <https://www.nrdc.org/stories/ipcc-climate-change-reports-why-they-matter-everyone-planet#sec-what-is> [<https://perma.cc/E7GT-BXMU>].

62. IPCC, *CLIMATE CHANGE 2021: THE PHYSICAL AND SCIENCE BASIS V* (2021), https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport.pdf [<https://perma.cc/H29C-CWAA>].

63. IPCC, *CLIMATE CHANGE 2023 SYNTHESIS REPORT* 42 (2023), https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf [<https://perma.cc/YDN8-AS6Z>].

64. IPCC, *Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development*, in *SPECIAL REPORT: GLOBAL WARMING OF 1.5°C* 93, 95 (V. Masson-Delmonte et al. eds., 2018) (citing chapters 2.2, 2.3.5), <https://www.ipcc.ch/sr15/#:~:text=1.5%C2%B0C%20emission%20pathways,around%20100%20following%20an%20overshoot> [<https://perma.cc/S9HB->

passed⁶⁵—the IPCC Working Group Three Report, released in April 2022, laid out roadmaps with several modeled pathways to keep global warming to 1.5°C and below 2°C.⁶⁶

These pathways offer a different mix of possible strategies to achieve emissions decreases, and each relies on a different combination of technologies to reach climate targets. Though not legally binding, they offer policy makers detailed proposals for how to achieve climate goals at a range of intensity and mitigation; any of these models can serve to avert the public health and economic disaster of failing to act.⁶⁷ Although each strategy varies significantly in its mix of proposed solutions and the timelines for achieving net-zero goals, all modeled pathways required a widescale shift to renewable energy sources and dramatic decreases in coal reliance for primary energy sources.⁶⁸ The IPCC underscored that the primary strategies for achieving climate goals must rely on “[l]ow energy demand and low demand for land- and [greenhouse gas]-intensive consumption goods [that] facilitate limiting warming to as close as possible to 1.5°C.”⁶⁹ As part of those recommendations, the IPCC noted that “[i]n 1.5°C pathways with no or limited overshoot, renewables are projected to supply 70–85 percent . . . of electricity in 2050.”⁷⁰ This recommendation makes sense—renewables have significantly lower greenhouse gas emissions than other sources of fossil fuel-based energy⁷¹ and are sufficiently technologically advanced to be deployed at scale.⁷²

CZXR] (stating that “[u]nder emissions in line with current pledges under the Paris Agreement . . . global warming is expected to surpass 1.5°C above pre-industrial levels, even if these pledges are supplemented with very challenging increases in the scale and ambition of mitigation after 2030”).

65. *WMO Confirms 2024 as the Warmest Year On Record at About 1.55°C Above Pre-Industrial Level*, WORLD METEOROLOGICAL ORG. (Jan. 10, 2025), <https://wmo.int/news/media-centre/wmo-confirms-2024-warmest-year-record-about-155degc-above-pre-industrial-level#:~:text=The%20past%20ten%20years%202015,dead%20but%20in%20grave%20danger> [<https://perma.cc/EJ4P-ZE2P>]; *The World is Missing its Lofty Climate Targets. Time for Some Climate Realism*, THE ECONOMIST (Nov. 3, 2022), <https://www.economist.com/leaders/2022/11/03/the-world-is-missing-its-lofty-climate-targets-time-for-some-realism> [<https://perma.cc/E6JT-46E6>]; see also CARTON & MALM, *supra* note 56.

66. IPCC, CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE SUMMARY FOR POLICYMAKERS 24 (2022) [hereinafter 2022: MITIGATION OF CLIMATE CHANGE], <https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/> [<https://perma.cc/F6KD-7RAM>].

67. See generally Intergovernmental Panel on Climate Change: *Climate Change 2021 The Physical and Science Basis*, IPCC at Chapters 3 and 4 (2021).

68. 2022: MITIGATION OF CLIMATE CHANGE, *supra* note 66, at 24.

69. *Id.*

70. IPCC, SPECIAL REPORT: GLOBAL WARMING OF 1.5°C SUMMARY FOR POLICYMAKERS 15 (V. Masson-Delmotte et al. eds., 2018), https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM_version_report_LR.pdf [<https://perma.cc/J24Q-G6LL>] (citing paragraph C.2.2).

71. See *Renewable Energy-Powering a Safer Future*, U.N., <https://www.un.org/en/climate-change/raising-ambition/renewable-energy> [<https://perma.cc/9GZ3-L5HV>] (last visited Aug. 4, 2025).

72. Lori Bird et al., *US Clean Power Development Sees Record Progress, As Well As Stronger Headwinds*, WORLD RES. INST. (Feb. 21, 2025), <https://www.wri.org/insights/clean-energy-progress-united-states> [<https://perma.cc/T957-8PCB>].

But in addition to decreased demand and increased efficiency via renewable electrification, the report suggests that some CO₂ emissions must be removed from the atmosphere.⁷³ Indeed, the report emphasized that CO₂ removal is a necessary tool in all pathways to limit warming to 1.5°C with minimal or no overshoot.⁷⁴ CO₂ removal, distinct from carbon capture utilization and storage which captures CO₂ at the point of emission, pulls existing carbon from the atmosphere and includes technologies like reforestation, land restoration and soil carbon sequestration, direct air carbon capture and storage, and enhanced weathering and ocean alkalization.⁷⁵ These technologies were proposed in many IPCC pathways at varying percentages.⁷⁶

How much industrial CCS—carbon capture occurring at fossil fuel-powered facilities capturing carbon at the point of emission—might be required in a portfolio of emissions reduction strategies? The 2023 IPCC Report Summary for Policymakers notes, “The overall deployment of CCS varies widely across 1.5°C pathways with no or limited overshoot”⁷⁷ It emphasized that CCS could be useful for “hard to abate” sectors, like “steel, concrete, and some chemical manufacturing.”⁷⁸ However, “in the best-case scenario, with carbon capture technology working flawlessly and deployed at large scale, it could only account for a little over 2 percent of global carbon emissions reductions by 2030.”⁷⁹ On the potentially limited role for CCS: “nuclear and fossil fuels with carbon dioxide capture and storage . . . are modelled to increase in *most* 1.5°C pathways with no or limited overshoot,”⁸⁰ but not all pathways, and they are included as a significantly lower share of the energy mix—only 8 percent.⁸¹ Indeed, the report suggested that radical reduction in energy demand and carbon-

73. CCS is technically not a subset of CDR because CCS does not remove CO₂ directly from the atmosphere. CIEL Report, *supra* note 32, at 2. A full evaluation of CDR is outside the scope of this Article, but it is important to note that only some CDR measures include the buildout of CO₂ pipeline and well infrastructure—like DAC—while others do not transport or store captured CO₂ at all. CDR “measures include afforestation and reforestation, land restoration and soil carbon sequestration, [bioenergy with carbon capture and storage], direct air carbon capture and storage [], [and] enhanced weathering and ocean alkalization.” IPCC, SPECIAL REPORT, *supra* note 70 (citing paragraph C.3.1).

74. *Id.*

75. *Id.* Some of these CDR technologies, like direct air carbon capture and storage, require the buildout of CO₂ pipelines and storage wells.

76. *Id.*

77. IPCC, *Mitigation Pathways Compatible with 1.5°C*, *supra* note 64, at 97 (citing chapter 2.4.2) (noting that “cumulative CO₂ stored through 2050 rang[es] from zero up to 300 GtCO₂ (minimum-maximum range), of which zero up to 140 GtCO₂ is stored from biomass”).

78. Amy Westervelt, *Companies Sold the Public on a Fake Climate Solution – and Swindled Taxpayers Out of Billions*, VOX (July 20, 2024), <https://www.vox.com/climate/363076/climate-change-solution-shell-exxon-mobil-carbon-capture> [<https://perma.cc/4VQ4-ZBSW>].

79. *Id.*; see also CLIMATE CHANGE 2023 SYNTHESIS REPORT, *supra* note 63; INST. FOR ENERGY ECON. & FIN. ANALYSIS, FACT SHEET: CARBON CAPTURE AND STORAGE (CCS) HAS A POOR TRACK RECORD 2 (2024), <https://ieefa.org/sites/default/files/2024-02/fact-sheet-CCS-ADR.pdf> [<https://perma.cc/7KA3-ZKZH>].

80. IPCC, SPECIAL REPORT, *supra* note 70, at 15 (emphasis added).

81. *Id.*

neutral alternatives to liquids and gases that do not rely on bioenergy might achieve deep mitigation and obviate the need to rely on CCS at all.⁸²

In fact, in one IPCC pathway, labeled Low Energy Demand (LED), 1.5°C is attained without any reliance on CCS.⁸³ Instead, the LED pathway relies on “rapid phaseout of fossil fuels along with limited carbon removal by *natural sources* such as reforestation and enhanced soil carbon uptake.”⁸⁴ Other reports have suggested that “[b]y transitioning the transportation, industry, and building sectors to 100 percent clean, renewable energy through rapid electrification and phase out of fossil fuels, and enhanced natural carbon sequestration through improved land management and restoration, it is possible to keep warming at or below [1.5°C] *without* CCS.”⁸⁵

2. *The Complicated Role of CCS as a Potential Decarbonization Tool*

Not only did the IPCC report propose limited reliance on CCS technology, but the report also expressed “concerns about storage safety and cost” and the “non-negligible risk of carbon dioxide leakage from geological storage and the carbon dioxide transport infrastructure”⁸⁶—risks like those that had just materialized in Satartia. Indeed, the IPCC pointedly underscored that “CCS has much less potential for [greenhouse gas] emissions mitigation than solar and wind energy, and is far more costly.”⁸⁷

While the IPCC reports do not mandate the use of CCS to meet climate goals and are careful to point out the substantial costs and risks associated with the technology,⁸⁸ other studies support the idea that overreliance on CCS in the energy transition could actually *subvert* climate goals. For instance, Mark Jacobson, a researcher at Stanford University, conducted a study that found that attaching CCS to power plants fueled by fossil fuels is worse for the climate than simply deploying renewables.⁸⁹ “They actually increase carbon dioxide emissions by doing this, in addition to increasing air pollution.”⁹⁰ Indeed, Jacobson’s study, which reviewed the use of CCS at a power plant fueled by electricity generated from natural gas, found that when “accounting for the

82. IPCC, *Mitigation Pathways Compatible With 1.5°C*, *supra* note 64, at 134–36 (citing chapter 2.4.2.3).

83. *Id.* at 134–36.

84. CIEL Report, *supra* note 32, at 2–3.

85. *Id.* at 3.

86. *Id.*

87. CBD Petition, *supra* note 40, at 14.

88. See generally CTR. FOR INT’L ENV’T L., LOST IN TRANSLATION: LESSONS FROM THE IPCC’S SIXTH ASSESSMENT ON THE URGENT TRANSITION FROM FOSSIL FUELS AND THE RISKS OF MISPLACED RELIANCE ON FALSE SOLUTIONS (2023), <https://www.ciel.org/wp-content/uploads/2023/03/Lost-in-Translation-Lessons-from-the-IPCCs-Sixth-Assessment.pdf> (discussing the IPCC’s qualified endorsement of carbon capture and concerns about cost) [<https://perma.cc/HV52-U62P>].

89. Mark Jacobson, *The Health and Climate Impacts of Carbon Capture and Direct Air Capture*, 12 ENERGY ENV’T SCI. 3567, 3571 (2019).

90. Westervelt, *supra* note 78.

electricity needed to run the carbon capture equipment, the combustion and upstream emissions resulting from that electricity, and, in the case of the coal plant, its upstream emissions,” the equipment actually only captured 10–11 percent of the emissions they produced over a twenty-year average.⁹¹ Jacobson further found that “[e]ven when the capture equipment is powered by renewable electricity . . . it is always better to use the renewable electricity instead to replace coal or natural gas electricity or to do nothing, from a social cost perspective.”⁹²

Existing CCS infrastructure does not inspire hope about the future efficacy of the technology. “The 28 CCS facilities currently operating globally have a capacity to capture only 0.1 percent of fossil fuel emissions . . . [o]f that capacity, just 19 percent . . . is being captured for actual geological sequestration.”⁹³ As discussed below, the rest is being used for EOR, an activity that inherently supports ongoing fossil fuel reliance.⁹⁴ Additionally, current capture rates are low.⁹⁵ A study reviewing thirteen active CCS projects found that eight failed or vastly underperformed.⁹⁶ For instance, many proponents of CCS cite the Petra Nova plant, a coal-fired power station in Texas, as an example of the feasibility of CCS deployment.⁹⁷ But in reality, that plant only captured 7 percent of its total CO₂ emissions, despite promises to capture 90 percent.⁹⁸ The CCS portion of the plant was ultimately shuttered, leaving the coal-fired portion running the same as before.⁹⁹

Class VI wells, intended to store CO₂ underground into perpetuity, are similarly undertested. One review of two active CO₂ sequestration projects in Norway found that injected CO₂ often behaved in unexpected ways that required

91. *Stanford Study Casts Doubt on Carbon Capture*, STANFORD REP. (Oct. 25, 2019), <https://news.stanford.edu/stories/2019/10/study-casts-doubt-carbon-capture> [<https://perma.cc/22ZX-8NUF>].

92. *Id.*

93. CIEL Report, *supra* note 32, at 2.

94. THE SCI. & ENV'T HEALTH NETWORK, THE BOLD ALL., THE FALSE PROMISE AND POTENTIAL HEALTH HARMS OF CARBON DIOXIDE ENHANCED OIL RECOVERY (CO₂ EOR) AS A TOOL OF CLIMATE MITIGATION 2 (2024), https://s3.documentcloud.org/documents/25546674/sehn_co2_eor_report240805.pdf?ref=floodlightnews.org [<https://perma.cc/8CHL-CYU4>].

95. See INST. FOR ENERGY ECON. & FIN. ANALYSIS, *supra* note 79.

96. *Id.*; see also Bruce Robertson, *Carbon Capture Has a Long History. Of Failure*, THE BULL. (Sept. 1, 2022), <https://thebulletin.org/2022/09/plagued-by-failures-carbon-capture-is-no-climate-solution> [<https://perma.cc/9PVN-CEBM>].

97. Ayla Majid, *Why Carbon Capture is Key to Reaching Climate Goals*, WORLD ECON. F. (Oct. 16, 2023), <https://www.weforum.org/agenda/2023/10/why-carbon-capture-is-key-to-reaching-climate-goals> [<https://perma.cc/9QUV-AL63>].

98. CIEL Report, *supra* note 32, at 2.

99. *Id.* Notably, the community next to Petra Nova was already overburdened by ozone and particulate matter air pollution from the existing coal fired power plant at the site. The addition of carbon capture to the facility did not alleviate this pollution burden. See *Summary of Analysis, Residents Within 3 Miles of This Specified Point (Site 1, ejam_uniq_id 1) Centered at 29.482643, -95.634613* EJSscreen, <https://ejamapi-84652557241.us-central1.run.app/report?lon=-95.634613&lat=29.482643&buffer=3> [<https://perma.cc/3DCG-TF7H>] (last visited Mar. 10, 2026).

prompt, well-funded responses.¹⁰⁰ It emphasized that “storing carbon dioxide underground is not an exact science,” and further, that “[i]t may carry even more risk and uncertainty than drilling for oil or gas.”¹⁰¹ And one of the few Class VI wells to be permitted and actually built in the United States is already leaking, potentially endangering nearby drinking water sources.¹⁰² Indeed, the operator of that well, located in Decatur, Illinois, kept the leak secret from EPA for many months after detection, highlighting additional risks where industry interests and public safety priorities do not align.¹⁰³ That well is located in a heavily industrialized, already-overburdened environmental justice community, demonstrating the asymmetrically distributed harm of how these wells are sited.¹⁰⁴ Further, in the long run, carbon must be captured and stored for at least ten thousand years—which is considered permanent storage on climate-relevant timescales—to achieve its promised climate potential.¹⁰⁵ But if sequestration sites leak even a little, it could reduce the benefit of CCS by up to 35 percent, to say nothing of its potentially disastrous consequences to drinking water supply and human health.¹⁰⁶

Other recent analyses have questioned the role of CCS in achieving net-zero goals. For instance, the International Energy Agency’s 2025 World Energy

100. GRANT HAUBER, INST. FOR ENERGY ECON. & FIN. ANALYSIS, NORWAY’S SLEIPNER AND SNØHVIT CCS: INDUSTRY MODELS OR CAUTIONARY TALES? 6 (2023) (emphasis added), <https://ieefa.org/sites/default/files/2023-06/Norway%E2%80%99s%20Sleipner%20and%20Sn%C3%B8hvit%20CCS-%20Industry%20models%20or%20cautionary%20tales.pdf> [https://perma.cc/3RKE-7ZGZ].

101. *Id.* at 5.

102. See EPA Announces Proposed Order, *supra* note 27; Annie Snider, *ADM Finds 24 Other Wells Near its Leaky Illinois Carbon Sequestration Site*, E&E NEWS (Nov. 5, 2024), <https://www.eenews.net/articles/adm-finds-24-other-wells-near-its-leaky-illinois-carbon-sequestration-site/> [https://perma.cc/8358-G757].

103. Juanpablo Ramirez-Franco, *The Nation’s First Commercial Carbon Sequestration Plant is in Illinois. It Leaks.*, YALE CLIMATE CONNECTIONS (Nov. 20, 2024), <https://yaleclimateconnections.org/2024/11/the-nations-first-commercial-carbon-sequestration-plant-is-in-illinois-it-leaks/> [https://perma.cc/437M-2LFM].

104. See EJ Screen Community Report for 5-mile radius around point 39.866446, -88.882488, Decatur, Illinois, <https://ejamapi-84652557241.us-central1.run.app/report?lon=-88.882488&lat=39.866446&buffer=5> (showing that the community is over one-third people of color, 41 percent low-income, and exposed to disproportionately high levels of particulate matter, ozone, and air toxics, among other environmental hazards).

105. See Stephanie Arcusa & Klaus Lackner, *Carbon Sequestration Ought to Be Permanent on Climate-Relevant Timescales*, 173 ENV’T SCI. & POL’Y (Oct. 2025) (noting that greater than ten thousand years is “permanent” on the climate-relevant timescale); see also *Carbon Dioxide Can Be Stored Underground for Ten Times the Length Needed to Avoid Climatic Impact*, UNIV. OF CAMBRIDGE, <https://www.cam.ac.uk/research/news/carbon-dioxide-can-be-stored-underground-for-ten-times-the-length-needed-to-avoid-climatic-impact#:~:text=The%20CO2%20must%20remain,maintaining%20CO2%20storage%20sites> [https://perma.cc/2AAQ-2WN7].

106. CLARK BUTLER, INST. FOR ENERGY ECON. & FIN. ANALYSIS, CARBON CAPTURE AND STORAGE IS ABOUT REPUTATION, NOT ECONOMICS 8 (2020), https://ieefa.org/wp-content/uploads/2020/07/CCS-Is-About-Reputation-Not-Economics_July-2020.pdf [https://perma.cc/7DVK-NYJR].

Outlook, which details the path to a net-zero-emissions scenario, does not view CCS as essential to decarbonization.¹⁰⁷ Indeed, as one commentator, Grant Hauber, wrote about the report, “While CCUS is referenced in the text assessing future energy mixes, it is barely visible in the most important metric—the percentage contribution to reduced CO₂ emissions.”¹⁰⁸ He further says:

The IEA notes that the combination of renewables, electrification, fuel switching, and energy efficiency will contribute over 82% of the emissions reductions needed to achieve net zero. By contrast, it states that CCUS-equipped energy production accounted for a mere 0.003% of the global energy supply in 2024. Even under the NZE Scenario, CCUS is projected to contribute no more than 4.9% of the energy decarbonization solution by 2050. These numbers fall far short of what is touted as a “vital” technology.¹⁰⁹

Thus, the picture of CCS is incredibly complex—it is a largely untested, historically underperforming, and extremely expensive technology.¹¹⁰ For these reasons, advocates have urged extreme caution. Indeed, the Climate Action Network, a 1,500 member organization network and the largest network of climate organizations worldwide, adopted a shared position statement in early 2021 noting that it “does not consider currently envisioned CCS applications as proven sustainable climate solutions” and urged that CCS could distract from the need to take other concerted action.¹¹¹ In a petition created by the Center for Biological Diversity and signed by over 354 environmental advocacy organizations nationally, advocates characterized CCS infrastructure as “fossil fuels in sheep’s clothing,” and “a dangerous delay tactic championed by polluting industries to continue dependence on their dirty products, such as biomass and fossil fuels.”¹¹² The petition further goes on to warn that “[t]he approval of CCS infrastructure projects not only adds to the severe and ongoing harms of climate change but could also make it impossible to limit warming to 1.5°C, and thus impossible to avoid truly apocalyptic damages.”¹¹³

107. *World Energy Outlook*, INT’L ENERGY AGENCY (Nov. 2025), <https://iea.blob.core.windows.net/assets/9753df19-0a71-422a-b725-012c555763b3/WorldEnergyOutlook2025.pdf> [<https://perma.cc/X64F-VYKD>]; see also Grant Hauber, *Minimal Role for Carbon Capture, Utilization, and Storage (CCUS) in IEA’s World Energy Outlook 2025*, INST. FOR ENERGY ECON. & FIN. ANALYSIS (Jan. 22, 2026), <https://ieefa.org/resources/minimal-role-carbon-capture-utilization-and-storage-ccus-ieas-world-energy-outlook-2025> [<https://perma.cc/38XD-S2J4>].

108. *Id.* (“Across all applications, IEA’s figures in the WEO 2025 NZE Scenario show CCUS accounting for a maximum of 4.9% of total emissions reduction, with 1.2% from power generation and 3.7% from industry.”) (referring to CCUS but applying equally to CCS).

109. *Id.*

110. See CIEL Report, *supra* note 32.

111. CLIMATE ACTION NETWORK INT’L, CAN POSITION: CARBON CAPTURE, STORAGE, AND UTILIZATION 6 (2021), https://climatenetwork.org/wp-content/uploads/2021/01/can_position_carbon_capture_storage_and_utilisation_january_2021.pdf [<https://perma.cc/4ZZT-RNFS>].

112. CBD Petition, *supra* note 40, at 12.

113. *Id.*

B. Carbon Capture as a “Solution”

Yet despite these concerns and the IPCC’s own ambivalence about CCS, the subsequent reporting and public narrative on the IPCC-modeled pathways overwhelmingly emphasized the purported necessity of carbon capture as a transition solution.¹¹⁴ Instead of emphasizing the report’s conclusion that renewables and actual carbon emission reductions¹¹⁵ could comprise the majority of efforts to reach 1.5°C *without* CCS, media outlets suggested that “[t]o get back below [1.5°C] after overshoot would require carbon capture on a massive scale.”¹¹⁶

If carbon capture is costly, relatively unproven at scale, and highly risky from a safety perspective, why is the prevailing narrative that it is necessary to meet climate goals? Perhaps, in part, because with large federal subsidies from the IRA,¹¹⁷ which were recently reaffirmed and extended in the OBBBA,¹¹⁸ the

114. See, e.g., Jocelyn Timperley, *Climate Change: Can We Really Take CO₂ Back Out the Air?*, BBC (Mar. 21, 2023), <https://www.bbc.com/future/article/20230321-ipcc-the-rising-need-for-negative-emissions> [https://perma.cc/Q42F-3PX6]; 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/FQ3A-79L9]; Chelsea Harvey, *Carbon Removal Unavoidable as Climate Dangers Grow, New IPCC Report Says*, E&E NEWS (Apr. 5, 2022), <https://www.scientificamerican.com/article/carbon-removal-unavoidable-as-climate-dangers-grow-new-ipcc-report-says> [https://perma.cc/FQ3A-79L9]; Emma Parry et al., *Now the IPCC Has Recognized that Carbon Removals are Critical to Addressing Climate Change, It’s Time to Act*, MCKINSEY SUSTAINABILITY (June 10, 2022), <https://www.mckinsey.com/capabilities/sustainability/our-insights/sustainability-blog/now-the-ipcc-has-recognized-that-carbon-removals-are-critical-to-addressing-climate-change-its-time-to-act> [https://perma.cc/JQE5-4BN3]; *Critical Role for CCUS Highlighted in Latest IPCC Report. What’s Next?*, INT’L ENERGY F. (May 17, 2022), <https://www.ief.org/news/critical-role-for-ccus-highlighted-in-latest-ipcc-report-whats-next#:~:text=The%20latest%20IPCC%20report%20includes,1.5%20and%202%2C%20B0C> [https://perma.cc/T5TD-5QP6].

115. By actual carbon emissions reductions, the author is referring to transitioning to technologies, practices, and ways of living that have a lower carbon footprint.

116. Martha Henriques, *Climate Change: The 1.5C Threshold Explained*, BBC (Feb. 8, 2024) (emphasis added), <https://www.bbc.com/future/article/20231130-climate-crisis-the-15c-global-warming-threshold-explained> [https://perma.cc/2V4H-HF42].

117. The vast regime of federal incentives for carbon capture is outside the scope of this Article. But to briefly summarize, much of the current boom in CCS development has been made possible by the 45Q tax credit. See, e.g., Angela C. Jones & Donald J. Marples, *The Section 45Q Tax Credit for Carbon Sequestration*, CONG. RSCH. SERV. (Aug. 25, 2023), <https://crsreports.congress.gov/product/pdf/IF/IF11455> [https://perma.cc/7V8N-WF6T]; see also Westervelt, *supra* note 78 (noting the vast expansion of CCS is “thanks to major changes to the CCS tax credit known as 45Q, which started out in 2008 paying \$10 for every metric ton of carbon sequestered and now pays as much as \$85 per metric ton, and up to \$60 per ton stored and then used for EOR The credit nominally requires companies to verify their claims, but aside from some specific requirements to ensure condensed CO₂ doesn’t wind up in groundwater, the EPA is not verifying how much carbon is actually sequestered by these projects.”).

118. One Big Beautiful Bill Act of 2025, Pub. L. No. 119-21, §70524, 139 Stat. 281 (2025). Indeed, many other subsidies for renewable energy were cut from the bill, but with lobbying from the fossil fuel industry, the 45Q tax credit was saved. Blackburn, *supra* note 31. This is perhaps in part because of the recognition that carbon capture technology will prolong fossil fuel reliance and, somewhat perversely, makes it profitable to produce CO₂. See also Levien, *supra* note 39 (“We have

fossil fuel industry realized that CCS might be an economically viable method to extend the life of fossil fuel infrastructure that would otherwise have to be phased out.¹¹⁹ Indeed, the fossil fuel industry has invested heavily in advocacy, research, and policy around CCS, and in the OBBBA, the 45Q tax credit now applies equally to CO₂ utilized for extractive purposes—for instance, for further fossil fuel extraction via EOR—as for CO₂ permanently sequestered in Class VI wells to reduce greenhouse gas emissions.¹²⁰ Whether CCS is an objectively false solution or a potential stop-gap technology for reaching climate targets, it is clear that the fossil fuel industry has bought in, and that it will depend on CCS to further entrench reliance on its products. Indeed, as sociologist Mike Levien has dubbed it, “[CCS] is the cutting edge of what [he] suggest[s] we call *reactionary decarbonization*. It is reactionary because it represents a defensive recalibration of the fossil energy regime to ward off the radical challenge to its existence posed by the climate movement.”¹²¹

That the fossil fuel industry’s advocacy for a climate “solution” may be driven by ulterior motives is hardly revelatory given widespread reports of its climate change denial tactics. One such report illuminates how industry views CCS as instrumental for prolonging oil and gas markets. In April 2024, House and Senate Democrats released a Joint Staff Report entitled “Denial, Disinformation, and Doublespeak: Big Oil’s Evolving Efforts to Avoid Accountability for Climate Change.”¹²² That report, relying on industry documents obtained through subpoena, detailed the decades-long efforts of major fossil fuel companies to cast doubt on climate change and the industry’s recent pivot toward advancing technologies like carbon capture, which would support ongoing global reliance on fossil fuels.¹²³ Its findings were damning, underscoring that the fossil fuel industry’s uptake of CCS would extend the lifespan of carbon-emitting fossil fuels at public expense.¹²⁴ Specifically, it noted,

The rosy story that the fossil fuel industry depicts [about CCS] through news and social media campaigns targeting consumers, however, is

seen that the CCS subsidy in the IRA has perversely encouraged a buildout of *new* plants, representing new emissions that would not exist if it were not for the subsidies for capturing them. Even if those plants captured upwards of 90 percent of their emissions—a claim so far unproven—they would still represent net positive emissions.”).

119. CTR. FOR INT’L ENV’T L., *FUEL TO THE FIRE: HOW GEOENGINEERING THREATENS TO ENTRENCH FOSSIL FUELS AND ACCELERATE THE CLIMATE CRISIS* 10 (2019), https://www.ciel.org/wp-content/uploads/2019/02/CIEL_FUEL-TO-THE-FIRE_How-Geoengineering-Threatens-to-Entrench-Fossil-Fuels-and-Accelerate-the-Climate-Crisis_February-2019.pdf [<https://perma.cc/YF7P-3T5R>].

120. CIEL Report, *supra* note 32, at 9; *see also* Blackburn, *supra* note 31.

121. Levien, *supra* note 39.

122. HOUSE COMM. ON OVERSIGHT & ACCOUNTABILITY, SENATE COMM. ON THE BUDGET, *DENIAL, DISINFORMATION, AND DOUBLESPEAK: BIG OIL’S EVOLVING EFFORTS TO AVOID ACCOUNTABILITY FOR CLIMATE CHANGE* (2024), https://www.budget.senate.gov/imo/media/doc/fossil_fuel_report1.pdf [<https://perma.cc/F535-NGMH>].

123. *Id.* at 30–34.

124. *Id.* at 33 (noting the expressed reliance of industry CCS projects on taxpayer dollars).

inconsistent with statements the companies make in internal documents, which show: (1) a coordinated campaign to use CCS to prolong the use of natural gas, perhaps indefinitely; (2) natural gas plant projects do not economically capture CO₂ compared to a free-to-pollute business model; (3) fossil fuel companies refuse to adequately fund their CCS projects (despite billions in profits) and advocate instead for increased subsidies from the federal government; and (4) at present levels of industry investment, the current pace of the CCS buildout is too slow to achieve needed reductions in CO₂.¹²⁵

Internal documents from major oil and gas companies related to this report show they recognize CCS is a relatively ineffective and costly technology, and suggest these companies will not actually deploy the technology on the scale needed to meet the climate goals they purport to serve.¹²⁶ In Exxon's 2023 Global Outlook, it started to embrace CCS because market conditions had changed.¹²⁷ In other words, industry's embrace of CCS is not about embrace of the technology as a climate solution, but rather about newfound potential for profit. With generous federal subsidies, CCS can be used to extend business as usual with little private cost. The congressional report concludes, soberly, that "[t]he industry's true goal is to prolong, perhaps indefinitely, the unabated use of fossil fuels."¹²⁸

As Mike Levien writes about the usurpation of this purported climate "solution" by the fossil fuel industry:

CCS is no longer science fiction or something that the fossil fuel industry is avoiding. Since the Inflation Reduction Act of 2022 nearly doubled the tax breaks for each ton of carbon dioxide stored—from \$45 to \$85 per cubic ton—over a hundred CCS projects have been proposed across the country. These are almost exclusively being managed by the

125. *Id.* at 31.

126. *Id.* at 32–33 ("By Exxon's own admission, CCS technology would need to be deployed at 185 times its current rate of deployment to reach net zero by 2050. A June 15, 2016, internal presentation by BP's Carbon Solutions division titled 'CO₂ Capture, Utilization, and Storage (CCUS): Overview of the technology components, policy and value proposition,' contains no fewer than eight statements contradicting BP's own public ad campaigns. The presentation reveals that CCS at scale is not economically viable against a free-to-pollute business model and that a 'robust carbon price [would be] needed to stimulate CCUS deployment.' In sum, '[d]espite its importance and ambition to meet decarbonization goals, CCUS has stalled and commercial deployment is very limited.'").

127. Westervelt, *supra* note 78.

128. HOUSE COMM. ON OVERSIGHT & ACCOUNTABILITY, SENATE COMM. ON THE BUDGET, *supra* note 122, at 34 ("BP stated that 'CCUS could help sustain gas demand growth for longer, supporting gas markets, the value of gas and potentially liquid fuels.' A July 2018 briefing for Bernard Looney, then-Chief Executive of BP's Upstream Business (and later BP's [Chief Executive Officer]) stated that 'CCUS . . . enables 21 years . . . of continued current consumption level of coal, 59 years . . . for gas, and 29 years . . . for oil.' A 2021 document titled 'Campaign . . . Gas, CCS, and Hydrogen' identifies BP's business objective of ensuring that gas has 'an enduring role over the next decades.' BP and other fossil fuel giants view publicizing CCS without actually deploying it at scale as a method to ensure that fossil fuels like natural gas are used for as long as possible.'").

fossil fuel industry, of which CCS is a growing and lucrative sector. Most entail capturing carbon dioxide from power plants and industrial sources—especially petrochemical and ethanol plants—and transporting them through new pipelines for permanent geological storage (not enhanced oil recovery) in what are called Class VI Injection Wells. Only a small minority, including four regional hubs funded partially by the Department of Energy [], involve DAC—and . . . these projects resemble CCS projects in most respects.¹²⁹

As Levien underscores, many new projects that propose the use of carbon capture would implement the technology at facilities reliant on, or producing, fossil fuels.¹³⁰ Alternatively, some projects would use CCS at new facilities that produce lower-carbon products, like ammonia or hydrogen, but which have high emissions of other potent greenhouse gases, like methane and nitrogen oxides.¹³¹ But “almost every single company involved in CCS injection wells is an oil and gas company, or [a] subsidiary of one.”¹³²

The following are some examples of projects that will enable this perpetuation of fossil fuel reliance, and which will contribute to significant greenhouse gas emissions outside the use of CCS technology.

CCS Deployed at Existing Power Plants

Some proponents of CCS have suggested that using it to lower the carbon emissions of existing, fossil-fueled power plants will help “green” those facilities and enable them to stay online for longer periods of time.¹³³ But these facilities often have significant emissions of other non-CO₂ greenhouse gases with substantial warming potential.¹³⁴ And indeed, in some instances, CCS technology at these facilities may only capture around 10 percent of total

129. Levien, *supra* note 39.

130. *Id.*

131. See generally DAVID SCHLISSEL & ANIKA JUHN, INST. FOR ENERGY ECON. & FIN. ANALYSIS, BLUE HYDROGEN: NOT CLEAN, NOT LOW CARBON, NOT A SOLUTION (2023), https://ieefa.org/sites/default/files/2024-01/Blue%20Hydrogen%20Not%20Clean%20Not%20Low%20Carbon_September%202023_0.pdf [<https://perma.cc/2CFZ-N7K7>] (detailing the high greenhouse gas emissions associated with “blue” hydrogen projects).

132. Levien, *supra* note 39 (“It should be emphasized that they include the likes of ExxonMobil, Shell, TotalEnergies, Venture Global, and Occidental Petroleum. Early movers included the industrial gas company Air Products and OxyChem, who had leases signed before the ink dried on the IRA. While the initial boom involves some smaller industry players trying to be the first to get an injection hub in place and likely cash out, we can expect concentration. ExxonMobil is positioning itself to capture a major share of the carbon management market.”).

133. CIEL Report, *supra* note 32, at 4.

134. See generally Jacobson, *supra* note 89 (discussing uncaptured methane leaks from CCS projects); see also Sam Meredith, *Shell’s Massive Carbon Capture Facility in Canada Emits Far More Than It Captures, Study Says*, CBNB (Jan. 24, 2022), <https://www.cnbc.com/2022/01/24/shell-ccs-facility-in-canada-emits-more-than-it-captures-study-says.html> [<https://perma.cc/CR5G-89A9>].

emissions.¹³⁵ Not only do these proposals often overlook other emissions, but they also ignore the significant costs associated with extending the life of fossil fuel infrastructure with CCS added on. As some observers have noted, “[a]dding CCS onto a fossil-fueled power plant inevitably makes operating the underlying source more expensive With coal- and gas-fired power stations already becoming more costly than renewable alternatives, adding CCS simply makes them even less economic and even less necessary.”¹³⁶ Indeed, CCS is an especially bad financial bargain for gas-fired plants.¹³⁷

Hard-to-Abate Industries, Including “Blue” Hydrogen and Ammonia Infrastructure

CCS proponents also suggest that it might be used in “hard-to-decarbonize” sectors. In 2019, industries like cement, steel, and petrochemicals accounted for 27 percent of the United States’ greenhouse gas emissions.¹³⁸ These sites of industrial manufacturing also disproportionately release their emissions into environmental justice communities. For example, 25 percent of the national petrochemical industry’s products are generated in Louisiana’s Cancer Alley alone.¹³⁹ Many facilities in these industries would be exceptionally difficult—if not impossible—to retrofit by adding CCS to their operations.¹⁴⁰ In partial response to these challenges, there have been many proposals for “blue” hydrogen and ammonia infrastructure.¹⁴¹ The Department of Energy has proposed seven hydrogen hubs, at least three of which are currently moving forward.¹⁴² And as of December 2025, there were twenty-seven proposed blue

135. See Jacobson, *supra* note 89, at 3567, 3571.

136. CIEL Report, *supra* note 32, at 4.

137. Peter Psarras et al., *Cost Analysis of Carbon Capture and Sequestration from U.S. Natural Gas Fired Power Plants*, 54 ENV’T SCI. & TECH. 6272, 6273 (2020).

138. INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS, 1990-2019, EPA 2-16 (2021), <https://www.epa.gov/sites/default/files/2021-04/documents/us-ghg-inventory-2021-main-text.pdf> [<https://perma.cc/B49R-43HA>].

139. *Louisiana’s ‘Cancer Alley’ Is More Deadly Than Previously Imagined*, JOHNS HOPKINS UNIV. BLOOMBERG SCH. OF PUB. HEALTH (Aug. 4, 2025), <https://publichealth.jhu.edu/2025/the-shocking-hazards-of-louisianas-cancer-alley> [<https://perma.cc/WN7J-3YCC>]; see also “We’re Dying Here”: The Fight for Life in a Louisiana Fossil Fuel Sacrifice Zone, HUM. RTS. WATCH (Jan. 25, 2024), <https://www.hrw.org/report/2024/01/25/were-dying-here/fight-life-louisiana-fossil-fuel-sacrifice-zone> [<https://perma.cc/8AKJ-DYAD>].

140. See Hélène Pilorgé et al., *Cost Analysis of Carbon Capture and Sequestration of Process Emissions from the U.S. Industrial Sector*, 54 ENV’T SCI. & TECH., 7524–32 (2020).

141. “Blue” in this context refers to products made with fossil fuel as a feedstock—usually natural gas—but with carbon capture applied to the production process to capture carbon dioxide emissions. See, e.g., *Ammonia, the Missing Link in the Energy Transition?*, IEF (Dec. 1, 2021), <https://www.ief.org/news/ammonia-the-missing-link-in-the-energy-transition> [<https://perma.cc/36TP-9HZU>].

142. Bruce White, *Shifting Energy Priorities Are Reshaping the H2Hubs Program*, BARNES & THORNBURG (July 30, 2025), <https://btlaw.com/en/insights/alerts/2025/shifting-energy-priorities-are-reshaping-the-h2hubs-program> [<https://perma.cc/BY2N-9SVK>]; see also *U.S. Hydrogen Hubs Map*,

ammonia plants.¹⁴³ Though the underlying technology of each proposed project would vary, blue hydrogen and ammonia share the same essential process: Using natural gas as a feedstock, they will use steam methane reforming processes to make ammonia or hydrogen and capture the carbon at the point of emission.¹⁴⁴

Studies suggest that because these facilities use natural gas as their feedstock, they will have larger short-term greenhouse gas emissions than conventional fossil fuels.¹⁴⁵ Indeed, one study found that

[w]hile carbon dioxide emissions are lower, fugitive methane emissions for blue hydrogen are higher than for gray hydrogen because of an increased use of natural gas to power the carbon capture. Perhaps surprisingly, the greenhouse gas footprint of blue hydrogen is more than 20% greater than burning natural gas or coal for heat and some 60% greater than burning diesel oil for heat¹⁴⁶

IPCC reports emphasize that other greenhouse gas emissions from sources like methane and nitrogen oxides must be drastically reduced to meet climate goals.¹⁴⁷ However, the air permit applications for blue hydrogen and ammonia projects project high emissions rates of both.¹⁴⁸ These projects also likely cannot capture carbon at promised rates, some of which stretch credulity with projections as high as a 99 percent capture rate, which has never been achieved at any existing facility.¹⁴⁹

CCS for Use in EOR

As previously mentioned, not all carbon capture projects propose sequestering the captured product. Some would sell the captured CO₂ and use it to aid the extraction of additional oil and gas reserves through EOR. When industry proponents of CCS claim that they have employed CCS technology for decades, they usually mean through the EOR process because EOR involves

CLEAN AIR TASK FORCE, <https://www.catf.us/us-hydrogen-hubs-map> [<https://perma.cc/BA3F-F46N>] (last visited Aug. 4, 2025).

143. OIL & GAS WATCH, THE AMMONIA BUILDOUT IN THE U.S. (2025), https://cdn.prod.website-files.com/62963b843bd3a03f930371e2/694456354be551d3785df7de_OGW_Ammonia_FactSheet_12.17.25_2.pdf [<https://perma.cc/J5GK-DCSG>].

144. Patricia Mayer et al., *Blue and Green Ammonia Production: A Techno-Economic and Life Cycle Assessment Perspective*, ISCIENCE (Aug. 18, 2023) at 1–2.

145. Robert W. Howarth & Mark Z. Jacobson, *How Green is Blue Hydrogen?*, 9 ENERGY SCI. & ENG'G 1676, 1682 (2021).

146. *Id.* at 1676.

147. Zeke Hausfather, *Analysis: What the New IPCC Report Says About How to Limit Warming to 1.5C or 2C*, CARBON BRIEF (Apr. 6, 2022), <https://www.carbonbrief.org/analysis-what-the-new-ipcc-report-says-about-how-to-limit-warming-to-1-5c-or-2c> [<https://perma.cc/3PUA-95G2>].

148. See, e.g., CLEAN ENERGY GROUP, BLUE AND GREEN HYDROGEN PRODUCTION: POTENTIAL HARMS AND GLOBAL WARMING IMPACTS 1 (2023), <https://www.cleanenergygroup.org/wp-content/uploads/Blue-and-Green-Hydrogen-Production-Harms.pdf> [<https://perma.cc/TZX4-Q278>]; Howarth & Jacobson, *supra* note 145, at 1676.

149. See, e.g., SCHLISSEL & JUHN, *supra* note 131.

capturing and transporting CO₂ for injection into the ground, like CCS.¹⁵⁰ Specifically, EOR is a process whereby CO₂ can be injected into oil reservoirs “to push additional oil to a production wellbore.”¹⁵¹ In other words, it is the process of capturing CO₂ to extract more fossil fuels. Using captured CO₂ in this way “exacerbates global warming by boosting oil production and prolonging the fossil fuel era.”¹⁵² The “vast majority” of currently-deployed carbon capture operations are used for this purpose.¹⁵³ Indeed, more than 80 percent of all deployed CCS capacity has been used for EOR.¹⁵⁴ And EOR could be used to extract an additional forty-eight billion barrels of oil in the United States alone by 2030.¹⁵⁵ As one critic has noted, “The argument in favor of enhanced oil recovery is often that if they weren’t using this captured CO₂, they’d be using some other CO₂, but I don’t think you can call anything where you’re getting more oil out of the ground to burn a climate solution.”¹⁵⁶

The OBBBA made the continued use of carbon capture for EOR more likely. Previously, under the IRA, the 45Q tax credit gave a greater subsidy to carbon that would be captured and permanently sequestered, and a smaller subsidy to carbon that would be utilized for EOR.¹⁵⁷ In the OBBBA, there is now parity between the subsidies, meaning that it is as profitable to sequester CO₂ as it is to use CO₂ to extract more fossil fuels (which in turn produces more CO₂).¹⁵⁸ Oil and gas companies can therefore use these subsidies to extract even more oil through EOR, rather than focusing on decarbonizing hard-to-abate industries.

Some jurisdictions have recognized that using carbon capture to perpetuate activities like EOR counteracts any potential climate-related benefits of the technologies. For instance, California banned the use of CCS for EOR in 2022.¹⁵⁹ But it is by far the exception, not the rule. And the widespread embrace of CCS by the industries that have contributed to climate change seems destined to continue, given the extension and expansion of current federal incentives.

150. NAT’L PETROLEUM COUNCIL, MEETING THE DUAL CHALLENGE: A ROADMAP TO AT-SCALE DEPLOYMENT OF CARBON CAPTURE, USE, AND STORAGE, CHAPTER EIGHT – CO₂ ENHANCED OIL RECOVERY 12–13, https://dualchallenge.npc.org/files/CCUS-Chap_8-030521.pdf (last updated Mar. 12, 2021) [<https://perma.cc/M2NR-23P9>] (discussing how existing Class II EOR technologies can be used to advance long-term CCS).

151. *Enhanced Oil Recovery*, DEP’T OF ENERGY, <https://www.energy.gov/fecm/enhanced-oil-recovery> [<https://perma.cc/T7SA-DQZY>] (last visited Aug. 4, 2025).

152. CIEL Report, *supra* note 32, at 2; *see also* MARK Z. JACOBSON, 100% CLEAN, RENEWABLE ENERGY AND STORAGE FOR EVERYTHING 91–106 (2020).

153. CIEL Report, *supra* note 32, at 2.

154. *Id.* at 8.

155. NAT’L ENERGY TECH. LAB’Y, CARBON DIOXIDE ENHANCED OIL RECOVERY: UNTAPPED DOMESTIC ENERGY SUPPLY AND LONG TERM CARBON STORAGE SOLUTION 20 (2010), https://www.netl.doe.gov/sites/default/files/netl-file/CO2_EOR_Primer.pdf [<https://perma.cc/NS7M-YCC2>].

156. Westervelt, *supra* note 78.

157. Jones & Marples, *supra* note 117.

158. Blackburn, *supra* note 31.

159. SB-1314, 2022 (Cal. 2022); David C. Smith, *Carbon Capture and Sequestration – “Essential,” But Too Little, Too Late?*, 44 ENERGY L.J. 65, 73–74 (2023).

Thus, the entities that are responsible for the greatest production of CO₂ have come to champion CCS. There is reason to be skeptical. As Mike Levien aptly summarizes the issue:

Whether CCS is *truly* decarbonization is a more difficult question. It seeks to remove carbon dioxide only at the very last stage of the fossil economy (combustion), leaving the remainder of its metabolic cycle intact. It does not represent energy transition, as it is precisely the preservation rather than liquidation of fossil fuels.¹⁶⁰

C. *Slow Violence*

Whether for sequestration or EOR, CCS creates an “out of sight, out of mind” solution to the question of what to do with excess CO₂ emissions. But in fact, CCS technology would simply prolong and amplify existing risks—both to the communities near its infrastructure and to a world struggling to meet climate targets. This is why, rather than serving as a panacea to bridge the transition to a new era, CCS fits more straightforwardly in an existing lineage of technologies whose spatially and temporally decentralized toxic impacts wreak a very real violence on people and the environment. Characterizing CCS as part of this lineage is a necessary first taxonomic step to understanding why the current regulatory regime is insufficient.

The theory of “slow violence,” developed first in the social sciences but since deployed by legal scholars in diverse disciplines,¹⁶¹ offers a relatively straightforward insight to conceptualize this phenomenon and renders visible the otherwise hidden risks with CCS technology. “Violence is customarily conceived as an event or action that is immediate in time, explosive and spectacular in space, and as erupting into instant sensation visibility.”¹⁶² And in the environmental context, violence is often defined by major destructive events. From the BP Oil Spill in the Gulf of Mexico to the Norfolk Southern derailment in East Palestine, Ohio, major headlines and public concern around environmental harm is often effectively roused by visible disaster.¹⁶³ But, as is increasingly clear, there are many grave environmental harms that occur at an

160. Levien, *supra* note 39.

161. See, e.g., Helen H. Kang, *Bearing Witness to Environmental Injustice: The Path Forward*, 54 ENV'T L. 315 (2024); Laila L. Hlass, *The Slow Death of Childhood for Immigrant Youth*, 19 HARV. L. & POL'Y REV. 539, 545–48 (2025); Cynthia Godsoe, *The Victim/Offender Overlap and Criminal System Reform*, 87 BK. L. REV. 1319, 1335 (2022); Elena Gofel & Kate Evans, *The Road to Slow Deportation*, 74 DUKE L. REV. 1389, 1404–07 (2025); Sarah L. Swan, *Plaintiff Cities*, 71 VAN. L. REV. 1227, 1249–51 (2018).

162. NIXON, *supra* note 43, at 2.

163. See, e.g., Lisa Friedman, *Ten Years After Deepwater Horizon, U.S. is Still Vulnerable to Catastrophic Spills*, N.Y. TIMES (Apr. 21, 2020), <https://www.nytimes.com/2020/04/19/climate/deepwater-horizon-anniversary.html> [<https://perma.cc/6WGW-JWMX>]; Scott Detrow, Erika Ryan & Tinbete Ermyas, *'People Do Avoid Me': How a Toxic Train Derailment Split a Village in Two*, NPR (Feb. 5, 2024), <https://www.npr.org/2024/02/05/1228772709/east-palestine-train-derailment-norfolk-southern-lawsuit-epa> [<https://perma.cc/488P-TUAK>].

incremental and largely invisible scale. For instance, “forever chemicals,” and perhaps most obviously climate change, are the types of insidious environmental harms that occur—for the most part—at a relatively undetectable and unspectacular scale.¹⁶⁴ Indeed, it is sometimes episodes of spectacular violence that render longer, quieter patterns of slow violence visible.

In his study of global environmental movements, Rob Nixon posits the need “to engage a different kind of violence, a violence that is neither spectacular nor instantaneous, but rather incremental and accretive, its calamitous repercussions playing out across a range of temporal scales.”¹⁶⁵ He thus defines slow violence as “a violence of delayed destruction that is dispersed across time and space, an attritional violence that is typically not viewed as violence at all.”¹⁶⁶

As Julie Sze further elaborates on the phenomenon, “Slow violence [is] primed for interpretive debate, even new imaginings of accountability Protracted harm can at times condition apathy. [However,] it can also inspire *manipulations* of time and creative rearrangements of history.”¹⁶⁷ Thus, phenomena that perpetuate slow violence distort temporal registers and make it difficult to attribute causality and responsibility to harm, rendering remedies elusive. And, as Chloe Ahmann adds, “Slow violence is a condition that seems to invite incoherence. It takes too long, it is hard to notice, and it casts a wide chasm between effects and the various forces”¹⁶⁸

Time is a key element to slow violence. Nixon notes that we live “[i]n an age of degraded attention spans” where “[f]ast is faster than it used to be.”¹⁶⁹ This obscures the ability to think, and act, with longer time horizons in mind. “In this cultural milieu of digitally speeded up time, and foreshortened narrative, the intergenerational aftermath becomes a harder sell.”¹⁷⁰ He therefore suggests that

164. Of course, climate change is becoming increasingly visible with major natural disasters capturing headlines across the world. See, e.g., Robert McSweeney & Ayesha Tandon, *Mapped: How Climate Change Affects Extreme Weather Around the World*, CARBONBRIEF (Nov. 18, 2024), <https://interactive.carbonbrief.org/attribution-studies/index.html> [<https://perma.cc/X9MH-NZ3H>]; *Climate Change Widespread, Rapid, and Intensifying*, IPCC (Aug. 9, 2021), <https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr> [<https://perma.cc/H4UM-P8DX>]; UNITED NATIONS ENVIRONMENT PROGRAMME, EMISSIONS GAP REPORT 2025: OFF TARGET- CONTINUED COLLECTIVE INACTION PUTS GLOBAL TEMPERATURE GOAL AT RISK xii–xxi (2025), <https://wedocs.unep.org/rest/api/core/bitstreams/4830e1a8-14c0-44a5-a066-cdd2ba5b3e10/content> [<https://perma.cc/9HY5-ZMP7>].

165. NIXON, *supra* note 43, at 2.

166. *Id.*

167. JULIE SZE, ENVIRONMENTAL JUSTICE IN A MOMENT OF DANGER 55 (1st ed., 2020) (quoting Chloe Ahmann, *Slow Violence and the Manipulation of Time*, 33 CULTURAL ANTHROPOLOGY 165 (2018)).

168. Chloe Ahmann, “*It’s Exhausting to Create an Event Out of Nothing*”: *Slow Violence and the Manipulation of Time*, 33 CULTURAL ANTHROPOLOGY 142, 164 (2018).

169. NIXON, *supra* note 43, at 13.

170. *Id.*

to respond to environmental crises that play out on a slower time scale, and “to render slow violence visible” we must “redefin[e] speed.”¹⁷¹

Slow violence is especially prevalent in debates around climate science. Nixon writes that “well-funded, well-organized interests . . . invest heavily in manufacturing and sustaining a culture of doubt around the science of slow violence, thereby postponing policies that would help rein in the long-term impacts of climate change in particular.”¹⁷² Fossil fuel interests, namely Big Oil and Big Coal, are invested in perpetuating dependence on their products, and “slow violence provides prevaricative cover of deferred consequences,” employing lobbyists and consultants to “literally buy time.”¹⁷³

The research of geographer Thom Davies renders visible forms of slow violence playing out in communities that are soon-to-be sites of new carbon capture infrastructure. Davies’s study of Louisiana’s Cancer Alley “examines the role of time within communities exposed to toxic hazards”¹⁷⁴ and illustrates some common characteristics of the experience of slow violence. In particular, he shows how “communities who have been ‘designated expendable’ are allowed to suffer the attritional violence of environmental pollution, often through the violent inaction of regulating authorities.”¹⁷⁵ He posits that in Cancer Alley, communities have been deemed sacrifice zones.¹⁷⁶ Among residents who are aware of the invisible toxicity of the industry that surrounds them, Davies documented a pervading sense that slowly, they have been left to die.¹⁷⁷ Against this backdrop, there is a constant uneasiness, an anxiety about what comes next. When new industry arrives, residents receive little notice. “We don’t find out that something is *going* to happen to us—it’s already happened!”¹⁷⁸ They also have a sense that state and federal agencies are impotent in the face of these forces, if not actively advancing them.¹⁷⁹

As will be developed further in Part III, carbon capture infrastructure, as a false solution to the climate crisis, embodies these characteristics of slow violence.¹⁸⁰ Reliance on carbon capture as a salvo to anthropogenic warming

171. *Id.* (“We see such efforts in talk of accelerated species loss, rapid climate change, and in attempts to recast ‘glacial’—once a dead metaphor for ‘slow’—as a rousing, iconic image of unacceptably fast loss.”).

172. *Id.* at 39.

173. *Id.* at 40.

174. Davies, *supra* note 44, at 1538.

175. *Id.* at 1540.

176. *Id.* at 1542; *see also* Shalanda H. Baker, *Anti-Resilience: A Roadmap for Transformational Justice Within the Energy System*, 54 HARV. C.R.-C.L. L. REV. 1, 5–6 (2019).

177. *See* Davies, *supra* note 44, at 1540.

178. *Id.* at 1546.

179. *Id.* at 1545–46.

180. Indeed, the Cancer Alley corridor of Louisiana is slated to receive many carbon capture projects if permitting proceeds as planned. *See U.S. Carbon Capture Activity and Project Map*, CLEAN AIR TASK FORCE, <https://www.catf.us/ccsmapus> [<https://perma.cc/PP2R-EPTQ>] (last visited Aug. 4, 2025); Nina Lakhani, *Costly Climate ‘Solutions’ Look Like More Pollution in Louisiana’s ‘Cancer*

distorts the realities of time and space to perpetuate harm. It manipulates time by extending reliance on fossil fuels, concealing the urgency of the need for a true transition away from those sources of energy, and embedding a landscape of dangerous infrastructure for decades to come. And it manipulates space by hiding the siting of that infrastructure—through vast networks of pipelines and underground wells, it literally conceals the material generated through continued reliance on fossil fuels.¹⁸¹ It also has an extreme potential for “violence,” as Nixon uses the term.¹⁸² As explored in the following Part, this potential for “slow violence” is not an inherent attribute of the technology but one that flows from the lax regulatory apparatuses governing carbon capture infrastructure, especially CO₂ pipelines and sequestration wells.

II. THE FEDERAL REGULATORY REGIMES GOVERNING CO₂ PIPELINES AND WELLS

The federal regulatory regimes that govern carbon capture projects will facilitate their potential for slow violence—a violence that will be punctuated and made visible by inevitable episodes of spectacular violence, like the pipeline rupture in Satartia. Unlike other types of energy infrastructure, where longstanding and robust federal regulation provides ample opportunity to engage with the potential near- and long-term impacts of projects, CCS infrastructure is relatively under-regulated at the federal level. Indeed, in some ways it is an area of federal regulation that bucks the “abundance” critique of regulatory regimes.

As previously discussed, it is federal funding that has driven the frantic boom in CCS development across the country.¹⁸³ But other areas of federal law that would ensure the safe deployment of this relatively-untested technology have not kept pace with the financial incentives, leaving it up to individual states and localities to respond to this rapid imposition.¹⁸⁴ Indeed, as one commentator

Alley,’ THE GUARDIAN (July 29, 2024), <https://www.theguardian.com/environment/article/2024/jul/29/carbon-capture-pollution-louisiana-cancer-alley> [<https://perma.cc/B5VH-DEHP>].

181. Mike Levien’s insights about reactionary decarbonization further underscore this potential for slow violence by articulating how CCS represents the ossification of hegemonic energy frameworks, rather than serving as a bridge towards a just transition. As Levien writes:

[CCS] is the cutting edge of what I suggest we call reactionary decarbonization. It is reactionary because it represents a defensive recalibration of the fossil energy regime to ward off the radical challenge to its existence posed by the climate movement. It is also reactionary because in shoring up the regional hegemony of the oil and gas industry, CCS not only reproduces but expands its ecologically destructive and unequal status quo—especially in the racial distribution of toxic risk.

Levien, *supra* note 39.

182. See generally *supra* Introduction (discussing the accident in Satartia).

183. Indeed, the OBBBA has only reaffirmed the federal financial commitment to this buildout in the form of the 45Q tax credit.

184. There is a diverse patchwork of state and local laws that will also regulate the buildout of the CCS industry. A review of these laws is outside the scope of this Article, but it bears noting that some of those laws, if sufficiently rigorous in their application requirements and inclusive of public participation, could combat or slow some of the worst outcomes furthered by current federal law. Some

aptly noted, “[n]o coherent regulatory framework governs CCS,” and instead, “each project is subject to a patchwork of both federal and state regulations.”¹⁸⁵ This Part will explore how the primary federal regimes regulating CCS pipelines and wells act to expedite development of new CCS infrastructure without providing opportunities for individualized considerations of risk, especially when it comes to siting, and without sufficient notice to those who would be exposed to the risk. They also do not provide long-term accountability mechanisms to ensure that foreseeable harms are averted or redressed. The regulations that apply to the point of capture, namely to individual facilities using carbon capture technology to capture their CO₂ emissions, are outside the scope of this Article. Instead, the focus of this discussion is the infrastructure that supports and facilitates the transport and storage of that CO₂.

This Part will first examine pipelines, discussing how the current federal regulatory regimes governing CO₂ pipelines are not sufficiently protective of the communities these pipelines will impact. The primary federal laws that most owners and operators of CO₂ pipelines must comply with are the Army Corps Clean Water Act Section 404 permitting process—which applies if a pipeline will cross a water of the United States, as many will, given their size¹⁸⁶—and the Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations.¹⁸⁷ Some projects may require approvals under other federal regulatory regimes, such as the Endangered Species Act, Fish and Wildlife Conservation Act, National Historic Preservation Act, and Clean Air Act, but this Article will focus predominantly on the Corps’ permitting process and PHMSA compliance.¹⁸⁸ These two sets of legal requirements—Corps permitting and PHMSA regulations—do not adequately provide for community notice about where pipelines will be sited, allow for public engagement, or measure risk, locally or more broadly.¹⁸⁹ Moreover, on the front end, they allow for expedited, generalized permitting instead of careful, deliberative siting decisions. And on the back end, they do not provide sufficient long-term protections for decommissioning old infrastructure.

This Part will next discuss the federal regulatory regimes governing Class VI wells, which are intended for the long-term storage of CO₂. On the front end,

of these laws may also afford real sites of local resistance by rendering visible the harms of CCS infrastructure, both through siting policy and meaningful cumulative impacts review. For a comprehensive list of those laws, see *CCUS State Legislative Tracker*, CDRL, <https://cdrlaw.org/ccus-tracker> (last updated Feb. 10, 2026) [<https://perma.cc/F5Q7-D4YK>].

185. Carl E. Stenberg & Alexander Lawson, *Technology Agnosticism and Carbon Capture: A Practical Effort Against Climate Change in an Era of Polarized Policymaking*, 53 TEX. ENV’T L.J. 44, 81 (2023).

186. Clean Water Act § 404, 33 U.S.C. § 1344; 40 C.F.R. § 230.1 (2026).

187. 49 U.S.C. §§ 60101–60303; 49 C.F.R. § 195 (2026).

188. MARTIN LOCKMAN, PERMITTING CO₂ PIPELINES, SABIN CENTER FOR CLIMATE CHANGE LAW 28 (2023), https://scholarship.law.columbia.edu/sabin_climate_change/207 [<https://perma.cc/M439-RSN8>]; see also Righetti, *supra* note 204, at 930, 931.

189. See 49 U.S.C. §§ 60101–60303; see also 49 C.F.R. § 195 (2026).

permitting is governed by the Safe Drinking Water Act (SDWA) because the wells are part of the Underground Injection Control (UIC) program, which is concerned with the interplay between underground wells for waste injection and potential risks to drinking water.¹⁹⁰ The SDWA requires extensive environmental review for initial Class VI well permitting.¹⁹¹ But the SDWA also allows states to seek primary enforcement authority over Class VI regimes, so long as their statutes are approved by EPA for being “as stringent” as their federal counterparts.¹⁹² As discussed below, those state primacy applications already approved by EPA suggest a concerning trend of liability release for well owners and operators—which are not available under the federal regime—that would transfer the long-term risk of accidents from private entities onto state governments and ultimately their residents. Those provisions are problematic for two reasons. First, they suggest that state regimes are not as “stringent” as their federal counterparts. Second, they could incentivize risky well site development, with owners and operators knowing they will not be liable for accidents in the future, burying long-term risk to future disastrous consequences. As with the laws covering pipelines, these liability release laws lay the groundwork for a protracted risk timeline where cause and potential future effect are separated. Transparency, accountability, and community-centered decision making are notably absent from any of these regimes.

Finally, this Part will briefly offer a counterpoint to federal under-regulation by discussing one area where federal oversight is more stringent and there is greater opportunity for public participation: the laws governing CO₂ pipelines on federal lands. Although a thoroughgoing review of the state of carbon capture on federal lands is largely outside the scope of this Article, this Part will introduce the Bureau of Land Management’s (BLM) treatment of CO₂ pipeline projects as a contrast to the dominant regulatory regime on non-federal lands. Then, the final Part of this Article will explore how the BLM’s regulatory regime slowed a recently proposed CO₂ pipeline, mandating additional public participation and review.

A. Laws Governing Pipelines Transporting CO₂

Pipelines will play an essential role in facilitating the proposed CCS buildout, acting as the connective tissue between facilities and Class VI wells or EOR sites by conveying captured CO₂ from the points of emission to the final injection site.¹⁹³ Yet only about five thousand miles of CO₂ pipeline are currently

190. 42 U.S.C. §§ 300h–300h-9 (governing the UIC program).

191. 40 C.F.R. § 146.81–146.95 (2026).

192. 40 C.F.R. § 145.11(b)(1); *Primary Enforcement Authority for the Underground Injection Control Program*, EPA, <https://www.epa.gov/uic/primary-enforcement-authority-underground-injection-control-program-0> (last updated Nov. 17, 2025) [<https://perma.cc/RV9K-RWQW>].

193. Julia Davis, et al., *Carbon Dioxide Pipelines Are Disproportionally Located in Marginalized Communities in the United States*, 6 COMM’NS, EARTH, & ENV’T 339, 1 (May 2, 2025) (describing the role of and need for more carbon dioxide pipelines).

operational in the United States.¹⁹⁴ The Department of Energy predicts that to meet net-zero goals by 2050, there will need to be six to almost twenty times as much pipeline infrastructure—or between thirty thousand and ninety-six thousand miles of pipeline.¹⁹⁵ Additionally, current pipeline infrastructure has been largely used to facilitate the transportation of liquified CO₂ for EOR.¹⁹⁶ Many experts suggest that substantial upgrades must be made to this infrastructure if it is to be used for CCS purposes.¹⁹⁷ But whether through building new or retrofitting existing infrastructure, there is a massive projected boom in CO₂ pipelines.

As will be discussed in greater detail below, from a safety standpoint, “[t]hese are not your grandmother’s pipelines.”¹⁹⁸ CO₂ pipelines can be uniquely lethal if rupture allows for a high-volume release of supercritical CO₂.¹⁹⁹

Pipelines transporting CO₂ are also unique because, unlike other types of pipelines, they have no federal operational regulator.²⁰⁰ Both the Federal Energy Regulatory Commission and the Surface Transportation Board (STB) have disclaimed operational oversight over CO₂ pipelines.²⁰¹ And although there is debate about whether the STB might have authority to regulate the operation of CO₂ pipelines under federal law, “no agency currently exercises that authority.”²⁰² Some suggest that STB oversight is only a matter of time and

194. PAUL W. PARFOMAK, CONG. RSCH. SERV., IN 12269, SITING CHALLENGES FOR CARBON DIOXIDE (CO₂) PIPELINES 1 (Nov. 30, 2023); *USDOT Proposes New Rule to Strengthen Safety Requirements for Carbon Dioxide Pipelines*, U.S. DEP’T OF TRANS. (Jan. 15, 2025), <https://www.transportation.gov/briefing-room/usdot-proposes-new-rule-strengthen-safety-requirements-carbon-dioxide-pipelines> [<https://perma.cc/289Y-XKAK>].

195. U.S. DEP’T OF ENERGY, PATHWAYS TO COMMERCIAL LIFTOFF: INDUSTRIAL DECARBONIZATION FAMILY 26-27 (2024), <https://liftoff.energy.gov/wp-content/uploads/2024/02/20230424-Liftoff-Carbon-Management-vPUB> [<https://perma.cc/44KK-CHGG>].

196. PARFOMAK, *supra* note 194, at 1; Tristan Baurick, *Trump Withdraws New Pipeline Rules Inspired by CO₂ Leaks in Mississippi, Louisiana*, LA. ILLUMINATOR (Mar. 8, 2025), <https://lailluminator.com/2025/03/08/co2-pipeline> [<https://perma.cc/D358-YCKU>].

197. See Philip M. Marston & Patricia A. Moore, *From EOR to CCS: The Evolving Legal and Regulatory Framework for Carbon Capture and Storage*, 29 ENERGY L.J. 421, 463 (2008) (noting that the “operational imperatives of a CO₂ pipeline built to support EOR oil production projects . . . differ substantially from the operational requirements likely to be required of CO₂ pipelines used solely for CCS purposes”).

198. Westervelt, *supra* note 78; see also *A CO₂ Pipeline Rupture Could be Deadly. Are You in the Kill Zone?*, CO₂ PIPELINE KILL ZONE, <https://www.co2pipelinezone.com> [<https://perma.cc/8U9D-GVKS>] (last visited Feb. 24, 2026).

199. Westervelt, *supra* note 78.

200. Lockman, *supra* note 188, at 9.

201. *Id.* The Federal Energy Regulatory Commission regulates interstate oil and natural gas pipelines per the Natural Gas Act and Interstate Commerce Act. See *id.* at 8. STB oversees the interstate land and water transportation of any commodity other than water, gas, or oil. 49 U.S.C. § 15301.

202. Lockman, *supra* note 188, at 10 (discussing the tension between *Cortez Pipeline Co.*, 7 FERC ¶ 61024, 61040 (1979) and a 1998 Government Account Office report suggesting that STB has oversight authority over CO₂ and hydrogen); see also William G. Bolgiano, *FERC’s Authority to Regulate Hydrogen Pipelines Under the Interstate Commerce Act*, 43 ENERGY L.J. 1, 52–53 (2022); Marston & Moore, *supra* note 197, at 453 (“Accordingly, it seems clear under current law that the

litigation, but in the interim, operators do not need to seek operational permits from the federal government.²⁰³ Thus, in a domain where one might expect federal regulatory oversight—for the often interstate transport of hazardous materials via pipeline—there is none.

Indeed, there are few federal permitting and regulatory requirements for CO₂ pipeline infrastructure. Although there is no federal siting or eminent domain authority over CO₂ pipelines, CO₂ pipeline projects could trigger requirements under several other federal regulatory regimes, including the Clean Water Act, the National Environmental Policy Act (NEPA), the Endangered Species Act, and the National Historic Preservation Act.²⁰⁴ When triggered, “These processes may increase public awareness about CO₂ pipeline projects, enhance consideration of potential impacts, and influence siting decisions made pursuant to state law.”²⁰⁵ But as discussed below, the Army Corps’ Nationwide Permit (NWP) program may render these analyses largely insubstantial and exclude community participation. Additionally, pipeline safety is regulated by the PHMSA under the Pipeline Safety Act (PSA) and lags far behind what would ensure safe and informed siting of CCS pipeline infrastructure.²⁰⁶

Therefore, the only meaningful federal regulation over CCS exists under the Army Corps’ Clean Water Act permitting authority and the PSA. This Subpart will discuss the Clean Water Act permitting under the Army Corps’ NWP program because it is the primary site of environmental regulation relating to project siting and could preclude the invocation of other often-triggered federal environmental review statutes like NEPA. It also will explore the safety regulations that CO₂ pipelines must follow under the PSA. Both statutory regimes work to “invisibilize” pipeline infrastructure by limiting public notice and participation. They also promote the concretion of CCS as a false solution by easing the path to pipeline construction, expediting carbon capture market dominance to the exclusion of renewable energy sources, and extending reliance on fossil fuel infrastructure.

1. *Environmental Regulations under the Clean Water Act*

The primary site of environmental regulation for CO₂ pipelines is the Army Corps of Engineers’ permitting program under Section 404 of the Clean Water

interstate transportation of supercritical CO₂ by pipeline is not subject to STB regulation under the Interstate Commerce Act.”).

203. Bolgiano, *supra* note 202, at 53 (“[I]n a fully litigated proceeding [there] should be a sound basis to conclude that, as soon as the STB faces the issue, carbon dioxide pipelines will be found to be regulated and that no gap exists between any of the [Natural Gas Act, Interstate Commerce Act, or Interstate Commerce Commission Termination Act] regulatory regimes.”).

204. Tara K. Righetti, *Siting Carbon Dioxide Pipelines*, 3 OIL & GAS, NAT. RES. & ENERGY L.J. 907, 931 (2017).

205. *Id.*

206. 49 U.S.C. §§ 60101–60301; 49 C.F.R. § 195 (2026); *see* PARFOMAK, *supra* note 194, at 3; *see also* Baurick, *supra* note 196.

Act. Many of the pipelines, by virtue of their size, will cross “navigable waters” of the United States, which are under the Corps’ jurisdiction.²⁰⁷ Section 404 allows permits for “the discharge of dredged or fill material” into navigable waters of the United States on either an individual basis or through a more general “nationwide permit.”²⁰⁸

Individual Permits

To understand what is lost by regulating CO₂ pipelines under the NWP program, it is useful to understand the alternative: the individual permit. Individual permits require extensive site-specific analysis by the Corps. First, the Corps’ 404(b)(1) Guidelines interpreting the Clean Water Act begin with a strong statement that “most wetlands constitute a productive and valuable public resource, the unnecessary alteration or destruction of which should be discouraged as contrary to the public interest.”²⁰⁹ Interpreting courts have emphasized that the “presumption [against destruction] is very strong.”²¹⁰ This presumption may be overcome only after careful balancing of extensive criteria, including impacts to wetlands; water quality; historic, cultural, scenic, and recreational values; property ownership; floodplain management; and other requirements under federal, state, or local law.²¹¹ The 404(b)(1) Guidelines also require an extensive alternative sites analysis to demonstrate that there is no “practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem.”²¹²

Additionally, individual permits require review under NEPA and the Corps’ public interest regulations.²¹³ Under NEPA, when issuing individual permits, the Corps must prepare either an environmental assessment (EA) if the project “is not likely to have significant effects” or “the significance of the effects is unknown,”²¹⁴ or a longer environmental impact statement (EIS) for “major Federal actions significantly affecting the quality of the human environment.”²¹⁵ Although the Council on Environmental Quality’s NEPA regulations long relied upon by the Corps were recently rescinded, where an EIS is required, the plain text of NEPA itself mandates that the Corps consider the “reasonably foreseeable

207. 33 U.S.C. § 1334(a).

208. 33 U.S.C. § 1334(a); Lockman, *supra* note 188, at 29.

209. 33 C.F.R. § 320.4(b).

210. *Buttrey v. U.S.*, 690 F.2d 1170, 1180 (5th Cir. 1982).

211. 33 C.F.R. §§ 320.4(b)–(r).

212. 40 C.F.R. § 230.10(a).

213. This Article will not explore how pipelines crossing federal Bureau of Land Management lands might trigger additional NEPA review.

214. 33 C.F.R. § 333.15. For some projects, a categorical exclusion may preclude NEPA review altogether. *See id.* § 333.14.

215. 42 U.S.C. § 4332(C).

environmental effects.”²¹⁶ Additionally, under the Corps’ new and recently-released implementing regulations for NEPA, the agency must consider “both short- and long-term effects . . . beneficial and adverse effects . . . effects on public health and safety . . . [and] economic effects” when determining the scope of review, and produce an EIS if there is a “reasonably foreseeable significant effect” on the environment.²¹⁷ Moreover and importantly, even though NEPA does not “mandate[] a specific outcome, the NEPA process provides opportunity for stakeholder and agency input on proposed projects”²¹⁸

The impacts of any particular CO₂ pipeline—and whether an EA or EIS is required—would vary depending on the piece of the project reviewed. Referred to as the “small-handle” problem,²¹⁹ if the Corps were to look only at the piece of a project impacting navigable waters of the United States, the impacts assessment would be more modest than if its review were required to expand out to include the full pipeline, the facility and carbon sequestration well, or even the greenhouse gas emissions of the overall operation.²²⁰

Finally, under its separate public interest regulations, the Corps must balance the reasonably foreseeable benefits of a project against its “reasonably foreseeable detriments.”²²¹ This requires consideration of a host of factors, including “conservation, economics, aesthetics, general environmental concerns, wetlands . . . and, in general, the needs and welfare of the people.”²²² Especially important is a showing that the following general criteria have been met:

- (i) The relative extent of the public and private need for the proposed structure or work;
- (ii) Where there are unresolved conflicts as to resource use, the practicability of using reasonable alternative locations and methods to accomplish the objectives of the proposed structure or work; and
- (iii) The extent and permanence of the beneficial and/or detrimental effects which the proposed structure or work is likely to have on the public and private uses to which the area is suited.²²³

216. 42 U.S.C. § 4332(C)(i). Formerly, the agency was required to weigh the direct, indirect, and cumulative effects of a project. Cumulative effects are defined as the “other past, present, and reasonably foreseeable future actions regardless of what agency . . . or person undertakes such other actions.” 40 C.F.R. § 1508.1(i)(3). Those effects do not just include ecological impacts, but also “aesthetic, historic, cultural, economic, social, or health [impacts], such as disproportionate and adverse effects on communities with environmental justice concerns.” *Id.* § 1508.1(i)(4). Whether or how any cumulative impacts analysis will survive under the new regulations remains to be seen.

217. 33 C.F.R. §§ 333.12(b)(2)(i)–(iv); 333.20(a).

218. Righetti, *supra* note 204, at 932.

219. See, e.g., Mary K. Fitzgerald, *Small-Handles, Big Impacts: When Should the National Environmental Policy Act Require an Environmental Impact Statement?*, 23 B.C. ENV’T L. AFFS. L. REV. 437, 437–38 (1996).

220. See, e.g., Michael Burger & Jessica A. Wentz, *Downstream and Upstream Greenhouse Gas Emissions: The Proper Scope of NEPA Review*, 41 HARV. ENV’T L. REV. 109, 121 (2017).

221. 33 C.F.R. § 310.4(a)(1).

222. 33 C.F.R. § 320.4(a)(1).

223. 33 C.F.R. § 320.4(a)(2).

These analyses are thorough, and site specific. With the rescission of the Council on Environmental Quality's NEPA regulations, this review will be all the more important because, like the former NEPA regulations, the Corps' public interest review requires careful consideration of the cumulative impacts of a project in its entirety²²⁴ and requires a fair balancing of the costs and benefits of the project.²²⁵ This arguably requires an honest assessment of whether the purported climate benefits of a project are actually borne out in practice, and whether those purported benefits have attendant costs that have been discounted or otherwise concealed.

Finally, individual permits also require robust public notice and an opportunity for comment.²²⁶ Specifically, they must include "sufficient information to give a clear understanding of the nature and magnitude of the activity to generate meaningful comment."²²⁷ This includes the location of the proposed project, a brief description of it, drawings showing general character and location of the site, and information about how the project interacts with other statutes like NEPA and the Endangered Species Act.²²⁸ At a minimum, written comments are allowed, and in some instances, a public hearing is held.²²⁹

NWP 58

By contrast, the NWP program offers a more streamlined approach to permitting through general permits. NWPs are used for permitting projects that "are similar in nature, cause only minimal adverse environmental effects when performed separately, and have only minimal cumulative adverse effect on the environment."²³⁰ The purpose of the program is to "regulate with little, if any, delay or paperwork certain activities having minimal impacts."²³¹

NWPs require one initial, national-scale assessment of compliance with other federal environmental statutes, including NEPA, and one public notice and comment period.²³² Indeed, for each NWP, the Corps "issues a decision document, which includes a NEPA environmental assessment, a public interest review, and if applicable, a 404(b)(1) Guidelines analysis."²³³ After the Corps

224. The Supreme Court's recent decision in *Seven County Infrastructure Coalition v. Eagle County* may limit the non-project-related impacts that agencies are required to review, even if those impacts are related and foreseeable. *See* 605 U.S. 168 (2025).

225. *See, e.g.,* Hough v. Marsh, 557 F. Supp. 74, 81 (D. Mass. 1982).

226. 33 U.S.C. § 1344.

227. 33 C.F.R. § 325.3.

228. *Id.*

229. *Id.* § 325.2; 33 C.F.R. § 327.

230. Reissuance and Modification of Nationwide Permits, 86 Fed. Reg. 2744, 2745 (Jan. 13, 2021); 33 U.S.C. § 1344 (e)(1).

231. 33 C.F.R. § 330.1(b).

232. NICOLE T. CARTER, CONG. RSCH. SERV., THE ARMY CORPS OF ENGINEERS' NATIONWIDE PERMITS PROGRAM: ISSUES AND REGULATORY DEVELOPMENTS 6 (Jan. 12, 2017).

233. Issuance and Reissuance of Nationwide Permits, 82 Fed. Reg. 1860, 1861 (Jan. 6, 2017).

conducts this analysis once to issue the original general permit, it does not conduct another analysis until the NWP is up for renewal, which occurs every five years.²³⁴ Similarly, there is no additional notice or opportunity to be heard after the initial NWP rule.²³⁵ In other words, for each project that seeks permitting under a NWP rather than an individual permit, there is no notice to the public alerting potentially impacted community members that the project is seeking Corps approval.

NWPs are intended to regulate similar categories of activities. In January 2021, the Corps issued a rulemaking that created a new NWP for “utility lines” and included pipelines carrying CO₂ in that category.²³⁶ Specifically, it defined utility lines as:

any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose that is not oil, natural gas, or petrochemicals. Examples of activities authorized by this NWP include utility lines that convey water, sewage, stormwater, wastewater, brine, irrigation water, and industrial products that are not petrochemicals.²³⁷

The final rule went on to say that “[NWP] 58 can be used to authorize pipeline activities that require [Department of the Army] authorization and are used to convey hydrogen, methanated hydrogen, or carbon dioxide.”²³⁸

The Corps’ stated reasoning for grouping these pipeline categories together was, in part, to “ensure that the categories of activities authorized by these NWPs are substantially similar in nature and that they will result in no more than minimal individual and cumulative adverse environmental effects.”²³⁹ But in its decision document, there is no specific discussion about how the transport of supercritical CO₂ is substantially similar to the conveyance of water, sewage, or wastewater.²⁴⁰ It does not consider any of the broader climate impacts of

234. U.S. ARMY CORPS OF ENGINEERS, NATIONWIDE PERMIT REISSUANCE 1 (2022), <https://www.swf.usace.army.mil/Portals/47/docs/regulatory/Hot%20Topics/HQ%20NWPs%20Fact%20Sheet.pdf?ver=J4VKGcUGn0uJJl8Lvl6mA%3D%3D> [<https://perma.cc/ZHH4-CQHT>]; 33 U.S.C. § 1344(e)(2); 33 C.F.R. § 330.6(b).

235. 33 C.F.R. § 330.1(b) (describing the only notice and comment period provided for NWPs).

236. U.S. ARMY CORPS OF ENGINEERS, DECISION DOCUMENT: NATIONWIDE PERMIT NO. 58 1 (2021), <https://usace.contentdm.oclc.org/digital/api/collection/p16021coll7/id/16849/download> [<https://perma.cc/3JAM-T54H>].

237. U.S. ARMY CORPS OF ENGINEERS, NATIONWIDE PERMIT 58- UTILITY LINE ACTIVITIES FOR WATER AND OTHER SUBSTANCES 1 (2021) <https://www.swf.usace.army.mil/Portals/41/docs/missions/regulatory/2021%20NWP/2021%20nwp-58.pdf?ver=n07Ucn6ig9l0A9WtHnTTfw%3D%3D> [<https://perma.cc/ZUM9-F6XJ>].

238. Reissuance and Modification of Nationwide Permits, 86 Fed. Reg. 2744, 2771 (Jan. 13, 2021).

239. *Id.* at 2778.

240. See generally DECISION DOCUMENT: NATIONWIDE PERMIT REISSUANCE NO. 58, *supra* note 236.

including CO₂ pipelines in NWP 58, and in fact, offers almost no analysis whatsoever supporting the decision for CO₂ pipeline inclusion.²⁴¹

CO₂ pipelines are substantially different from the other types of pipelines included in NWP 58, and their inclusion obscures the true risks associated with this technology. First, many of the proposed CO₂ pipelines will cover more geographically expansive areas, often thousands of miles, traversing thousands of water bodies. For instance, Summit Carbon Solutions has proposed a 2,500 mile-long CO₂ pipeline to transport CO₂ across the Midwest, starting at ethanol plants in Iowa, traveling through Minnesota, Nebraska, and South Dakota, and ending at a Class VI well in central North Dakota.²⁴² Summit's pipeline has a projected 3,357 waterbody crossings.²⁴³ Before cancelling the project, Navigator CO₂ Ventures proposed to build a 1,300 mile pipeline across five Midwestern states.²⁴⁴ The Navigator pipeline would have had over 1,800 crossings of surface waters and wetlands.²⁴⁵ Both projects applied for NWPs by submitting preconstruction notices, rather than applying for individual permits.²⁴⁶

Under NWP 58, so long as the pipeline crossing navigable waters of the United States “does not result in the loss of greater than ½-acre of waters of the United States for each single and complete project,” it will be considered under a NWP, rather than an individual permit.²⁴⁷ Under 33 C.F.R. Section 330.2(i), each pipeline crossing of a jurisdictional water is treated as distinct, rather than cumulative, even if it crosses that same body of water multiple times at different locations or crosses multiple different jurisdictional waters.²⁴⁸ “There is no limit to the number of times that a single pipeline project can invoke NWP 58, nor is there a maximum number of acres of water that a pipeline project can impact while still being authorized in a piecemeal fashion under NWP 58.”²⁴⁹

Additionally, the risks associated with CO₂ pipeline rupture are unique and more severe than the other types of pipelines considered under the “utility line”

241. See generally *id.*

242. Jack Dura, *Midwestern Carbon Dioxide Pipeline Project Gets Approval in Iowa, But Still Has a Long Way to Go*, AP NEWS (June 25, 2024), <https://apnews.com/article/iowa-carbon-capture-co2-pipeline-summit-a3071ed0e3a8021c1ac7715ef846e47a> [<https://perma.cc/28CS-U4QG>].

243. Carolyn Raffensperger, *Who Must Protect the Rivers, Streams, and Wetlands From CO₂ Pipelines?*, SCIENCE & ENV'T'L HEALTH NETWORK (Aug. 28, 2023), <https://www.sehn.org/sehn/2023/8/24/who-must-protect-the-rivers-streams-and-wetlands-from-co2-pipelines> [<https://perma.cc/M7LK-4G9X>].

244. Leah Douglas, *Navigator CO₂ Ventures Cancels Carbon-Capture Pipeline Project in US Midwest*, REUTERS (Oct. 20, 2023), <https://www.reuters.com/sustainability/climate-energy/navigator-co2-ventures-cancels-carbon-capture-pipeline-project-us-midwest-2023-10-20> [<https://perma.cc/VLN5-UD2P>].

245. *Id.* (likening the permitting of the Summit and Navigator pipelines to the Dakota Access Pipeline).

246. CBD Petition, *supra* note 40, at 21 (describing the Summit pipeline), 23 (describing the Navigator pipeline).

247. NATIONWIDE PERMIT 58- UTILITY LINE ACTIVITIES FOR WATER AND OTHER SUBSTANCES, *supra* note 237, at 1; Lockman, *supra* note 188, at 29.

248. Raffensperger, *supra* note 243.

249. CBD Petition, *supra* note 40, at 19.

category and indeed can be potentially fatal. A report completed for the Pipeline Safety Trust explains that “[CO₂] gas is odorless, colorless, doesn’t burn, is heavier than air, and is an asphyxiant and intoxicant, making CO₂ pipeline releases harder to observe and avoid especially as a released plume spreads and migrates well off the pipeline right-of-way.”²⁵⁰ As discussed in greater detail in the following Subpart, the current federal regulatory regime does not adequately account for these unique features of CO₂.²⁵¹

For an individual permit, impacts to wetlands and threats to human health and safety would be evaluated on a site-by-site basis with full notice and comment as part of 404(b)(1), NEPA, and public interest analyses.²⁵² But by permitting CO₂ pipelines under the NWP program, the Corps does not have to conduct any of these reviews. For those CO₂ pipelines invoking NWP 58, the only documentation that the applicants submit is a preconstruction notification to the responsible engineer in the relevant Army Corps District.²⁵³ After receiving a preconstruction notification, it is the duty of the District Engineer “to evaluate the individual and cumulative adverse environmental effects of the activities authorized by an NWP The [D]istrict [E]ngineer determines the appropriate geographic scale for consideration of off-site compensatory mitigation options.”²⁵⁴ Then, to approve the project, rather than completing a full permit process as is required for an individual permit, the District Engineer need only provide a verification letter—often a box-checking exercise—confirming that the project meets the criteria of the NWP.²⁵⁵ The invocation of NWP 58 for CO₂ pipeline projects allows the pipelines to be viewed as atomized units, isolated from the other infrastructure to which they are connected and which will have significant environmental impacts.

As explored in greater detail in Part III below, the impacts of these expedited permits fall most heavily on those who are already overburdened, including many environmental justice communities and rural, low-income communities. By expediting CCS permitting and removing project assessments from public view, the NWP process perpetuates slow violence. And as developed in Part IV, although some proponents of the “abundance” movement might find value in this relatively streamlined process, these CCS projects are arguably the

250. RICHARD B. KUPREWICZ, PIPELINE SAFETY TR., ACCUFACTS’ PERSPECTIVES ON THE STATE OF FEDERAL CARBON DIOXIDE TRANSMISSION PIPELINE SAFETY REGULATIONS AS IT RELATES TO CARBON CAPTURE, UTILIZATION, AND SEQUESTRATION WITHIN THE U.S. 8 (2022) [hereinafter Pipeline Safety Trust Report], <https://pstrust.org/wp-content/uploads/2022/03/3-23-22-Final-Accufacts-CO2-Pipeline-Report2.pdf> [<https://perma.cc/95MB-TCQJ>].

251. *Id.* at 8–10.

252. *See* CBD Petition, *supra* note 40, at 8–9.

253. NATIONWIDE PERMIT 58- UTILITY LINE ACTIVITIES FOR WATER AND OTHER SUBSTANCES, *supra* note 237, at 3; Reissuance and Modification of Nationwide Permits, 86 Fed. Reg. 2744, 2744 (Jan. 13, 2021).

254. *Id.* at 2751.

255. 33 C.F.R. §§ 330.6(a)(1), 330.1(e)(1).

sort that should be subjected to slower and more deliberative approval processes to provide opportunities for fulsome risk assessments.

Pipelines in the Coastal Zone

It bears mentioning that many of the CO₂ pipelines proposed for states along the southern Gulf Coast will occur in areas that are designated as being within the coastal zone.²⁵⁶ Under 33 U.S.C. § 330.4(d), any invocation of a NWP in the coastal zone “requires the Corps to provide a consistency determination and receive state agreement prior to the issuance, reissuance, or expansion of activities authorized by an NWP that authorizes activities within a state with a Federally-approved Coastal Management program,” where the proposed CO₂ pipeline would affect or happen in the coastal zone.²⁵⁷ This determination could entail review of “additional conditions” imposed by the state.²⁵⁸ However, critically, this does not route an otherwise NWP-eligible project through the individual permit process because District Engineers “will not require or process an individual permit application for an activity otherwise qualifying for an NWP solely on the basis that the activity has not received [Coastal Zone Management Act] consistency agreement from the state.”²⁵⁹

Additionally, regional conditions can limit the impact of an NWP. Regional conditions are modifications to NWPs issued by each Corps office.²⁶⁰ For instance, Louisiana, which has many proposed CO₂ pipeline projects,²⁶¹ has a regional condition that applies specifically to NWP 58.²⁶² It requires applicants to “obtain a Louisiana Department of Natural Resources determination/certification before the NWP is valid.”²⁶³ It is unclear whether this will provide a substantial roadblock to any individual project receiving a federal permit. Regardless, it falls far short of the review normally required for an

256. 16 U.S.C. § 1453(1) (defining the coastal zone). State coastal zones are differently defined, but many states have Coastal Zone Management Programs for areas that fall within their coastal zones, often capturing areas within a certain distance of major bodies of water. *See Coastal Zone Management Programs*, NATIONAL OCEANIC AND ATMOSPHERIC ADMIN. OFF. FOR COASTAL MGMT., <https://coast.noaa.gov/czm/mystate> [<https://perma.cc/A6KZ-C7PA>] (*see, e.g.*, Texas, Louisiana).

257. 33 C.F.R. § 330.4(d)(1).

258. *Id.* § 330.4(d)(2).

259. *Id.* § 330.4(d)(5).

260. *See* Proposal to Reissue and Modify Nationwide Permits, 90 Fed. Reg. 26100, 26103 (June 18, 2025).

261. CARBON CAPTURE AND STORAGE IN LOUISIANA, OIL & GAS WATCH 4 (2023), https://environmentalintegrity.org/wp-content/uploads/2024/01/OGW_LACCSProjects_FactSheet_Final.pdf [<https://perma.cc/WR67-Q9GE>].

262. U.S. ARMY CORPS OF ENGINEERS, STATE OF LOUISIANA 2021 NATIONWIDE PERMIT (NWP) REGIONAL CONDITIONS 6 (2021), <https://www.mvk.usace.army.mil/Portals/58/docs/regulatory/2021%20NWP/2021%20NWP%20Regional%20Conditions-Louisiana.pdf?ver=tfwAunovKezuBN3EP6Rf2w%3D%3D> [<https://perma.cc/352T-E82K>].

263. *Id.*

individual permit, and offers no public notice or comment period, apart from what might be offered by the state agency.²⁶⁴

2. Safety Permitting through PHMSA Regulations

PHMSA's administration of the PSA also governs CO₂ pipelines but does not influence siting or issue individualized permits, offering only sparse safety guidelines.²⁶⁵ Specifically, PHMSA has authority to regulate the safety of pipelines, preempting state or local authority in the field of safety.²⁶⁶ This authority includes the regulation of the “‘design, construction, pressure testing, operation, maintenance, corrosion control, and reporting requirements for hazardous liquid pipelines,’ the definition of which includes pipelines transporting CO₂,” as well as emergency response planning.²⁶⁷ The limitations of PHMSA's current regulation of CO₂ pipelines are many.

First, it is not clear whether *all* CO₂ pipelines will fall under PHMSA's jurisdiction. PHMSA regulations define covered CO₂ as “a fluid consisting of more than 90 percent carbon dioxide molecules compressed to a supercritical state.”²⁶⁸ Therefore, this jurisdiction only extends to CO₂ transported in a gas or supercritical state, but not as a liquid.²⁶⁹ Yet “supercritical fluid carbon dioxide has properties of both gas and liquid.”²⁷⁰ Thus, under current regulations, some proposed CO₂ pipelines may not be covered by existing federal safety regulations at all.

Additionally, and importantly, PHMSA regulations do not cover the siting of pipelines.²⁷¹ Although the regulations govern safety concerns, these relate

264. Some of the major initial projects proposed for Louisiana's coastal zone have required individual permits because of their sizable impacts to waters of the United States, including jurisdictional wetlands. *See, e.g., MVN-2011-03218-EDM*, U.S. ARMY CORPS OF ENGINEERS (June 30, 2025), <https://www.mvn.usace.army.mil/Missions/Regulatory/Public-Notices/Article/4225953/mvn-2011-03218-edm> [<https://perma.cc/HR6N-Y84H>]. But these represent a small fraction of all permitted CCS projects. It is difficult to obtain evidence of NWP approval for CCS projects because, unlike permits, they are not publicly noticed.

265. 49 C.F.R. § 195 (2026).

266. 49 U.S.C. § 60104(c).

267. Lockman, *supra* note 188, at 46–47 (citing Jada F. Garofalo & Madeleine Lewis, *Sources to Sinks: Expanding A National CO₂ Pipeline Network*, 50 ENV'T'L L. REP. 10057, 10062 (2020)); *see also* 49 C.F.R. §§ 195.100–195.591 (2026).

268. 49 C.F.R. § 195.200 (2026).

269. *See* 49 U.S.C. § 60102(i); 49 C.F.R. §§ 195.0–195.12 (2026); CAL. NAT. RES. AGENCY, PROPOSAL TO THE LEGISLATURE FOR ESTABLISHING A STATE FRAMEWORK AND STANDARDS FOR INTRASTATE PIPELINES TRANSPORTING CARBON DIOXIDE 4 (2023), <https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Transitioning-to-Clean-Energy/SB-905--CO2-Pipeline-Regulatory-Framework--Stds-March-2023.pdf#:~:text=In%20the%20area%20of%20CCUS%20and%20carbon,intrastate%20pipelines%20transporting%20CO2%20as%20a%20liquid> [<https://perma.cc/WCP4-2FGE>].

270. CARBON DIOXIDE PIPELINE SAFETY, PIPELINE SAFETY TR. 3 (2023), https://pstrust.org/wp-content/uploads/2023/06/carbon_dioxide_pipeline_safety_summary_6_21_23.pdf [<https://perma.cc/D27V-MWYM>].

271. 49 U.S.C. § 60104(e) (explicitly noting that the chapter “does not authorize the Secretary of Transportation to prescribe the location or routing of a pipeline facility”).

entirely to risks associated with “the design, construction, operation, and maintenance” of pipelines.²⁷² But PHMSA has explicitly disclaimed any authority over siting: “the responsibility for siting new carbon dioxide pipelines rests largely with the individual states and counties through which the pipelines will operate and is governed by state and local law.”²⁷³ Therefore, whether or how the siting process can be used to protect communities will be left largely up to a patchwork of state and local regulations.²⁷⁴ But, paradoxically, courts have recently blocked several local attempts to regulate CO₂ pipeline siting as infringing on the federal government’s exclusive control over safety.²⁷⁵ These rulings may represent a growing void in the law, where no regulatory authority squarely governs CCS siting. Further, because the PSA applies only to owners and operators of pipelines,²⁷⁶ PHMSA cannot impose safety standards on state or local agencies.

Current PHMSA regulations also do not provide for adequate assessments of hazard zones from CO₂ pipelines, and current impact area analyses required for owners and operators do not sufficiently account for the types of widespread impacts that can result from CO₂ pipeline ruptures which can stretch for miles.²⁷⁷ CO₂ is piped at “very high pressure and extremely low temperatures,” and a rupture in a pipeline can cause CO₂ to release far more quickly than an equivalent gas pipeline explosion.²⁷⁸ CO₂ pipelines may be prone to “unzipping,” a process whereby ductile fractures allow a pipeline split to run a significant length of the pipe, releasing large amounts of CO₂ and potentially metal projectiles as the pipeline bursts apart.²⁷⁹ Additionally, CO₂ streams are rarely pure and may contain other dangerous contaminants mixed with the suffocating supercritical carbon, such as hydrogen sulfide, a highly flammable gas that causes irritation to eyes and respiratory tissue upon exposure, asphyxiates at high concentrations, and, like CO₂, accumulates in topographic lows.²⁸⁰ But current regulations do

272. Letter from Alan K. Mayberry, Associate Administrator for Pipeline Safety, U.S. Dep’t of Transp. Pipeline and Hazardous Materials Safety Admin., to Mr. Lee Blank, CEO, Summit Carbon Solutions 1 (Sept. 15, 2023), <https://pipelinefighters.org/news/webinar-10-12-explaining-federal-pipeline-safety-agency-phmsas-letter-re-local-authority-over-co2-pipelines> [https://perma.cc/XQY8-PLH7].

273. *Id.*

274. *See, e.g.,* Washington Gas Light Co. v. Prince George’s Cnty. Council, 711 F.3d 412, 414 (4th Cir. 2013).

275. *Couser v. Shelby Cnty., Iowa*, 139 F. 4th 664 (8th Cir. 2025) (striking down Story and Shelby County’s zoning laws limiting the siting of CCS infrastructure as preempted under state and federal law).

276. 49 U.S.C. § 60102(a)(2).

277. Pipeline Safety Trust Report, *supra* note 250, at 10.

278. CIEL Report, *supra* note 32, at 10.

279. *Id.*; *see also* Mark Hefflinger, *Tell Sec. Pete: PHMSA Must Take Action Now on CO₂ Pipeline Safety*, BOLD NEB. (May 10, 2023), <https://boldnebraska.org/tell-sec-pete-phmsa-must-take-action-now-on-co2-pipeline-safety> [https://perma.cc/9ZP2-X6ET].

280. CIEL Report, *supra* note 32, at 10; Paul Blackburn, *Rotten Eggs: The Case of the Missing Hydrogen Sulfide in Satartia Mississippi*, PIPELINE FIGHTERS HUB (July 18, 2024),

not adequately manage the possible impurities in CO₂ streams, not the least of which is water, which can cause CO₂ to be highly corrosive to pipeline infrastructure.²⁸¹ Additionally, because CO₂ is odorless, it is undetectable when it leaks.²⁸² PHMSA regulations mandate no odorant requirement.²⁸³

PHMSA regulations do require additional safeguards for areas deemed High Consequence Areas (HCAs).²⁸⁴ These areas are defined by population density and, when a pipeline with a jurisdictional substance is slated to pass through an HCA, additional regulatory hurdles must be met.²⁸⁵ Specifically, HCAs include locations with forty-six or more buildings where a pipeline is within one hundred yards of a building or well-defined outside area;²⁸⁶ or a place “where buildings with four or more stories above ground are prevalent;”²⁸⁷ or areas “where the potential impact radius is greater than 660 feet,” and there are “[twenty] or more buildings intended for human occupancy” within that circle.²⁸⁸ Although a focus on HCAs can provide needed protections for more densely populated areas, it excludes people living in rural areas. As recent briefing in the Summit Pipeline case before the Iowa Utilities Board makes clear, this can erase rural residents and communities, depriving them of protections afforded to other populations and placing their lives and property at great risk.²⁸⁹

These risks and deficiencies with the current regulatory regime were laid bare by the Satartia, Mississippi accident—which happened in a rural area, not an HCA.²⁹⁰ The PHMSA investigation that ensued resulted in a Notice of Proposed Violation to Denbury, the pipeline operator, and a proposed \$3.9 million in civil penalties, which was later decreased to \$2.8 million—a pittance for a company of Denbury’s size.²⁹¹ Indeed, the fine amounted to 0.2 percent of Denbury’s annual oil production value.²⁹² The accident has served to highlight the serious risks of CO₂, and initially prompted PHMSA to release a proposed rule offering far more stringent safety protections for CO₂ pipelines including

<https://pipelinefighters.org/news/paul-blackburn-rotten-eggs-the-case-of-the-missing-hydrogen-sulfide-in-satartia-mississippi> [<https://perma.cc/3WDH-ESUK>].

281. Pipeline Safety Trust Report, *supra* note 250, at 1.

282. *Id.* at 8.

283. *Id.*

284. 49 C.F.R. § 195.452 (2026).

285. *Id.* §§ 195.450–195.452.

286. *Id.* § 193.903; *see also id.* § 192.5(b)(3).

287. *Id.* § 192.5(b)(4).

288. *Id.* § 193.903.

289. *See In Re: Summit Carbon Solutions LLC*, Docket No. HLP-2021-0001 (Ia. U. B. Dec. 29, 2023) (Sierra Club’s Post-Hearing Brief).

290. FAILURE INVESTIGATION REPORT, *supra* note 12, at 1.

291. *Id.*; Paul Blackburn, *What Did PHMSA’s “Consent Agreement” Over Denbury’s CO₂ Pipeline Rupture in Satartia Really Do?*, PIPELINE FIGHTERS HUB (Apr. 24, 2023), <https://pipelinefighters.org/news/what-did-phmsas-consent-agreement-on-the-denbury-co2-pipeline-rupture-in-satartia-really-do> [<https://perma.cc/HV6C-YNMT>].

292. Blackburn, *supra* note 291.

additional protections for pipelines slated to pass within two miles of HCAs.²⁹³ However, that rule—proposed in January 2025 shortly before the Trump administration took office—was promptly rescinded.²⁹⁴ The agency has not proposed a new rule.²⁹⁵ Meanwhile, residents continue to experience long-term health impacts from the accident.²⁹⁶

Finally, there is no plan for safely decommissioning this infrastructure after its operational use is completed. PHMSA regulates pipelines only until the end of operational activity—once pipelines are no longer in use, there is no requirement to maintain or remove the potentially dangerous infrastructure from people's neighborhoods, or even their backyards.²⁹⁷

In sum, PHMSA regulations work to obscure the threat of CCS infrastructure, making it invisible. There is no notice to communities about pipeline siting and no opportunity for potentially impacted residents to learn about it, let alone weigh in on potential risks. If there is a rupture, because CO₂ is odorless and current regulations require no odorant, it might be hard to detect. And because there is no federal regulation of pipeline siting, there is no requirement that uniform siting safety measures be taken to ensure this infrastructure is sufficiently far from people's homes to avoid grave harm to human life. PHMSA's reliance on HCAs renders visible who will be neglected and most unaccountably impacted: people living in more rural areas, including many environmental justice communities. And once operations cease, ghost infrastructure may remain in communities indefinitely.

B. Class VI UIC Wells and Liability Release Provisions

A third way in which federal regulatory regimes embed long-term risk in communities is through the Class VI well program, and in particular, the state applications for primary enforcement authority that EPA has approved that transfer regulatory authority from the federal government to the states.²⁹⁸ This Subpart will explore how, in the face of uncertainty about long-term storage capabilities of Class VI wells, EPA has begun an alarming, and arguably

293. See generally Pipeline Safety: Safety of Carbon Dioxide and Hazardous Liquid Pipelines, 49 C.F.R. 190, 195, 196, 198 (proposed Jan. 10, 2025); Kenneth Clarkson, *Proposed CO₂ Pipeline Safety Rule, A Step in the Right Direction to Protect Communities*, PIPELINE SAFETY TR. (Jan. 17, 2025), <https://pstrust.org/proposed-co2-pipeline-safety-rule-a-step-in-the-right-direction-to-protect-communities> [<https://perma.cc/N67T-9BKM>].

294. DOT Withdraws Proposed Carbon Dioxide Pipeline Safety Rules, COLUMBIA LAW SCHOOL SABIN CENTER FOR CLIMATE CHANGE LAW, <https://climate.law.columbia.edu/content/dot-withdraws-proposed-carbon-dioxide-pipeline-safety-rules> [<https://perma.cc/C76J-C7H8>] (last visited Mar. 4, 2026).

295. Last verified January 21, 2026.

296. Zegart, *supra* note 1.

297. Pipeline Safety: Clarification of Terms Relating to Pipeline Operational Status, 81 Fed. Reg. 54512, 54513 (Aug. 16, 2016) (to be codified at 49 C.F.R. pts. 192, 195).

298. 42 U.S.C. § 300h-1; see also *Primary Enforcement Authority for the Underground Injection Control Program*, *supra* note 192.

unlawful, trend of approving primacy applications from states that grant long-term liability releases to well owners and operators. However, no such release is available under federal law, and state programs are supposed to be “as stringent” as their federal counterparts to be approved by EPA.²⁹⁹ The state-level liability releases allow for complete release from all future liability if an accident occurs at a Class VI well any time after a site closure certificate has been issued.³⁰⁰ But with the substantial likelihood of future accidents, this creates a legal regime where communities near Class VI wells in states with liability releases would be subjected to a lurking, subsurface danger with little recourse to remedy.

Liability releases temporally sever cause from effect, making it hard to determine who can be held accountable in the event of future disaster, if anyone. Because Class VI wells create an “out of sight, out of mind” solution, burying the byproducts of ongoing fossil fuel consumption, they also bury potential catastrophe for future generations. Without a path to holding owners and operators accountable on the back end in the case of well failure, EPA’s current primacy policy incentivizes unacceptable levels of risk taking by states that do not accurately account for the real magnitude of long-term risk. This is because well owners and operators in states with primacy where liability releases exist know that they will not be financially responsible in the long-term in the event of well failure after site closure. These dynamics of temporally and spatially dispersed environmental risk sound in slow violence.

Class VI wells for the underground injection and storage of carbon are regulated by the SDWA.³⁰¹ This program is administered by EPA, although states can apply for “primacy” or primary enforcement authority over the program if they show that their regulatory regime is as stringent as EPA’s.³⁰² Currently, most states do not have primacy—to date, only Wyoming, North Dakota, Louisiana, West Virginia, Texas, and Arizona³⁰³ have received EPA approval to directly regulate Class VI CCS wells, although other states have started to apply, especially in areas anticipating a high volume of CCS development.³⁰⁴

299. *Primary Enforcement Authority for the Underground Injection Control Program*, *supra* note 192.

300. *See* Rossie & DiGiulio, *infra* note 308; LA. LEGIS. AUDITOR, *infra* note 314.

301. *Underground Injection Control Regulations and Safe Drinking Water Act Provisions*, EPA, <https://www.epa.gov/uic/underground-injection-control-regulations-and-safe-drinking-water-act-provisions> (last updated May 27, 2025) [<https://perma.cc/EM6V-MJ87>].

302. *Primary Enforcement Authority for the Underground Injection Control Program*, *supra* note 192.

303. West Virginia received Class VI approval on January 17, 2025. *See* 40 C.F.R. § 147; West Virginia Underground Injection Control (UIC) Program; Class VI Primacy, 89 Fed. Reg. 93538 (Nov. 27, 2024) (to be codified at 40 C.F.R. pt. 147).

304. *Primary Enforcement Authority for the Underground Injection Control Program*, *supra* note 192 (noting that Alaska, Arkansas, Mississippi, Nebraska, New Mexico, Oklahoma, Utah, Puerto Rico, Alabama, and Colorado are all currently applying for Class VI primacy).

To serve their intended climate function to permanently hold the CO₂ injected into them, Class VI wells must sequester carbon into perpetuity.³⁰⁵ But there are extensive unknowns about how well Class VI wells will serve this function, especially because there are few extant Class VI wells, and even fewer that have been successful.³⁰⁶ Uncertainties are especially high because of the unique properties of injected CO₂—it is quite buoyant, can be corrosive when it interacts with water, and may be mixed with other toxic substances pulled from the CO₂ removal process.³⁰⁷ Geologic uncertainties around proposed well sites may also pose problems, like those in Louisiana, where Class VI wells are slated for areas known for abandoned oil and gas wells.³⁰⁸ These orphaned and abandoned wells can serve a straw-like function, providing a path for sequestered CO₂ to leak upward toward the surface and potentially contaminate groundwater and soil, or even reach the surface.³⁰⁹ The Department of the Interior estimates that the United States has more than 3.5 million abandoned wells.³¹⁰ In Louisiana alone, there are about 190,000 orphaned wells.³¹¹ And although the state has a partial inventory of these orphaned wells, many remain unidentified.³¹² The collocation of Class VI wells with abandoned well infrastructure substantially increases the likelihood of future well leakage.³¹³ The state has not taken sufficient measures to keep nearby communities safe.³¹⁴ As Mike Levien noted, “[a]s with pipelines, carbon dioxide leakage is a public health concern that has been brushed aside by industry. A proposed Louisiana bill that would have

305. June Sekera & Andreas Lichtenberger, *Assessing Carbon Capture: Public Policy, Science, and Societal Need*, 5 BIOPHYSICAL ECON. SUSTAINABILITY 1, 12 (2020) (emphasizing the need for permanent storage).

306. See, e.g., GRANT HAUBER, INST. FOR ENERGY ECON. AND FIN. ANALYSIS, NORWAY’S SLEIPNER AND SNØHVIT CCS: INDUSTRY MODELS OR CAUTIONARY TALES? 5 (2023), <https://ieefa.org/sites/default/files/2023-06/Norway%E2%80%99s%20Sleipner%20and%20Sn%C3%B8hvit%20CCS-%20Industry%20models%20or%20cautionary%20tales.pdf> [https://perma.cc/YTF2-7QA3].

307. ANGELA C. JONES, CONG. RSCH. SERV., R46192, INJECTION AND GEOLOGIC SEQUESTRATION OF CARBON DIOXIDE: FEDERAL ROLE AND ISSUES FOR CONGRESS 14 (Sept. 22, 2022).

308. ROBERT J. ROSSIE & DOMINIC C. DIGIULIO, ENVIRONMENTAL INTEGRITY PROJECT, DOCUMENTING KNOWN ABANDONED WELLS IN PROXIMITY TO POTENTIAL CARBON STORAGE FORMATIONS IN LOUISIANA 2 (2023), https://environmentalintegrity.org/wp-content/uploads/2024/03/Rossi-and-DiGiulio_Final-with-ES.pdf [https://perma.cc/ZK7P-JJBQ].

309. *Carbon Capture, Use, and Sequestration*, ENV’T’L INTEGRITY PROJECT, <https://environmentalintegrity.org/carboncaptureuseandstorage> [https://perma.cc/PH4Y-6BVY] (last visited Mar. 5, 2026).

310. ROSSIE & DIGIULIO, *supra* note 308, at 2.

311. *Id.*

312. *Id.*

313. *Id.*

314. LA. LEGIS. AUDITOR, PROGRESS REPORT: STATE EFFORTS TO ADDRESS ORPHANED OIL AND GAS WELLS 4 (2024), [https://app2.lla.state.la.us/publicreports.nsf/0/fd253aa20b74174d86258bbf00730b5c/\\$file/00006296a.pdf?openelement&.7773098](https://app2.lla.state.la.us/publicreports.nsf/0/fd253aa20b74174d86258bbf00730b5c/$file/00006296a.pdf?openelement&.7773098) [https://perma.cc/MQ8V-XV6H] (detailing the ongoing shortcomings of Louisiana’s efforts to plug orphaned wells).

created a two-mile setback between injection wells and schools, hospitals and residences was neutered, bringing it to a meager five hundred feet.”³¹⁵

Existing projects do not offer much hope for the security of Class VI wells. One of the only EPA-permitted and operational Class VI wells in the United States, located in Decatur, Illinois, has already received a Notice of Violation from EPA for violations of the Safe Drinking Water Act from well leaks.³¹⁶ And two Norwegian projects, which have been operational since 2017 and are often touted as the most effective carbon capture projects to date, recently revised the reported capture rate of their wells to reflect a far lower sequestration rate than initially reported.³¹⁷

Against this backdrop of long-term uncertainty about the efficacy and security of underground wells storing sequestered CO₂, EPA has endorsed a policy of liability release for owners and operators of Class VI wells by approving primacy applications where the underlying state regime allows for liability release.³¹⁸ Indeed, almost every state to receive primacy has a version of a liability release law—although West Virginia and Wyoming’s policies are technically outside of the primacy program.³¹⁹

Taking Louisiana as an example, under the EPA-approved Class VI primacy rule, owners and operators of Class VI wells can be absolved from all liability associated with wells “fifty years after cessation of injection into a

315. Levien, *supra* note 39.

316. *Notice of Violation of Safe Drinking Water Act a CCS#2 Well (IL-115-61-0001) Injection Well in Decatur, Macon County, Illinois and Opportunity to Confer*, EPA (Aug. 14, 2025), <https://subscriber.politicopro.com/eenews/f/eenews/?id=00000191-e799-d539-add7-e7db17e90000> [<https://perma.cc/GU3T-JHJQ>]; see also Carlos Anchondo, *ADM Pauses Illinois Carbon Injection as It Probes Second Leak*, E&E NEWS BY POLITICO (Oct. 3, 2024), <https://www.eenews.net/articles/adm-pauses-illinois-carbon-injection-as-it-probes-second-leak> [<https://perma.cc/A394-QSN9>]. There are currently eleven Class VI wells that have received EPA permits, as of July 15, 2025. *UIC Class VI Data Repository*, EPA, https://udr.epa.gov/ords/uicdr/r/uicdr_ext/uicdr-pub/map [<https://perma.cc/C65Q-2CT3>] (last visited July 15, 2025).

317. Edward Donnelly, *Norway’s Equinor Admits It ‘Over-Reported’ Amount of Carbon Captured at Flagship Project for Years*, DESMOG (Oct. 28, 2024), <https://www.desmog.com/2024/10/28/norways-equinor-admits-it-over-reported-amount-of-carbon-captured-at-flagship-project-for-years> [<https://perma.cc/4UQA-9249>].

318. See GREAT PLAINS INST. & ENVT’L DEF. FUND, *ISSUE BRIEF: APPROACHES TO LONG-TERM LIABILITY OF CLASS VI INJECTION WELLS 2* (2024), <https://carboncaptureready.betterenergy.org/wp-content/uploads/2024/07/Long-Term-Liability.pdf> [<https://perma.cc/8ZDR-9WJD>] (discussing the approach EPA has taken and how it has responded to concerns with liability release).

319. Wyoming’s liability release was passed after the state received primacy. See 2022 Wyo. Sess. Laws SF0047. And EPA explicitly excepted West Virginia’s liability release provision from the primacy approval after commenters expressed alarm about the long-term ramifications of such a policy. See EPA, *EPA RESPONSE TO PUBLIC COMMENTS ON THE EPA’S PROPOSED APPROVAL OF THE WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION’S CLASS VI PRIMACY APPLICATION 11* (2025), https://www.epa.gov/system/files/documents/2025-01/wv-rtc_final508c.pdf [<https://perma.cc/B99Q-D69Y>]. Additionally, the recently approved Arizona Class VI program does not appear to have a liability release provision. See Arizona Underground Injection Control (UIC) Program; Class I-VI Primacy, 90 Fed. Reg. 21264, 21267 (May 19, 2025) (to be codified at 40 C.F.R. pt. 147). Nor does the Texas program. 90 Fed. Reg. 91421 (Nov. 14, 2025) (to be codified as 40 C.F.R. pt. 147).

storage facility, or *any other time frame* established on a site-specific basis”³²⁰ Once a well owner or operator has met the post-injection site care and closure requirements in the federal regulations, Louisiana’s liability release statute cancels some of the post-closure obligations and liabilities.³²¹ Specifically, it provides that:

Upon the issuance of the certificate of completion of injection operations, the storage operator, all generators of any injected carbon dioxide, all owners of carbon dioxide stored in the storage facility, and all owners otherwise having any interest in the storage facility shall be released from any and all future duties or obligations under this Chapter and any and all liability associated with or related to that storage facility which arises after the issuance of the certificate of completion of injection operations.³²²

Instead, ownership of the Class VI well transfers to the state, but the state also disclaims any assumption of liability.³²³ Louisiana does have a Carbon Dioxide Geologic Sequestration Trust Fund, but it is the only source of post-closure money to address well accidents and is capped at \$5 million per storage facility or \$10 million overall per owner or operator and does not cover some types of damages, including non-economic harms.³²⁴ This means that, upon meeting site closure requirements, well owners and operators can largely walk away from the Class VI wells that they have injected with supercritical CO₂, and nobody is on the hook if something goes wrong. Individual communities and Louisiana taxpayers will be left to shoulder the consequences.

EPA has repeatedly approved primacy applications with these provisions, finding that Class VI regimes with liability releases are “as stringent” as their federal counterparts.³²⁵ But federal law explicitly does not allow for post-closure liability release.³²⁶ Advocates have argued that because federal law allows for no

320. LA. STAT. ANN. § 30:1109 (2025).

321. *Id.*

322. *Id.* § 30:1109(A)(3).

323. *Id.* §§ 30:1109(A)(2), 30:1109(A)(6). Louisiana’s statute does have a clawback provision that may apply in some circumstances to rescind the liability waiver, such as where an owner or operator of a well did not comply with applicable UIC laws, or where the state Carbon Dioxide Geologic Storage Trust Fund does not have sufficient funds to cover a post-closure accident. *See id.* §§ 30:1109(A)(3)–(5), 30:1109(G). But these do not apply in all circumstances, and it is not clear whether they would actually work in practice. They assume the ability to locate a prior owner—if that owner still exists—and a robust state enforcement apparatus that has historically been absent in the state. *See generally* LA. LEGIS. AUDITOR, *supra* note 314 (detailing the existing issues with enforcement of abandoned oil and gas infrastructure in the state).

324. LA. STAT. ANN. §§ 30:1110(A)–(E) (2025).

325. *See, e.g.*, EPA, EPA RESPONSE TO PUBLIC COMMENTS ON THE LOUISIANA DEPARTMENT OF NATURAL RESOURCES’ CLASS VI PRIMACY APPLICATION 15 (2024), https://www.epa.gov/system/files/documents/2023-12/responsivenesssummary_508pdf.pdf [<https://perma.cc/G9MK-QA64>] (concluding that Louisiana’s law is as stringent as its federal counterpart, despite the liability release provision).

326. *See* 40 C.F.R. §§ 146.81–146.95.

such release from liability in EPA-permitted wells, primacy approvals arguably violate the mandate of the SDWA and could put human health and precious groundwater resources at great risk.³²⁷ Indeed, this issue was extensively litigated in a challenge to EPA's approval of Louisiana's Class VI primacy application.³²⁸ The Fifth Circuit ruled against the challenging plaintiffs on standing grounds,³²⁹ finding that their anticipated future injuries from the liability release provision did not meet Article III requirements.³³⁰ But it remains to be seen whether a subsequent challenge would prevail if brought after a well accident causes harm that cannot be remedied because of the liability release provision. Regardless, the current legal regime embeds high-risk infrastructure deep below ground, extending the timeline for accountability for any future harm indefinitely. For communities living near and even on top of Class VI wells, this perpetuates the lingering feelings of malaise that are hallmarks of slow violence.

Carbon Dioxide Pipelines on Federal Lands

Briefly, and by way of contrast to the preceding examples, the Department of the Interior, through the Bureau of Land Management (BLM), has a specific and fairly robust regime covering the siting of CO₂ pipelines under its Mineral Leasing Act (MLA) authority to regulate rights-of-way for "natural gas" on federal land.³³¹ Although a full evaluation of this regulatory regime is outside the scope of this Article, these requirements can trigger the NEPA process and, under the prior NEPA regime when regulations from the Council on Environmental Quality (CEQ) were operative, could require substantial review including an Environmental Impact Statement or public notice and comment.³³² As one commenter noted, this NEPA-driven process on federal lands "may

327. See, e.g., State of Louisiana Underground Injection Control Program; Class VI Primacy, 89 Fed. Reg. 703, 707 (Jan. 5, 2024) (to be codified at 40 C.F.R. pt. 147) (discussing public concern over Louisiana's liability release program); see also OHIO RIVER VALLEY INST., CARBON STORAGE LIABILITY TRANSFER & PORE SPACE UNITIZATION 1–2 (2024), https://centerforcoalfieldjustice.org/wp-content/uploads/2024/02/Carbon-Storage-Liability-Transfer-Pore-Space-Unitization_-Statute-Survey-and-Background-1.pdf [<https://perma.cc/F3A9-5NXW>].

328. See generally *Deep South Center for Env'tl Justice v. United States EPA*, 138 F.4th 310 (5th Cir. 2025).

329. "Standing" is the legal requirement for a plaintiff to demonstrate their claim involves a legal injury causally connected to a defendant's action which the court can remedy through the law. See *Friends of the Earth v. Laidlaw*, 528 U.S. 167, 181 (2000). It stems from Article III of the United States Constitution; without standing, a claim cannot be brought. *Id.*

330. *Id.* at 177.

331. 30 U.S.C. § 185(a) (2006); Robert P. Nordhaus & Emily Pitlick, *Carbon Dioxide Pipeline Regulation*, 30 ENERGY L.J. 85, 93–94 (2009) (noting the debate about whether CO₂ pipelines are properly regulated as common carriers under the MLA or the Federal Land Policy and Management Act (FLPMA) in *Exxon Corp. v. Lujan*, 970 F.2d 757 (10th Cir. 1992)); see also Lockman, *supra* note 188, at 17–18 (noting the same debate as described in the previous citation).

332. Lockman, *supra* note 188, at 31; see also 40 C.F.R. §§ 1500–1508 (2024).

increase public awareness about CO₂ pipeline projects, enhance consideration of potential impacts, and influence siting decisions made pursuant to state law.”³³³

Whether NEPA review will continue to have the effect post-rescission of the CEQ regulations remains to be seen.³³⁴ Additionally, there are categorical exclusions that exempt pipelines placed “in an approved right-of-way corridor,” where the corridor was approved within five years of the proposed project.³³⁵ However, as is discussed in Part III, at least one CO₂ pipeline project on BLM lands required a robust NEPA process, including public notice and comment that altered the course of the project and made it more responsive to community concern.³³⁶ As such, this might provide a useful model for federal oversight over proposed CCS projects, including more community participation and deliberative consideration of risk.

III. “WHO IS DYING FOR ALL THIS PROGRESS?”: COMMUNITY IMPACTS AND POTENTIAL SOLUTIONS

The sparse regulatory framework detailed above creates myriad opportunities for harm. This Part will briefly explore the localized impacts of these policies on communities and more broadly at the global level. It will then posit that this is an area of law where, rather than removing regulatory barriers or embracing an “abundance” mindset, it would be prudent to treat CCS as a technology of last resort with concomitantly stringent regulatory oversight. As a technology of fossil fuel preservation rather than transition, and one that stands to entrench existing harms while proliferating new ones, uniform and demanding oversight at the federal level would help surface whether any particular project is truly necessary and in the public interest.

A. *The Potential for Harms from the Current Regulatory Regime*

As described in the preceding Part, the dearth of federal regulatory oversight over and long-term liability for carbon capture pipelines and Class VI wells creates incentives and opportunities for rapid expansion of high-risk infrastructure without sufficiently rigorous review. By removing individualized risk determinations and public notice and participation from the permitting process, project timelines can be expedited. Paired with the lack of robust safety standards for pipeline operation and liability release provisions for Class VI well owners and operators, the infrastructure that is hastily built will put communities

333. Righetti, *supra* note 204, at 931.

334. Removal of National Environmental Policy Act Implementing Regulations, 91 Fed. Reg. 618 (Jan. 8, 2026) (to be codified at 40 C.F.R. pts. 1500–08).

335. 42 U.S.C. § 15942(b)(4).

336. See *infra* A Critical Approach to Abundance: Real Solutions to Counter the False ; see also Bureau of Land Mgmt., *BLM Approves Limited Access for Carbon Sequestration Test Well in Response to Public Input* (July 31, 2025), <https://www.blm.gov/announcement/blm-approves-limited-access-carbon-sequestration-test-well-response-public-input> [<https://perma.cc/UF3B-Y787>].

at short- and long-term risk: in the shorter term because pipeline networks at risk of rupture will operate in too-close proximity to peoples' neighborhoods, homes, and schools,³³⁷ and in the longer term because once the CO₂ is buried, communities will have little recourse to remedy when there is a leak.³³⁸

As one Louisiana resident powerfully put it, “[w]ho is doing all the dying for progress?”³³⁹ These effects will be felt most immediately and disproportionately by communities that are already overburdened by the impacts of other infrastructure—the impacts of which have been well-documented by other scholars writing in this space.³⁴⁰ Indeed, much of the proposed CCS infrastructure will need to connect to existing infrastructure in areas already treated as sacrifice zones because of the pollution burden they bear,³⁴¹ or will thread through rural expanses that are invisible to legal protections because they are not considered “high consequence areas.”³⁴²

For instance, the Gulf Coast of Texas and Louisiana’s industrial corridor, known as “Cancer Alley,” have been slated for widescale CCS development “due to existing concentrations of oil, gas, and petrochemical infrastructure, along with oil fields and salt domes that are the most viable injection and storage sites.”³⁴³ A review by the Tishman Center suggests currently proposed CCS infrastructure will be overwhelmingly co-located with environmental justice communities.³⁴⁴ And if new CO₂ pipelines follow past examples from the natural

337. See Tristian Baurick, *Latest Carbon Dioxide Leak Raises Concerns About Safety, Regulation*, THE LA. ILLUMINATOR (May 1, 2024), <https://lailluminator.com/2024/05/01/carbon-dioxide-leak> [<https://perma.cc/MB77-2LYG>].

338. See generally *supra* The Federal Regulatory Regimes Governing CO₂ Pipelines and Wells

339. Levien, *supra* note 39; see also Wyatt Sassman, *Community Empowerment in Decarbonization: NEPA’s Role*, 96 WASH. L. REV. 1511, 1514 (2021) (noting that in some instances, siting of renewables in communities already overburdened by industry asks “the community to shoulder burdens for others’ benefit . . . [and] represents not a new threat but another example in a history of exploitation”).

340. See, e.g., Lowell, *supra* note 29; Wyatt Sassman, *The Legal Foundations of Extractive Power*, 71 UCLA L. REV. 66, 99–100 (2024); see generally Baker, *supra* note 176.

341. See CIEL Report, *supra* note 32, at 7; Baker, *supra* note 176, at 6 n.22 (citing Donald T. Hornstein, *Reclaiming Environmental Law: A Normative Critique of Comparative Risk Analysis*, 92 COLUM. L. REV. 562, 598 n.164 (1992) (describing emergence of the term in the context of the health impacts of the petrochemical and nuclear industries)) (“The term ‘sacrifice zones’ refers to communities or regions that bear disproportionate health and environmental risks to facilitate development activities.”).

342. See *Fueling America’s Economy: Legislation to Improve Safety and Expand U.S. Pipeline Infrastructure: Before the H. Comm. on Energy and Commerce* (2024) (written statement of Tristan Brown, Deputy Administrator, Pipeline and Hazardous Materials Safety Administration); see also THE SABIN CTR., *supra* note 48.

343. CIEL Report, *supra* note 32, at 11; see also CENTER FOR INT’L ENV’T L. LAW, CARBON CAPTURE AND STORAGE: AN EXPENSIVE AND DANGEROUS PROPOSITION FOR LOUISIANA COMMUNITIES 1 (2021), https://www.ciel.org/wp-content/uploads/2021/06/Carbon-Capture-and-Storage_Louisiana.pdf [<https://perma.cc/N6A8-FNXY>].

344. LAM ET AL., *supra* note 47, at 3.

gas context, developers will overwhelmingly locate transmission lines in areas with high social vulnerability.³⁴⁵

Where carbon is sequestered in Class VI wells, communities will live atop high-risk burial sites indefinitely because, in order to meet the purported climate goals of these projects, the sequestered CO₂ must stay in the ground for millennia.³⁴⁶ Those Class VI wells are also at high risk of leakage, especially when sited near abandoned oil and gas infrastructure, and can create a host of serious consequences including groundwater contamination.³⁴⁷ Moreover, extending fossil fuel infrastructure will delay the attainment of climate targets and exacerbate the impacts of warming, thereby making the places where CCS infrastructure is sited increasingly vulnerable to extreme weather events like flooding, fires, and landslides.

Importantly, the risks and impacts of carbon capture infrastructure will also be felt by rural property owners who may not have been previously impacted by industry but whose land will now host countless miles of CCS pipelines or Class VI wells or be in proximity to the risk zones for either. The fights around the Summit pipeline—“a \$4.5 billion, 2,100-mile pipeline system and [CCS] project, which would tap CO₂ emissions from Midwest ethanol plants and transport them via pipeline across five states to an underground sequestration site in North Dakota”—reveal how rural landowners may be impacted.³⁴⁸ Indeed, many families whose property stood in Summit’s path organized together in the fight to detail the extensive potential harms that the pipeline would subject them to.³⁴⁹ The Summit fight also shows the critical role that state and local governments can, and ultimately must, play in fighting these projects in the absence of sufficient federal regulatory oversight. Concerns about the pipeline prompted several county-level ordinances that attempted to regulate in the absence of federal protection,³⁵⁰ and a bipartisan group of legislators tried to pass eminent domain reform to prevent the pipeline from taking Iowans’ land for its

345. Ryan E. Emanuel, Martina A. Caretta, Louie Rivers III, & Pavithra Vasudevan, *Natural Gas Gathering and Transmission Pipelines and Social Vulnerability in the United States*, 5 GEOHEALTH 1 (2021).

346. An Institute for Energy Economics and Financial Analysis report examining the storage security of two existing wells in Norway suggests that sequestered CO₂ often behaves unpredictably, and wells require constant monitoring and vigilance. See HAUBER, *supra* note 306, at 6.

347. *Carbon Capture, Use, and Sequestration*, ENVT’L INTEGRITY PROJECT, <https://environmentalintegrity.org/carboncaptureuseandstorage> [<https://perma.cc/EW3U-EZBE>] (last visited Aug. 4, 2025).

348. *Summit Midwest Carbon Express CO₂*, PIPELINE FIGHTERS HUB, <https://pipelinefighters.org/pipelinefights/summit-carbon-solutions-midwest-carbon-express> [<https://perma.cc/2F7R-82ZB>] (last visited Mar. 7, 2025); *In Re: Summit Carbon Solutions LLC*, Docket No. HLP-2021-0001 (Ia. U. B. Dec. 29, 2023)(Sierra Club’s Post-Hearing Brief).

349. *In Re: Summit Carbon Solutions LLC*, *supra* note 348.

350. Cami Koons, *Appellate Court Upholds Decisions Favoring Summit Over County Pipeline Ordinances*, IOWA CAPITAL DISPATCH (June 5, 2025), <https://iowacapitaldispatch.com/briefs/appellate-court-upholds-decisions-favoring-summit-over-county-pipeline-ordinances> [<https://perma.cc/DS4X-BGAW>] (noting that the ordinances were ultimately held to be preempted by state law).

construction.³⁵¹ Though these efforts were not successful, they created significant hurdles that slowed the Summit project,³⁵² and in the future, differently structured state and local laws might better address the gaps left by federal under-regulation.

Both communities living in already-industrialized areas and those living in rural areas are rendered invisible by the current laws governing CCS. As Thom Davies observed when writing about the lived experiences of slow violence for residents of Cancer Alley, this failure to regulate amounts to a policy of “violent inaction.”³⁵³ Communities anticipating this infrastructure are waiting, knowing all-too-well that they will not “find out that something is *going* to happen to [them]—it’s already happened!”³⁵⁴

Satartia makes clear how this dynamic plays out with CCS: An invisible, odorless threat, CO₂ can seep out undetected to hazardous consequence—whether from pipelines or wells—putting people and the environment at serious risk. And it underscores that only through an explosive accident is the potential violence of this infrastructure rendered visible, thereby forcing agency action. What Satartia does not make visible are the other threats of CCS infrastructure, which will subject already-overburdened communities to compounding harms like increased air pollution from nitrogen oxides and fine particulate matter, and wetlands degradation.³⁵⁵ This is because the proposed CCS infrastructure buildout will extend the lifecycle of already-harmful polluting facilities that might otherwise be shuttered as part of the energy transition. It will also incentivize the buildout of new facilities that have sizable air pollution and wetlands impacts, depending upon where they are sited. Indeed, CCS will exponentially increase those harms and extend risk timelines well beyond the present moment—a continuation of the slow, toxic violence from existing industrial infrastructure.

The negative impacts of overreliance on CCS will also be felt nationally and internationally. Relying on CCS to prop up the lifespan of fossil fuel infrastructure will delay the transition to truly renewable energy and the attainment of climate targets, thereby increasing warming and the likelihood that the world will overshoot and reach irrevocable “tipping points.”³⁵⁶ Of course, any overshoot will have global impacts disproportionately felt in vulnerable

351. Ben Jealous, *In Iowa, a Pipeline Fight Shows What the People Can Do*, SIERRA CLUB (June 20, 2025), <https://www.sierraclub.org/sierra/iowa-pipeline-fight-shows-what-people-can-do> [https://perma.cc/Z8DX-FTKV].

352. *Id.*

353. Davies, *supra* note 44, at 1540.

354. *Id.* at 1546. Keith Krokawa and Cinnamon Carlarne have helpfully suggested this dynamic “reflect[s] a particular form of spatial dominance that fails to recognize and protect the interests of all people.” Keith H. Hirokawa & Cinnamon P. Carlarne, *Climate Dominance*, 35 GEO. ENV’T L. REV. 485, 496 (2023).

355. Lowell, *supra* note 29, at 107.

356. See Steffen et al., *supra* note 58, at 8254, 8258; see also WIM CARTON AND ANDREAS MALM, *OVERSHOOT: HOW THE WORLD SURRENDERED TO CLIMATE BREAKDOWN* (2024).

places—indeed, the places where CCS infrastructure is proposed are among those vulnerable places, at greater risk of extreme weather events like flooding, fires, and landslides.³⁵⁷ All this in the name of a climate “solution.”

A. A Critical Approach to Abundance: Real Solutions to Counter the False

Lost in the race to capture and bury CO₂—or worse, to use it as a means to extract more fossil fuels—is an opportunity for more creative thinking. We need a just transition, not mere preservation or repackaging of the status quo.³⁵⁸ At a minimum, and perhaps most obviously, this transition will require substantial new energy infrastructure. But as a critical chorus led by abundance advocates has rightly noted, the United States has considerable supply-side barriers to building energy infrastructure.³⁵⁹ As these barriers relate to the law, new energy projects must comply with a host of regulations, many of which have robust procedural requirements that add time and expense to projects.³⁶⁰

Perversely, CCS is a case study of the opposite: The paucity of federal regulatory safeguards over CCS projects demonstrates how the federal government can ease the path to rapid deployment of new energy infrastructure. With generous federal subsidies through the newly expanded 45Q tax credit³⁶¹ and scant federal permitting, safety, or long-term liability requirements,³⁶² CCS is emerging as a technology that does not suffer from the same barriers to deployment as other decarbonization technologies. As developed in the preceding Parts, this is cause for concern. CCS technology risks outpacing the transition to true renewables, like solar and wind, thereby further entrenching fossil fuel dominance and sowing harm in already-overburdened communities. This Part will argue for a quasi “anti-abundance” approach to CCS.

The “abundance” movement is the latest articulation in a long lineage of advocates diagnosing regulatory barriers to energy development and calling for reform.³⁶³ An evaluation of the full abundance debate is beyond the scope of this Article. However, because this Article advances a proposal for *additional*, not *fewer*, regulations and permitting requirements, it will briefly introduce abundance ideas to explain why, in some cases, regulation serves more than a

357. See generally Erin Middleton et al., *Environmental Justice and CCS Infrastructure: Overlaps and Oversights at the National and State Levels*, 2 J. OF CLIMATE RESILIENCE & JUST. 57 (2025); see LAM ET AL., *supra* note 49, at 1.

358. See generally SHALANDA BAKER, *REVOLUTIONARY POWER: AN ACTIVIST’S GUIDE TO THE ENERGY TRANSITION* (1st ed. 2021) (advocating for the creation of a new energy system that radically subverts the power dynamics of the current system).

359. See Klass & Appel, *supra* note 38, at 69–71 (describing supply-side critiques in the context of the “abundance agenda”).

360. *Id.* at 65.

361. See Lowell, *supra* note 29.

362. See generally *supra* The Federal Regulatory Regimes Governing CO₂ Pipelines and Wells

363. See, e.g., KLEIN & THOMPSON, *supra* note 60.

mere “procedure fetish”³⁶⁴ and instead provides substantive protections that should be preserved.

As previously introduced, the abundance agenda aims to shift American development policy away from what it perceives to be a scarcity-driven approach to one driven by growth and abundance, with the goal of fixing the country’s housing and energy crises in particular.³⁶⁵ As it relates to both, the abundance agenda is fixated on regulation as a barrier to building more of what we want and need. Environmental litigation under NEPA is a particular target for the abundance movement’s ire. As Jonathan Chait notes in writing about how environmental groups have used the statute: “They pursued an energetic legal strategy to expand [NEPA’s] reach, turning it into a suffocating weapon against development Most perversely, NEPA and similar laws have become a way to stop efforts to address climate change.”³⁶⁶ In particular, he cites concerns about community-led litigation efforts that use NEPA’s requirements to block green energy and pipeline projects.³⁶⁷ As he sees it, “This is a diametric conflict: The progressive-activist network believes that local activists should have more legal power to block new housing and energy infrastructure. The abundance agenda is premised on taking that power away.”³⁶⁸ And as Klein and Thompson themselves write of the strain of liberalism that, in their view, over-litigates environmentally beneficial projects, liberalism “needs to see the problems in what it has been taught to see as the solution . . . it is not always clear how to strike the right balance. But a balance that doesn’t allow us to meet our climate goals has to be the wrong one.”³⁶⁹

Some environmental law scholars have questioned the core premises that underpin some facets of the “abundance” argument³⁷⁰—for instance, that NEPA is a central cause of the problem, or that environmental permitting is even the primary source of project delays and failures.³⁷¹ Indeed, they point out that many renewable projects either “do not require federal environmental reviews or permits or, if they do, are able to benefit from streamlined processes.”³⁷² They found instead that “a project review may stop and restart for external reasons

364. Nicholas Bagley, *The Procedure Fetish*, 118 MICH. L. REV. 345 (2019).

365. See, e.g., KLEIN & THOMPSON, *supra* note 60; see also Derek Thompson, *A Simple Plan to Solve All of America’s Problems*, THE ATLANTIC (Jan. 12, 2022), <https://www.theatlantic.com/ideas/archive/2022/01/scarcity-crisis-college-housing-health-care/621221> [<https://perma.cc/S5TP-YVUA>].

366. Jonathan Chait, *The Coming Democratic Civil War*, THE ATLANTIC (May 25, 2025), <https://www.theatlantic.com/ideas/archive/2025/05/abundance-democrats-political-power/682929> [<https://perma.cc/4CBF-VRN6>].

367. *Id.*

368. *Id.*

369. Zephyr Teachout, *An Abundance of Ambiguity*, WASH. MONTHLY (Mar. 23, 2025), <https://washingtonmonthly.com/2025/03/23/an-abundance-of-ambiguity> [<https://perma.cc/W7J9-96JE>] (citing Klein and Thompson).

370. See generally David E. Adelman et al., *Dispelling the Myths of Permitting Reform and Identifying Effective Pathways Forward*, 55 ENV’T L. REP. 10038 (2025).

371. *Id.* at 10040–41.

372. *Id.* at 10041.

such as funding, engineering requirements, changes in agency priorities, delays in obtaining nonfederal approvals, or political opposition to the project.”³⁷³

As critics of the abundance agenda have rightly pointed out, without a more nuanced approach to effectuating its goals, the abundance agenda’s exhortations could be distilled to a brute deregulatory program—one that is so concerned about building new infrastructure that it throws the baby out with the proverbial bathwater and invites an era of excessive, under-regulated development that could sow lasting environmental harm.³⁷⁴ As Zephyr Teachout aptly observes, “[I]t would be very easy to take [Klein and Thompson’s] critique as a muffled call for deregulation writ large; if they are not careful, the ambiguity could be used by big financial interests to make abundance a bible for a Ronald Reagan-style deregulatory juggernaut.”³⁷⁵ She warns that the abundance agenda is ambiguous and should not be ignorant to how the consolidation of power, through monopolization and financialization, has contributed to supply-side stagnation.³⁷⁶ These issues could arguably be fixed with more, not less, regulation, albeit differently targeted regulation.³⁷⁷ This is, of course, especially the case in the energy sector, where a few major fossil fuel companies have long dominated production and would now dominate the transition to decarbonization as well through carbon capture and sequestration development.³⁷⁸ Without pairing calls for abundance with an accounting of economic power, one risks more harm to those already disempowered under the current regime.

Other critics have underscored that abundance should not ignore *why* communities use regulatory safeguards to oppose infrastructure projects proposed in their backyards.³⁷⁹ It is not all NIMBYism.³⁸⁰ As discussed

373. *Id.* at 10046.

374. Mark Schlosberg & Mitch Jones, “Abundance” Won’t Save Us. Here’s What Will, FOOD & WATER WATCH (Oct. 2, 2025), <https://www.foodandwaterwatch.org/2025/10/02/abundance-wont-save-us-heres-what-will> [<https://perma.cc/3RBL-GYH9>]; Matt Huber et al., *Abundance for the 99 Percent*, JACOBIN (Aug. 2, 2025), <https://jacobin.com/2025/08/klein-thompson-abundance-liberalism-socialism> [<https://perma.cc/VFQ4-RX4E>] (noting that critics of abundance often cast it as a program of deregulation); Jerel Ezell, *The Abundance Agenda Sounds Like a Political Winner, But It Isn’t*, THE HILL (Nov. 15, 2025), <https://thehill.com/opinion/campaign/5604963-economic-inequality-abundance-scarcity> [<https://perma.cc/8WAZ-EVBJ>].

375. Teachout, *supra* note 369.

376. *Id.*

377. *Id.*

378. *Carbon Capture and Sequestration (CCS) Market Size, Share & Industry Analysis, By Capture Source (Chemicals, Natural Gas Processing, Power Generation, Fertilizers Production, and Others), By End-Use (Enhanced Oil Recovery {EOR} and Dedicated Storage & Treatment), and Regional Forecast, 2026-2034*, FORTUNE BUS. INSIGHTS, <https://www.fortunebusinessinsights.com/industry-reports/carbon-capture-and-sequestration-market-100819> (last updated Feb. 16, 2026) [<https://perma.cc/C2TG-JYTE>] (listing the major developers of CCS infrastructure).

379. Matt Bruenig, *What the “Abundance Agenda” Leaves Out*, JACOBIN (Mar. 24, 2025), <https://jacobin.com/2025/03/abundance-klein-thompson-book-review> [<https://perma.cc/24EN-EXED>].

380. See Miriam Axel-Lute, *What is NIMBYism and How Do Affordable Housing Developers Respond To It?*, SHELTERFORCE (Nov. 17, 2021), <https://shelterforce.org/2021/11/17/what-is-nimbyism-and-how-do-affordable-housing-developers-respond-to-it> [<https://perma.cc/X8BP-ZFNU>].

throughout this Article, many communities have been long overburdened by industrial infrastructure and face significant harm to their health and economic interests. Those communities know all too well what it means to sacrifice their interests to serve the country's rapacious energy demands.³⁸¹ As Matt Bruenig warns, the unequal burdens already shouldered by those communities must be heeded in any sort of abundant future, lest "[t]he preservation or deepening of economic inequality . . . turn [Klein and Thompson's] utopian vision of 2050 into a dystopian nightmare. Attending to distribution is a must."³⁸²

To be clear, combatting climate change requires significant, immediate action. There must be a rapid paradigm shift away from a fossil economy—and historically, environmental laws have prevented the rapid deployment of many projects.³⁸³ There is a well-developed literature about the barriers that environmental laws have posed to renewable energy projects in particular, and there is no doubt that for a true “green new deal,” we would benefit from new “green laws.”³⁸⁴ But even though the energy transition will require expeditious and widescale deployment of renewable energy, this cannot be executed in a way that preserves existing, extractive power structures or is to the exclusion of community safety and climate goals. As Megan Gibson recently wrote, “energy abundance does not mean a free-for-all buildout of all energy projects—it means building the right projects, i.e. clean, affordable, and reliable energy infrastructure.”³⁸⁵ And in the case of carbon capture, expeditious treatment would serve only to further embed fossil fuel dominance, at the local level in individual communities and more broadly in our nation. To this end, some legal scholars have begun to posit a “Law of Energy Abundance.”³⁸⁶ This program would not treat all energy projects equally but would employ an abundance framework exclusively to incentivize the development of carbon-free energy infrastructure.³⁸⁷ As a form of reactionary decarbonization, carbon capture has no place in this abundant “carbon-free” mix.

381. Sassman, *The Legal Foundations of Extractive Power*, *supra* note 340, at 100–101; *see generally* Baker, *supra* note 176.

382. Bruenig, *supra* note 379.

383. J.B. Ruhl & James Salzman, *What Happens When the Green New Deal Meets the Old Green Laws?*, 44 VT. L. REV. 693, 697 (2020).

384. *See, e.g., id.*; David B. Spence, *Regulation and the New Politics of (Energy) Market Entry*, 95 NOTRE DAME L. REV. 327, 330, 338 n.62 (2019); Michael B. Gerrard, *Legal Pathways for a Massive Increase in Utility-Scale Renewable Generation Capacity*, 47 ENV'T L. REP. 10591, 10612 (2017). By new “green laws” the Author means new environmental regulations to facilitate the development of new and more environmentally friendly infrastructure.

385. Megan C. Gibson, *Reclaiming Energy Abundance: The Role of Environmental Lawyering, Clean Energy Advocacy, and the Need to Build Right*, N.Y.U. ENV'T L.J. (forthcoming 2026) manuscript at i (emphasizing that supply- and demand-side sustainability must be aligned because “demand reduction and efficiency are crucial components” to an energy transition such that “‘abundance’ remains sustainable and does not lead to wasteful overbuilding”).

386. Klass & Appel, *supra* note 38, at 69–71.

387. *Id.*

Indeed, to take an abundance approach to point source carbon capture projects that attach to fossil fuel-driven facilities, or to projects that capture CO₂ for use in EOR, would sow great risk but reap little reward. Overreliance on this sort of carbon capture without a clear-eyed assessment of how it could preserve fossil fuel dominance and continue to harm communities risks reifying existing inequities—what Shalanda Baker refers to as “climate change fundamentalism.”³⁸⁸ Specifically, this term describes a “narrow focus on carbon reduction that only serves to exacerbate the root causes of inequity.”³⁸⁹ Baker argues that “simply decarbonizing the current economic system—hard as this might be— . . . does not challenge the fundamental logic or economic power relationships of this extractive global economy.”³⁹⁰ To center carbon capture as a solution in the energy transition would miss heeding this critical insight.

To prevent the warp-speed deployment of infrastructure that embeds networks of future slow violence, deliberate and deliberative processes are required. Imperfect though they may be, regulatory regimes that slow things down, force companies to justify need and articulate risks, and provide communities with notice and an opportunity to be heard can provide important sites for advocacy. These regulatory frameworks create spaces for public action to counteract what Thom Davies diagnosed as the usual “violent inaction” of state apparatuses that ignore community harm.³⁹¹ Further, they force public agencies to review, grapple with, and respond to community concerns, a process that can result in significant revisions to project design or outright permit denials.

A recent example from the Snowy River project in Montana highlights the potential successes of such an approach. There, Denbury Carbon Solutions, LLC—the same company responsible for the pipeline that ruptured in Satartia—sought a right-of-way on federal BLM lands for a pipeline to sequester CO₂ from natural gas processing plants.³⁹² Local residents expressed alarm about the potential environmental impacts of the project, including impacts to the landscape, water, native plants, and the sage grouse; the potential risks associated with accidents; and possible economic harms, including devaluation of property values and disruptions to ranchers’ cattle grazing on those lands.³⁹³ The BLM provided a public notice and comment period on the draft EA, during which residents pressed the BLM for a more extensive review of the project’s potential impacts and requested a full EIS.³⁹⁴ “In direct response to public feedback,” the

388. BAKER, *REVOLUTIONARY POWER*, *supra* note 358, at 74.

389. *Id.*

390. *Id.*

391. Davies, *supra* note 44, at 1540.

392. See OIL & GAS WATCH, SNOWY RIVER CARBON DIOXIDE SEQUESTRATION PROJECT, https://oilandgaswatch.org/facility/rec_cnf0qtcvdlpemgf9qp10 [<https://perma.cc/LH9B-68M2>].

393. Najifa Farhat, *Montana Is a Frontier for Deep Carbon Storage, and the Controversies Surrounding the Potential Climate Solution*, INSIDE CLIMATE NEWS (July 18, 2024), <https://insideclimatenews.org/news/18072024/montana-deep-carbon-storage-controversies/> [<https://perma.cc/J5D9-6TLZ>].

394. *Id.*

BLM approved only a small portion of the proposed project and decided to not approve Denbury's full requested right-of-way and surface infrastructure.³⁹⁵ The limited approval was intended to allow Denbury "to collect additional geologic and hydrologic data before any further development on federally managed lands is considered."³⁹⁶ In its announcement, the BLM was clear that it "heard the public's concerns, and [that the agency is] acting on them."³⁹⁷ Whether this will serve to completely halt the project or provide additional safeguards remains to be seen. But this example illustrates the critical role that public participation can play in raising awareness about project risks and forcing more thorough review of potential impacts.

To apply these safeguards to all CCS projects, not just those crossing federal lands, would at a minimum require removing CO₂ pipelines from the Army Corps' NWP 58 and instead mandating individualized permits for all CO₂ pipeline projects, with a particular focus on cumulative impacts to already-overburdened communities. It would also require updating the PHMSA regulations to account for impact areas, contaminants, odorants, and siting near communities, providing a safety-related buffer zone around areas of human habitation or use, and mandating decommissioning processes for retired infrastructure. Additionally, EPA should not recognize any state-created liability release provisions as part of state primacy applications. These processes should be used to test whether a proposed use of carbon capture would serve climate goals and protect communities from additional harm, especially those that are already overburdened. With further technological advances and deployment in remote locations, perhaps some DAC projects would meet these criteria. But most CCS projects would not.

Of course, the proliferation of procedure alone is insufficient if those who lack power cannot meaningfully avail themselves of it. Further, industry is adept at navigating procedural hurdles, and agency capture is a real concern.³⁹⁸ But the response is not to do away with procedures. As David Adelman insightfully notes about the failures of current regulatory processes, "[t]he principal problem is . . . not too much process, but rather inadequate or poorly timed processes."³⁹⁹ The solution is not to streamline procedures, but rather to improve "the timing and levels of public involvement."⁴⁰⁰ Community involvement early and often is necessary. And agency attentiveness to community concern is paramount.

To reject an abundance approach to carbon capture would prevent the establishment of a new regime of slow violence. Instead, reliance on the aforementioned deliberate and deliberative methods would force an honest

395. Bureau of Land Mgmt., *supra* note 336.

396. *Id.*

397. *Id.*

398. Bagley, *supra* note 364, at 389–400 (discussing the potential for regulatory capture).

399. Adelman, *supra* note 59, at 162.

400. *Id.*

confrontation with the risks of future reliance on carbon capture, before pipelines are laid and wells are dug, rather than in the aftermath of future disaster. This is especially so because, as has been developed throughout this Article, carbon capture comes with especially high future risks. *Satartia* illustrates the spectacular violence carbon capture can produce at the local level, but perhaps even more grave is the slower violence it could engender globally by delaying a true energy transition and ossifying fossil dependence, thereby locking in catastrophic warming of the planet.

IV. CONCLUSION

The energy transition will require rapid, widescale decarbonization that will undoubtedly demand regulatory reforms to streamline deployment. But streamlined review cannot occur at the expense of creating more sacrifice zones or achieving broader climate targets. Preventing reliance on carbon capture as a “false solution” is just one step in what must be a coordinated effort to fundamentally shift power away from extractive fossil fuels and toward truly renewable, equitably distributed power—power that lies in communities. At a minimum, we must demand additional federal regulatory oversight over carbon capture so that projects provide an accurate accounting of the risk associated with this infrastructure and facilitate honest communication about who will bear that risk and when.

We welcome responses to this Article. If you are interested in submitting a response for our online journal, *Ecology Law Currents*, please contact cse.elq@law.berkeley.edu. Responses to articles may be viewed at our website, <http://www.ecologylawquarterly.org>.