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ENVIRONMENTAL WAR CRIMES: ECOCIDE AND THE *ARMENIA V. AZERBAIJAN* CASE

Ilona Evelina Mantachian*

ABSTRACT

War is one of the most catastrophic climate emergencies. From the displacement of Indigenous peoples to its impacts on natural landscapes, war cripples vital ecologies and environmental resources and leaves ecosystems scarred long after ceasefires. Nowhere is this more evident than in the decades of Azerbaijan's state-sanctioned violence against Armenians. As a result, forests have burned, soils have been laced with phosphorus residues, and historic landscapes sacred to Armenians have been irrevocably altered. The emerging concept of ecocide promises to fill this gap. However, its political feasibility, definitional ambiguity, and limited international enforcement capacity remain fiercely contested.

Using the Armenia v. Azerbaijan *proceedings before the International Court of Justice (ICJ) as a case study, this Article examines whether ecocide can be operationalized to hold perpetrators of environmental war crimes accountable or whether alternative legal tools offer a more effective path to justice.*

First, this Article traces the historical evolution of ecocide, situating its most recent draft definition within the broader context of international environmental law and policy trends. This Part also explores the practical and conceptual challenges of prosecuting ecocide. Second, this Article analyzes the factual record of environmental destruction in the former Republic of Artsakh, specifically the overt ecological damage from Azerbaijan's use of white phosphorus munitions on ancient, biodiversity-rich forests. This Part also considers the applicability of ecocide to the destruction of cultural heritage, arguing that these sites are integrally linked to their surrounding ecosystems. Third, this Article assesses whether alternative legal approaches provide a complementary avenue for addressing certain battlefield practices.

Lastly, this Article proposes targeted policy recommendations, such as creating a Special Rapporteur on ecocide within the United Nations Human Rights Council (UNHRC), amending international instruments to explicitly recognize the destruction of cultural heritage as a form of environmental

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harm, and requiring mandatory Environmental Impact Assessments (EIAs) in armed conflict zones to build a more ecocentric framework for future conflict-related environmental claims.

This Article seeks to highlight the vulnerability of biodiversity in historically disputed war zones. By analyzing the complex environmental dimensions of a war in a disputed territory, this Article raises awareness of this conflict and its history, as well as its significant impacts on the people and the environment of the region.

DISCLAIMER

Throughout this Article, the region internationally known as Nagorno-Karabakh will be referred to as the former Republic of Artsakh, or simply, Artsakh. Historically, Artsakh was the tenth province in the Kingdom of Armenia from 189 BC to 387 AD.[1] From 387 to 1000 AD, it maintained varying degrees of autonomy under successive empires until the establishment of the Kingdom of Artsakh.[2] Between 1603 and 1918, the region was divided and controlled by either Russia or Persia, and in 1921, following regional tensions and wars, the Central Committee of the Russian Communist Party intervened.[3] Despite initially affirming Artsakh's status as part of Armenia, Joseph Stalin subsequently altered this decision, redrawing its borders to isolate Artsakh within Azerbaijan's sovereign territory.[4]

Cut off from Armenia, the Nagorno-Karabakh Autonomous Oblast was created illegally and without the consent of the overwhelming majority of the region's populace.[5] This decision dispossessed the Indigenous Artsakh peoples of their right to self-governance.[6] Using the name Nagorno-Karabakh helps to invalidate the independence referendums of 1988 and 1991, and legitimizes Azerbaijani claims to the ancestral lands of the Armenian peoples.

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1. *Know Your Facts: A Historical Overview of Artsakh*, ARM. MUSEUM OF AM., https://www.armenianmuseum.org/artsakh (last visited Nov. 28, 2025).

2. ROBERT H. HEWSON, ARMENIA: A HISTORICAL ATLAS 102 (2001).

3. *Chronology of Events*, USCDORNSIFE: INST. OF ARM. STUD., https://dornsife.usc.edu/armenian/initiatives/resources-on-karabakh/chronology-of-events/ (last visited Nov. 28, 2025).

4. Alex Ward, *The Conflict Between Armenia and Azerbaijan Explained*, VOX (Oct. 7, 2020), https://www.vox.com/21502327/armenia-azerbaijan-nagorno-karabakh-war-explained.

5. *Id.*

6. ROBERT SERVICE, STALIN: A BIOGRAPHY 204 (2006).

I. INTRODUCTION

Nestled within the South Caucasus, conservation biologists have long recognized the former Republic of Artsakh as a biodiversity hotspot.[7] Its ancient forests harbor more than 6,000 plant species, cliff-side monasteries stand watch over river valleys that have fed Armenian communities for centuries, while steep meadows provide critical habitat for Caucasian leopard corridors and raptor flyways.[8] Those same ridgelines have also been frontline

7. *See Our Story*, WWF, https://www.wwfcaucasus.org/about_us/our_story/ (last visited Nov. 28, 2025); *see also MapMaker: Terrestrial Biodiversity*, NAT'L GEOGRAPHIC: EDUC., https://education.nationalgeographic.org/resource/mapmaker-terrestrial-biodiversity/ (last visited Nov. 28, 2025).

8. *Statement of 50 NGOs in Armenia on Use of Phosphorus Weapons in Artsakh Forests Address to International Community*, ECOLUR NEW INFO. POL'Y IN ECOLOGY (Nov. 2, 2020), https://www.ecolur.org/en/news/biodiversity/12807/; *see Armenia – Country Profile,* CONVENTION ON BIOLOGICAL DIVERSITY, https://www.cbd.int/countries/profile?country=am (last visited Nov. 28, 2025).

trenches in a century-old dispute that most recently erupted in the 2020 war between Armenia and Azerbaijan.

The violence of armed conflict typically conjures images of human suffering and geopolitical upheaval, while the environmental toll of war often remains a silent casualty despite its long-term consequences rippling through ecosystems. While international laws proscribe protections against indiscriminate attacks on civilians, they offer little protection for the natural environment.[9] This accountability gap has generated global interest in criminalizing ecocide by codifying it as the "fifth core crime" under the Rome Statute of the International Criminal Court (ICC).[10] Opponents respond that this concept suffers from definitional ambiguity, evidentiary burdens, and foreseeable geopolitical resistance.[11] This is largely because the process of amending the Rome Statute necessitates a proposal by a state party, followed by approval for negotiations, and ultimately requiring a two-thirds majority vote from the Assembly of State Parties for adoption.[12] Securing this level of political support can be a complex and potentially lengthy process.

Using the ongoing *Armenia v. Azerbaijan* proceedings before the International Court of Justice (ICJ) as a case study, this Article seeks to answer the central question: Can the doctrine of ecocide be effectively operationalized to hold perpetrators of environmental war crimes accountable? If not, do existing instruments offer a more viable interim path to justice?

Against that backdrop, this Article asks six interlinked questions: (1) Do the Artsakh burn scars, toxic residues, and cultural heritage losses satisfy the elements in the leading draft definitions of ecocide; (2) What evidentiary standards are adequate to demonstrate knowledge or reckless disregard on the part of commanding officers; (3) Should cultural heritage be read as

9. *See generally* Matthew Gillet, *Eco-Struggles: Using International Criminal Law to Protect the Environment During and After Non-International Armed Conflict*, *in* ENV'T PROT. & TRANSITIONS FROM CONFLICT TO PEACE 220, 220–53 (Carsten Stahn et al. eds., 2017).

10. Ella Geraghty, *The Proposed Fifth International Crime: Ecocide*, DENVER J. INT'L L. & POL'Y BLOG (Apr. 24, 2025), https://web.archive.org/web/20250524185606/https://djilp.org/the-proposed-fifth-international-crime-ecocide/.

11. *See generally* Matthew Gillet, *A Tale of Two Definitions: Fortifying Four Key Elements of the Proposed Crime of Ecocide (Part II)*, OPINIOJURIS (June 20, 2023), https://opiniojuris.org/2023/06/20/a-tale-of-two-definitions-fortifying-four-key-elements-of-the-proposed-crime-of-ecocide-part-ii/; *see also* Harry Muir, *Will the Creation of the Crime of Ecocide at the International and National Level Hold Those Who Cause Severe and Irreversible Harm to the Environment Liable?*, UWE BRISTOL: BRISTOL L. SCH. BLOG (Jan. 16, 2023), https://blogs.uwe.ac.uk/bristol-law-school/will-the-creation-of-the-crime-of-ecocide-at-the-international-and-national-level-hold-those-who-cause-severe-and-irreversible-harm-to-the-environment-liable/.

12. Rome Statute of the International Criminal Court art. 121, July 17, 1998, 2187 U.N.T.S. 90.

ecocide in its own right, or does that stretch the doctrine beyond its ecological core; (4) Can Armenia deploy the Environmental Modification (ENMOD) Convention, despite Azerbaijan's non-party status, to frame white phosphorus use as a breach of emerging customary norms; (5) How might an ecocide amendment and ENMOD operate together to close the accountability gap; and lastly, (6) What policy levers are most likely to render environmental protection an operational, rather than aspirational, component of international environmental law and policy?

II. UNDERSTANDING ECOCIDE

A. Historical Development, Scope, and Definition of Ecocide

Derived from the Greek word *oikos*, meaning home, and the Latin word *cadere*, meaning to kill, ecocide means the killing of one's home.[13] The term first gained public attention during the Vietnam War in the 1970s, when Swedish Prime Minister Olof Palme famously condemned the United States for committing ecocide through its large-scale use of Agent Orange.[14] Agent Orange is a defoliant that caused widespread environmental devastation and long-term health consequences.[15] This marked a pivotal moment, as it brought the concept of environmental destruction during wartime to the forefront of international discourse. However, despite the term being used for decades, only one provision in the Rome Statute explicitly mentions environmental damage.[16]

Efforts to formally define ecocide have gained momentum, particularly in response to the escalating climate crisis and the increasing recognition of the interconnectedness between human well-being and the health of the

13. Jojo Mehta & Julia Jackson, *To Stop Climate Disaster, Make Ecocide an International Crime. It's the Only Way*, THE GUARDIAN (Feb. 24, 2021), https://www.theguardian.com/commentisfree/2021/feb/24/climate-crisis-ecocide-international-crime.

14. Peter Hough, *Trying to End the War on the World: The Campaign to Proscribe Military Ecocide*, 1 GLOB. SEC.: HEALTH, SCI. & POL'Y 10, 11–12 (2016) (explaining how Palme's use of the term "ecocide" at the 1972 Stockholm Conference popularized the concept and led to a temporary suspension of U.S.-Swedish diplomatic relations).

15. *See generally* INST. OF MED. COMM. TO REV. THE HEALTH EFFECTS IN VIET. VETERANS OF EXPOSURE TO HERBICIDES, VETERANS AND AGENT ORANGE: HEALTH EFFECTS OF HERBICIDES USED IN VIETNAM (1994) (detailing the U.S. military's use of Agent Orange during Operation Ranch Hand and documenting its toxic contamination and associated health concerns that led to its suspension).

16. *See generally Citizen Campaign to End Ecocide in Europe*, INST. FOR ENV'T SEC. (Jan. 22, 2013), https://www.envirosecurity.org/news-archives/citizen-campaign-to-end-ecocide-in-europe (discussing the European Citizens' Initiative to criminalize ecocide and noting ICC recognition that only Article 8(2)(b)(iv) of the Rome Statute expressly mentions environmental damage).

planet.[17] Additionally, prosecuting ecocide could provide a powerful tool for holding individuals in positions of power accountable for actions that lead to mass environmental destruction.[18] This could address the issue of impunity for those who make high-level decisions with devastating environmental consequences.

Seeking to establish a clear and legally sound basis for criminalizing environmental destruction, the Independent Expert Panel (IEP) for the Legal Definition of Ecocide, convened by the Stop Ecocide Foundation, has proposed a widely discussed legal definition: "unlawful or wanton acts committed with knowledge that there is a substantial likelihood of severe and either widespread or long-term damage to the environment being caused by those acts."[19] Within this proposed definition, "wanton" is specifically defined as "with reckless disregard for damage which would be clearly excessive in relation to the social and economic benefits anticipated."[20] This element introduces an aspect of proportionality, highlighting that some level of environmental impact is unavoidable in the pursuit of societal progress while aiming to criminalize actions where the resulting damage is disproportionate to any benefits gained.

Furthermore, the IEP provides specific meanings for the key terms used to describe the threshold of environmental harm. "Severe" damage is defined as that "which involves very serious adverse changes, disruption, or harm to any element of the environment, including grave impacts on human life or natural, cultural, or economic resources."[21] "Widespread" damage is defined as "damage which extends beyond a limited geographic area, crosses state boundaries, or is suffered by an entire ecosystem or species or a large number of human beings."[22] "Long-term" damage is defined as "irreversible damage which cannot be redressed through natural recovery within a reasonable period of time."[23]

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17. *See generally* Mark Hillsdon, *Society Watch: Drive to Make Ecocide an International Crime Gains Momentum*, REUTERS (Feb. 20, 2023), https://www.reuters.com/business/sustainable-business/society-watch-drive-make-ecocide-an-international-crime-gains-momentum-2023-02-20/ (describing renewed international efforts to define and criminalize ecocide amid growing recognition of the link between environmental destruction, human well-being, and the global climate crisis).

18. Iryna Rekrut, *Environmental Destruction in Conflict: Broadening Accountability in War*, HUMANITARIAN L. & POL'Y (Mar. 20, 2025), https://blogs.icrc.org/law-and-policy/2025/03/20/environmental-destruction-in-conflict-broadening-accountability-in-war/.

19. STOP ECOCIDE FOUND., INDEPENDENT EXPERT PANEL FOR THE LEGAL DEFINITION OF ECOCIDE: COMMENTARY AND CORE TEXT 5 (2021).

20. *Id*.

21. *Id.*

22. *Id.*

23. *Id.*

B. Legal Criteria and Evidentiary Challenges

Each element in the proposed definition poses its own set of hurdles. First, establishing "knowledge" on the part of the individuals responsible for acts that cause environmental damage is a remarkably complex task. Proving that the perpetrators were aware of the substantial likelihood of causing severe and long-term environmental harm requires access to information about their intentions and decision-making processes. Gathering such evidence can be exceedingly difficult in the context of armed conflict, as military operations are often shrouded in secrecy, limiting access to information.[24]

Additionally, determining whether the damage meets the high threshold of severe, widespread, or long-term requires clear legal standards and robust scientific evidence.[25] Gathering the necessary scientific data to demonstrate that the damage reaches these thresholds will require extensive environmental assessments, long-term monitoring, and expert analysis. This process can be time-consuming and resource-intensive, especially in conflict-affected regions.[26]

Finally, attributing responsibility for ecocidal acts to specific individuals, particularly within military or corporate structures, can present another significant hurdle. Establishing a clear chain of command and demonstrating individuals' direct culpability in ordering or facilitating actions that lead to mass environmental destruction requires thorough investigations and access to potentially sensitive information.[27]

Taken together, these challenges suggest that the practicalities of prosecuting ecocide cases could place even greater demands on the International Criminal Court's (ICC) institutional capacity.

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24. *See generally* LÉA WEIMANN ET AL., CENTER FOR CLIMATE ENGAGEMENT RESPONSE TO OTP'S DRAFT POLICY ON ENVIRONMENT CRIMES (2025) (noting the difficulty of proving direct intent in environmental crime cases).

25. *See* Wim Zqijnenburg & Ollie Ballinger, *Leveraging Emerging Technologies to Enable Environmental Monitoring and Accountability in Conflict Zones*, 105 INT'L REV. RED CROSS 1497, 1505 (2023) (explaining that reliable damage assessments in war require multi-temporal satellite analysis, ground-truth sampling, and long-term ecological monitoring, all of which are costly, data-intensive, and often impossible while conflict is ongoing).

26. *Id.*

27. *See* Vrishank Singhania, *The Proposed Crime of Ecocide – Ignoring the Question of Liability*, OPINIOJURIS (Feb. 16, 2022), https://opiniojuris.org/2022/02/16/the-proposed-crime-of-ecocide-ignoring-the-question-of-liability/.

C. Current International Discourse and Momentum

While the crime of ecocide is not yet explicitly codified in international law, potential pathways and emerging precedents could pave the way for its establishment and application in international courts.[28] As previously mentioned, a significant aspect of the current international discourse surrounding ecocide is the growing movement advocating towards placing it alongside the existing core international crimes of genocide: crimes against humanity, war crimes, and aggression.[29]

Furthermore, existing provisions within the Rome Statute itself offer a potential precedent. Specifically, Article 8(2)(b)(iv) of the Statute already criminalizes ecocide as a war crime:

> [I]ntentionally launching an attack with the knowledge that such an attack will cause incidental loss of life or injury to civilians or damage to civilian objects or widespread, long-term, severe damage to the natural environment, which would be clearly excessive in relation to the concrete and direct overall military advantage anticipated.[30]

While this provision is limited to armed conflict and sets a high threshold for environmental damage, it demonstrates that international criminal law already recognizes the severity of environmental harm in specific contexts.[31]

Additionally, the movement towards criminalizing ecocide is gaining traction across regional levels as well. Several countries, including Armenia, have already adopted national ecocide legislation or are actively considering its implementation.[32] Furthermore, the European Union's (EU) Environmental Crime Directive includes provisions addressing "qualified criminal offenses" that encompass conduct comparable to ecocide.[33] This

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28. *See* Jessica Durney, *Crafting a Standard: Environmental Crimes as Crimes Against Humanity Under the International Criminal Court*, 24 U.C. L. ENV'T J. 413, 415 (2018) (providing an example of an effort to expand the criminalization of ecocide that suggests prosecuting environmental crimes as crimes against humanity).

29. *Id.* at 416.

30. Rome Statute of the International Criminal Court, *supra* note 12, art. 8(2)(b)(iv).

31. *Id.*

32. *Ecocide/Serious Environmental Crimes in National Jurisdictions*, ECOCIDE LAW, https://ecocidelaw.com/existing-ecocide-laws/ (last visited Nov. 28, 2025); *see* CRIMINAL CODE OF THE REPUBLIC OF ARMENIA art. 394 (referencing ecocide as a punishable offense).

33. Michael Faure, *The Creation of an Autonomous Environmental Crime through the New EU Environmental Crime Directive*, 2 EUCRIM 81, 154–55 (2024) (analyzing the Environmental Crime Directive's introduction of "qualified offenses" and describing it as a major expansion of environmental criminal liability in the EU).

directive mandates that EU member states criminalize certain severe environmental harms, indicating a regional commitment to tackling serious environmental offenses through criminal law mechanisms.[34]

Lastly, the Office of the Prosecutor (OTP) of the ICC has also shown an increasing interest in environmental crimes, signaling a potential shift towards greater accountability for such offenses within the Court's existing mandate.[35] Specifically, the OTP has launched policy initiatives and consultations to explore how the existing provisions of the Rome Statute can be utilized to address environmental destruction.[36] Note that it is essential to clarify the distinct roles of international courts in this context. While the International Court of Justice (ICJ) primarily handles disputes between states and can address state responsibility for environmental damage, it lacks jurisdiction over individual criminal liability, which is the focus of the proposed crime of ecocide.[37] Therefore, establishing individual criminal accountability for ecocide at the international level hinges primarily on the willingness of states to amend the Rome Statute, despite the political and legal challenges this path presents.

D. Conceptual and Practical Challenges to Operationalizing Ecocide

Despite widespread efforts to criminalize ecocide, the path toward recognizing and effectively enforcing such criminalization is fraught with obstacles. Legally, one of the primary hurdles is the lack of a universally agreed-upon definition.[38] Specifically, this concern centers on the potential vagueness and overbreadth of the ecocide definition. Critics argue that the broad language could lead to the criminalization of legitimate activities that cause environmental damage as a byproduct, such as infrastructure development, agriculture, or resource extraction necessary for economic development.[39] Thus, while the definition proposed by the IEP has gained

34. *Id.*

35. *See ICC Office of the Prosecutor Launches Second Public Consultation on a Policy Initiative to Advance Accountability for Environmental Crimes Under the Rome Statute*, INT'L. CRIM. CT. (Dec. 18, 2024), https://www.icc-cpi.int/news/icc-office-prosecutor-launches-second-public-consultation-policy-initiative-advance.

36. *Id.*

37. Juliette McIntyre, *How Does the International Court of Justice Differ from the International Criminal Court?*, UNIV. OF MELBOURNE: PURSUIT (Jan. 8, 2024), https://pursuit.unimelb.edu.au/articles/how-does-the-international-court-of-justice-differ-from-the-international-criminal-court.

38. Rachel Killean, *The Benefits, Challenges, and Limitations of Criminalizing Ecocide*, IPI GLOB. OBSERVATORY (Mar. 30, 2022), https://theglobalobservatory.org/2022/03/the-benefits-challenges-and-limitations-of-criminalizing-ecocide/.

39. *See generally* Liana Georgieva Minkova, *Ecocide, Sustainable Development and Critical Environmental Law Insights*, 22 J. INT'L. CRIM. JUST. 81 (2024) (critiquing the IEP's ecocide definition

considerable traction, it has also faced criticism and has not yet been formally adopted by the international community.[40]

Furthermore, the inclusion of the "wanton" element in the proposed definition—requiring an assessment of whether the environmental damage is "clearly excessive" in relation to the social and economic benefits anticipated—introduces a degree of subjectivity into the legal standard.[41] As previously mentioned, determining an acceptable balance between environmental protection and socioeconomic development can be highly context-dependent and politically charged. This balance makes it challenging to apply this standard consistently across different cases and jurisdictions.

Additionally, and arguably most importantly, defining the requisite level of "knowledge" that the perpetrator possessed regarding the substantial likelihood of causing severe and long-term damage presents a significant challenge.[42] Proving the mental state of individuals, particularly those operating within complex organizational structures such as corporations, governments, or militaries, can be challenging. Thus, establishing they were aware of the likely environmental consequences of their actions to the degree required by the definition poses a considerable evidentiary burden.

On the political front, resistance from powerful states protective of their national sovereignty and economic and military interests is expected. Such nations often hold strong concerns about international interference in what they consider their internal affairs.[43] They are wary of any international legal framework that could expose their actions to scrutiny or prosecution, particularly during times of conflict.[44] Their reluctance is rooted in the belief that environmental matters are intrinsically linked to their national independence, making them hesitant to cede authority over these issues.[45]

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for importing a cost-benefit "wantonness" test that could sweep lawful development into criminal liability and incentivize greenwashing).

40. Kevin Jon Heller, *Skeptical Thoughts on the Proposed Crime of "Ecocide" (That Isn't)*, OPINIOJURIS (June 23, 2021), https://opiniojuris.org/2021/06/23/skeptical-thoughts-on-the-proposed-crime-of-ecocide-that-isnt/ (praising the IEP's effort yet arguing the draft's mens rea design is "unworkable" and underscoring that states have not yet adopted the definition).

41. *Id.*

42. *Id.*

43. Mohamad Albakjaji & Jinane El Baroudy, *The Effectiveness of the International Environmental Law: The Issues of State Sovereignty, National Interests, and Differing Levels of Commitments*, 3 J. ECOHUMANISM 1348, 1353 (2024).

44. Roberta Chardulo Andrade, *The Time to Criminalize Ecocide is Here, But a Fifth International Crime Could Hurt the Very System from Which it Draws Power and Legitimacy*, OPINIOJURIS (Sept. 6, 2024), https://opiniojuris.org/2024/09/06/the-time-to-criminalize-ecocide-is-here-but-a-fifth-international-crime-could-hurt-the-very-system-from-which-it-draws-power-and-legitimacy/.

45. *Id.* (stating that criminalizing ecocide would impose tangible limitations on the sovereignty that states have traditionally enjoyed over the use of their own natural environment, and that major powers not party to the Rome Statute are likely to be wary of accepting that their nations be prosecuted).

Protecting their national interests, which may include maintaining military operational flexibility, can often take precedence over environmental concerns in the international arena.[46] Overcoming this obstacle will require sustained international cooperation, robust diplomatic efforts, and a strong commitment from states to prioritize environmental protection and accountability at the highest levels of international law.

Beyond sovereignty, geopolitical considerations further complicate matters. States may prioritize broader political and strategic alliances, making them reluctant to sanction allies or powerful nations, even in cases of severe environmental harm.[47] This suggests that national interests and stability can sometimes take priority over the urgency of addressing environmental destruction.

Finally, beyond these challenges, critics have also raised concerns about the potential for ecocide law to be applied selectively or disproportionately, targeting certain states or actors based on political considerations rather than solely on the objective assessment of environmental harm.[48] This could undermine the perceived legitimacy and fairness of the international criminal justice system. Additionally, some argue that existing international environmental laws already provide sufficient legal mechanisms to address environmental destruction in conflict, suggesting the focus should instead be on strengthening the enforcement of these mechanisms rather than creating a new crime that might unnecessarily complicate the existing landscape.[49]

E. Ecocide and Cultural Heritage: Boundaries and Intersections

While the natural environment and cultural heritage are often interconnected and can influence each other, their primary focus and the legal regimes designed to protect them differ. The currently proposed definitions

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46. *See generally* Ananya Bhargava, *Are We at War with the Environment?*, OPINIOJURIS (Feb. 14, 2025), https://opiniojuris.org/2025/02/14/are-we-at-war-with-the-environment/ (arguing that wartime environmental law is state-centric and anthropocentric, with proportionality and "military necessity" privileging operational advantage over environmental protection, including under Rome Statute art. 8(2)(b)(iv)).

47. *Id.*

48. *See generally* Rebecca J. Hamilton, *Criminalizing Ecocide: An Opportunity to Embed the Inseparability of Humans from Nature into the Law*, 38 HARV. HUM. RTS. J. 69 (2025) (noting concerns that ecocide prosecutions could replicate existing structural and geopolitical biases within international criminal law, leading to politically influenced enforcement favoring powerful states).

49. *See generally* Thomas Obel Hansen, *Accountability for Environmental Crimes in Conflict Zones: Why Expanding the International Criminal Court's Jurisdiction Is Not the Best Solution*, 56 N.Y.U. J. INT'L L. & POL. 879 (2024) (arguing that, given ICC constraints, accountability for conflict-linked environmental harm is more effectively advanced by using existing International Humanitarian Law and International Environmental Law tools and domestic prosecutions, including extraterritorial jurisdiction, than by adding a new ecocide crime at the ICC).

of ecocide, including the one drafted by the IEP, primarily emphasize harm to ecosystems, biodiversity, natural resources, and the overall health and integrity of Earth's systems and living organisms.[50] In contrast, cultural heritage—which encompasses both tangible assets such as monuments, archaeological sites, and artworks, and intangible aspects like traditions, customs, and knowledge—typically falls under separate legal frameworks within international law.[51]

However, strong arguments can be made for considering cultural heritage destruction within the scope of ecocide. Specifically, cultural heritage sites (e.g., ancient churches and cemeteries) are not isolated human constructs but are deeply embedded in their ecological contexts.[52] The UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage specifically recognizes the "combined works of nature and of man" as worthy of protection, affirming the inseparability of cultural and natural heritage.[53]

Additionally, instruments like the UN Declaration on the Rights of Indigenous Peoples establish that cultural destruction, especially when tied to Indigenous lands, is a recognized harm in international law.[54] Lastly, excluding cultural heritage from ecocide artificially separates humans from nature, perpetuating an outdated, anthropocentric worldview. Thus, as an emerging crime, ecocide should build on frameworks that affirm an ecocentric legal philosophy that acknowledges the mutual dependence of human culture and environmental health.

Opponents of expanding the definition of ecocide to include cultural destruction could argue that it might dilute the primary focus on the natural environment and create additional challenges in its legal application and prosecution.[55] Specifically, opponents may argue that the core aim of ecocide

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50. *See generally* STOP ECOCIDE FOUND., *supra* note 19.

51. *See, e.g.*, Convention for the Protection of Cultural Property in the Event of Armed Conflict art. 3, May 14, 1954, 3511 U.N.T.S. 240 (safeguarding tangible cultural property); Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property art. 3, Nov. 14, 1970, 11806 U.N.T.S. 232 (creating export-certificate and restitution duties to curb illicit trafficking in movable cultural objects); and Convention for the Safeguarding of the Intangible Cultural Heritage, Oct. 17, 2003, 2368 U.N.T.S. 35, 37 (covering intangible expressions via representative and urgent-safeguarding lists and national inventory duties).

52. *See Cultural Landscapes*, UNESCO WORLD HERITAGE CONVENTION, https://whc.unesco.org/en/culturallandscape/ (last visited Nov. 28, 2025) (highlighting the ecological embeddedness of cultural heritage by stating "[c]ombined works of nature and humankind . . . express a long and intimate relationship between peoples and their natural environment").

53. *Id.*; *see* Convention Concerning the Protection of the World Cultural and Natural Heritage art. 1, Nov. 16, 1972, 1037 U.N.T.S. 151.

54. G.A. Res. 61/295 art. 8 (Sept. 13, 2007).

55. Kevin Jon Heller, *Ecocide and Anthropocentric Cost-Benefit Analysis*, OPINIOJURIS (June 26, 2021), https://opiniojuris.org/2021/06/26/ecocide-and-anthropocentric-cost-benefit-analysis/

law is to protect Earth's life-supporting systems from mass destruction. Therefore, including cultural heritage within this definition could cause overlap with existing legal frameworks specifically designed for cultural heritage protection. This could lead to confusion, fragmentation, and weakening of both legal regimes. Thus, a more focused approach that centers solely on the natural environment might be more effective for establishing ecocide as a distinct and powerful international crime.

However, these arguments are of little value when considering that the destruction of cultural sites disrupts the social fabric of communities, weakening their connection to the land and reducing their role as environmental stewards. This undermines the very same long-term environmental conservation efforts that ecocide law targets. The Parts below expand on this argument.

III. CASE STUDY: *ARMENIA V. AZERBAIJAN*

Understanding the historical and political backdrop is essential for analyzing the arguments presented by Armenia before the International Court of Justice (ICJ). Armenia and Azerbaijan have had a strained relationship—deeply rooted in ethnic and territorial disputes—for several decades.[56] While their 21st-century rivalry mainly revolves around the unresolved status of Artsakh, Armenia's painful past with Turkey has long fueled the dispute between the two neighboring countries.[57] Turkey, bordering Armenia on its eastern side, is Azerbaijan's closest ally.[58] Azerbaijan and Turkey are bound by ethnic, cultural, and historical ties, and both countries refer to their relationship as one between "one nation, two states."[59] Turkey was the first country in the world to recognize Azerbaijan's independence from the Soviet Union in 1991.[60] Ever since, they have maintained a close alliance.[61]

(arguing that stretching the crime's contours to capture social and economic benefits would unjustifiably dilute the concept of ecocide, illustrating how adding things to the definition risks eroding its core environmental focus).

56. EUR. COMM'N AGAINST RACISM & INTOLERANCE, SECOND REPORT ON AZERBAIJAN 6 (2007).

57. *See generally* CHRIS MORRIS, THE NEW TURKEY: THE QUIET REVOLUTION ON THE EDGE OF EUROPE (2005).

58. *Press Statements of Presidents of Azerbaijan and Turkey Recep Tayyip Erdogan*, OFF. WEBSITE OF PRESIDENT OF AZER. REPUBLIC (Sept. 15, 2010), https://president.az/en/articles/view/736/print.

59. *Id.*

60. Susan Fraser, *AP Explains: What Lies Behind Turkish Support for Azerbaijan*, AP NEWS (Oct. 2, 2020), https://apnews.com/article/turkey-territorial-disputes-azerbaijan-ankara-armenia-9a95d9690569623adedffe8c16f3588d.

61. *Id.*

Ongoing historical grievances have also defined Armenia's relationship with Turkey.[62] This is primarily due to lingering resentment since the 1915 Armenian Genocide carried out by Ottoman Turkey, in which 1–2 million Armenians were murdered between 1915 and 1923.[63] While governments and parliaments of 33 countries—including the United States and 15 other NATO members—have formally recognized the Armenian Genocide, both Turkey and Azerbaijan continue to adopt a policy of denial.[64]

A. Historical Background: The Fight for Artsakh

Although the region is a *de jure* part of Azerbaijan, the territorial ownership of the mountainous enclave is fiercely contested between Armenia and Azerbaijan.[65] Dotted with medieval Armenian churches, historians have affirmed the presence of Indigenous Armenian peoples in Artsakh since the second century BC.[66] Nonetheless, Azerbaijan claims historical ties to the region.[67]

For most of the 19th century, Artsakh was under the rule of the Russian Empire.[68] After the collapse of the Empire in 1918, Armenia and Azerbaijan formed new countries and immediately began fighting over the region.[69] Just three years later, Russian Soviets conquered the entire Caucasus and eventually made Armenia and Azerbaijan republics within the Soviet Union, and drew new borders.[70]

In 1923, the Soviet government established the Nagorno-Karabakh Autonomous Oblast, placing Artsakh within the borders of Azerbaijan

62. BENNY MORRIS & DROR ZE'EVI, THE THIRTY-YEAR GENOCIDE: TURKEY'S DESTRUCTION OF ITS CHRISTIAN MINORITIES, 1894–1924, at 244 (2019).

63. *Id.*

64. *See* Armenian Genocide Recognition, ARM. NAT'L COMM. AM. https://anca.org/armenian-genocide/recognition/ (last visited Nov. 28, 2025); *see also Denial*, THE GENOCIDE EDUC. PROJ., https://genocideeducation.org/background/denial/ (last visited Nov. 28, 2025).

65. *See UNHCR Publication for CIS Conference (Displacement in the CIS) – Conflicts in the Caucasus*, UNHCR: THE UN REFUGEE AGENCY (May 1, 1996), https://www.unhcr.org/publications/refugeemag/3b5583fd4/unhcr-publication-cis-conference-displacement-cis-conflicts-caucasus.html.

66. *See Know Your Facts: A Historical Overview of Artsakh*, *supra* note 1.

67. THOMAS DE WAAL, BLACK GARDEN: ARMENIA AND AZERBAIJAN THROUGH PEACE AND WAR 127–28 (2003) [hereinafter BLACK GARDEN]; *see* Tigran Zakaryan, *The Karabakh War of 1918–1920 and the "Resolution" of the Conflict Under Soviet Authorities*, REG'L POST: CAUCASUS (Apr. 30, 2021), https://regionalpost.org/en/articles/the-karabakh-war-of-1918-1920.html.

68. *See Know Your Facts: A Historical Overview of Artsakh*, *supra* note 1.

69. *Id.*

70. Robert Coalson, *How Stalin Created Some of the Post-Soviet World's Worst Ethnic Conflicts*, ATLANTIC (Mar. 1, 2013), https://www.theatlantic.com/international/archive/2013/03/how-stalin-created-some-of-the-post-soviet-worlds-worst-ethnic-conflicts/273649/.

despite its 95% Armenian populace.[71] Assigning territories with one predominant ethnic group to a republic dominated by another ethnic group was a calculated tactic to maintain Soviet control, as it kept local nationalities divided and dependent on Moscow for peace and stability.[72] This decision by the Soviet authorities sowed the seeds for future unrest as the Armenian population increasingly desired reunification with neighboring Armenia.[73]

When the Soviet Union began disintegrating, a new policy initiative called Glasnost was announced.[74] Glasnost was intended to grant the various peoples of the Soviet Republics more political freedoms, which gave ethnic Armenians in Artsakh a chance for independence.[75] Alongside Mikhail Gorbachev's reform program of Perestroika, this period loosened long-standing restrictions on political expression and national self-determination.[76] Across the Soviet republics, this newfound openness stirred political activism and debates over cultural identity, particularly in regions with complex ethnic compositions such as Artsakh.[77]

In 1988, the regional legislature voted to transfer control over the territory from Azerbaijan to Armenia.[78] This move was met with opposition in Azerbaijan.[79] In Armenia, people rallied for reunification, while counter-protests ensued in Azerbaijan.[80] The Republic of Azerbaijan rejected the proposals in an attempt to claim Artsakh as part of its territory.[81] The Armenian Supreme Soviet and the Oblast's Supreme Council (the highest

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71. Ctr. for Preventative Action, *Tensions Between Armenia and Azerbaijan*, COUNCIL ON FOREIGN RELS.: GLOB. CONFLICT TRACKER, https://www.cfr.org/global-conflict-tracker/conflict/nagorno-karabakh-conflict (last updated Aug. 12, 2025); *see* RICHARD G. HOVANNISIAN, THE REPUBLIC OF ARMENIA: VOLUME I THE FIRST YEAR, 1918–1919, at 82 (1971).

72. Thomas de Waal, *Revenge of the Border*, CARNEGIE ENDOWMENT FOR INT'L PEACE (Dec. 8, 2016), https://carnegieendowment.org/posts/2016/12/revenge-of-the-border?lang=en (stating Soviet ethno-territorial borders were intentionally crafted to "set one ethnic group against another," thereby weakening potential unified resistance).

73. *Armenia,* HUM. RTS. WATCH, https://www.hrw.org/reports/1995/WR95/HELSINKI-01.htm (last visited Nov. 28, 2025).

74. *See generally* Olivia B. Waxman, *Mikhail Gorbachev Championed 'Glasnost' and 'Perestroika.' Here's How They Changed the World*, TIME (Aug. 30, 2022), https://time.com/5512665/mikhail-gorbachev-glasnost-perestroika/.

75. *Id.*

76. *Id.*

77. Matthew Tentler, *Armed Conflict in Nagorno-Karabakh: Crisis, Exodus, and Ethnic Cleansing*, GLOB. GOVERNANCE INST. (Oct. 9, 2023), https://www.globalgovernance.eu/publications/armed-conflict-in-nagorno-karabakh-crisis-exodus-and-ethnic-cleansing?.

78. *Chronology of Events*, *supra* note 3; BLACK GARDEN, *supra* note 67.

79. Vox, *The Armenia and Azerbaijan War, Explained*, YOUTUBE (Dec. 3, 2020), https://www.youtube.com/watch?v=YU2v38hRRbg.

80. *Id.*

81. *Id.*

elected body in the former territory) issued a joint declaration calling for the unification of Armenia and Artsakh, which Azerbaijan declared illegal and void.[82] This series of events triggered the resurfacing of long-suppressed nationalist aspirations. The growth of anti-Armenian sentiment resulted in ethnic violence, beginning with a series of pogroms between 1988 and 1990 against Armenians in Sumgait, Ganja, and Baku.[83]

The Armenians in the region then held an independence referendum, with an overwhelming majority voting in favor of independence.[84] Azerbaijan refused to recognize the legitimacy of the vote and responded militarily.[85] As Armenia and Azerbaijan achieved independence in 1991 following the dissolution of the Soviet Union, Azerbaijan's escalating anti-Armenian violence and territorial demands erupted into a full-scale war.[86] The First Karabakh War, which lasted from 1991 to 1994, was a brutal conflict that resulted in an estimated 30,000 casualties and created hundreds of thousands of refugees and internally displaced persons.[87] By the time a ceasefire was brokered by Russia in 1994 through the Bishkek Protocol, Armenian forces officially regained control over the entire region.[88]

The 1994 ceasefire left Artsakh in a state of *de facto* independence, operating as an extension of the Armenian government, with a self-proclaimed government in Stepanakert.[89] For three decades following the war, this "unresolved" status led to a prolonged period of "no war, no peace," characterized by intermittent deadly incidents, ceasefire violations, and diplomatic efforts that failed to yield a lasting political solution.[90]

In 2020, in a sudden and unprovoked escalation, Azerbaijanis rallied for war against Armenia, and Turkey voiced its firm support for Azerbaijan.[91]

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82. *Joint Resolution of Armenia SSR & Nagorny Karabakh Oblast on Reunification* (Dec. 1, 1989), *in* NAGORNO-KARABAKH: DOCUMENTS, RESOLUTIONS AND AGREEMENTS (2014); *see also* Econ. & Soc. Council, Report on the Situation of Human Rights in Nagorno-Karabakh, at 5, U.N. Doc. E/CN.4/2005/G.23 (2005).

83. INS RES. INFO. CTR., AZERBAIJAN: THE STATUS OF ARMENIANS, RUSSIANS, JEWS AND OTHER MINORITIES 11 (1993); *see Baku Pogroms*, COUNCIL OF EUR.: PARLIAMENTARY ASSEMBLY (Jan. 31, 2020), https://pace.coe.int/en/files/28589/html.

84. Vox, *supra* note 79.

85. *Id.*

86. *Id.*

87. Ctr. for Preventative Action, *supra* note 71.

88. *Id.*

89. Natalie Mychajlyszyn, *The OSCE and Regional Conflicts in the Former Soviet Union*, *in* ETHNICITY AND TERRITORY IN THE FORMER SOVIET UNION 194, 211 (James Hughes & Gwendolyn Sasse eds., 2014).

90. WALTER LANDGRAF & NAREG SEFERIAN, A "FROZEN CONFLICT" BOILS OVER: NAGORNO-KARABAKH IN 2023 AND FUTURE IMPLICATIONS 9 (2024).

91. RealLifeLore, *Why Azerbaijan Will Keep Attacking Armenia*, YOUTUBE (Oct. 15, 2022), https://www.youtube.com/watch?v=7NOMj7n6QAM&t=640s.

The war officially began with a large-scale Azerbaijani ground offensive that included targeting of infrastructure using rocket artillery and cluster munitions in the capital of Artsakh on September 27, 2020.[92] During this war, the use of white phosphorus munitions by the Azerbaijani military triggered an ecocide alert—the central component of this Article.[93] After 44 days of intense fighting, Azerbaijan occupied most of the territories it had lost to Armenian forces in the early 1990s.[94] A Russian-mediated ceasefire agreement brought the 44-day war to an end on November 10, 2020. This agreement mandated the deployment of Russian peacekeeping forces to the parts of Artsakh that remained under Armenian control and the establishment of a narrow corridor connecting Artsakh with Armenia across the Lachin region.[95]

The fragile peace established by the 2020 ceasefire was short-lived. On December 12, 2022, Azerbaijan imposed a brutal blockade on the Lachin Corridor, severely restricting the movement of people and goods into Artsakh, leading to a humanitarian crisis that lasted nine months, two weeks, and four days.[96] On September 20, 2023, Azerbaijan launched a large-scale military offensive against Artsakh.[97] Within days, the local Armenian authorities were forced to surrender, resulting in the complete takeover of the region by Azerbaijani forces.[98] This offensive resulted in the mass exodus of the vast majority of the ethnic Armenian population of Artsakh, numbering

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92. *Azerbaijan: Unlawful Strikes in Nagorno-Karabakh*, HUM. RTS. WATCH (Dec. 11, 2020), https://www.hrw.org/news/2020/12/11/azerbaijan-unlawful-strikes-nagorno-karabakh.

93. Eoghan Darbyshire, *Report: Investigating the Environmental Dimensions of the 2020 Nagorno-Karabakh Conflict*, CONFLICT & ENV'T OBSERVATORY (Feb. 2021), https://ceobs.org/investigating-the-environmental-dimensions-of-the-nagorno-karabakh-conflict/.

94. Ctr. for Preventative Action, *supra* note 71.

95. Hayk Smbatyan & Heydar Isayev, *An Analysis of the November 9 Ceasefire Agreement and Its Implementation*, CAUCASUS EDITION J. FOR CONFLICT TRANSFORMATION (Aug. 26, 2022), https://caucasusedition.net/an-analysis-of-the-november-9-ceasefire-agreement-and-its-implementation/.

96. *Azerbaijan: Blockade of Lachin Corridor Putting Thousands of Lives in Peril Must Be Immediately Lifted*, AMNESTY INT'L (Feb. 9, 2023), https://www.amnesty.org/en/latest/news/2023/02/azerbaijan-blockade-of-lachin-corridor-putting-thousands-of-lives-in-peril-must-be-immediately-lifted/; *see UN Experts Urge Azerbaijan to Lift Lachin Corridor Blockade and End Humanitarian Crisis in Nagorno-Karabakh*, U.N. HUM. RTS.: OFF. OF THE HIGH COMM'R (Aug. 7, 2023), https://www.ohchr.org/en/press-releases/2023/08/un-experts-urge-azerbaijan-lift-lachin-corridor-blockade-and-end; *see also* Ewelina U. Ochab, *Lachin Corridor Blockade Starves Nagorno-Karabakh*, FORBES (Aug. 8, 2023), https://www.forbes.com/sites/ewelinaochab/2023/08/08/lachin-corridor-blockade-starves-nagorno-karabakh/.

97. Rupert Neate, *Wednesday Briefing: What You Need to Know About the Nagorno-Karabakh Conflict*, THE GUARDIAN (Sept. 27, 2023), https://www.theguardian.com/world/2023/sep/27/first-edition-nagorno-karabakh.

98. Christian Edwards, *Republic of Artsakh Will Cease to Exist January 1, 2024*, GENOCIDE WATCH (Sept. 29, 2023), https://www.genocidewatch.com/single-post/nagorno-karabakh-will-cease-to-exist-from-next-year-how-did-this-happen.

around 120,000 people, to Armenia, effectively ending the Armenian presence in the region for the first time in its millennia-old history.[99] On January 1, 2024, the self-proclaimed Republic of Artsakh officially dissolved itself.[100]

B. Ecocide Alert in Artsakh

On October 30, 2020, during the 44-day war, video footage of white phosphorus rainfall in the forests of Artsakh circulated on the internet.[101] Shortly after these videos surfaced, the Ministry of Defense of the former Republic of Artsakh stated that the Azerbaijani military had used white phosphorus weapons to burn the forests of Artsakh.[102] The Armenian Human Rights Defender announced that civilians were hiding in these forests.[103] While Azerbaijan has accused Armenia of being the perpetrator, the Armenian government has openly called for an independent assessment by the Organization for the Prohibition of Chemical Weapons, a call that the American Armenian Bar Association supports.[104]

The Armenian Human Rights Defender subsequently confirmed that approximately 1815 hectares (4400 acres) of forested areas throughout Artsakh had been damaged.[105] While both parties have blamed one another for the use of white phosphorus, restrictions on media and the work of international journalists within Azerbaijan have made it difficult to investigate the events and responsible parties.[106] However, findings of the

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99. Patrick Reevell, *Nagorno-Karabakh Enclave Emptied After Entire Ethnic Armenian Population Flees*, ABCNEWS (Oct. 2, 2023), https://abcnews.go.com/International/nagorno-karabakh-enclave-emptied-entire-armenian-population-flees/story?id=103655356.

100. Edwards, *supra* note 98.

101. Astghik Karapetyan, *The Use of White Phosphorus by Azerbaijan and the Armenian Government's Slow Response*, EVN REPORT: POL. (Sept. 7, 2021), https://evnreport.com/politics/the-use-of-white-phosphorus-by-azerbaijan-and-the-armenian-governments-slow-response-2/; *see A Reporter Documents Impact of Azerbaijan's White Phosphorus Munitions in Karabakh*, CIVILNET (Feb. 28, 2021), https://www.civilnet.am/en/news/540162/a-reporter-documents-impact-of-azerbaijans-white-phosphorus-munitions-in-karabakh/.

102. THE HUM. RTS. DEF. OF THE REPUBLIC OF ARM. & THE HUM. RTS. OMBUDSMAN OF THE REPUBLIC OF ARTSAKH, AD HOC PUBLIC REPORT ON THE USE OF INCENDIARY AMMUNITION OF MASS DESTRUCTION (INCENDIARY WEAPON) AGAINST CIVILIAN OBJECTS OF ARTSAKH (NAGORNO-KARABAKH) BY THE AZERBAIJANI ARMED FORCES 5–6 (2020) [hereinafter PUBLIC REPORT].

103. *Id.* at 31.

104. Darbyshire, *supra* note 93.

105. PUBLIC REPORT, *supra* note 102, at 21.

106. *See Azerbaijan*, REPS. WITHOUT BORDERS, https://rsf.org/en/country/azerbaijan (last visited Nov. 16, 2025) (ranking Azerbaijan at 167th place, as the 13th worst ranking country in 2025); *see also* Darbyshire, *supra* note 93 (stating the Azerbaijani "Ministry of Foreign [A]ffairs actively encouraged journalists to avoid the conflict"). Hence, much of the journalistic content on the Azerbaijani perspective is state sponsored. *Id.*

burned territories were published in the Joint Ad Hoc Report by the Human Rights Defender in the Republic of Armenia and the Human Rights Ombudsman of the Republic of Artsakh.[107] No equivalent legal reporting exists from Azerbaijan.[108] Additionally, the Atlantic Council's Digital Forensic Research Lab identified large, burnt fields resembling burn damage from white phosphorus in Armenian-controlled territories.[109] Specifically, satellite imagery provides visual evidence of extensive burn marks across large forested areas, particularly in locations such as northwest of the village of Dadivank and near the village of Arpagetik, which aligns with Armenia's assertions.[110] The report resulted in the U.S. House of Representatives passing an amendment calling for a report on Azerbaijani war crimes, including the use of illegal munitions and white phosphorus against Armenian civilians.[111]

The use of white phosphorus munitions immediately triggered an Ecocide Alert on November 2, 2020 from 51 non-governmental organizations (NGOs) from Armenia, France, Sweden, and Luxembourg, headed by the Foundation for the Preservation of Wildlife and Cultural Assets.[112] This is mainly due to Artsakh being known for its biodiversity and its high number of endemic species.[113] Specifically, the forests of Artsakh are home to over 6000 plant species, 153 mammal species, and approximately 400 bird species.[114] Hundreds of these species are listed in the Red Book of Threatened Species and the global IUCN Red List.[115] The alert highlighted the significant biodiversity and number of endangered species in Artsakh, noted how the use of white phosphorus posed an existential threat to their survival, and called on global environmental actors to prevent ecocide.[116]

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107. Darbyshire, *supra* note 93.

108. *Id.*

109. Lukas Andriukaitis, *Satellite Imagery Shows Environmental Damage of Reported White Phosphorus Use in Nagorno-Karabakh*, MEDIUM (Nov. 12, 2020), https://medium.com/dfrlab/satellite-imagery-shows-environmental-damage-of-reported-white-phosphorus-use-in-nagorno-karabakh-9826391a295.

110. *Id.*

111. Jackie Abramiam, *A Year After Unleashing War Crimes Against Indigenous Armenians, Azerbaijan's Threats and Violations Continue*, FORBES (Sept. 27, 2021), https://www.forbes.com/sites/jackieabramian/2021/09/27/a-year-after-unleashing-war-crimes-against-indigenous-armenians-azerbaijans-threats-and-violations-continue/?sh=ef4745a8cc12.

112. Darbyshire, *supra* note 93.

113. *See* Valida Ali-zade et al., *Armenia*, *in* RED LIST OF THE ENDEMIC PLANTS OF THE CAUCASUS: ARMENIA, AZERBAIJAN, GEORGIA, IRAN, RUSSIA, AND TURKEY 73, 73 (James Solomon et al. eds., 2014).

114. *Statement of 50 NGOs in Armenia on Use of Phosphorus Weapons in Artsakh Forests Address to International Community*, *supra* note 8.

115. Valida Ali-zade et al., *supra* note 113.

116. *Biodiversity of Nagorno-Karabakh's Forests in Danger Because of Extensive Fires. Armenian NGOs Seeking Support from International Environmental Platforms*, ARNIKA (Nov. 5, 2020),

The ecocide alert also triggered the Conflict and Environment Observatory to investigate the environmental dimensions of the war.[117] This report, published in 2021, offers a neutral and objective assessment of the environmental damage resulting from the war. The report cites the poorly informed and partisan ways the conflict has been investigated and reported upon as one of their two main concerns.[118] Using earth observation data from both sides, the Observatory investigated the hundreds of landscape fires that occurred between October 16 and November 4, 2020 in the forests of Artsakh.[119]

The report reiterated the harm done to the environment through fires and bioaccumulation in water, soil, crops, and animals due to the use of white phosphorus munitions.[120] The report cites potential reasons for the use of these weapons, including burning down the forests to remove cover from ground troops or to cause ecocide intentionally.[121]

Lastly, albeit most importantly, the report states that environmental damage caused by the recent and historical fighting will continue to have humanitarian consequences.[122] This includes psychological costs, given the importance attached to the natural environment as an aspect of cultural heritage.[123] While the report states that this is exemplified by the emotion attached to digital posts around ecocide and environmental terrorism, it is also apparent in *Armenia v. Azerbaijan*, as the destruction of Armenian cultural heritage sites in these forests is one of the primary claims of the petition.[124] More importantly, Armenia is one of only ten nations to have ecocide codified as a crime, sending a clear message about the importance of the natural world in Armenian culture and society.[125]

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https://arnika.org/en/news/biodiversity-of-nagorno-karabakhs-forests-in-danger-because-of-extensive-fires-armenian-ngos-seeking-support.

117. *See* Darbyshire, *supra* note 93.

118. *Id.*

119. *Id.*

120. *Id.*

121. *Id.*

122. *Id.*

123. *Id.*; *see* Application of the International Convention of the Elimination of All Forms of Racial Discrimination (Arm. v. Azer.), Application Instituting Proceedings, 2021 I.C.J. 1, 21–22, 42–44 (Sept. 16, 2021).

124. *Id.*; *see* Darbyshire, *supra* note 93.

125. *See* CRIMINAL CODE OF THE REPUBLIC OF ARMENIA art. 394.

C. White Phosphorus Munitions

White phosphorus munitions are weapons that use one of the common allotropes of the chemical element phosphorus.[126] White phosphorus is pyrophoric, meaning it ignites upon contact with air.[127] When white phosphorus interacts with oxygen, it ignites and burns, producing a dense, toxic white smoke.[128] While militaries predominantly use white phosphorus as an obscurant to provide visual cover for ground operations, it can also be used as an incendiary weapon, burning or setting fire to the ground below it.[129] White phosphorus burns fiercely, and certain uses of these weapons are banned or restricted by general international laws, particularly those related to incendiary devices.[130]

While not directly forbidden by any treaty, if the toxic properties of white phosphorus are specifically intended to be used as a weapon, it is prohibited under the Convention on the Prohibition of the Development, Production, Stockpiling, and Use of Chemical Weapons and on their Destruction (CWC).[131] Specifically, air-dropping white phosphorus is prohibited as it can result in indiscriminate attacks due to the wide dispersion of the burning fragments.[132] The CWC applies to any chemicals used against humans or animals that cause harm or death through the toxic properties of the chemical.[133]

These operations cause irreversible environmental damage, ranging from widespread forest fires to permanent air, soil, and water pollution.[134] When used as a weapon, white phosphorus can cause fire to rain down on targets, inflicting sweeping damage.[135] This is largely why such use is

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126. Paul Reynolds, *White Phosphorus: Weapon on the Edge*, BBC NEWS, http://news.bbc.co.uk/2/hi/americas/4442988.stm (last updated Nov. 16, 2025); *see Molecule of the Week: White Phosphorus*, AM. CHEM. SOC'Y (Sept. 7, 2020), https://www.acs.org/content/acs/en/molecule-of-the-week/archive/w/white-phosphorus.html.

127. *Id.*

128. *See* Ian Sample, *What is White Phosphorus?*, THE GUARDIAN (Nov. 19, 2005), https://www.theguardian.com/science/2005/nov/19/thisweekssciencequestions.uknews.

129. *Id.*

130. *"They Burn Through Everything," The Human Cost of Incendiary Weapons and the Limits of International Law*, HUM. RTS. WATCH (Nov. 9, 2020), https://www.hrw.org/report/2020/11/09/they-burn-through-everything/human-cost-incendiary-weapons-and-limits.

131. *See* Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction art. 2, Sept. 3, 1992, 1975 U.N.T.S. 45.

132. *Id.*

133. *Id.*

134. PUBLIC REPORT, *supra* note 102, at 19.

135. *See generally Rule 1. The Principle of Distinction Between Civilians and Combatants*, ICRC: INT'L HUMANITARIAN L. DATABASES, https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_rul_rule1 (last visited Nov. 28, 2025).

banned, as international law requires combatants to distinguish between civilian and military elements.[136]

Lastly, customary international humanitarian law states that particular care must be taken to avoid, or in any event minimize, incidental loss of civilian life, injury to civilians, and damage to civilian objects when incendiary weapons are used.[137] The natural environment is classified as a civilian object and should, therefore, also enjoy such protection.[138]

D. Evaluating the Applicability of Ecocide to the Armenia v. Azerbaijan *Case*

On October 21, 2021, the Republic of Armenia initiated proceedings against Azerbaijan before the ICJ, citing violations of the International Convention on the Elimination of All Forms of Racial Discrimination (CERD).[139]

Armenia has called on the tribunal to take provisional measures as a matter of extreme urgency to protect and preserve Armenia's rights and to prevent the aggravation of the dispute between the two countries until the Court determines the merits of the allegations.[140] Specifically, Armenia's petition details how Armenians have been subjected to systemic discrimination, mass killings, torture, and other forms of abuse at the hands of Azerbaijan.[141] These violations are directed at individuals of Armenian ethnic or national origin, and these practices have intensified as a result of the 2020 war.[142]

While the environmental harm caused by the 2020 war is a matter of concern and has been raised by Armenia in various contexts, it is not the central legal argument in the ongoing ICJ proceedings under CERD.[143] Nevertheless, the evidence presented by the Republic of Armenia to support its claims of cultural heritage destruction in Artsakh's forests and natural landscapes is one of Armenia's primary causes of action and overlaps with

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136. *Id.*

137. *See generally Rule 84. The Protection of Civilians and Civilian Objects from the Effects of Incendiary Weapons*, ICRC: INT'L HUMANITARIAN L. DATABASES, https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_rul_rule84 (last visited Nov. 28, 2025).

138. *See generally Rule 43. Application of General Principles on the Conduct of Hostilities to the Natural Environment,* ICRC: INT'L HUMANITARIAN L. DATABASES, https://ihl-databases.icrc.org/customary-ihl/eng/docs/v2_rul_rule43 (last visited Nov. 28, 2025).

139. *See generally* Application of the Internation Convention of the Elimination of All Forms of Racial Discrimination (Arm. v. Azer.), *supra* note 123.

140. *Id.*

141. *Id.* at 6, 16, 24.

142. *Id.* at 24–30.

143. *Id.* at 6.

the evidence of environmental damage. Specifically, the petition states that "in keeping with its long-standing policy of ethnic cleansing, Azerbaijan has systematically sought to destroy, erase, and falsify Armenian cultural heritage in the region."[144]

Among many other well-documented examples is the destruction of historic Armenian cemeteries, which once boasted the world's largest collections of Khachkars (distinctive Armenian cross-stones) from the 15th and 16th centuries.[145] The destruction has been acknowledged and denounced by the International Council on Monuments and Sites, the European Parliament, and numerous international press reports describing Azerbaijan's acts as the "worst cultural genocide of the 21st century."[146] This destruction of cultural sites located in environmentally sensitive areas could be presented as evidence of a broader pattern of disregard for Armenian heritage and well-being, encompassing both cultural and natural aspects.

With all of this in mind, the environmental damage documented by Armenia presents a compelling test case for the applicability of the concept of ecocide. This is particularly so because these findings align with every core element of the proposed definition. The use of white phosphorus is a "wanton" act as defined within the framework, as the reckless disregard for damage is clearly excessive in relation to any legitimate military objectives. Similarly, white phosphorus, known for its destructive effects and capacity to contaminate soil and water for extended periods, meets the severe and long-term damage criteria. Thus, while *Armenia v. Azerbaijan* does not directly involve the prosecution of ecocide as a distinct international crime, the arguments of environmental harm—particularly involving white phosphorus—provide a concrete example for examining the potential applicability of the concept of ecocide in the context of international law and policy.

144. *Id.* at 44–50.

145. *Id.* at 44.

146. *See* Dale Berning Sawa, *Monumental Loss: Azerbaijan and 'the Worst Cultural Genocide of the 21st Century'*, THE GUARDIAN (Mar. 1, 2019), https://www.theguardian.com/artanddesign/2019/mar/01/monumental-loss-azerbaijan-cultural-genocide-khachkars; *see also* Resolution on the Destruction of Cultural Heritage in Azerbaijan, EUR. PARL. DOC. B6-0126-06 (2006); MICHAEL PRETZET ET AL., INT'L COUNCIL ON MONUMENTS & SITES, REPORT ON THE DESTRUCTION OF ARMENIAN CULTURAL HERITAGE (2003).

IV. ALTERNATIVE LEGAL APPROACHES

A. The ENMOD Convention: An Overview

The ENMOD Convention provides a legal framework that could be relevant to allegations of environmental harm in armed conflict, particularly those involving deliberate manipulation of natural processes. The ENMOD Convention refers to the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques.[147]

ENMOD is an international treaty established in 1976 and entered into force in 1978, representing a specific effort within international disarmament law to protect the environment during armed conflict by prohibiting the hostile use of environmental modification techniques as a means of warfare.[148] The impetus for the ENMOD Convention arose primarily from Cold War-era concerns, later intensified during the Vietnam War, about the potential for states to manipulate the environment for military purposes (such as through weather modification or geophysical techniques).[149] The Convention aims to prevent the development and deployment of methods that could weaponize natural systems.

The ENMOD Convention defines environmental modification as "any technique for changing—through the deliberate manipulation of natural processes—the dynamics, composition, or structure of the earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space."[150] This definition emphasizes the requirement of deliberate manipulation of natural processes, distinguishing it from incidental environmental damage that may occur during conventional warfare. Under this strict definition, the use of white phosphorus might not necessarily be classified as an environmental modification technique unless it can be demonstrated that it was employed to deliberately alter the environment in a widespread, long-lasting, or severe manner.

However, one could make a strong argument that the deliberate targeting of forests with incendiary weapons like white phosphorus—with the

147. *See generally Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques*, UN: OFF. FOR DISARMAMENT AFFS., https://disarmament.unoda.org/en/our-work/weapons-mass-destruction/convention-prohibition-military-or-any-other-hostile-use (last visited Nov. 28, 2025) [hereinafter ENMOD Convention].

148. *Id.*

149. *Id.*; *see* James R. Lee*, Cloud Seeding, Conflict, and Climate Change*, UK PARLIAMENT: SCI. & TECH. COMM. (Dec. 2009), https://publications.parliament.uk/pa/cm200910/cmselect/cmsctech/memo/geoengineer/ucm0102.htm (linking the Vietnam-era weather warfare scandal to the final political push that produced the treaty).

150. Joanna Jarose, *ENMOD: Dead Letter or Environmental Lifeline?*, W. POINT LIEBER INST. (Mar. 18, 2025), https://lieber.westpoint.edu/enmod-dead-letter-environmental-lifeline/.

knowledge that it could cause widespread and long-lasting fires leading to significant ecological damage—could be interpreted as a hostile use of a technique to manipulate the environment (in this case, fire ecology) for destructive purposes. This interpretation would depend on how broadly one defines "deliberate manipulation of natural processes."

Furthermore, ENMOD's "Understandings" relating to Article II provide a non-exhaustive list of phenomena that could result from environmental modification techniques, including "an upset in the ecological balance of a region."[151] The widespread destruction of forests could arguably lead to an upset in the ecological balance.

B. Applicability of ENMOD to Armenia v. Azerbaijan

Evaluating the applicability of the ENMOD Convention to Armenia's contentions against Azerbaijan requires careful consideration of the Convention's scope and limitations. As of 2022, the ENMOD Convention has 78 state parties, including Armenia, who ratified the treaty in 2002.[152] However, a primary limitation to ENMOD's applicability in this case is the fact that Azerbaijan is not a party to the Convention. The Convention's obligations are primarily binding on state parties.[153]

However, creative legal strategies could extend ENMOD's reach in international adjudications. Even though Azerbaijan is not a party to the Convention, there might still be potential advantages to invoking ENMOD's provisions in international adjudications related to Azerbaijan's environmental war crimes. For example, while Azerbaijan's lack of ratification means the treaty's obligations do not directly bind it, Armenia could argue the principles underlying the ENMOD Convention reflect an emerging norm of customary international law prohibiting the hostile use of environmental modification techniques.[154]

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151. *Id.*; *see* ICRC, ADVISORY SERV. ON INT'L HUMANITARIAN L., 1976 CONVENTION ON THE PROHIBITION OF MILITARY OR ANY HOSTILE USE OF ENVIRONMENTAL MODIFICATION TECHNIQUES (2003).

152. ENMOD Convention, *supra* note 147; *see Convention on the Prohibition of Military or Any Hostile Use of Environmental Modification Techniques, 10 December 1976*, ICRC: INT'L HUMANITARIAN L. DATABASES, https://ihl-databases.icrc.org/en/ihl-treaties/enmod-1976/state-parties (last visited Nov. 28, 2025) (showing that Armenia ratified the ENMOD Convention in 2002).

153. *Rule 45. Causing Serious Damage to the Natural Environment*, ICRC: INT'L HUMANITARIAN L. DATABASES, https://ihl-databases.icrc.org/en/customary-ihl/v1/rule45 (last visited Nov. 28, 2025) [hereinafter *Rule 45*].

154. *See* Jelena Jaros, *A Sleeping Giant? The ENMOD Convention as a Limit on Intentional Environmental Harm in Armed Conflict and Beyond*, 118 AM. J. INT'L L. 468, 469 (2024) (stating that ENMOD has broader potential application than it has historically been given, and that its potential expansive meaning does, in essence, support the ICRC customary law study rule that "destruction of the natural environment may not be used as a weapon").

By referencing ENMOD, Armenia could strengthen its argument that Azerbaijan's actions violate international norms related to environmental protection in armed conflict. More specifically, Armenia could argue that the deliberate use of white phosphorus weapons in a manner that causes widespread and long-lasting forest fires constitutes a hostile use of a technique (incendiary weapons). Since white phosphorous weapons have severe and long-term environmental effects, Armenia could argue that they fall within the spirit, if not the strict letter, of the Convention.[155]

Thus, states should explore the potential for invoking existing legal frameworks, such as the ENMOD Convention, even when the perpetrator is not a party to the Convention. In the context of Armenia's arguments against Azerbaijan, invoking the ENMOD Convention might be more relevant as an argument for developing or interpreting customary international law norms regarding environmental warfare rather than as a direct legal obligation that Azerbaijan has violated.

C. Strengths and Limitations of ENMOD Compared to Ecocide

One of ENMOD's key strengths is that it is an existing and legally binding international treaty that specifically aims to prevent the hostile use of environmental modification techniques. It provides a concrete legal framework, albeit a limited one, for addressing the deliberate manipulation of natural processes for destructive purposes. Furthermore, the Convention covers military and other hostile uses of environmental modification techniques, meaning its reach extends beyond traditional armed conflict scenarios.[156]

However, as previously stated, ENMOD also requires a demonstration of hostile intent and that the damage is inflicted upon another state party, which limits its applicability in non-international armed conflicts or when the perpetrator is not a party to the Convention.[157] In comparison, the proposed crime of ecocide aims to provide broader environmental protections. Unlike ENMOD, ecocide intends to cover environmental damage in both peacetime and conflict, and it encompasses a broader range of harmful acts beyond the

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155. Note that *Rule 45*, *supra* note 153, and the ILC Draft Principles show that the substance of ENMOD's ban on hostile environmental modification is increasingly treated as customary international law. *See* ILC Draft Principles on the Protection of the Environment in Relation to Armed Conflicts, Principle 17 (2022).

156. *See* Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Technique art. I, Dec. 10, 1976, 2 U.N.T.S. 3.

157. *See generally* Silja Voneky, *Limiting the Misuse of the Environment during Peacetime and War – The ENMOD Convention*, FREIBURG INFO. PAPERS ON INT'L L. AND PUB. L., May 2020, at 1, 13–14 (confirming that ENMOD's reach is essentially inter-state).

deliberate manipulation of natural processes.[158] A key strength of ecocide is its potential to hold individuals accountable for ecocidal acts, including those in positions of leadership within governments.[159] That is not to say that ecocide does not face significant limitations; it is not widely recognized as a crime and thus lacks the established treaty framework of ENMOD. Defining the crime and establishing clear legal standards and thresholds for its application are ongoing challenges.

In essence, the ENMOD Convention provides a specific but limited legal tool, whereas ecocide, if recognized, could provide a broader and more encompassing framework for environmental protection. The limitations of ENMOD highlight the potential value of ecocide as a complementary or alternative legal approach.

V. POLICY RECOMMENDATIONS

To effectively strengthen the ecocide framework, a multi-pronged approach is necessary. This includes continued efforts to refine and achieve an internationally accepted definition of ecocide, preferably through an amendment to the Rome Statute. Codifying ecocide gives it international legal recognition, creating a binding obligation for member states to prosecute environmental war crimes.[160]

This process should involve consultations with legal experts and policymakers to ensure a legally sound, scientifically informed, and politically viable definition. Building a strong coalition of supporting states will be essential for achieving this long-term goal. Beyond these foundational steps, it is imperative for states to actively support and advocate for the formal recognition of ecocide as an international crime at the International Criminal Court (ICC).[161] This involves engaging in diplomatic efforts to

158. *See generally* STOP ECOCIDE FOUND., *supra* note 19 (explaining that the proposed definition of ecocide extends environmental protection beyond wartime to peacetime and encompasses a broader range of environmentally destructive acts than those prohibited under ENMOD).

159. Fiona Harvey, *Pacific Islands Submit Court Proposal for Recognition of Ecocide as a Crime*, THE GUARDIAN (Sep. 9, 2024), https://www.theguardian.com/law/article/2024/sep/09/pacific-islands-ecocide-crime-icc-proposal.

160. *See FAQs: Ecocide & the Law*, STOP ECOCIDE INT'L, https://www.stopecocide.earth/faqs-ecocide-the-law (last visited Nov. 28, 2025) (stating that once a country ratifies ecocide as a crime, the ICC comes into play only if nation states cannot or will not prosecute, i.e., complementarity confirms the binding obligation).

161. As noted by Jojo Mehta of Stop Ecocide International and other advocates, a number of states have formally submitted proposals to amend the Rome Statute, reflecting efforts of the broader view that without active support and advocacy from states, formal recognition is unlikely to materialize and sustain momentum. *See Mass Destruction of Nature Reaches International Criminal Court (ICC) as Pacific Island State Propose Recognition of "Ecocide" as International Crime*, STOP ECOCIDE INT'L (Sep. 9,

build consensus among states, supporting initiatives at the UN and the ICC's Assembly of States Parties, and raising public awareness about the importance of criminalizing ecocide.[162] Additionally, targeted policy reforms that address the main legal and political hurdles while pushing for concrete, actionable changes are necessary to make criminalizing ecocide a viable option.

A. Establishing a UN Special Rapporteur on Ecocide

First, establishing a Special Rapporteur on ecocide under the UN Human Rights Council (UNHRC) mandate would provide a non-judicial, high-profile mechanism to hold states accountable.[163] This independent expert would be tasked with investigating, reporting, and advising on cases of severe environmental harm resulting from military actions, occupation, and state activities during times of conflict. This role could help document evidence, provide expert analysis, and increase international awareness, laying the groundwork for future legal action.[164]

A Special Rapporteur would reframe ecocide within the human rights discourse, emphasizing the indivisibility of environmental and human rights harms. Specifically, rapporteurs contribute to the development of international norms by issuing thematic reports, country-specific recommendations, and best practices.[165] This could help mainstream the concept of ecocide in international law and policy, even before formal criminalization occurs. An official monitoring mechanism would also establish a systematic way to track and report instances of environmental destruction in conflict zones, serving as an early warning system to prevent

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2024), https://www.stopecocide.earth/2024/mass-destruction-of-nature-reaches-international-criminal-court-icc-as-pacific-island-states-propose-recognition-of-ecocide-as-international-crime.

162. *See generally* Alexandria M. Hanna, *Killing Our Home: The Case for Creating an International Crime of Ecocide*, 6 WILLAMETTE U.C.L. SOC. JUST. & EQ. J. 1 (2023) (outlining why active engagement from states is not just helpful, but essential for advancing ecocide recognition at the ICC).

163. *Human Rights and the Crime of Ecocide: Conversations with the OHCHR and UN Special Procedures*, UCLA L., https://law.ucla.edu/academics/centers/promise-institute-europe/human-rights-and-crime-ecocide (last visited Nov. 28, 2025) (noting that Special Rapporteurs witness the impacts of severe environmental damage across their mandates, and that their ongoing work is "procedural and substantive" to the emerging crime of ecocide).

164. *See* Kate Mackintosh & Lisa Oldring, *Watch This Space: Momentum Toward an International Crime of Ecocide*, JUST SEC. (Dec. 5, 2022), https://www.justsecurity.org/84367/watch-this-space-momentum-toward-an-international-crime-of-ecocide/ (describing the newly created climate-change mandate and explaining that the Rapporteur is "tasked with recommending ways to address and prevent the adverse effects of climate change on human rights," showing how a thematic rapporteur can spotlight environmental harms and press States toward accountability mechanisms).

165. *See generally* INT'L SERV. FOR HUM. RTS., A PRACTICAL GUIDE TO THE UN SPECIAL PROCEDURES 4 (2019) (stating that mandate-holders make recommendations and present reports to the HRC, and that special procedures have played a key role in normative development of rights).

escalation and provide evidence for future accountability.[166] For smaller nations like Armenia, which often lack the geopolitical leverage to pursue ecocide claims against more powerful aggressors like Azerbaijan, a Special Rapporteur would offer a credible international platform to voice concerns and push for global attention.

This mechanism would not depend on the ICC's jurisdictional limitations but rather complement ongoing efforts by keeping ecocide in the global spotlight and maintaining pressure for eventual legal codification. Similar mandates have been established for issues like human rights, toxics, and the adverse impacts of unilateral coercive measures.[167]

B. Amending International Instruments to Include Cultural Heritage

Second, amending existing legal instruments—such as the Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict and the UNESCO World Heritage Convention—to explicitly recognize the destruction of cultural heritage as a form of environmental harm would ensure that acts of cultural destruction are addressed as attacks on identity and history, and as serious environmental crimes.

As previously mentioned, cultural heritage law and international environmental law operate in separate legal silos.[168] This separation overlooks the holistic nature of the harm caused by acts like the deliberate targeting of cultural monuments in war. Recognizing the cultural-ecological nexus would create a more comprehensive legal protection mechanism against environmental and cultural erasure. Furthermore, UNESCO and the UN Declaration on the Rights of Indigenous Peoples already hint at the interdependence of cultural and environmental preservation.[169] Codifying this relationship into binding legal treaties would build upon these soft law instruments.

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166. *See generally* ERICA HARPER & BAINA UBUSHIEVA, GENEVA ACAD., RESEARCH BRIEF: ENVIRONMENTAL HUMAN RIGHTS AS A TOOL IN EARLY WARNING AND CONFLICT PREVENTION: THE ROLE OF THE HUMAN RIGHTS COUNCIL 3 (2024) (stating that a systematic mechanism for monitoring environmental rights violations would generate trend data, act as an early warning tool and "[feed] through to relevant organs with programming and conflict de-escalation mandates").

167. An example of this can be seen in the case of the Special Rapporteur who led the push that kept the right to a healthy environment on the UN agenda until its eventual codification. *See* Maria Alejandra Serra Barney & Richard Harvey, *The UN Officially Recognized the Right to a Healthy Environment. Here's What That Means*., GREENPEACE (Aug. 9, 2022), https://www.greenpeace.org/international/story/55098/un-resolution-right-healthy-environment-legal-historic/.

168. *See infra* Part II.E.

169. G.A. Res. 61/295, *supra* note 54, at art. 29.

C. Integrating Mandatory Environmental Impact Assessments

Lastly, integrating binding Environmental Impact Assessments (EIAs) into international humanitarian law (IHL) would establish legal obligations for states and armed forces to assess, document, and mitigate potential environmental harm during armed conflicts, thereby creating a proactive framework for environmental protection.[170] Currently, IHL provisions vaguely prohibit environmental harm but lack specific operational tools.[171] Mandating EIAs introduces a preventative and evidence-based mechanism to minimize environmental damage before it occurs.

EIAs would also generate official records, providing crucial documentation for future legal action in cases of ecocide, shifting environmental harm from being an invisible casualty of war to a legally traceable violation. Mandatory EIAs would also increase state accountability and transparency, forcing militaries to consider and justify the environmental consequences of their actions publicly.[172] Many states are already obligated to conduct EIAs under environmental treaties (e.g., the Espoo Convention) for peacetime activities.[173] Extending this obligation to wartime conduct is a logical progression, especially in the context of climate and biodiversity crises.

CONCLUSION

This Article has shown that: (1) the factual record in Artsakh meets most of the severity, geographic-spread, and long-term-harm thresholds found in leading draft definitions of ecocide; (2) evidentiary and jurisdictional barriers currently limit ecocide prosecution; and (3) existing instruments offer a state-centered, if under-utilized, legal hook that Armenia could wield to frame deliberate large-scale environmental damage as a breach of emerging

170. Note that this suggestion is loosely inspired by Environmental Impact Statements (EISs) and general record-keeping procedures established under the National Environmental Policy Act. *See e.g.*, 42 U.S.C. §§ 4321–70.

171. Lydia Millar, *Warfare's Silent Victim: International Humanitarian Law and the Protection of the Natural Environment During Armed Conflict*, 2022 CAMBRIDGE J.L. POL. & ART. 186, 186–87 (stating that "IHL's anthropocentric focus has stunted the development of thorough and coherent laws for the protection of the environment during armed conflict, and what has been achieved has been criticized as ineffective.").

172. Tseming Yang, *The Emergence of the Environmental Impact Assessment Duty as a Global Legal Norm and General Principle of Law*, 70 HASTINGS L.J. 525, 531–33 (2019) (describing how mandatory EIAs "enhanc[e] transparency" and "promote accountability" by requiring decisionmakers to disclose environmental information publicly, thereby allowing civil society to scrutinize harmful actions).

173. U.N. ECON. COMM'N FOR EUR., GUIDANCE ON THE PRACTICAL APPLICATION OF THE ESPOO CONVENTION 5 (2006) (stating that the Convention requires that assessments are extended across borders between parties when a planned activity may cause significant adverse transboundary impacts).

customary norms. Complementary policy measures would bolster prevention, documentation, and accountability.

Ultimately, this Article argues that ecocide's most significant promise lies in its capacity to make environmental integrity per se a protected legal interest rather than a collateral value derivative of human welfare. If codified, it would: (1) create individual criminal liability for ecological devastation; (2) operationalize the precautionary principle by stigmatizing reckless military or corporate conduct before the damage becomes irreversible; and (3) encourage the development of evidentiary methodologies that could spill over into other areas of international adjudication. While the challenges are real, they are not insurmountable, and the potential benefits of establishing ecocide as an international crime for the future of the planet outweigh the difficulties in its implementation. Furthermore, the Artsakh case illustrates how a live conflict can supply the fact pattern and political urgency needed to propel the concept from advocacy to treaty text and ultimately to courtroom practice. More broadly, codifying ecocide would rebalance international law toward an ecocentric paradigm, where states and non-state actors alike owe duties not only to other peoples but also to the Earth that sustains them.

In sum, Artsakh's forests may already bear the scars of war. Still, the legal response to those scars can chart a forward-looking path: one in which environmental stewardship becomes a core obligation of international society, and where the language of war crimes finally speaks for the voiceless ecosystems that wars too often consume.

GREENING THE SUPPLY CHAIN: FINANCIAL TOOLS TO CATALYZE DECARBONIZATION BY SMALL BUSINESSES

Kyle J. Blasinsky*

ABSTRACT

As the need to decarbonize grows more pressing and public law fails to unilaterally address this need, scholars and practitioners are increasingly seeking private-governance solutions to decarbonization's challenges. Their efforts have found strong support among many large multinational firms. Most large firms' emissions, however, originate within their supply chains, which often consist of small- and medium-sized enterprises (SMEs). SMEs are often left out of conversations about climate change—a massive blind spot in decarbonization efforts—likely because their individual-level emissions are so inconsequential. Notwithstanding their insignificant individual emissions, SMEs' collective impact is huge; aggregate emissions from SMEs account for half of all emissions in the United States annually. To their credit, many SMEs express interest in decarbonization, but they often cite insufficient capital and expertise as central barriers to their decarbonization efforts.

To help overcome these technical and financial barriers, this Article proposes integrating energy savings performance contracts (ESPCs) into large firms' supply chains, looking to sustainable supply chain financing (SSCF) for guidance in so doing. ESPCs allow firms to invest in energy efficiency upgrades with an experienced energy-services company that oversees the project and accesses financing for it by guaranteeing savings from the underlying efficiency upgrades. These arrangements have historically been limited, however, to large publicly owned properties. SSCF provides trade financing to SMEs when they meet sustainability metrics using their larger buyers' credit lines, but the financing is typically short term (roughly ninety days), preventing utilization for deep-decarbonization efforts. This Article argues for incorporating ESPCs into supply chain contracts by tying buyers' unit price of a procured good to the energy savings realized under the ESPC, which utilizes the buyers' higher creditworthiness (as in SSCF) to access low-cost financing for energy efficiency upgrades in SMEs. These "supply chain energy saving guarantees" could be integrated

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into ESPCs to help bring SMEs into the decarbonization conversation, reduce larger firms' Scope 3 emissions, and provide low-risk investment opportunities that reduce costs for all parties in the long run.

INTRODUCTION

In 2015, 196 countries adopted the Paris Climate Agreement, aiming to reduce global warming to less than 1.5 degrees Celsius above preindustrial levels.[1] To achieve this, signatories must reduce emissions to 45% below

1. *For A Livable Climate: Net-Zero Commitments Must Be Backed by Credible Action*, UNITED NATIONS, https://www.un.org/en/climatechange/net-zero-coalition (last visited Nov. 16, 2025).

2010 levels by 2030 and meet carbon neutrality by 2050.[2] Many nations have announced net-zero goals to aid this effort,[3] and corporate commitments to decarbonize will certainly play a pivotal role in reaching these goals as well.[4] If implemented across carbon-intensive industries, corporate climate pledges would reduce carbon emissions by 3.2 to 4.2 billion tons annually by 2030.[5] Corporate commitments and the discussion of the private sector's role in advancing environmental ends, however, often center on large global firms with the resources to invest in sustainability.

The historical exclusion of small businesses from sustainability policy and governance debates must give way to a more holistic view of what private environmental governance (PEG) looks like in firms large and small alike if decarbonization goals are to be met.[6] Estimates suggest small- and medium-sized enterprises (SMEs)—firms with less than 500 employees[7]—account for as much as half of all greenhouse gas (GHG) emissions in the United States annually.[8] Consequently, there is no viable path to net-zero that excludes these emitters, notwithstanding their seemingly *de minimis* individual contributions.[9]

Nonetheless, questions remain about how to bring smaller firms into the decarbonization fold. Applying the principles of PEG to SMEs offers an opportunity to strengthen the business case for environmental intervention

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2. *Id.*; *What Does Net Zero Emissions Mean?*, CLIMATE COUNCIL, https://www.climatecouncil.org.au/resources/what-does-net-zero-emissions-mean/ (last updated Nov. 3, 2025).

3. STEPHAN RAES ET AL., NO NET ZERO WITHOUT SMES: EXPLORING THE KEY ISSUES FOR GREENING SMES AND GREEN ENTREPRENEURSHIP 8 (OECD SME & Entrepreneurship Papers No. 30, 2021).

4. Oren Perez & Michael P. Vandenbergh, *Making Climate Pledges Stick: A Private Ordering Mechanism for Climate Commitments*, 50 ECOLOGY L.Q. 683, 685 (2023). Some, however, think the goals of the Paris Agreement are no longer attainable. *See e.g.*, J.B. Ruhl & Robin K. Craig, *4°C*, 106 MINN. L. REV. 191, 198 (2021) ("[D]espite the continued international homage to this mitigation goal, most contemporary evaluations of the progress of climate change indicate that the increase in global average temperature will exceed 2°C and probably exceed 3°C this century, with increases continuing beyond 2100."). Nonetheless, the marginal effects of increased warming still justify efforts to decarbonize to the largest extent possible.

5. Perez & Vandenbergh, *supra* note 4, at 685.

6. *See Hidden Heroes of Climate Action: How Small and Medium-sized Enterprises (SMEs) Can Lead Global Decarbonization*, ZEIGO 3 (2023), https://www.zeigo.com/wp-content/uploads/2023/10/Zeigo-Hidden-Heroes-of-Climate-Action.pdf (describing the historical focus on large firms' ability to lead sustainability efforts in the private sector while acknowledging an emerging recognition of small businesses' role in these efforts).

7. This is the definition used by the U.S. Small Business Administration, but common definitions vary across sectors and agencies. *See* DANIEL TROMBLEY, ONE SMALL STEP FOR ENERGY EFFICIENCY: TARGETING SMALL AND MEDIUM-SIZED MANUFACTURERS 2 (ACEEE Rep. No. IE1401, 2014) (summarizing different definitions of small business).

8. *Carbon Footprint of the US: SMEs' Role*, ECOHEDGE (Jan. 6, 2024), https://ecohedge.com/blog/carbon-footprint-of-the-us-smes-role/.

9. RAES ET AL., *supra* note 3, at 9.

by these smaller firms.[10] Business-to-business pressures, for example, create strong incentives for SMEs to undertake sustainability efforts consistent with the goals their larger buyers set forth in supply chain contracts.[11] The supply chain is a natural place for large firms to engage in PEG, leveraging their existing relationships with smaller suppliers to induce deep decarbonization in SMEs. Beyond the existing business relationship, the supply chain also binds firms in an environmental sense. As such, there is an increasing pressure for large companies to address not only the emissions they immediately control (e.g., those from the facilities they directly own) but also the emissions originating along their supply chains—emissions that amount to 80% or more of the total emissions associated with the firm in many sectors.[12]

But generating additional external pressure on SMEs may not do much to aid decarbonization in SMEs because it assumes a lack of motivation drives SMEs' limited sustainability efforts to date.[13] Although that may be the case in some instances, many SMEs report an eagerness to undertake sustainability efforts. The firms point to both the strong business case that already exists for such action, including business-to-business supply chain pressures, and the normative values these firms seek to embody.[14] Bringing SMEs into the sustainability dialogue likely requires less of a focus on the external motivations to decarbonize than on the external and internal limitations that prevent these firms from decarbonizing. SMEs frequently cite inadequate financing and expertise as barriers to their decarbonization efforts,[15] so an unfunded mandate enforced through a supply chain contract may do little to catalyze environmental action. Large firms must do more than compel decarbonization; they need to support SMEs in their sustainability efforts.

This Article centers on two financing mechanisms to help facilitate this

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10. *See infra* Part I.B.

11. *See infra* notes 94–98 and accompanying text.

12. Anne-Titia Bové & Steven Swartz, *Starting at the Source: Sustainability in Supply Chains*, MCKINSEY & CO. (2016), https://www.mckinsey.com/capabilities/sustainability/our-insights/starting-at-the-source-sustainability-in-supply-chains; MICHAEL P. VANDENBERGH ET AL., PRIVATE ENVIRONMENTAL GOVERNANCE 178 (2023).

13. RAES ET AL., *supra* note 3, at 12.

14. Julia Selig, *Small Businesses Are Prioritizing Climate Action, But They Need More Support*, SME CLIMATE HUB (Apr. 10, 2024), https://smeclimatehub.org/small-businesses-are-prioritizing-climate-action-but-they-need-more-support (noting the strong business case for sustainability but also that 63% of SMEs report undertaking sustainability efforts because they "believe taking climate action is the right thing to do").

15. *New Data Reveals Two-Thirds of Surveyed Small Businesses Concerned over Navigating Climate Action,* SME CLIMATE HUB (Feb. 23, 2022) [hereinafter *Small Businesses Concerned over Navigating Climate Actions*], https://smeclimatehub.org/new-survey-reveals-small-business-barriers-climate-action/ (describing barriers to climate action by SMEs).

end: sustainable supply chain financing (SSCF) and energy savings performance contracts (ESPC). These mechanisms should enable decarbonization in SMEs by increasing access to financial resources to fund decarbonization and sustainability knowledge to inform those efforts. Large buyers of goods and services establish SSCF programs with financial intermediaries to provide preferential trade financing to small suppliers when those suppliers satisfy sustainability criteria set by the buyer.[16] Such a program leverages existing supply chain relationships to incentivize sustainability in SMEs while providing necessary financing to support further investments in sustainability. Although SSCF programs focus on SMEs, their impact is limited by the short-term financing that they provide. SSCF's financing benefits arise from open account trade, which usually allows buyers only 60 or 90 days to pay outstanding invoices.[17]

ESPCs offer another means of financing sustainability investments in firms, but with a longer duration, enabling more expansive sustainability investments. ESPCs allow a firm (the customer) to contract with an energy service company (ESCO) to carry out an energy efficiency investment project on the firm's property.[18] Prior to initiating the project, the ESCO undertakes an energy audit of the property. The ESCO leverages its sustainability expertise, identifies investments that are expected to yield returns sufficient to cover the project's cost—essentially paying for energy efficiency investments today with tomorrow's energy savings.[19] The projected savings are often guaranteed by the ESCO through an energy savings guarantee provision in the ESPC, which shifts all technical performance risk associated with the project away from the customer and subsequently lowers the cost of financing the project.[20] The existing market for ESPCs focuses on large, usually publicly owned properties where large savings can offset transaction costs, leaving SMEs out of the market. Smaller ESCOs may try to serve this group of small businesses, but their collectively poor credit reduces the energy savings guarantee's impact on financing,

16. *See* Charlotte Bancilhon et al., *Win-Win-Win: The Sustainable Supply Chain Finance Opportunity*, BSR 9 (2017), https://www.bsr.org/en/reports/win-win-win-the-sustainable-supply-chain-finance-opportunity.

17. TRANSFORM TO NET ZERO, SUSTAINABLE SUPPLY CHAIN FINANCE: TRANSFORMATION GUIDE 8 (2024) (noting the time-based limitation).

18. *Energy Savings Performance Contract*, U.S. DEP'T OF ENERGY, https://betterbuildingssolutioncenter.energy.gov/financing-navigator/option/espc-financing (last visited Nov. 16, 2025).

19. *Id.*; U.S. DEP'T OF ENERGY, WHAT IS ENERGY SAVINGS PERFORMANCE CONTRACTING (ESPC)? (2014) [hereinafter WHAT IS ESPC?].

20. *ESCO Contracts*, IEA, https://www.iea.org/reports/energy-service-companies-escos-2/esco-contracts (last visited Nov. 16, 2025); *Energy Savings Performance Contract*, *supra* note 18.

making many projects nonviable.[21]

Both SSCF and ESPCs create value for the parties involved—small firms, large firms, ESCOs, and financial institutions—but their impact and inclusion of SMEs is mixed. In addition to exploring opportunities for altering these existing tools to overcome their limitations, this Article proposes a novel combination of the two. Leveraging the strong relationships defined by the supply chain contract, the "supply chain energy savings guarantee" (as this Article refers to them) will allow a large buyer to support its suppliers' access to the financing necessary for ESPCs and further strengthen the relationship between the buyer and suppliers. Rather than rely on large ESCOs to serve SMEs, which they have been hesitant to do thus far,[22] the supply chain energy savings guarantee will support new and smaller ESCOs. With this support, the new, smaller ESCOs can enter the market and serve SMEs without the financial burdens or financing consequences associated with taking on the energy savings guarantee themselves.

This Article proceeds as follows. Part I motivates the focus on SMEs and PEG as a driver of decarbonization in smaller firms before highlighting persistent barriers to decarbonization in SMEs.[23] This Part closes with a specific focus on the supply chain connection that ties large firms' emissions to that of their smaller suppliers, delving into normative questions about large firms' duties to their smaller counterparts in the climate context.[24] Part II describes SSCF and ESCPs, including discussion of not only the tools' benefits and limitations, but also opportunities for improving the tools' reach and impact.[25] Part III reflects on the lessons SSCF and ESPCs teach about the ingredients necessary to effectively support decarbonization efforts in SMEs before introducing the supply chain energy savings guarantee as a new tool for bringing ESPCs to SMEs through the supply chain.[26] A brief conclusion follows.

I. GREENING SMALL- AND MEDIUM-SIZED ENTERPRISES

Small- and medium-sized enterprises (SMEs) represent a significant blind spot in decarbonization efforts to date. But an increasing recognition of SMEs' cumulative impact on the environment and looming climate targets has begun to change this situation. This Part begins by motivating the reconceptualization of SMEs as a part of the climate solution and problem,

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21. *See* KARINE LAFFONT-ELOIRE ET AL., STUNNING, SUSTAINABLE BUSINESS MODELS FOR THE DEEP RENOVATION OF BUILDINGS 30–31 (2019).

22. *See id.*; *Energy Savings Performance Contract*, *supra* note 18.

23. *See infra* Part I.A–C.

24. *See infra* Part I.D.

25. *See infra* Part II.

26. *See infra* Part III.

as opposed to solely the former.[27] After motivating the focus on SMEs, this Part engages in a theoretical analysis of how, where, and why private environmental governance (PEG) applies to SMEs.[28] Notwithstanding the incentives PEG creates, this Part discusses lingering barriers to decarbonization in SMEs before applying lessons from PEG to understand how the supply chain relationship between large buyers and smaller suppliers can form the basis of further efforts to decarbonize SMEs.[29]

A. Small Business, Big Impact

Achieving net-zero carbon emissions is not attainable without bringing SMEs into climate change discourse; however, SMEs have been largely left out of this dialogue, skirting climate change scrutiny and missing opportunities to reduce operating costs.[30] On the surface that may not sound so bad. Conventional wisdom suggests, "They're just too small to be worth anyone's time."[31] But the tide may be turning on this conception of SMEs' limited role in decarbonization efforts.[32]

Even if an individual SME is "too small to be worth anyone's time,"[33] this position cannot be defended in light of the global climate's precarious state and the pitfalls of the "one percent problem."[34] This is especially true if one recalls the massive role that SMEs play in upholding the U.S. economy and other economies around the world.[35] SMEs account for 99.9% of all businesses in the United States—over 33 million firms.[36] They were responsible for almost two-thirds of the jobs created between 1995 and 2021 (63%), almost one-third of known export value (32.6%), and over 40% of

27. RAES ET AL., *supra* note 3, at 8; *see infra* Part I.A.

28. *See infra* Part I.B.

29. *See infra* Parts I.C., I.D.

30. RAES ET AL., *supra* note 3, at 10; Daniel Hill, *Small Business: The 'Neglected Middle' of Climate Change*, HUFFPOST (Feb. 7, 2015), https://www.huffpost.com/entry/small-business-the-neglec_b_6289210.

31. Hill, *supra* note 30.

32. *See, e.g.*, Jesper Brodin & Maria Mendiluce, *Comment: We'll Only Beat Climate Change if We Help Small Businesses Cut Emissions - and Fast*, REUTERS (Mar. 16, 2023), https://www.reuters.com/default/comment-well-only-beat-climate-change-if-we-help-small-businesses-cut-emissions-2023-03-16/.

33. Hill, *supra* note 30.

34. Kevin M. Stack & Michael P. Vandenbergh, *The One Percent Problem*, 111 COLUM. L. REV. 1385, 1388 (2011).

35. *Small and Medium Enterprises (SMEs) Finance*, WORLD BANK GRP., https://www.worldbank.org/en/topic/smefinance (last updated Oct. 7, 2025) ("[SMEs] are the backbone of most economies, representing around 90 percent of all businesses and accounting for more than half of global employment.").

36. *The State of Small Business Now*, U.S. CHAMBER OF COM. (Apr. 10, 2023), https://www.uschamber.com/small-business/state-of-small-business-now.

gross domestic product (43.5%).[37] In fact, nearly half of the private sector workforce is employed by an SME.[38] "By almost any measure, small businesses are a vital part of the American economy and workforce."[39] SMEs must play a role in efforts to decarbonize the economy commensurate with the central role SMEs play in the economy in all other respects.[40]

New data confirms that SMEs contribute significantly to carbon emissions. Estimates of SMEs' environmental impacts vary across place, time, and sector, but the estimates collectively support the conclusion that SMEs have a substantial cumulative impact on the environment more than sufficient to justify their taking on a role in decarbonization efforts.[41] While precise estimates of SMEs' environmental impact are sparse—likely a function of their ability to fly under the radar in climate discourse for so long—estimates that have been produced put into perspective the potential for deep decarbonization from SMEs.[42]

SMEs collectively account for around half of U.S. GHG emissions based on estimates from Ecohedge, an emissions accounting and consulting firm.[43] Another estimate suggests U.S. small businesses are responsible for nearly 500 million metric tons of carbon emissions annually—roughly the same as derived from powering half the homes in the country every year—according to estimates from Daniel Hill, Co-Founder and President of the Green Impact Campaign.[44] Data from the Energy Information Administration tells a similar story. In 2010, 57% of the energy consumed by the U.S. manufacturing sector was consumed by SMEs therein (though no analogous data exists for the commercial sector).[45] A study from the American Council for an Energy-Efficient Economy (ACEEE) further supports this narrative, reporting that small- and medium-sized manufacturing firms account for 90% of manufacturing facilities in the United States and 48% of the industry's energy consumption.[46]

One highly cited study on SMEs' environmental impacts sponsored by the European Commission concluded that SMEs produce 64% of industrial

37. *Id.*

38. *Id.*

39. *Id.*

40. *But cf. infra* Part I.D.3.

41. *See* RAES ET AL., *supra* note 3, at 9–11 ("SMEs on aggregate have a significant environmental footprint."). *But see infra* Part I.D.3.

42. *See* RAES ET AL., *supra* note 3, at 11.

43. *Carbon Footprint of the US: SMEs' Role*, *supra* note 8.

44. Hill, *supra* note 30.

45. Tina Fawcett & Sam Hampton, *Why & How Energy Efficiency Policy Should Address SMEs*, 140 ENERGY POL'Y 1, 2 (2020).

46. TROMBLEY, *supra* note 7, at 5–6. The report also highlights the geographic variation in this statistic. Small manufacturing firms account for more manufacturing-sector energy consumption in the Midwest (55.4%), for example, than in the south (43.5%). *Id.* at 6.

pollution in the European Union and that 40 to 45% of SMEs have a significant impact on the environment based on energy consumption, emissions, and waste-production metrics. The former conclusion was consistent with the prevailing estimates at the time that attributed 60 to 70% of industrial pollution to SMEs.[47] Using data from 2018, a more recent study found that, in the European Union, SMEs produce between 37 and 41% of GHG emissions in the business sector and 30 to 39% in the manufacturing sector.[48] Regarding energy consumption, the International Energy Agency has estimated that SMEs account for roughly 13% of energy use globally.[49] These statistics make clear that SMEs, whether domestic or international, are significant contributors to climate change that cannot continue operating at the periphery of climate change discourse.[50]

The historical rationale for disinterest in SMEs, notwithstanding the statistics' indication of their collective impact, is multifaceted, but the validity of the rationales underlying this disinterest varies. The business strategy point of view assumes that SMEs have little interest in environmental performance beyond regulatory compliance.[51] Recent research calls this assumption into question, finding that SMEs have much more nuanced views on environmental stewardship than previously believed, both as it relates to proactive pollution prevention[52] and greening product and service offerings and processes within the firm.[53]

Even if there was a strong desire to study SMEs, data on the firms' environmental impacts is typically harder to acquire than data on larger firms, as evidenced by the sparse and disparate studies cited above.[54] Although somewhat circular, the lack of public focus on SMEs has disincentivized research and advocacy aimed at bringing SMEs into sustainability

47. CALOGIROU CONSTANTINOS ET AL., PLANET WITH TEKNOLOGISK INSTITUT SMES AND THE ENVIRONMENT IN THE EUROPEAN UNION, vii, x, 57–58 (2010). In passing, a report from the International Trade Centre notes that "[s]mall firms generate more than 50% of jobs *and greenhouse gas emissions*"; however, the source for this statistic is not provided. INT'L TRADE CTR., SME COMPETITIVENESS OUTLOOK: EMPOWERING THE GREEN RECOVERY xii (2021) (emphasis added).

48. MARCO MARCHESE & JUANA MEDUS, OECD SME & ENTREPRENEURSHIP PAPERS, NO. 42, ASSESSING GREENHOUSE GAS EMISSIONS AND ENERGY CONSUMPTION IN SMES: TOWARDS A PILOT DASHBOARD OF SME GREENING AND GREEN ENTREPRENEURSHIP INDICATORS 16–18 (2023).

49. INT'L ENERGY AGENCY, ACCELERATING ENERGY EFFICIENCY IN SMALL AND MEDIUM-SIZED ENTERPRISES 14 (2015).

50. RAES ET AL., *supra* note 3, at 9 ("SMEs on aggregate have a significant environmental footprint.").

51. J. Alberto Aragón-Correa et al., *Environmental Strategy and Performance in Small Firms: A Resource-Based Perspective*, 86 J. ENV'T MGMT. 88, 89 (2008).

52. *Id.* at 98–99.

53. Brigitte Hoogendoorn et al., *What Drives Environmental Practices of SMEs?*, 44 SMALL BUS. ECON. 759, 775–77 (2015).

54. Aragón-Correa et al., *supra* note 51, at 89; RAES ET AL., *supra* note 3, at 8.

discourse.[55] Data-acquisition costs and limited public interest may have resulted in a self-fulfilling prophecy about engaging SMEs in decarbonization policy and governance debates. Legal scholars, policymakers, and advocates have devoted relatively little attention to SMEs, and the data demonstrating SMEs' role in perpetuating climate change has been difficult to collect. But better data on SMEs' climate impacts would likely spark public and scholarly interest in the subject, and greater scholarly interest would likely produce better data on SMEs' environmental impacts.

The SME blind spot, the collective willingness to overlook, ignore, or discount SMEs' carbon emissions in climate change discourse—whether willful (as when a mental model constrains beliefs such that small enterprises cannot be conceived of as polluters[56]), or incidental (as when a dearth of data prevents an appreciation of the scope of the problem[57])—is just another manifestation of the one-percent problem. [58] In the climate context, the one-percent problem describes a situation where numerous individually small-scale polluters escape scrutiny as a class notwithstanding the massive scale of their collective impact.

Problematic as this ignorance may be to realizing climate change–mitigation efforts, it is not always irrational; an economic rationale justifies deprioritizing small-scale polluters.[59] Decarbonization efforts are efficient where the benefits of reducing emissions exceed the associated costs. This efficiency is most common in situations where there are large polluters to focus decarbonization efforts on because economies of scale make decarbonization and any associated regulation highly workable in such

55. Aragón-Correa et al., *supra* note 51, at 89.

56. Michael P. Vandenbergh, *The Social Meaning of Environmental Command and Control*, 20 VA. ENV'T L.J. 191, 208 (2001) (theorizing that command and control of large, point-source polluters conveyed a message that "industrial polluters are the source of environmental problems, and individual citizens are enforcers allied with the government to stop them"). This cognitive limitation also helps explain why SMEs were conceived of as part of the climate change solution long before their role in contributing to the climate change problem was appreciated. *See* RAES ET AL., *supra* note 3, at 8 (discussing SMEs' role as part of the solution, through green entrepreneurship and eco-innovation programs, in early climate change debates).

57. *Cf.* Allen Rostron, *The Dickey Amendment on Federal Funding for Research on Gun Violence: A Legal Dissection*, 108 AM. J. PUB. HEALTH 865 (2018) (noting the chilling effect that the Dickey Amendment, which prohibited federal funding for gun-violence research that recommended restricting access to firearms, had on firearms research and the impacts of this dearth of research on policymaking).

58. *See* Stack & Vandenbergh, *supra* note 34, at 1386–88. "One percent" in this context does not literally refer to polluters that contribute more than one percent of total annual emissions but instead to "very small-share contributors, whether they are actually one percent, a bit more, or less." *Id.* at 1393.

59. *See id.* ("At its core, the one percent problem is generated by accepting efficiency arguments under conditions *where they are not justified*." (emphasis added)).

settings.[60] But it is unclear how applicable this rationale is in the case of SMEs. Empirical research suggests that engaging SMEs in decarbonization efforts can support significant efficiency gains; strategic efficiency investments can reduce small businesses' utility bills by 10 to 30% according to estimates from Energy Star.[61] "In fact, small businesses can usually save as much money and prevent as much carbon pollution, per square foot, as bigger companies."[62] As the effects of climate change are increasingly felt both at home and abroad, and aspirational (yet concrete) decarbonization targets loom in 2030 and beyond, the consequences of the one-percent problem as applied to SMEs—the SME blind spot—have steadily grown.[63] Alongside these growing consequences, and likely in response to them, renewed interest in the role SMEs play as both contributors *and* solutions to climate change has developed.[64]

B. Can Private Governance Help?

Even once the size and impact of SMEs' aggregated emissions become

60. *Id.* at 1393–94. Efficiencies can materialize because transaction costs are lower in these settings. Note, however, that this is not a result of the diminishing marginal returns to emissions reduction, or what then-Professor Stephen Breyer referred to as the "last ten percent problem" in the regulatory context. *See* STEPHEN BREYER, BREAKING THE VICIOUS CIRCLE: TOWARD EFFECTIVE RISK REGULATION 12 (1993); Stack & Vandenbergh, *supra* note 34, at 1394 n.29. Justice Breyer recognized that when faced with a problem, regulators tended to spend an inordinate share of resources reducing the final ten percent of risk associated with that problem—roughly ninety percent of resources were expended to address the last ten percent of risk. BREYER, *supra* note 60, at 12–13. That observation does not necessarily translate to this setting, however, because each firm (even a low-emissions firm) likely hosts some "low-hanging fruit" that could return cost-effective emissions reductions. Such an assumption underlies the proposed financial instrument presented in Part III below. *See also infra* note 62 and accompanying text.

61. *Small Businesses: An Overview of Energy Use and Energy Efficiency Opportunities*, U.S. ENV'T PROT. AGENCY: ENERGY STAR (2007), https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100TBJH.TXT ("Small businesses that invest strategically can cut utility costs 10 to 30 percent without sacrificing service, quality, style, or comfort, all while making significant contributions to a cleaner environment."); *see also Energy Star Action Workbook for Small Business*, U.S. ENV'T PROT. AGENCY: ENERGY STAR (2019), https://www.energystar.gov/ (outlining steps that SMEs can take to improve the energy efficiency of their businesses).

62. *Boost Savings and Sustainability Through Energy Efficiency*, BANK OF AM. (Aug. 18, 2024), https://business.bankofamerica.com/resources/savings-and-sustainability-through-energy-efficiency. Even something as simple as replacing incandescent lightbulbs with LEDs can have huge impacts. *Lighting Choices to Save You Money*, U.S. DEP'T OF ENERGY, https://www.energy.gov/energysaver/lighting-choices-save-you-money (last visited Nov. 16, 2025) ("LEDs use up to 90% less energy and last up to 25 times longer than traditional incandescent bulbs.").

63. *See* RAES ET AL., *supra* note 3, at 8 ("[W]ith climate mitigation ambitions and milestones becoming more concrete and more urgent (focused on 2030 as well as 2050) it has become increasingly clear that all actors in the economy must play a role and that, although the impact of individual entrepreneurs or SMEs may be limited, collectively they play an important role.").

64. *See* Hill, *supra* note 30, ("We need to include small business as part of the climate change conversation, not only as a contributor, but also as part of the solution.").

clear and the importance of SMEs' decarbonization efforts is recognized, the question remains how these firms can be induced to decarbonize. Should governments utilize incentives or the coercive power of the state? Or put differently, should they employ carrots or sticks? Do governments have the public support necessary to use these tools? Over the last half century, these questions have morphed from a policy dialogue about what should be done to a dialogue about what, if anything, can be done.[65] The limited and uncertain future of public environmental governance has spurred interest among academics and practitioners in developing PEG tools to fill in gaps and push decarbonization efforts beyond what governments alone could achieve.[66] PEG refers to situations in which "private organizations play the

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65. The federal government is handicapped by gridlock in Congress and flip-flopping in the executive branch every four years, preventing the development of long-term climate policy. Since 1991, Congress has only enacted one coercive environmental statute—the Lautenberg Chemical Safety for the 21st Century Act, which amended the 1976 Toxic Substances Control Act. Despite the potential benefits of the subsidy-based approach adopted by Congress in enacting the Inflation Reduction Act (IRA) and Infrastructure Investment and Jobs Act (IRJA), the second Trump Administration was (correctly) expected to be openly hostile to the myriad environmental subsidies included in the IRA and IIJA. *See* David Goldman, *What Just Happened? It Was the Economy, Stupid*, CNN, https://www.cnn.com/2024/11/06/economy/economy-trump-reelection/index.html (last updated Nov. 6, 2024); Kate Magill, *Trump Freezes IRA Funding*, UTILITY DIVE, https://www.utilitydive.com/news/president-trump-inflation-reduction-act-executive-order-ev-mandate/738001/ (last updated Jan. 23, 2025). The administrative state, in its efforts to modernize older coercive environmental laws like the Clean Air Act to address the environmental harms of the modern day, has been handicapped by the courts. *See* West Virginia v. EPA, 142 S. Ct. 2587 (2022); *accord* Loper Bright Enters. v. Raimondo, 144 S. Ct. 2244 (2024); Jonathan H. Alder, *Supreme Court Grants Certiorari in Nondelegation Case*, REASON: THE VOLOKH CONSPIRACY (Nov. 23, 2024), https://reason.com/volokh/2024/11/23/supreme-court-grants-certiorari-in-nondelegation-case/ (describing the Supreme Court's grant of certiorari in a case that could resurrect the nondelegation doctrine). Of course, more localized efforts in states or local governments remain viable, although their geographic reach limits their impact and the opposition to climate mitigation is pervasive in roughly half the states. While these efforts at using public governance to address climate change harms should continue to be pursued, "at a time when politics in the United States (and elsewhere) are dysfunctional and Congress is paralyzed, it doesn't seem wise to put all of your eggs in that broken basket." Lou Leonard, *Stranger Than Fiction? Business Drives a New System of Climate Governance*, THE FINREG BLOG (July 22, 2020) [hereinafter *Stranger Than Fiction*], https://sites.duke.edu/thefinregblog/2020/07/22/stranger-than-fiction-business-drives-a-new-system-of-climate-governance/. PEG is another basket worth exploring. It is worth noting, however, that Congress has never been particularly keen on regulating small-scale polluters, as evidence by numerous *de minimis* polluter exceptions in the environmental laws. *See* Stack & Vandenbergh, *supra* note 34, at 1395–96, 1417 (describing *de minimis* exceptions in federal environmental legislation); *see also* Vandenbergh, *supra* note 56, at 208 (describing second generation environmental problems and a social meaning of environmental law that conceptualized individuals as "enforcers allied with the government to stop" the large "industrial polluters who are the source of environmental problems"). As such, it is not obvious that even if functioning, public governance would be capable of effectively regulating the second-generation environmental problems created by SMEs—numerous individually *de minimis* polluters that collectively have an enormous environmental impact. *See id.* at 196.

66. *See* VANDENBERGH ET AL., *supra* note 12, at 3–4 ("PEG complements, spurs, and even competes with government environmental laws, policies, and programs."); Michael P. Vandenbergh,

standard-setting, implementation, monitoring, enforcement, funding, and/or adjudication roles traditionally played by government actors to address environmental concerns."[67] Just as the threat of sanction by the leviathan motivates compliance with public law, private motivations precipitate PEG.

The strength of these motivations likely differs between large firms and small firms, which changes how and when PEG will be effective across firms. Large firms have the capital, extrinsic motivation, and expertise to engage in sustainability, but they only indirectly control much of their value chains. SMEs, by contrast, permeate large firms' value chains but often lack much of the capital, extrinsic motivation, and expertise necessary to act on environmental goals as large firms do. Exploring the distinct circumstances facing large firms and SMEs in the PEG context illuminates disparities in their efforts to decarbonize, reveals potential synergies between the firms, and highlights differences in their extrinsic motivations for climate consciousness. The comparative PEG analysis informs efforts to accelerate SMEs' decarbonization efforts.

When private firms engage in PEG, several factors typically motivate their participation: public pressures, evolving norms, financial-system pressures, business-to-business pressures, and internal economic opportunities.[68] Larger firms' PEG efforts are chiefly due to public pressure from customers and employees and financial-sector pressures. To some extent, business-to-business pressure and norms also play a role. SMEs' motivations to undertake PEG are undertheorized,[69] but they seem to turn this motivational hierarchy on its head. That is, SMEs appear more heavily influenced by norms and business-to-business pressures than employee or financial-system pressures. As one might expect, the business case for sustainability is likely a universal motivator of PEG adoption—at least among for-profit entities.

Notwithstanding the polarization that has prevented meaningful action in Congress, large swaths of the public support environmental protection[70] and

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Private Environmental Governance, 99 CORNELL L. REV. 129, 197–98 (2013) (describing the potential for new PEG tools); *Stranger Than Fiction*, *supra* note 65 (noting how hyper fixation on public governance solutions to climate change at the expense of business-driven solutions is a contributing factor to humanity's failure to address the climate issue); *see also* Louis G. Leonard III, *Under the Radar: A Coherent System of Climate Governance, Driven by Business*, 50 ENV'T L. REP. 10546 (2020) [hereinafter *Under the Radar*].

67. VANDENBERGH ET AL., *supra* note 12, at 6.

68. *Id.* at 79.

69. *Cf.* Fawcett & Hampton, *supra* note 45, at 3 (regarding SMEs, concluding that "[t]here has been relatively little research on how energy use and the potential for change in organizations should be conceptualized" and that "this is a topic in need of further work").

70. Alec Tyson & Brian Kennedy, *Two-Thirds of Americans Think Government Should Do More on Climate*, PEW RSCH. CTR. (June 23, 2020), https://www.pewresearch.org/science/2020/06/23/two-thirds-of-americans-think-government-should-do-

seek out sustainable products for purchase.[71] As such, large, highly visible firms have an incentive to present themselves as environmentally friendly to cater to this demographic and ensure their operations remain socially legitimate (even if their actions are "legal").[72] Otherwise, consumers on their own or after prodding by advocacy organizations can initiate boycotts of certain products or even whole companies.[73] SMEs also green their product and service offerings in response to customer demand,[74] but this response depends on the ultimate customer. When SMEs serve end-use customers, their products are more likely to be sustainable than when they sell to other companies.[75]

SMEs' response to customer pressure is complex because their customer base is complex. Insofar as SMEs service individuals, their small size and individually small environmental impacts make them unlikely targets of the naming-and-shaming campaigns that large firms have been subject to.[76] Smaller firms are also more willing to differentiate themselves by aligning with social issues, like environmentalism, because they face less pressure to

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more-on-climate/ (cataloging support in the United States); *The World's Largest Survey on Climate Change Is Out–Here's What the Results Show*, UNITED NATIONS DEV. PROGRAMME (June 27, 2024), https://climatepromise.undp.org/news-and-stories/worlds-largest-survey-climate-change-out-heres-what-results-show (cataloging support abroad). For longitudinal data on Americans' views on environmental policy, see *Environment*, GALLUP, https://news.gallup.com/poll/1615/environment.aspx (last visited Nov. 16, 2025).

71. *Degree to Which Consumers' Purchasing Behavior and Choices Shifted Towards Buying More Sustainable Products Over the Past Five Years Worldwide in 2022*, STATISTA, https://www.statista.com/statistics/1377869/global-shift-to-buying-sustainable-products/ (last visited Nov. 17, 2025).

72. This social legitimacy is referred to as the "social license to operate." *See Under the Radar*, *supra* note 66, at 10553 ("[A]s public concern and societal prioritization of climate change grows, some argue that demonstrating adequate action has become a fundamental part of a company's 'social license' to operate, though the concept is at most softly applied in the United States."); Neil Gunningham et al., *Social License and Environmental Protection: Why Businesses Go Beyond Compliance*, 29 L. & SOC. INQUIRY 307, 308–10 (2004); *cf.* Michael P. Vandenbergh et al., *The Moral Boundary of the Firm*, 110 IOWA L. REV. 2169 (2025).

73. *See Under the Radar*, *supra* note 66, at 10553.

74. Hoogendoorn et al., *supra* note 53, at 775 ("SMEs' engagement in green products and services . . . seems to be largely independent of firm size.").

75. *Id.* (finding that "SMEs that serve customers are more likely to engage in greening their products and services than SMEs that serve other companies").

76. *See, e.g.*, Sarah King, *My Week on a Plastic Beach Helping Name and Shame Its Polluters*, GREENPEACE (Oct. 3, 2017), https://www.greenpeace.org/canada/en/story/741/my-week-on-a-plastic-beach-helping-to-name-and-shame-its-polluters-2/ (recounting efforts to collect and tally the sources of plastic pollution on beaches in the Philippines; highlighting Nestle, Unilever, Proctor & Gamble, Colgate-Palmolive, Coca-Cola, and Pepsi as major contributors; and describing an ongoing boycott of Coca-Cola); *cf.* Vandenbergh, *supra* note 56, at 208 (theorizing that command and control of large, point-source polluters conveyed a message that "industrial polluters are the source of environmental problems, and individual citizens are enforcers allied with the government to stop them").

appeal to the public generally.[77] As public resistance to socially progressive policies has grown among some groups, however, SMEs' willingness to differentiate themselves also enables them to succeed by aligning with that resistance.[78]

Beyond customers, public preferences are also reflected in the workforce, finding their way into the firms through employees. Younger generations increasingly report a preference for working with employers whose values, like sustainability, align with their own.[79] Refusing to engage with these values may threaten access to young talent and, consequently, the company's future competitiveness.[80] These pressures will be most salient for large companies that compete for the best and brightest talent on a national scale. When discussing employee pressure as a rationale for PEG, scholars and commentators' focus is often placed on "[t]op-ranked business school graduates" and technology-sector employees at companies including Amazon, Google, and Microsoft—some of the most valuable companies in the world.[81] Among SMEs that recruit locally and from regional universities, it is not obvious that firms use sustainability policy to distinguish themselves from other firms competing for talent in the same labor market.

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77. *See, e.g.*, Gabrielle Policella, *12 Sustainable Small Businesses to Support Without the Guilt*, SMILE.IO, https://blog.smile.io/12-sustainable-small-businesses-to-support-without-the-guilt/ (Apr. 18, 2023) ("[W]e've created this list of 12 sustainable small businesses that are doing great things for the environment. Whether they are selling eco-friendly products or using sustainable packaging, these are brands you can do some sustainable shopping at without guilt."). Many SMEs cite reputational benefits as a rationale for becoming more sustainable. *See* Selig, *supra* note 14.

78. *See* David Gelles, *Red Brands and Blue Brands: Is Hyper-Partisanship Coming for Corporate America?*, N.Y. TIMES (Nov. 23, 2021), https://www.nytimes.com/2021/11/23/business/dealbook/companies-politics-partisan.html. Greenhushing describes a similar phenomenon in organizations that are conscious of the potential costs of differentiating themselves along environmental dimensions and consequently underplay those efforts to avoid alienating customers who might object to such action because it is too environmental or inadequately environmental. *See* Kiley Price, *'Greenhushing' Is on the Rise as Companies Go Silent on Climate Pledges*, INSIDE CLIMATE NEWS (Mar. 17, 2024), https://insideclimatenews.org/news/17032024/todays-climate-greenhushing-companies-greenwashing/ ("On the other side of the aisle, right-wing politicians and thought leaders are speaking out against 'woke' eco-campaigns and business decisions made with climate change in mind . . . ."); Rob Fisher et al., *Greenwashing, Greenhushing and Greenwishing: Don't Fall Victim to These ESG Reporting Traps*, KPMG, https://kpmg.com/us/en/media/news/greenwashing-esg-traps-2023.html (last visited Nov. 17, 2025) ("*Greenhushing* refers to a company's refusal to publicize ESG information. The company may fear pushback from stakeholders who would find its sustainability efforts lacking or from investors who believe ESG undermines returns.").

79. *Under the Radar*, *supra* note 66, at 10553 n.51.

80. *Id.* at 10553 (describing calls to action from employees at Amazon, which led to a threatened strike and sweeping sustainability commitments to prevent it).

81. *See id.*; *see also* VANDENBERGH ET AL., *supra* note 12, at 86 (presenting the following fact in a hypothetical for discussion: "The production of the widgets requires a great deal of sophistication, so many of X Corp's employees are *recruited from top universities with strong computer science and data analytics programs*." (emphasis added)).

Employees may still influence SMEs' decision-making in other ways. Although no firm is truly a monolith, the word is a more accurate descriptor for a large corporation with disparate shareholders and a hierarchical leadership structure than a local manufacturing operation. The small, and potentially more intimately connected, group of employees in an SME may increase employee influence in the firm through employees' conveyance of social norms. This distinction suggests that SMEs are better suited to cultivating a culture of sustainability.[82] SMEs frequently cite their normative beliefs of what is right and wrong as a central motivation for becoming more sustainable.[83] Even in large firms, a centralized decision-making authority may aid responsiveness to norms; such seems to be the case with Patagonia—a private, family-owned corporation whose owners recently transferred all voting and common shares to a trust dedicated to combating climate change.[84] Something similar may take place in SMEs given their relatively small, less disparate pool of shareholders, making norms more salient among and between the firm's leadership and ownership.

Pressure from the financial system—through investors, lenders, and insurers—also plays an important role in motivating PEG; however, these effects appear to be concentrated in large firms.[85] SMEs' status as privately held may make norms more salient, but this characteristic constrains some opportunities for shareholder activism—through proxy fights, for example.[86] By contrast, activist investors consistently put pressure on large, publicly traded firms to adopt environmentally friendly business practices,[87] pressures that are likely amplified by the rise of ESG investing. Banks similarly

82. *See* Fawcett & Hampton, *supra* note 45, at 4 ("Whereas the dominant narrative remains focused on business growth, productivity and employment, some researchers have observed a gradual increase in the degree to which climate change, energy conservation and environmental pollution have come to influence everyday practices in SMEs."); *Under the Radar*, *supra* note 66, at 10555 ("Such norm-shifting appears to be driven both by peer-to-peer influence among companies and within the culture of individual companies.").

83. *Small Businesses Concerned over Navigating Climate Actions*, *supra* note 15 ("[A]t 96%, SMEs overwhelmingly cited 'the right thing to do' as a key motivation for taking climate action.").

84. David Gelles, *Billionaire No More: Patagonia Founder Gives Away the Company*, N.Y. TIMES (Sept. 21, 2022), https://www.nytimes.com/2022/09/14/climate/patagonia-climate-philanthropy-chouinard.html (describing the Chouinard family's transfer of their 100% share of Patagonia's voting stock). Yvon Chouinard, the founder of Patagonia, was certainly an "environmental entrepreneur" by any measure. *See id.*; *Under the Radar*, *supra* note 66, at 10555 ("Some evidence indicates that 'environmental entrepreneurs' within companies, often driven by various motivations, can have a strong role in shaping sustainability decisions.").

85. *Under the Radar*, *supra* note 66, at 10553–54.

86. *See, e.g.*, Natalie Runyon, *New ESG Developments in 2024 Proxy Season Suggest Changes in Shareholder Engagements*, THOMSON REUTERS (Aug. 20, 2024), https://www.thomsonreuters.com/en-us/posts/esg/2024-proxy-season-engagement/ ("Climate change, corporate political influence, and artificial intelligence (AI) were among the top environmental, social & governance (ESG) issues showing up in shareholder proposals during the 2024 proxy season . . . .").

87. VANDENBERGH ET AL., *supra* note 12, at 79; *Under the Radar*, *supra* note 66, at 10553–54.

generate disparate PEG motives in large and small firms. Although large U.S. and global banks are heavily invested in the fossil fuel industry,[88] there is emerging evidence that these institutions are engaging in climate-conscious lending. They increasingly consider the physical and social risks of carbon-intensive investments and adopt standards, like the Equator Principles,[89] consistent with these considerations.[90] Conversely, community banks—central to small-business lending—rarely abide by the Equator Principles or other sustainable banking practices, likely because many of these community banks are SMEs themselves.[91] Pressures originating with insurers are likely to be felt by both large firms and SMEs more uniformly. While it appeared that insurers were content as passive observers of PEG's increasing prevalence as a catalyst for decarbonization efforts,[92] recent decisions by some insurers to leave markets and geographies exposed to significant environmental risk will likely have a noteworthy indirect effect on decarbonization efforts for firms large and small.[93]

Business-to-business pressures are another driver of PEG. Buyers can leverage their existing supply chain relationships or their purchasing power and procurement policies to mandate compliance with their sustainability practices.[94] This a practice that is becoming increasingly common: "A recent

88. *Under the Radar*, *supra* note 66, at 10554–55.

89. First adopted in 2003, "[t]he Equator Principles are a set of guidelines adopted by private lenders to ensure environmental and social risks, including climate change, are appropriately considered." *Id.* at 10554.

90. VANDENBERGH ET AL., *supra* note 12, at 16–17 (describing financial institutions' hesitancy to invest in oil and gas exploration in the Arctic National Wildlife Refuge); *see also infra* notes 168–171 and accompanying text (discussing different banks' involvement in supporting sustainable supply chain financing); *Under the Radar*, *supra* note 66, at 10554.

91. Eldar Beiseitov, *Small Banks, Big Impact: Community Banks and Their Role in Small Business Lending*, FED. RSRV. BANK ST. LOUIS (Oct. 20, 2023), https://www.stlouisfed.org/publications/regional-economist/2023/oct/small-banks-big-impact-community-banks-small-business-lending ("In 2022, 82% of small-business applicants were at least partially approved for loans from small banks. At larger banks, just 68% of small-business applicants received at least partial loan approval."); *Signatories & EPFI Reporting*, EQUATOR PRINCIPLES, https://equator-principles.com/signatories-epfis-reporting/ (last visited Nov. 17, 2025) (noting that only "130 financial institutions globally are Signatories to the Equator Principles"); *cf.* VANDENBERGH ET AL., *supra* note 12, at 173 ("All six major U.S. banks have announced climate commitments regarding their direct operational emissions.").

92. *Under the Radar*, *supra* note 66, at 10553.

93. *See* Elisabeth Buchwald, *Florida's Home Insurer of Last Resort Is in Serious Trouble. Will Milton Put it Over the Edge?*, CNN, https://www.cnn.com/2024/10/11/business/citizens-insurance-hurricane-milton/index.html (last updated Oct. 11, 2024); Cate Deventer & Shannone Martin, *Can Lawmakers Save the Collapsing Florida Insurance Market*, BANKRATE (Sept. 19, 2023), https://www.bankrate.com/insurance/homeowners-insurance/florida-homeowners-insurance-crisis/; Natalie Todoroff, *Limited Home Insurance Options in California as Major Carriers Pull Back*, BANKRATE (Aug. 12, 2024), https://www.bankrate.com/insurance/homeowners-insurance/carriers-exit-california-home-insurance/.

94. *Under the Radar*, *supra* note 66, at 10553.

study demonstrated that more than 80% of the largest firms in seven global sectors included environmental requirements in their supply chain contracting in 2020, up from roughly 50% in 2004."[95] Increased oversight of suppliers is understandable in light of the emerging empirical evidence that suggests moral culpability for environmentally harmful actions taken by a supplier is imputed onto the buyer by its customers.[96] Since SMEs are often suppliers to these large buyers and other PEG motivations have limited impact on SMEs, business-to-business pressure has emerged as a central motivator of PEG in SMEs.[97] Business-to-business pressures may manifest in large firms too when one firm with a competitive advantage in sustainability publicly calls on competitors to take greater climate action (likely at significant cost to those competitors), but this pressure is small compared to the supply chain pressures that SMEs experience.[98]

The public pressures, evolving norms, financial-system pressures, and business-to-business pressures described above all contribute to an economic case for PEG in large and small firms to varying degrees. Sustainability can independently create economic value for firms too. A 2014 study found firms with substantial sustainability policies in place outperformed competitors in both stock market and accounting performance over the long-term.[99] Similarly, research on carbon labeling suggests that the associated GHG emission assessments necessary for such labeling may help firms identify and address inefficiencies associated with their products.[100]

Some of the economic returns to sustainability efforts and PEG may be even greater in SMEs because of unique cost pressures that they face. For example, energy costs are a major concern for small businesses, bested only by healthcare costs and taxes.[101] Rightfully so, energy prices tend to fall with the size of the firm. The smallest SMEs, those with less than 100 employees,

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95. VANDENBERGH ET AL., *supra* note 12, at 178.

96. Vandenbergh, *supra* note 56.

97. *See* VANDENBERGH ET AL., *supra* note 12, at 178 ("These suppliers are often small companies that are not as often subject to NGO naming and shaming campaigns. Supply chain contracting initiatives are extending decarbonization pressure to these smaller companies and are an increasingly important component of the work of lawyers, managers, and advocates."); *Under the Radar*, *supra* note 66, at 10553 ("A company's supply chain largely consists of other private entities with whom it engages via contract. So, achieving a buyer company's supply chain target requires suppliers to address their own climate emissions.").

98. *See Under the Radar*, *supra* note 66, at 10552 & n.45.

99. Robert G. Eccles et al., *The Impact of Corporate Sustainability on Organizational Processes and Performance*, 60 MGMT. SCI. 2835, 2853 (2014); *Under the Radar*, *supra* note 66, at 10552.

100. Taufique et al., *Revisiting the Promise of Carbon Labeling*, 12 NATURE CLIMATE CHANGE 132, 136 (2022) ("One possible influence pathway involves making producers or intermediaries more aware of GHG-intensive inputs (that is, fossil fuel energy and fertilizers) that are being managed inefficiently. Thus, the mere assessment of GHG emissions from a product may draw attention to potential cost savings from reducing inefficiencies in product life cycles.").

101. TROMBLEY, *supra* note 7, at 6.

pay 7.5 cents per kilowatt-hour (kWh) for electricity on average compared to 5.6 cents per kWh for firms with over 500 employees. "On average, manufacturing facilities with fewer than 250 employees pay 30% more per kWh of electricity and 8% more per MMBtu of natural gas compared to larger facilities."[102] Tighter cashflow in SMEs exacerbates the consequences of energy insecurity and price volatility, which makes identifying inefficiencies even more valuable.[103]

C. Lingering Barriers to Decarbonizing Small Business

Notwithstanding the business-to-business pressures, social norms, public pressure, and economic benefits that incentivize decarbonization in SMEs, they face a series of barriers that prevent them from engaging in more pro-environmental behaviors. It is worth noting that many SMEs' difficulty reducing carbon emissions is not attributable to apathy about climate change. SMEs consistently report an interest in becoming more sustainable and describe an obligation to help reduce emissions to combat global climate change. Eight in ten SMEs consider emissions reductions a "high priority"—attempting to reduce energy consumption and waste, educate their employees, and upgrade inefficient equipment as a result.[104] Notwithstanding SMEs' interest in reducing their environmental impact and efforts to achieve this end, SMEs are less likely than their larger counterparts to engage in different sustainable practices. For example, 35% of SMEs report investing in energy efficiency compared to 60% of large firms.[105]

Various structural barriers explain the discrepancy between SMEs' stated preference for decarbonization and their actions supporting that end. First, SMEs frequently lack the technical expertise necessary to execute many sustainability projects.[106] This dearth of expertise is especially costly in some sectors—like manufacturing—where effective energy efficiency

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102. *Id.* "MMBtu" stands for million British thermal units (Btu). Btu are a measure of energy content distinct from volumetric measures of fuel, like cubic feet. The measure is useful when discussing natural gas because gas available at different locations may contain different amounts of energy per unit volume, so the energy-based unit aids comparability. An MMBtu is equivalent to roughly one thousand cubic feet (or 1 Mcf) of natural gas. *See Frequently Asked Questions: What Are Ccf, Mcf, Btu, and Therms? How Do I Convert Natural Gas Prices in Dollars per Ccf or Mcf to Dollars per Btu or Therm?*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/tools/faqs/faq.php?id=45&t=8 (last updated May 15, 2024); *How Natural Gas Is Measured*, TULSA GAS TECHS., https://www.tulsagastech.com/measure.html (last visited Nov. 26, 2025).

103. *Id.* at 7; *cf.* Taufique et al., *supra* note 100, at 136.

104. *Small Businesses Concerned over Navigating Climate Actions*, *supra* note 15 ("The most commonly-cited barrier to action is a lack of skills and knowledge, denoted by 63% of surveyed businesses . . . .").

105. RAES ET AL., *supra* note 3, at 12.

106. *Small Businesses Concerned over Navigating Climate Actions*, *supra* note 15.

upgrades require a detailed knowledge of how energy is principally consumed within that specific manufacturing subsector, or even that specific facility.[107] Even if the necessary technical expertise was theoretically available or learnable, many of the staff in SMEs lack the bandwidth to spearhead their firms' sustainability initiatives in addition to their other responsibilities.[108] Many SMEs also lack the excess revenues necessary to hire additional staff to lead sustainability efforts.[109] In fact, a lack of capital is the second most common barrier to climate action that SMEs cite, so even if a project were identifiable, the SMEs lack the financial resources to bring these projects to fruition.[110] The cumulative impact of SMEs' activities on the planet makes clear that SMEs must decarbonize if there is a realistic chance of hitting emission reduction targets. But it is also clear that SMEs cannot embark on that effort without support from external sources, whether they are governments, non-governmental organizations (NGOs), or larger and better-resourced firms.

D. Leveraging Supply Chain Connections

With the federal government plagued by gridlock, support for SMEs' decarbonization efforts will need to come from elsewhere. Business-to-business pressure is a significant driver of PEG in SMEs and offers a useful foundation for solutions to SMEs' technical and financial limitations to decarbonization. The supply chain contracts that define this pressure already link SMEs to large firms, but the supply chain is increasingly being used to couple buyers' and suppliers' emissions as well. Exploring this coupling and the emerging public and private law surrounding it helps illuminate the deep ties between large firms as buyers and SMEs as suppliers, which lays the groundwork for identifying potential cross-firm solutions to overcome barriers to decarbonization.

This Section first explores the regime governing the tracking of emissions across firms, both in-house emissions and those along a firm's supply chain. With a conceptual foundation laid, this Section then analyzes emission-disclosure regimes at varying stages of enactment, challenge, and repeal to highlight the complementary nature of public and private

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107. TROMBLEY, *supra* note 7, at 7–8.

108. *Small Businesses Concerned over Navigating Climate Actions*, *supra* note 15; Ashby Remley, *A Procurement Conundrum: Small Clean Energy Customers Encounter Roadblocks to Meeting Goals*, CLEAN ENERGY BUYERS ASS'N (Nov. 10, 2022), https://cebuyers.org/blog/a-procurement-conundrum-small-clean-energy-customers-encounter-roadblocks-to-meeting-goals/ ("SMBs with fewer staff have less time to devote to understanding the risks and benefits of potential procurement mechanisms.").

109. By contrast, large firms often have positions dedicated to sustainability.

110. *Small Businesses Concerned over Navigating Climate Actions*, *supra* note 15.

governance inherent in disclosure regimes. Finally, this Section explores the coupled climate destinies of SMEs and their larger counterparts, as well as the differentiated duties small and large firms owe each other to address their shared supply chain emissions.

1. Scoping Emissions

To better understand the sources of carbon emissions in the economy, the Greenhouse Gas Protocol (GHG Protocol) developed standards for tracking companies' emissions from different sources.[111] The GHG Protocol is an example of PEG; it is a widely adopted global standard developed by the World Resources Institute (a private global research organization) and the World Business Council for Sustainable Development (a consortium of sustainability-minded businesses).[112] Under the GHG Protocol, carbon emissions are broadly classified as Scope 1, Scope 2, or Scope 3. You cannot manage what you fail to measure,[113] and as such, the GHG Protocol's efforts to add structure to emissions reporting and standardize the practice represents a pivotal first step toward addressing corporate carbon emissions. While the two former categories capture emissions more directly within a firm's control, Scope 3 broadens the sphere of interest considerably by looking up and down a firm's value chain for further emissions.[114]

Scope 1 emissions are those emissions most directly attributable to the reporting firm—emissions produced in connection with property owned by the firm.[115] This typically includes emissions from company facilities and the company's vehicle fleet. Firms have slightly less control over their Scope 2 emissions, which are produced up their value chain. These are emissions associated with the electricity consumed by the firm and also includes heat or steam purchased for the firm's operations.[116] Scope 3 emissions seek to capture emissions associated with the reporting company's input goods and services as well as the use of the finished goods it produces.[117] As such,

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111. *About Us*, GREENHOUSE GAS PROTOCOL, https://ghgprotocol.org/about-us (last visited Nov. 17, 2025).

112. *Id.*; *see About Us*, WORLD RES. INST., https://www.wri.org/about (last visited Nov. 17, 2025); *Our History*, WBCSD, https://www.wbcsd.org/who-we-are/our-history/ (last visited Nov. 17, 2025).

113. WBCSD, WORLD RES. INST., FAQ: GREENHOUSE GAS PROTOCOL 2 (2022) [hereinafter GHG PROTOCOL FAQ]; VANDENBERGH ET AL., *supra* note 12, at 68.

114. *What Are Scope 3 Emissions (And Why Should I Care?)*, ZEIGO (Jan. 17, 2024), https://www.zeigo.com/2024/01/17/why-scope-3-emissions-matter-smes/.

115. GHG PROTOCOL FAQ, *supra* note 113, at 1.

116. *Id.*

117. *What Are Scope 3 Emissions and Why Do They Matter?*, CARBON TRUST, https://www.carbontrust.com/our-work-and-impact/guides-reports-and-tools/what-are-scope-3-emissions-and-why-do-they-matter (last visited Nov. 17, 2025); *Scope 1 and Scope 2 Inventory*

Scope 3 emissions capture emissions both up the value chain and down the value chain.

When the three categories are fleshed out in this way, it becomes clear that methods to combat one type of emissions would be ineffective at reducing emissions in other categories.[118] For example, installing energy efficient LED lighting in an oil major's corporate offices (Scope 1) will do nothing to address the much larger impact of end-users' combustion of gasoline (Scope 3). By contrast, research and development investments to increase the energy density of gasoline might reduce end-user emissions (Scope 3), even if it does nothing to reduce emissions from the oil-fueled boiler heating the research laboratory (Scope 2).

2. Scope 3 Disclosures

Reducing Scope 3 emissions has proven challenging in recent years. While the GHG Protocol includes disclosure guidelines for Scope 3 emissions, many of the firms that have adopted the GHG Protocol's accounting standards still do not report these emissions, instead focusing their efforts on Scope 1 and 2 emissions.[119] The lack of Scope 3 tracking and reporting is especially troubling given the relative size of the emissions across the three scope categories. An initial assessment by KraftFoods, for example, found that Scope 3 emissions comprised over 90% of the company's total emissions.[120] Other studies suggest that Scope 3 emissions account for 80% of the emissions from the typical consumer-goods company, an estimate applicable to companies in many sectors.[121]

The difficulty inducing Scope 3 tracking and reporting persists despite the numerous benefits of understanding these emissions: identifying risks and emission-reduction opportunities, enhancing engagement with supply

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Guidance, U.S. ENV'T PROTECTION AGENCY, https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance (last updated Apr. 23, 2025).

118. *See generally* GHG PROTOCOL FAQ, *supra* note 113.

119. *Id.* at 1.

120. *Id.*; *see* Kawal Preet, *Greening the Supply Chain to Beat Climate Change*, FORBES (Nov. 22, 2021), https://www.forbes.com/sites/fedex-express/2021/11/22/greening-the-supply-chain-to-beat-climate-change/.

121. Bové & Swartz, *supra* note 12, at 3 ("The typical consumer company's supply chain creates far greater social and environmental costs than its own operations, accounting for more than 80 percent of greenhouse-gas emissions and more than 90 percent of the impact on air, land, water, biodiversity, and geological resources. Consumer companies can thus reduce those costs significantly by focusing on their supply chains."); VANDENBERGH ET AL., *supra* note 12, at 178 ("Large companies are the targets of many persuasion campaigns and have the resources to participate in PEG initiatives, but 80% or more of the GHG emissions in many sectors arise from the value chain—the suppliers to these companies."); *What Are Scope 3 Emissions (And Why Should I Care?)*, *supra* note 114 ("Scope 3 emissions—the emissions that are represented up and downstream their supply chain—account for up to 75 percent of large companies' GHG emissions.").

chain partners, and reputational benefits associated with public disclosures.[122] Companies often cite the difficulty accurately measuring Scope 3 emissions as their basis for limiting their assessment to Scope 1 and 2. But the hesitation is expected for a more practical reason: polluting firms do not want to publicly out themselves as polluters. As minimally intrusive as disclosures may be, empirical research demonstrates the surprisingly large effects disclosure alone can have on behaviors subject to disclosure.[123] Even if voluntary disclosures are limited, Scope 3 disclosure requirements are one type of regulation where public and private governance work in concert—as is typical with public disclosure requirements.[124] The fate of existing emission disclosure requirements, however, remains uncertain.

When the Securities and Exchange Commission (SEC) first proposed a disclosure rule related to climate-related risks, it included disclosure requirements for Scope 1, 2, and 3 emissions. When the SEC promulgated the final rule in March 2024, it not only rolled back the Scope 1 and 2 emissions disclosure requirements but removed Scope 3 requirements altogether.[125] Notwithstanding the concessions, the watered-down rule's days appear numbered. Shortly after publishing the final rule, the SEC voluntarily stayed its implementation while litigation in the United States Court of Appeals for the Eighth Circuit is pending.[126] The rule is expected to face

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122. *What Are Scope 3 Emissions and Why Do They Matter?*, *supra* note 117. The tracking might also illuminate inefficiencies that the reporting firm could address, leading to potential cost savings. *See* Taufique et al., *supra* note 100, at 136. It is worth reraising the developing evidence of customer's attribution of culpability to downstream buyer firms for the actions of their upstream suppliers, strengthening the business case for this environmental link independent of the regulatory requirements associated with disclosure. *See* VANDENBERGH ET AL., *supra* note 12, at 179 (identifying this phenomenon experimentally).

123. Shameek Konar & Mark A. Cohen, *Information as Regulation: The Effect of Community Right to Know Laws on Toxic Emissions*, 32 J. ENV'T ECON. & MGMT. 109, 123 (1997); Stack & Vandenbergh, *supra* note 34, at 1432.

124. The Toxics Release Inventory (TRI) is one example where public governance's disclosure requirements aid private governance. The TRI requires entities that release sufficient quantities of specified toxic chemicals into the environment to report the releases publicly each year. In the public law context, the TRI is a regulatory tool leveraging the power of persuasion. VANDENBERGH ET AL., *supra* note 12, at 55–56. Private actors can then amplify disclosures' persuasive effect, like through a naming-and-shaming campaign (i.e., attacking a firm's reputation by spotlighting actions it has taken that harm the environment). *See id.* at 217–19. Public governance requires disclosure, and private governance gives disclosure teeth.

125. Lamar Johnson, *SEC Drops Scope 3 from Final Climate Rule, Takes Phased Approach to Scope 1 and 2 Reporting*, ESG DIVE (Mar. 6, 2024), https://www.esgdive.com/news/sec-final-climate-rule-scope-3-out-phased-approach-scope-1-scope-2/709420/; SEC. & EXCH. COMM'N, FACT SHEET: THE ENHANCEMENT AND STANDARDIZATION OF CLIMATE-RELATED DISCLOSURES: FINAL RULES; *see* The Enhancement and Standardization of Climate-Related Disclosures for Investors, 89 Fed. Reg. 21668 (Mar. 28, 2024).

126. In the Matter of the Enhancement and Standardization of Climate-Related Disclosures for Investors, Securities Act Release No. 11280, Exchange Act Release No. 99908, 89 Fed. Reg. 25804 (Apr. 4, 2024).

significant legal hurdles following the Supreme Court's decisions in *Loper Bright Enterprises v. Raimondo*,[127] which overturned the *Chevron* doctrine while the Eighth Circuit litigation was ongoing, and *West Virginia v. EPA*,[128] which formally introduced the major questions doctrine only a few years earlier.[129]

Setting aside these very real legal obstacles, it is unclear whether (or at least when) a merits ruling will come. With the Trump Administration set to assume power in January 2025 and restore Republican control of the SEC, it was assumed that the disclosure rule would be quickly repealed.[130] Through at least November 2025, however, the Trump-era SEC has yet to repeal or modify the rule. In July 2025, the SEC asked the Eighth Circuit to decide the case on the merits despite the Commission's inaction, having previously notified the court that it intended to withdraw its defense of the rule.[131] Nonetheless, the court rejected the invitation, ordering the proceedings "be held in abeyance . . . until such time as the Securities and Exchange Commission reconsiders the challenged Final Rules by notice-and-comment rulemaking or renews its defense of the Final Rules."[132] Ultimately, "[i]t is the agency's responsibility to determine whether its Final Rules will be rescinded, repealed, modified, or defended in litigation."[133] Even with the SEC disclosure rule's future uncertain, the combination of private governance-driven disclosures facilitated through NGOs and public requirements imposed by international and subnational governments may fill much of the gap.[134]

California is the state best positioned to fill the climate risk disclosure

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127. 144 S. Ct. 2244 (2024).

128. 142 S. Ct. 2587 (2022).

129. David A. Bell et al., *SEC Files Brief in Support of Climate Disclosure Rules*, HARV. L. SCH. FORUM ON CORP. GOV. (Sept. 1, 2024), https://corpgov.law.harvard.edu/2024/09/01/sec-files-brief-in-support-of-climate-disclosure-rules/.

130. Avery Ellfeldt, *SEC Climate Rule Unlikely to Survive a Trump Victory*, E&E NEWS: CLIMATE WIRE (Oct. 31, 2024), https://www.eenews.net/articles/sec-climate-rule-unlikely-to-survive-a-trump-victory/; Zoya Mirza, *The ESG, Climate Rules at Stake Under a Second Trump Term*, ESG DIVE (Nov. 7, 2024), https://www.esgdive.com/news/the-esg-climate-rules-at-stake-under-a-second-trump-presidency/732294/; Jesse Pound, *SEC Chair Gary Gensler Will Step Down Jan. 20, Make Way for Trump Replacement*, NBC (Nov. 21, 2024), https://www.cnbc.com/2024/11/21/sec-chair-gensler-will-step-down-jan-20-making-way-for-trump-replacement.html.

131. Sara Dewey & Sarah Hart-Curran, *Eighth Circuit Says SEC Must Defend or Revise Climate Risk Disclosure Rule*, HARV. L. SCH.: ENERGY & ENV'T L. PROG. (Oct. 8, 2025), https://eelp.law.harvard.edu/eighth-curcuit-says-sec-must-defend-or-revise-climate-risk-disclosure-rule/.

132. Iowa v. SEC, No. 24-1522 (8th Cir. Sept. 12, 2025) (order denying request to lift abeyance pending further agency action).

133. *Id.*

134. *See* Michael P. Vandenbergh, *Disclosure of Private Climate Transition Risks*, 63 WM. & MARY L. REV. 1695, 1744, 1750–57 (2022).

regulatory void left by the SEC and the second Trump Administration.[135] California's Climate Corporate Data Accountability Act, enacted in 2023, requires Scope 1, 2, and 3 disclosures for any large firm (i.e., those with annual revenues greater than $1 billion) that "does business in California."[136] Businesses must report Scope 1 and 2 emissions beginning in 2026, followed by additional Scope 3 emissions disclosures in 2027.[137] Not only would this disclosure law fill some of the void left by a SEC disclosure rule rollback of for firms that do business in California, but the law would also extend beyond the outer edges of the SEC's final rule since it covers Scope 3 emissions.

The California law can only have an impact if it survives challenges levied in federal court. Although the California Air Resources Board, the state agency charged with enforcing the state disclosure law, succeeded in defending the state law through the summary judgment phase of its litigation against the U.S. Chamber of Commerce and other business firms, the state law's future remains uncertain.[138] Although the Ninth Circuit denied a motion to enjoin enforcement of the law in November 2025 while the Chamber of Commerce's suit is pending,[139] ExxonMobil initiated a new lawsuit challenging the law in October 2025.[140]

Private governance offers firms the opportunity to leverage their resources and influence to complement or fill gaps left by public governance. Here too with Scope 3 disclosures, PEG could fill a void left by the SEC's retreat from Scope 3 and the potential nullification of California's disclosure law. The most apparent example of PEG in this space is the CDP, established in 2000 as the Carbon Disclosure Project and long predating the SEC or

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135. California is far from the only government filling the disclosure gap; New York, Illinois, New Jersey, Washington state, and thirty-five countries are "developing, refining, or implementing climate disclosure requirements for large companies that operate in their" jurisdictions. Bill Ainsworth, *The SEC Eliminated Climate Rules. Other Governments Are Doing the Opposite*, HARV. BUS. SCH.: INST. BUS. GLOBAL SOCIETY (July 1, 2025), https://www.hbs.edu/bigs/federal-climate-rules.

136. Raquel Fox et al., *State of Play: California Amends Climate Disclosure Rules*, SKADDEN (Oct. 28, 2024), https://www.skadden.com/insights/publications/2024/10/state-of-play-california-amends-climate-disclosure-rules; Brian V. Breheny et al., *California Poised to Adopt Sweeping Climate Disclosure Rules*, SKADDEN (Sept. 26, 2023), https://www.skadden.com/insights/publications/2023/09/california-poised-to-adopt-sweeping-climate-disclosure-rules; *see* CAL. HEALTH & SAFETY CODE § 38532 (West 2025).

137. Fox et al., *supra* note 136.

138. Zoya Mirza, *California's Climate Disclosure Laws Survive First Legal Challenge*, ESG DIVE (Nov. 12, 2024), https://www.esgdive.com/news/california-climate-disclosure-laws-survive-first-legal-challenge/732698/.

139. Zoya Mirza, *ExxonMobil Sues California over Climate Disclosure Laws, Alleging Free Speech Violations*, ESG DIVE (Oct. 31, 2025), https://www.esgdive.com/news/exxonmobil-sues-california-over-climate-laws-alleging-free-speech-violations-sb-253-261/804425/.

140. Zoya Mirza, *Federal Appeals Court Halts Implementation of California's Climate Disclosure Law*, UTILITY DIVE (Nov. 19, 2025), https://www.utilitydive.com/news/ninth-circuit-court-halts-implementation-of-california-climate-law-sb-261/805885/.

California policies discussed.[141] CDP is a non-profit NGO that operates a global emissions disclosure system for use by public and private entities. Thousands of companies report their emissions through CDP annually, and a growing number of buyers require their suppliers to report emissions to the buyers through CDP.[142] Even with an absence of coercive government pressure to track Scope 3 emissions, firms are utilizing CDP to do just that. This suggests a PEG motivator among large buyers may lead to disclosures for their smaller suppliers, even in the absence of public reporting mandates.

3. Common but Differentiated Responsibilities

Climate-risk disclosure laws only raise the stakes for private firms if public disclosure of their emissions increases public condemnation arising from the firm's emissions. But compelling firms to calculate their emissions, especially their Scope 3 emissions, creates non-reputational benefits as well. As the carbon-labeling literature has found, tracking emissions makes the climate risks and opportunities facing the company more salient, uncovering inefficiencies that might otherwise go unnoticed.[143] When assessing Scope 3 emissions, the firm and SMEs within the firm's supply chain may realize this same benefit. Again, the adage rings true, you cannot manage what you fail to measure.

Some skeptics of scoping highlight the fact that Scope 3 disclosures become redundant for firms up a reporting company's supply chain if the upstream firms report these emissions as their own Scope 1 or 2 emissions. This is less a bug than a feature of the GHG Protocol because scoping attributes emissions to firms that have the power to change them—even if that means emissions should not be summed across firms because of this double counting.[144] Overlapping emissions across scopes are less an indictment of emissions reporting than they are a lesson in properly interpretating the data that reporting generates.

The revenue threshold for reporting in the California disclosure law further illuminates the role tracking Scope 3 emissions serves. The California

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141. *About Us*, CDP, https://www.cdp.net/en/info/about-us (last visited Nov. 17, 2025) [hereinafter *CDP: About Us*].

142. *Id.* (highlighting that "$6.4 [trillion] of combined purchasing power among 270+ major buyers . . . asked their suppliers to disclose through CDP in 2025.").

143. Taufique et al., *supra* note 100; *CDP: About Us*, *supra* note 141 (highlighting the ability to "identify emerging environmental risks and opportunities that would otherwise be overlooked [and] to inform data-driven strategy" as benefits of carbon emissions reporting and disclosure).

144. GREENHOUSE GAS PROTOCOL, SCOPE 3 FREQUENTLY ASKED QUESTIONS 20–21 (2022) ("This type of double counting is an inherent part of Scope 3 accounting. Each entity in the value chain has some degree of influence over emissions and reductions. Scope 3 accounting facilitates the simultaneous action of multiple entities to reduce emissions throughout society.").

threshold means that in the absence of supply chain or other pressures, many small firms will not need to measure or disclose their emissions and expend scarce administrative resources in the process. Given these firms' significant emissions, is this a major gap in the disclosure requirements?[145] No, large buyers' Scope 3 emissions include SMEs' emissions. The larger buyers are better equipped technically and financially to undertake such reporting burdens. The GHG Protocol assumes both firms would be tracking and reporting emissions, notwithstanding double counting, because it "facilitates the simultaneous action of multiple entities to reduce emissions throughout society."[146] By contrast, the California law explicitly assigns to the large firm the responsibility for reporting emissions and, therefore, implicitly assigns the large firm the central role in tracking and (presumably) reducing those emissions.[147]

The relationship between SMEs with their tight operating margins, minimal sustainability expertise, and limited access to capital and large firms with their relatively deeper resource pools is reflective of other climate change mitigation relationships. The 1992 United Nations Framework Convention on Climate Change, for example, discusses the "common but differentiated responsibilities" of the world's many countries.[148] Even Pope Francis, in his 2015 encyclical Laudato Si', notes that "[w]e must continue to be aware that, regarding climate change, there are differentiated responsibilities" of rich and poor countries.[149] The world's nations may all

145. *See supra* Part I.A.

146. GREENHOUSE GAS PROTOCOL, *supra* note 144, at 21.

147. The same analysis is explicit in the Science Based Target initiative's approach to Scope 3 reporting. Under that initiative, SMEs track Scope 3 emissions but do not set Scope 3 goals. "Don't let that guidance fool you though. SMEs are critical to decarbonization efforts. Think about it—while SMEs are not required to set Scope 3 goals, larger enterprises are. And guess who's partially responsible for large enterprise's Scope 3, indirect carbon emissions? You guessed it—their SME vendors downstream." *What Are Scope 3 Emissions (And Why Should I Care?)*, *supra* note 114.

148. *See, e.g.*, Dipa Patel, *'Common But Differentiated Responsibilities': A Beacon of Realism*, LSE (July 29, 2020), https://blogs.lse.ac.uk/internationaldevelopment/2020/07/29/common-but-differentiated-responsibilities-a-beacon-of-realism/ ("The principle enshrined in Article 3(1) of the 1992 UNFCCC stipulates one of the foundational rules of international environmental law – that of 'common but differentiated responsibilities and respective capabilities.'").

149. *Encyclical Letter Laudato Si' of the Holy Father Francis on Care for Our Common Home*, VATICAN, https://www.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html (last visited Nov. 17, 2025) ("The poorest areas and countries are less capable of adopting new models for reducing environmental impact because they lack the wherewithal to develop the necessary processes and to cover their costs. We must continue to be aware that, regarding climate change, there are *differentiated responsibilities*."); *see* Stephanie Kirchgaessner, *Pope's Climate Change Encyclical Tells Rich Nations: Pay Your Debt to the Poor*, GUARDIAN (June 18, 2015), https://www.theguardian.com/world/2015/jun/18/popes-climate-change-encyclical-calls-on-rich-nations-to-pay-social-debt ("Pope Francis has called on the world's rich nations to begin paying their 'grave social debt' to the poor and take concrete steps on climate change, saying failure to do so presents an undeniable risk to a 'common home' that is beginning to resemble a 'pile of filth.'").

have a common goal, but each country's circumstances dictates their individual responses. So too in the corporate context, it is important to reflect on what differentiated responsibilities are appropriate: What duties do the large firms owe SMEs?

The supply chain is an obvious tie between SMEs and large firms, as evidenced by the recent push to require Scope 3 disclosures and some firm-level requirements that their suppliers track emissions.[150] Emission reporting requirements do not formally link large buyers and smaller suppliers in a legal sense, but they do highlight the environmental ties between SMEs and large firms through their pre-existing contractual relationships. The supply chain linkage, both contractual and environmental, forms a valuable relationship through which SMEs can forge deeper links with larger buyers through shared decarbonization goals, efforts, opportunities, and resources.

II. FINANCING DECARBONIZATION IN THE FIRM

With a heightened appreciation for the bonds formed through the supply chain, large firms are increasingly seeking out opportunities to support decarbonization in the small- and medium-enterprises (SMEs) that supply them. This Part explores two such financing vehicles: The first has strong ties to the supply chain and a strong focus on SMEs but uncertain environmental impact. The second principally focuses on improving environmental performance, but SMEs' uptake has been low and would require looking beyond existing supply chain relationships to reach them. Although neither instrument will eliminate SMEs' contributions to the climate crisis, both can yield substantial emissions reductions from a source category that is otherwise difficult to reach. Examining the instruments' structure and identifying their strengths and weaknesses will highlight additional opportunities for expanding their use and developing new instruments to achieve additional decarbonization in SMEs.

A. Sustainable Supply Chain Financing

Leaning heavily into the supply chain relationship, sustainable supply chain financing (SSCF) offers suppliers access to low-cost trade financing if they satisfy select sustainability metrics. The programs are frequently targeted at SMEs, who often supply the large buyers that establish SSCF programs, but these initiatives have had limited uptake and impacts to date. Growing awareness of this relatively simple financing tool, however, suggests SSCF may become much more widespread in the future. This

150. *See CDP: About Us*, *supra* note 141.

Section begins with a discussion of the mechanics of supply chain financing (SCF) generally and SSCF specifically, then provides an assessment of the benefits and limits of SSCF programs, and concludes with suggestions about how to amplify SSCF's reach and impact.

1. Mechanics

SCF is a funding mechanism that rose to prominence during the 2008 global financial crisis.[151] The 2008 recession brought to light the cash-flow issues that suppliers face when trying to collect on accounts receivable and that buyers face when waiting to discharge accounts payable.[152] This issue arises because of conflicting cash-flow priorities of suppliers and buyers. When a supplier receives an order and later delivers the goods or services associated with it, the supplier wants to be paid as quickly as possible. By contrast, after a buyer places an order, even after receiving the goods, the buyer wants to delay payment for as long as the supplier can bear.[153] Parties view this tug of war as a zero-sum game where both parties try to extract rents from the other party using what amounts to short-term loans.[154]

When set up correctly, SCF overcomes this tension, creating a win-win scenario for suppliers and buyers by improving the management of working capital and increasing liquidity along the supply chain. Most trade today is conducted on an open-account basis, to the benefit of buyers and the detriment of suppliers.[155] In essence, a buyer will receive goods or services and an invoice indicating when payment is due, normally 30 to 90 days after receipt.[156] While creating value for the buyer, the arrangement ties up capital that the supplier could otherwise use to grow its business and shifts to the supplier all the financial risk associated with the transaction.[157] Competition among suppliers, particularly international suppliers, creates pressure for the

151. Natasha Condon, *Incorporating ESG into Supply Chain Finance*, J.P.MORGAN, https://www.jpmorgan.com/insights/payments/trade-and-working-capital/incorporating-esg-into-supply-chain-finance (last visited Nov. 17, 2025).

152. *Id.*

153. *See* Bancilhon et al., *supra* note 16, at 9.

154. David Noah, *Methods of Payment in International Trade: Open Account*, SHIPPING SOLUTIONS (Nov. 10, 2025), https://shippingsolutionssoftware.com/blog/methods-of-payment-in-international-trade-open-account ("For exporters, any sale is a gift until payment is received.").

155. *See id.* at 14.

156. Bancilhon et al., *supra* note 16, at 9; *see id.* at 8 n.6.

157. *Id.* at 8–9; *see* Noah, *supra* note 154. These risks can be multifaceted, including economic and commercial risk but also political and cultural risk in international trade arrangements. *Id.*

suppliers to agree to these buyer-friendly terms.[158]

Given the asymmetric risk exposure of open-account trade, some have described SCF as a "tool for benefiting the small[] supplier."[159] The practice leverages the buyer's high credit rating to induce a financial intermediary to provide more timely payment to the supplier in exchange for an entitlement to the eventual payment from the buyer.[160] In practice, a buyer will coordinate with a financial services provider (FSP) to create a SCF facility that suppliers may utilize when they choose. If the supplier chooses to participate, after delivering the goods or providing the services contracted for with the buyer, the supplier receives payment from the FSP immediately, less a fee; in exchange, the financer receives the right to collect the buyer's payment when it comes due.[161]

Environmentally conscious firms are now using SCF to encourage sustainability from their suppliers too. SSCF operates in the same way traditional SCF arrangements do, but when buyers coordinate with financial intermediaries to initiate the programs,[162] the buyers establish different sustainability metrics that trigger access to the SCF program or to preferential financing terms within the program. For example, as a part of Project Gigaton,[163] Walmart established a SSCF program with the bank HSBC. Under Walmart's SSCF program, suppliers have access to preferential SCF terms if they set science-based emission reductions targets validated by the

158. *See* Noah, *supra* note 154 ("Because of intense competition in export markets, importers often press exporters for open account terms . . . . Therefore, exporters who are reluctant to extend credit may lose sales to their competitors.").

159. Condon, *supra* note 151.

160. A more detailed discussion of SCF's benefits follows in Part II.A.2.

161. Bancilhon et al., *supra* note 16, at 9. In other words, suppliers can sell a portion of their accounts receivable to an FSP for some fraction of the face value of the account to receive immediate payment for sales. *Id.* Other products and arrangements are available for discharging the risk associated with open account trade in addition to SCF, including export working capital financing (which can sometimes be government guaranteed), insurance, standby letters of credit, forward contracts (for trade in different currencies), and factoring. *See* Noah, *supra* note 154. Factoring is very similar to SCF but distinct both in that the buyer is less central to initiating a factoring relationship with an FSP and the relative risk that suppliers can discharge with these arrangements. *See Supply Chain Finance vs. Factoring: What's The Difference?*, LIQUIDITAS (Mar. 24, 2023), https://liquiditas.com/supply-chain-finance-vs-factoring-whats-the-difference/. For a more detailed discussion of the differences between factoring and SCF, see *infra* note 176 and the accompanying text.

162. Here again, the buyer's central role in SCF differentiates risk-hedging techniques available to SMEs since such buyer leverage would not be available in a factoring arrangement, for example, since the buyer plays no coordination role in factoring arrangements. *Supply Chain Finance vs. Factoring: What's The Difference?*, *supra* note 161.

163. *See Walmart Suppliers Lead the Charge, Help Deliver Project Gigaton Goal More Than Six Years Early*, WALMART (Feb. 21, 2024), https://corporate.walmart.com/news/2024/02/21/walmart-suppliers-lead-the-charge-help-deliver-project-gigaton-goal-more-than-six-years-early ("In 2017, Walmart announced a bold ambition to work with our suppliers to reduce, avoid or sequester 1 gigaton—that's 1 billion metric tons—of greenhouse gas emissions in product value chains by 2030. We called it Project Gigaton.").

Science Based Targets Initiative or if the suppliers achieve threshold sustainability scores based on Carbon Disclosure Project (CDP) metrics.[164]

Walmart's program specifically had SMEs in mind, coming in response to an HSBC and Boston Consulting Group study that found "small- and medium-sized businesses don't have the in-house climate expertise" of large firms and also "have limited access to capital to drive and fund climate transformation."[165] The study identifies a "need for a 'leadership crucible,' where large corporates can provide liquidity and share knowledge and resources with smaller businesses," that Walmart designed their SSCF program to help satisfy.[166]

Other firms offer programs like Walmart's, some of which predate Walmart's December 2021 rollout of their SSCF program. In February 2021, for example, Levi Strauss & Co. introduced an analogous program, also in collaboration with HSBC, with preferential financing tied to suppliers' adherence to Levi's Supplier Code of Conduct.[167] Levi's was no stranger to SCF, however, having established a program with the International Finance Corporation (IFC) in 2014.[168] PHV Corp., another textile retailer that owns brands Tommy Hilfiger and Calvin Klein, established a SSCF program with HSBC, DBS (a Singaporean multinational bank), and Standard Charter Bank in June 2022. Improved financing terms under the PHV program are based on improving workplace health, safety conditions, and other labor practices, highlighting SCF's ability to target other social and governance goals.[169] More recently, banks without connections to specific buyers have also announced efforts to establish SSCF programs with a focus on reaching SMEs in developing nations, including Taulia and Citi Bank's respective collaborations with the IFC announced in February 2024 and August 2024.[170]

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164. *Walmart Creates Industry First by Introducing Science-Based Targets for Supply Chain Finance Program*, WALMART: NEWS (Dec. 8, 2021) [hereinafter *Walmart Creates SCF Program*], https://corporate.walmart.com/news/2021/12/08/walmart-creates-industry-first-by-introducing-science-based-targets-for-supply-chain-finance-program.

165. *Id.*

166. *Id.*; *Seven Steps to Tackle a USD50 Trillion Challenge*, HSBC (Oct. 27, 2021), https://web.archive.org/web/20250729135816/https://www.hsbc.com/news-and-views/views/hsbc-views/seven-steps-to-tackle-a-usd50-trillion-challenge.

167. *Financing Supplier Sustainability with HSBC*, LEVI STRAUSS & CO. (Oct. 3, 2022), https://www.levistrauss.com/2022/10/03/financing-supplier-sustainability-with-hsbc/.

168. *Shared Prosperity: IFC and LS&Co. Team Up to Reward Suppliers for Doing the Right Thing*, LEVI STRAUSS & CO. (Nov. 5, 2014), https://www.levistrauss.com/2014/11/05/shared-prosperity-ifc-and-levis-team-up-to-reward-suppliers-for-doing-the-right-thing/.

169. Scot Case, *Retailers Fund the Future with Sustainable Supply Chain Finance Solutions*, NAT'L RETAIL FED. (July 10, 2023), https://nrf.com/blog/retailers-fund-future-sustainable-supply-chain-finance-solutions.

170. *Taulia and IFC Collaborate to Help Build Sustainable Supply Chain Finance Programs*, SAP TAULIA (Feb. 15, 2024), https://taulia.com/company/news/press-releases/taulia-and-ifc-collaborate-to-help-build-sustainable-supply-chain-finance-programs/.

2. Benefits

When businesses employ SCF in the proper setting, it creates a win-win-win scenario for all three entities involved, creating value for suppliers at no cost to buyers.[171] The buyer ensures that its critical suppliers have stability and the cash flow necessary to grow, at no cost to the buyer. The supplier gets increased cash flow, which improves liquidity[172]—a benefit that buyers also reap by maintaining access to open account trade. The FSP, for its part, receives a low-risk vehicle for making productive use of its capital.[173] The buyer typically has a low-risk profile due to its relative financial stability, and the buyer is the ultimate source of risk in SCF because this firm owes eventual payment to the FSP for goods or services the supplier previously provided.[174] As such, the smaller supplier has access to capital at a lower cost than if its own credit rating were implicated, while fully transferring the risk associated with the sale to the FSP.[175] This complete risk shifting primarily differentiates factoring from SCF, which is sometimes called "reverse factoring" because of the buyer's role in securing the financing.[176]

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171. Of course, the "proper setting" is one in which the transaction costs of the SCF program are offset by the benefits described in this Section. Most problematic here, the proper setting is not always inclusive of SMEs, as discussed further in Part II.A.3 below. *See also* Bancilhon et al., *supra* note 16, at 10.

172. A related benefit is that this cheaper capital is also *flexible*. Participation in SCF programs is not mandatory, and even for suppliers that choose to participate occasionally, they need not discount their receivables through SCF all the time—for example, if they have no immediate need for liquidity. Bancilhon et.al., *supra* note 16, at 10.

173. *Id.* at 10, 12 ("We estimate that in time the sustainable supply finance market will reach one third of the market, hence US$660 billion, representing a US$6 billion opportunity in sustainable supply chain revenue for financial service providers.").

174. *Id.* at 10; *Supply Chain Finance vs. Factoring: What's The Difference?*, *supra* note 161.

175. Bancilhon et al., *supra* note 16, at 10, 14 ("Micro, small, and medium-sized enterprises (MSMEs) face more difficulty accessing trade finance than large firms, with banks reporting that 74 percent of rejections [for trade finance transactions] come from MSMEs and mid-cap firms."). Small is used in a relative sense here. Since the buyer firm arranges SCF—in contrast to a factoring arrangement, for example—the suppliers taking advantage of the financing tend to be smaller than the buyers by comparison. *See Supply Chain Finance vs. Factoring: What's the Difference?*, *supra* note 161 ("This method is more cost-effective for the supplier as the lender takes on the risk associated with the larger company instead of the smaller supplier.").

176. *Supply Chain Finance vs. Factoring: What's the Difference?*, *supra* note 161. With factoring, the supplier retains some of the risk associated with nonpayment by the buyer. Factoring arrangements involve a buyer and an FSP (called a "factor"), with the factor immediately providing some fraction of the face value of the account receivable when the seller delivers goods or provides a service in exchange for title to the account receivable for that buyer. If the buyer later satisfies their obligations and pays the factor, the remaining fraction of payment that the factor withheld from the supplier is paid to it, less previously agreed upon fees. SCF differs in that a third party is involved, the buyer, which arranges the financing on behalf of the supplier rather than the supplier seeking financing on their own. Further, instead of providing a fraction of the account receivable upon delivery, the FSP in a SCF arrangement provides the full value of the account receivable—but still less previously agreed upon fees. *Id.* SCF may

SSCF may also produce non-pecuniary benefits for the firms involved. SSCF, and to some extent SCF, strengthens the relationships between suppliers and buyers while also aligning their goals.[177] As a buyer begins considering the creation of a SSCF program, the buyer invests significant resources connecting with suppliers. This ensures that suppliers are open to utilizing the program and helps the buyer understand how to structure the program to serve the suppliers' needs.[178] As a result, buyers that coordinate SSCF programs often cite these improved connections with their suppliers as a—if not the—primary benefit of initiating the programs.[179] Improved buyer-supplier relationships alongside the financial incentives at the center of SCF also help increase compliance with the buyers' supplier codes of conduct, especially when that compliance metric is tied to the financing terms.[180]

Perhaps most importantly, SSCF offers buyers a means of bringing their suppliers into their broader decarbonization and sustainability initiatives. By improving cash flow and liquidity for suppliers, SCF has the co-benefit of enabling suppliers to use that capital for sustainability investments. Similarly, by tying financing access or terms to sustainability metrics or other ESG goals of the buyer firms, SSCF incentivizes suppliers to act in accordance with those goals and reduce the environmental impact of their activities.[181] Consequently, SSCF has the potential to decrease suppliers' Scope 1 and 2 emissions, but as partners in the buyers' value chains, these reductions also reduce the buyers' Scope 3 emissions.[182] Endeavoring to decarbonize in this way provides positive press for suppliers and buyers as well as the financial intermediaries coordinating the programs,[183] strengthening these firms' social licenses to operate.[184] Collectively, SSCF appears to present a win-win-win-win scenario where suppliers, buyers, FSPs, and the planet all stand to benefit.[185]

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prove more advantageous than factoring where suppliers lack expertise acquiring their own financing or the supplier desires a risk-free means of increasing liquidity.

177. SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 11.

178. *Id.*

179. *Id.* at 7, 8, 11 ("Buyers who participated in the [SSCF] survey cited stronger relationships with suppliers as the primary benefit.").

180. *See id.* at 11; *Financing Supplier Sustainability with HSBC*, *supra* note 167.

181. Bancilhon et. al., *supra* note 16, at 19 (describing how the financial incentives of SSCF programs help induce sustainability investments in SMEs who might have difficulty quantifying other benefits of sustainability improvements); *see also Financing Supplier Sustainability with HSBC*, supra note 167 (discussing Levi's SCF program as a way of supporting suppliers' adherence to its supplier code of conduct).

182. *See What Are Scope 3 Emissions (And Why Should I Care?)*, *supra* note 167.

183. *See, e.g.*, *Financing Supplier Sustainability with HSBC*, *supra* note 167; *Walmart Creates SCF Program*, *supra* note 164.

184. *See supra* note 72 and accompanying text.

185. SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 7.

3. Limitations

Notwithstanding the many benefits of SSCF, the practice is not a panacea; however, reflecting on these limitations also opens new perspectives on reforms, which may increase SSCF's efficacy. SSCF, like other public-facing sustainability measures, is susceptible to greenwashing—a practice where firms make environmental commitments despite little ability to publicly assess whether the firms follow through on their promises.[186] Firms may rely on the positive press associated with initiating an SSCF program to temporarily boost the firms' reputations with minimal consequences if the SSCF fails to deliver any environmental benefits in the future.[187]

Although greenwashing can take place with malicious intent (i.e., the firm has no intention of fulfilling its sustainability promises), SSCF also suffers from systemic deficiencies that might precipitate inadvertent greenwashing. While capital-freeing SSCF theoretically enables suppliers to invest in further sustainability measures, with potential to receive still more preferential financing terms, SSCF programs rarely have formal restrictions on the use of the capital provided.[188] Just because someone received SSCF does not mean the financing will be used for sustainability investments in the same way other green financing would need to be.[189] One consequence of this unrestricted use of capital is the difficulty with which buyers measure and report the tangible sustainability impacts of their programs. Frequently, SSCF programs publish metrics related to capital payouts or reductions in

186. Perez & Vandenbergh, *supra* note 4, at 685; *see* Amanda Shanor & Sarah A. Light, *Greenwashing and the First Amendment*, 122 COLUM. L. REV. 2033, 2043–45 (2022) (defining different types of greenwashing). *But cf.* Quinn Curtis et. al., *Do ESG Funds Deliver on Their Promises?*, 120 MICH. L. REV. 393 (2021) (using empirical methods to conclude that ESG funds fulfill the green promises of their environmental labeling and should not be singled out for special regulatory scrutiny).

187. Firms are not totally free from scrutiny, however, as limited government oversight of climate pledges through disclosure, private environmental governance initiatives, consumer protection laws, and tort law provide some downside risk to greenwashing. *See* Perez & Vandenbergh, *supra* note 4, at 692–704 (describing governance of corporate climate commitments).

188. SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 6 ("The sustainability incentive is at the front end, where suppliers must illustrate sustainability achievements to qualify for funding. Once the supplier obtains the financing, they have discretion on how it may be used, whether that be towards sustainability improvements to qualify for higher pricing tiers or towards non-sustainability related needs.").

189. *Id.* ("Green loans and bonds and sustainability capital funds may provide examples of other sustainable financing mechanisms that do implement requirements on use of capital."); *see, e.g.*, *What You Need to Know About Green Loans*, WORLD BANK GRP. (Oct. 4, 2021), https://www.worldbank.org/en/news/feature/2021/10/04/what-you-need-to-know-about-green-loans ("A green loan is a form of financing that enables borrowers to use the proceeds to exclusively fund projects that make a substantial contribution to an environmental objective.").

payment times but not emissions reductions.[190]

Low participation rates exacerbate SSCF program's uncertain impacts. Although most buyers describe their SSCF experiences positively and voice their intention to continue their programs, uptake among suppliers tends to be low. In one survey, buyers indicated that only around 20% of the suppliers they approached ultimately participated in their SSCF programs.[191] Frequently, buyers must grapple with the uncertain effects of weakening eligibility criteria to increase uptake, which may reduce participant-level sustainability gains.[192] But uptake among buyers has been limited as well, likely due to a lack of awareness of SSCF opportunities and diverse stakeholders' misaligned priorities within large companies.[193]

The transactions costs associated with SSCF also act as a barrier to widespread adoption of SSCF. Many FSPs supporting SCF programs, for example, are hesitant to engage with firms that are too small—the firms already facing the highest barriers to access traditional financing.[194] As one bank shared, "[T]he general rule of thumb is that costs outweigh benefits for suppliers that have less than US$350,000 in receivables, depending [on] the duration and the composition of the account receivable."[195] SMEs may similarly avoid SSCF programs if they perceive the associated costs to be too high, especially perceived risk from being locked into a relationship with a buyer if a significant portion of their financing comes through the buyer's FSP.[196]

SSCF's most significant limitation comes from its short duration. Because SSCF is a short-term credit source, it does not provide the long-term capital necessary to catalyze more costly and impactful means to decarbonize.[197] Relatedly, although SSCF can theoretically enable suppliers to further their decarbonization efforts—notwithstanding the lack of conditions on the funding once its received—it seems to put the cart before

190. SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 6, 8 ("[T]he most common impact metrics focus on total dollar amount received by suppliers, total dollar amount of early payments made, number of days from order of payment relative to typical payment timeframes, and total number of suppliers participating.").

191. SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 8.

192. *Id.* ("For example, increasing standards for participation over time could eliminate suppliers from qualifying. At the same time, maintaining the same standards hinders ambition.").

193. Bancilhon et al., *supra* note 16, at 21; SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 8.

194. *See, e.g.*, Leora Klapper & Natascha Beinker, *Smaller Businesses Lack the Financing to Be Sustainable. Here's How We Can Help*, WORLD ECON. FORUM (Nov. 8, 2017), https://www.weforum.org/stories/2017/11/smes-need-financing-to-improve-their-sustainability-practices-here-s-how-we-can-help/ (describing SMEs' significant difficulty accessing financing from the large corporations they supply or financial institutions, leading to trillion-dollar financing shortfalls).

195. Bancilhon et. al., *supra* note 16, at 21.

196. *Id*.

197. SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 8.

the horse. If suppliers lack the access to capital necessary to decarbonize,[198] how can SMEs successfully invest in sustainability to satisfy the eligibility requirements of their buyers' SSCF programs? And even with unrestricted access to capital, SMEs' lack of knowledge about how to effectively and efficiently decarbonize will remain a significant barrier to their sustainability efforts.[199] Some firms with existing access to capital and sustainability knowledge about how to invest that capital may be incentivized by SSCF programs to choose the investment with the largest sustainability returns at the margin, but many SMEs who lack these resources will be left behind by existing SSCF programs.

4. Opportunities

SSCF's limitations are not indictments of the programs but are instead opportunities for implementing reforms to new and existing programs. These limitations principally fall into two categories around which adjustments to future SSCF programs should be based: low uptake and low impact. Reforms to address low uptake could easily center on improved communications by NGOs and FSPs with SMEs and large buyers, respectively. Efforts like the SME Climate Hub[200] are doing just that, providing resources to SMEs so they can understand the ways decarbonization can work for them. The SME Climate Hub also goes further, communicating how SMEs can finance climate action.[201] These efforts should be celebrated, amplified, and replicated but also expanded to reach buyers as well. FSPs should similarly continue engaging with buyers about the sustainability and economic case for initiating a SSCF program.[202] Specifically, FSPs should focus their efforts

198. *See* PEDRO ANAYA ET AL., HSBC, BOSTON CONSULTING GRP., DELIVERING NET ZERO SUPPLY CHAINS: THE MULTI-TRILLION DOLLAR KEY TO BEAT CLIMATE CHANGE 10 (2021) ("Most small businesses don't have the capacity or money to focus on a net zero strategy. Of the SMEs in our survey that have not launched initiatives to reduce emissions, about half report the lack of access to finance as a key preventing factor.").

199. *Id.* at 8 ("More than half of the SMEs in the survey mentioned the lack of know-how as one of the top 2 reasons for not having net zero transition plans. The number for large corporates was only half that. As a result, SMEs simply do not feel ready for the transition.").

200. SME Climate Hub was founded by the UN Climate Change High Level Champion's Race to Zero campaign, the We Mean Business Coalition, and the Exponential Roadmap Initiative in collaboration with Oxford University and Normative. The organization's goal is "to mainstream climate action in the small and medium-sized enterprises (SMEs)" community and enable SMEs to build resilient businesses for the future. *About Us*, SME CLIMATE HUB, https://smeclimatehub.org/about-us/ (last visited Nov. 19, 2025).

201. *See Customers (Buyers)*, SME CLIMATE HUB, https://smeclimatehub.org/customers-buyers/ (last visited Nov. 19, 2025) (discussing financing options for SMEs and how SMEs gain access to these resources, including supply chain financing).

202. *See, e.g.*, Condon, *supra* note 151; SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17; *Your ESG Vision, In Action*, SAP TAULIA, https://taulia.com/platform/enterprises/sustainable-supplier-

on building coalitions within large corporations to support an SSCF program rather than focusing on a firm's sustainability or supply chain departments in isolation.[203]

Improving firms' understanding of SSCF will also enable better communication between buyers and suppliers, which should improve the programs' design and maximize enrollment incentives for SMEs.[204] Further improving the relational aspect of SSCF may also reduce the salience of the risk associated with securing significant financing from one buyer's affiliated FSP because a long-term relationship with a trusted buyer is desirable.[205] Extending the span of these relationships reduces transactions costs by decreasing aggregated fixed costs from SME enrollment (because there are fewer firms leaving the program once enrolled)[206] and may help overcome the temporal limitations inherent in SCF.

Reforms to address the low impact of existing SSCF programs should focus on effectively measuring environmental benefits. Given the diversity of sustainability audits and assessment schemes available to firms across industries, scaling an SSCF program around one of them can be difficult. For example, the apparel industry alone utilizes myriad sustainability-assessment measures, many of which differ from other industries.[207] Whereas collective standards for SSCF assessment would mitigate this concern, the system's seemingly unilateral standards inhibit SSCF uptake, as well as effective

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finance/ (last visited Nov. 19, 2025); *Sustainable Supply Chain Financing*, ING, https://www.ingwb.com/en/sustainable-finance/sustainable-supply-chain-finance, (last visited Nov. 19, 2025); *Creating a Path for Sustainable Supply Chains,* FLOW (May 19, 2022), https://flow.db.com/trade-finance/creating-a-path-for-sustainable-supply-chains ("Deutsche Bank's Anil Walia explores the various motivations driving a path towards a sustainable future and how banks are helping through innovative products in the supply chain finance space."); GEOFFRY BRADY & CONNOR MILLER, BANK OF AM., SUSTAINABILITY ACROSS THE SUPPLY CHAIN 2 (2022); MIZUHO BANK, MIZUHO BANK LAUNCHED JAPAN'S FIRST SUSTAINABLE SUPPLY CHAIN FINANCE (SSCF) (2022); *Citi Launches Sustainability-linked Supply Chain Financing in Asia Pacific*, CITI (Nov. 1, 2021), https://www.citigroup.com/global/news/press-release/2021/citi-launches-sustainability-linked-supply-chain-financing-in-asia-pacific.

203. *See* Bancilhon et. al., *supra* note 16, at 21–22 (describing issues aligning sustainability priorities in large, multinational firms).

204. *See* SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 11. Increased interest rates may also increase the desirability of SCF even without changes to existing SCF programs. *See The Impact of Higher Rates on Small Businesses*, GOLDMAN SACHS (Oct. 15, 2023), https://www.gspublishing.com/content/research/en/reports/2023/10/16/86420194-1c0b-4c3c-ba94-eb127f9acae1.html (discussing the consequences of increased financing costs on small businesses).

205. Buyers can also increase the sense of mutual good faith in their SSCF programs by avoiding temptations to "sweeten the pill"—changing financing terms after starting an SSCF program to increase repayment periods to the suppliers' detriment. Bancilhon et. al., *supra* note 16, at 20–21.

206. The digitization of trade financing is also expected to reduce these transaction costs, which would further increase SMEs' access to SSCF. *Id.* at 14 ("The elimination of paper from trade finance is thought to have significant cost-reduction opportunities, for example by reducing compliance costs by 30 percent and increasing the ability to serve SMEs.").

207. *Id.* at 21.

environmental impact measurements across and within programs.[208] To combat this, NGOs should work in partnership with suppliers and buyers to support specific assessment standards for SSCF programs and participants. These metrics need not be new; they could center on adoption of and progress toward reaching a science-based target, as Walmart's SSCF program does.[209] Or, they could focus on something as simple as tracking emissions through the SME Climate Hub's emissions calculator.[210] This effort should be undertaken with a sensitivity to the benefits that flexible metrics provide buyers for reaching diverse ESG goals through SSCF programs. With more concrete, comparable assessments in place, buyers will be positioned to introduce capital-use restrictions to their SSCF programs and reduce potential greenwashing.[211] Coupling this reform with others may increase both the utilization and impact of SSCF to support decarbonization in SMEs.

B. Energy Savings Performance Contracts

Focused on capturing the savings from energy efficiency upgrades to allow them to pay for themselves, energy savings performance contracts (ESPCs) offer capital-constrained organizations a cost-free opportunity to become more efficient and sustainable. Projects where such investments have been historically economical are concentrated in large, government-owned facilities, but efforts are underway to expand this financing mechanism to private firms, including SMEs. This Section begins with a discussion of how ESPCs function followed by a recounting of the tool's benefits and limitations and suggestions for how to expand ESPCs' reach.

1. Mechanics

An ESPC is a budget neutral contracting mechanism for making sustainability upgrades to publicly and privately owned facilities.[212] ESPCs first appeared in the late 1980s as utility companies faced increasing costs for

208. *See* Michael P. Vandenbergh, *The New Wal-Mart Effect: The Role of Private Contracting in Global Governance*, 54 UCLA L. REV. 913, 922–24 (2007) (discussing private collective standards and private unilateral standards).

209. *Walmart Creates SCF Program*, *supra* note 164.

210. SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 11; *Calculate Your Business Emissions*, SME CLIMATE HUB, https://businessclimatehub.org/start-measuring/ (last visited Nov. 20, 2025).

211. To further combat greenwashing concerns, firms may consider novel financial commitment devices to create downside economic consequences if their SSCF programs fail to reach promised sustainability goals. *See* Perez & Vandenbergh, *supra* note 4.

212. *Energy Savings Performance Contracting,* U.S. DEP'T OF ENERGY, https://www.energy.gov/eere/buildings/energy-savings-performance-contracts (last visited Nov. 20, 2025).

fuel and construction of new electricity generation resources.[213] As part of a broader reconceptualization of domestic energy regulation, states embraced energy efficiency as a tool for combating the ongoing energy crisis.[214] State-regulated utilities were ordered to develop integrated resource plans,[215] which included requirements for acquiring energy efficiency resources.[216] This investment helped develop a new subindustry of ESCOs that would develop turnkey energy efficiency projects for large industrial and institutional clientele.[217] After the industry adopted a standardized measurement and verification (M&V) procedure that ensured projects delivered meaningful energy savings and ESCOs produced a record of project savings, energy performance contracting experienced rapid growth around the turn of the century.[218] Once the industry demonstrated that financing performance contracts were a profitable and low-cost investment—thanks to mature energy efficiency technology and lower-cost M&V procedures—new FSPs entered the market, driving down financing costs that had previously handicapped the industry.[219] The Enron implosion and corresponding energy crisis in California during the early 2000s briefly dampened growth before the industry rebounded with 22% annual growth through the end of the 2000s.[220] A study from the Lawrence Berkeley National Laboratory estimates ESCOs invest around $7 billion annually in energy efficiency retrofits,[221] even as year-over-year growth has slowed.[222]

Many of the factors that have historically driven interest in performance contracting persist today, suggesting continued vibrancy of the energy performance contracting market. Geopolitical conflict in Eastern Europe and

213. ICF INT'L, NAT'L ASS'N OF ENERGY SERV. COS., INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING 8 (2007); TUTTLE ET AL., U. TEX. ENERGY INST., THE HISTORY AND EVOLUTION OF THE U.S. ELECTRIC INDUSTRY 6–7 (2016).

214. INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 8; TUTTLE ET AL., *supra* note 213, at 6–7.

215. *See* Coley Girouard, *Understanding IRPs: How Utilities Plan for the Future*, ADVANCED ENERGY PERSPS. (Aug. 11, 2015), https://blog.advancedenergyunited.org/understanding-irps-how-utilities-plan-for-the-future ("An IRP is a roadmap to meet forecasted energy demand using both supply and demand side resources to ensure reliable service to customers in the most cost-effective way.").

216. INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 8.

217. *Id.*; *see The ESCO Story*, NAESCO, https://www.naesco.org/esco/ (last visited Nov. 20, 2025) ("ESCOs[] [c]ontract with institutional energy users in the public and private sectors to provide cost-effective energy efficiency retrofits across a wide spectrum of client facilities, from college campuses to water treatment plants. Effectively utilizing a performance-based contract business model, ESCO's have implemented significant comprehensive energy efficiency retrofit projects over the last three decades.").

218. INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 8, 31.

219. *Id.* at 8, 29–30.

220. *Id.* at 12.

221. ELIZABETH STUART ET AL., LAWRENCE BERKELEY NAT'L LAB'Y, U.S. ESCO INDUSTRY: INDUSTRY SIZE AND RECENT MARKET TRENDS 25 (2021); *see The ESCO Story*, *supra* note 217.

222. STUART ET AL., *supra* note 221, at 25.

the Middle East has introduced new volatility into energy markets.[223] Electricity prices are increasing rapidly in some parts of the country.[224] Governments are still very interested in developing energy efficiency resources as part of integrated resource plans.[225] The interest in reducing greenhouse gas emissions has never been so widespread.[226] Perhaps most importantly here, many governments and businesses—particularly SMEs—lack the capital and maintenance funding to keep up with maintaining their facilities or upgrading them to capture the gains from efficiency due to technological advances.[227]

ESPCs speak to these interests and serve these goals by facilitating the identification and installation of energy efficiency upgrades that functionally pay for themselves. In essence, a customer partners with an ESCO, who serves as a general contractor. In that capacity, the ESCO scopes, develops, and implements energy efficiency improvements across one or more of the customer's facilities.[228] Once a customer decides on an ESPC to implement energy efficiency improvements and selects an ESCO partner, the ESCO will conduct a comprehensive energy audit of the customer's facilities to identify what upgrades are available and cost-effective in that specific setting.[229] The

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223. Adrian-Gabriel Enescu & Monica Răileanu Szeles, *Discussing Energy Volatility and Policy in the Aftermath of the Russia–Ukraine Conflict*, 11 FRONTIERS ENV'T SCI. 1 (2023) (Russia–Ukraine); Qi Zhang et al., *Assessing the Extent and Persistence of Major Crisis Events in the Crude Oil Market and Economy: Evidence from the Past 30 Years*, 11 HUMANITIES & SOC. SCIS. COMMC'NS 1 (2024) (global conflicts); Adi Imsirovic, *Experts React: Energy Implications of Escalating Middle East Conflict*, *Market Undercurrents Steering Oil Prices Amid Middle East Conflict*, CTR. FOR STRATEGIC & INT'L STUD. (Oct. 8, 2024), https://www.csis.org/analysis/experts-react-energy-implications-escalating-middle-east-conflict. Recall that the 1973 Arab Oil Embargo helped birth the performance-contracting industry decades ago. *See* TUTTLE ET AL., *supra* note 213, at 6–7.

224. Brad Plumer et al., *Why the Price of Electricity Is Spiking Around the Country*, N.Y. TIMES: CLIMATE (Oct. 30, 2025), https://www.nytimes.com/2025/10/30/climate/electricity-prices.html.

225. *Energy Efficiency as a Resource*, AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON., https://database.aceee.org/state/energy-efficiency-resource (last visited Nov. 20, 2025).

226. *See, e.g.*, Alec Tyson et al., *Americans Largely Favor U.S. Taking Steps to Become Carbon Neutral by 2050*, PEW RSCH. CTR. (Mar. 1, 2022), https://www.pewresearch.org/science/2022/03/01/americans-largely-favor-u-s-taking-steps-to-become-carbon-neutral-by-2050/.

227. LAND-OF-SKY REG'L COUNCIL, A DECISION-MAKERS GUIDE TO ENERGY SAVING PERFORMANCE CONTRACTING: LOCAL GOVERNMENTS IN NORTH CAROLINA 1 ("Many local governments have identified deferred maintenance items and needed energy efficiency upgrades, but lack the funds to make improvements. Smaller counties and municipalities may lack the technical staffing to effectively accomplish these upgrades on their own."); CORRIE E. CLARK, CONG. RSCH. SERV., R45411, ENERGY SAVINGS PERFORMANCE CONTRACTS (ESPCS) AND UTILITY ENERGY SERVICE CONTRACTS (UESCS) 1 (Dec. 17, 2018) ("Many Members of Congress have expressed a continuing interest in improving energy efficiency and increasing the use of renewable energy. One barrier to federal agencies making such investments relates to the availability of capital given the constrained fiscal environment."); *see, e.g.*, Klapper & Beinker, *supra* note 194.

228. *Energy Savings Performance Contract*, *supra* note 18.

229. *Id.*

investments are selected to ensure the energy savings they generate are sufficient to cover the costs associated with implementing the project; as such, ESPCs allow customers to use tomorrow's energy savings to fund today's facility upgrades.[230] Potential projects are tailored to the facility but may include energy efficiency upgrades (e.g., lighting, HVAC, energy management and control, envelope insulation), renewable energy investments, and water conservation and sustainable material and operations measures.[231] Once projects are identified, the ESCO and customer enter into a formal ESPC with the following terms:

> [L]egal requirements, energy savings analysis, projected annual cash flows, Measurement & Verification (M&V), technical audit report, project costs breakdown, and all construction process provisions and a number of attachment "schedules" that define various project information, guarantee, responsibilities, insurance, warranties, M&V, commissioning, training, project costs and more.[232]

The customer and ESCO, however, must first agree on how to finance the projects.[233] The first question a customer faces is whether to self-finance the project or utilize third-party financing.[234] Given their capital constraints, SMEs typically prefer to use the latter option. In this case, the ESCO will often arrange financing on behalf of the customer.[235] The loans are issued to the customer, but the financing contracts may be structured as operating leases to avoid adding new debt to customers' balance sheets.[236] Third-party

230. WHAT IS ESPC?, *supra* note 19, at 1 ("ESPC is a financial mechanism used to pay for today's facility upgrades with tomorrow's energy savings—without tapping your organization's capital budget."); *Energy Savings Performance Contract*, *supra* note 18.

231. Peter K. Floyd, *Funding Options for Energy Saving and Other Operational Cost Saving Transactions*, Alston & Bird, LLP, at 13 (2013); LAFFONT-ELOIRE, *supra* note 21.

232. LAND-OF-SKY REG'L COUNCIL, *supra* note 227, at 3.

233. U.S. DEP'T OF ENERGY: OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, ENERGY SAVINGS PERFORMANCE CONTRACTING (ESPC): THE ESPC PROCESS 1 (2014).

234. *Energy Savings Performance Contract*, *supra* note 18 ("The customer may pay for the installation out of pocket if it has enough cash on hand, or it may seek financing from a third-party lender to cover some or all of the upfront cost.").

235. Floyd, *supra* note 231, at 13. *But see Energy Savings Performance Contract*, *supra* note 18 ("Historically, ESCOs have often helped their customers arrange financing for ESPCs. However, due to passage of the Dodd-Frank Act in 2010, ESCOs are sometimes prohibited from arranging financing as part of their service package without appropriate registration. In some cases, this means customers must now independently arrange financing with a third party.").

236. *ESCO Contracts*, *supra* note 20 ("[T]his is not the case in the United States, where under the Generally Accepted Accounting Principles, EPCs are often structured as operating leases, which are also not accounted for on a company's balance sheet. Reporting an EPC on balance sheet [sic] indicates an increase in debt or liabilities held by that company, and is therefore an unattractive prospect for an

financiers in the ESPC market include both specialized ESPC project finance brokers and major financial institutions, like Bank of America and Citibank.[237] Technical performance risk can be shared by the customer and ESCO—as in a shared savings contract—or shouldered exclusively by the ESCO—as in a guaranteed savings contract.[238] The latter method is more prominent in the United States,[239] but the former may be more advantageous in the developing world where customers prefer less investment risk.[240] Under the guaranteed savings contract, the customer uses the savings from the project to repay any financing facilitating the investment. If the realized savings are insufficient to service the debt, the ESCO satisfies the difference.[241] By contrast, if the realized savings exceed the amount necessary to service the debt, the customer may retain the surplus or share it with the ESCO, depending on the specific terms of the ESPC.[242] This arrangement makes the ESPC more attractive to customers by shifting technical performance risks to another party, while reducing financing costs. This is because a second party (the ESCO) is ensuring repayment of the debt

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organization considering investment in energy efficiency improvements."); *Energy Savings Performance Contract*, *supra* note 18 ("In some cases, ESPCs may be backed by an off-balance sheet financing mechanism in which the third-party financier owns the equipment during the term, such as an ESA or operating lease, or by a tax-exempt lease purchase agreements [sic] for public organizations.").

237. INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 24.

238. SERGI MOLES-GRUESO ET AL., JOINT RSCH. CTR.: EUROPEAN ENERGY EFFICIENCY PLATFORM, ENERGY PERFORMANCE CONTRACTING 4 (2023) (comparing the two types of performance contracting).

239. *Energy Savings Performance Contract*, *supra* note 18 ("The ESCO typically provides a savings guarantee."); SERGI MOLES-GRUESO ET AL., *supra* note 238 ("In the US the guaranteed savings model evolved from the shared savings model in response to drop [sic] in interest in fuel savings and attempt [sic] of ESCOs to make value-based offerings for cost – rather than energy – savings."); INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 29 ("[T]he ESCO is guaranteeing the level of energy savings."); Floyd, *supra* note 231, at 13 ("The ESCO provides a guarantee that the savings produced by the project will be sufficient to cover the cost of project financing for the life of the project."); LAND-OF-SKY REG'L COUNCIL, *supra* note 227, at 1 ("About 95 percent of performance contracts are structured for guaranteed energy saving with the local government (i.e., owner) accepting the debt through third party financing.").

240. This is because ESCOs typically shoulder the financing burden in shared savings contracts. In these arrangements, the ESCOs discharge some technical risk by sharing potential savings (or losses) from the efficiency upgrades but take on risk of the customer defaulting because the ESCO finances the project (either directly or with third-party financing). In developing markets, customers have less desire to accept financing risk, so they prefer the shared savings model. *See Energy Performance Contracting*, *supra* note 225 ("The guaranteed savings concept is difficult to use [to introduce] the ESCO concept in developing markets because it requires customers to assume investment repayment risk.").

241. SERGI MOLES-GRUESO ET AL, *supra* note 238 ("If the savings are not enough to cover debt service, then the ESCO has to cover the difference.").

242. *Id.* ("If savings exceed the guaranteed level, then the customer pays an agreed upon percentage of the savings to the ESCO."); *ESCO Contracts*, *supra* note 20 ("[T]he ESCO guarantees a certain savings on the client's energy bill. The ESCO takes on the technical risk. The client obtains a bank loan, or uses their own equity, to pay contractually determined fees to the ESCO and the bank, and keeps the difference.").

underlying the project through the energy savings guarantee.[243]

Once the ESPC is finalized and financing is secured, the ESCO oversees execution of the project according to the ESPC and monitors the subsequent savings using pre-established M&V procedures.[244] The ESCO may also undertake operations and maintenance responsibilities, conduct repairs, and provide service upgrades during the life of the ESPC.[245] In return, the customer will continue making payments on any debt associated with the project and issue service payments to the ESCO as agreed upon.[246] Once the ESPC expires, the ESCO moves on to other projects and the customer retains remaining energy savings in perpetuity.[247]

Governments and schools have historically been common customers in ESPC arrangements with ESCOs. In 1999, President Clinton signed Executive Order 13,123—which required federal agencies to reduce their energy use per square foot by 35% from 1985 levels by 2010.[248] Congress's reluctance to appropriate funds to support this goal, which was estimated to cost $6–7 billion to reach, left federal agencies with few options for fulfilling their requirements under the Order.[249] Lacking public funding, the Department of Energy's Federal Energy Management Program (FEMP) sought to unleash the power of private capital to support energy efficiency investments. To do so, the FEMP coordinated ESPCs on behalf of other federal agencies.[250]

In less than three years, 26 projects totaling $65 million in investments were carried out under the program.[251] Investments include a $170,000 project updating lighting for the Department of Labor; a nearly $600,000 project improving boiler efficiency, building automation systems, energy management control systems, HVAC, lighting, and other equipment for the Department of the Interior; and a roughly $1 million project upgrading lighting, HVAC, energy management control systems, and boilers for the Coast Guard.[252] Annual savings amounted to roughly $30,000; $80,000; and

243. *Energy Savings Performance Contract*, *supra* note 18.

244. *Id.*; ENERGY SAVINGS PERFORMANCE CONTRACTING (ESPC): THE ESPC PROCESS, *supra* note 233.

245. *Energy Savings Performance Contract*, *supra* note 18.

246. *Id.*

247. *Id.*

248. Exec. Order No. 13,123, 3 C.F.R. 180 (1999); Patrick J. Hughes & Tatiana Strajnic Muessel, *Energy Savings Performance Contracting: Experience of the U.S. Department of Energy Federal Energy Management Program*, *in* ACEEE SUMMER STUDY ON ENERGY EFFICIENCY IN BUILDINGS 175, 175 (2000).

249. Hughes & Muessel, *supra* note 248, at 175.

250. *Id.* at 176.

251. *Id.* at 176–77.

252. *Id.* at 179.

$230,000 for each project, respectively.[253] The FEMP results demonstrate the impact of performance contracting in this setting. Between 2005 and 2017, the federal government invested $21.7 billion in facility energy efficiency improvements, $5.7 billion of which was funded through ESPCs.[254]

With this record of success,[255] interest in using ESPCs in the federal government remains high,[256] especially in defense facilities.[257] State governments utilize ESPCs too. For example, nearly a dozen local and county governments in North Carolina invested in energy efficiency improvements with ESPCs in a several-year timespan.[258] Investments across the ten customers totaled over $13 million; individual project costs ranged from below $500,000 to over $4.5 million and led to 20% average reductions in utility bills.[259] Similarly, the Rockford Housing Authority in Illinois entered into a $7.5 million ESPC to facilitate energy efficiency improvements across eight of its multi-family housing projects; the projects produced six-figure energy savings annually.[260] Also in Illinois, Lewis and Clark Community College partnered with an ESCO to secure $185,000 in funding for fluorescent to LED lighting conversions, building envelope improvements, pipe insulation, and HVAC management systems—an investment producing over $17,000 in annual energy savings.[261]

Private entities utilize ESPCs to accelerate decarbonization efforts. Concerned it would not be able to achieve its energy reduction goals without additional capital investments, General Motors turned to performance contracting as a solution. Since 2012, the company has used shared-savings ESPCs to fund an additional $40 million in energy conservation projects, doubling its initial investment in such projects.[262] General Motors' lighting

253. *Id.*

254. CLARK, *supra* note 227, at 1.

255. *See generally* ROCKY MOUNTAIN INST., GSA, DEEP ENERGY RETROFITS USING ENERGY SAVINGS PERFORMANCE CONTRACTS: SUCCESS STORIES (2015).

256. CLARK, *supra* note 227, at 1 (discussing congressional interest in improving energy efficiency and the ways ESPC may be used to finance these investments).

257. *See* Sarah E. Light, *The Military-Environmental Complex*, 45 ENV'T L. REP. 10763, 10767–68 (2015).

258. LAND-OF-SKY REG'L COUNCIL, *supra* note 227, at 1.

259. *Id.*

260. *Energy Savings Performance Contract*, *supra* note 18 ("The Rockford Housing Authority engaged in a $7.5 million Energy Performance Contract to evaluate the conduct [sic] a comprehensive energy audit and implement energy efficiency measures at eight of its multifamily properties, reducing energy costs by over $100,000 a year while improving the quality of housing for low-income housing tenants.").

261. *Lewis and Clark Community College Infuses Education and Sustainability*, CENTRICA, https://www.centricabusinesssolutions.com/us/case-study/lewis-and-clark-community-college-infuses-education-and-sustainability (last visited Nov. 20, 2025).

262. *General Motors Funds Energy Conservation Projects Through an Energy Performance Contracting Model*, U.S. DEP'T OF ENERGY: BETTER BUILDINGS,

and steam elimination projects funded through their ESPCs have resulted in an additional 120,000 megawatt-hour reduction in energy consumption annually[263]—the equivalent of more than 11,000 homes' annual consumption.[264]

2. Benefits

Under the proper conditions, ESPCs provide tangible sustainability and economic benefits to the firms that sign onto them. The benefits from ESPCs, however, tend to be more principally pecuniary than with SSCF. These pecuniary benefits center on the contracting mechanism's ability to enable investments in sustainability upgrades at no cost to the customer, preserving capital budget dollars for other necessary services[265] and stretching existing sustainability investments.[266] Since ESCOs work with customers to select projects with high energy-savings potential, investments undertaken today are effectively paid for with tomorrow's energy savings.[267] Although customers often secure financing for the projects they undertake, ESCOs' energy savings guarantees should reduce the cost of this financing by reducing risk associated with the projects, just as the focus on installing reliable energy efficiency technologies has.[268] When public entities participate, even greater financing benefits may be available under applicable state law.[269]

The efficiency investments that ESPCs facilitate create substantial forward-looking value for customers once projects are completed. ESPCs

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https://betterbuildingssolutioncenter.energy.gov/implementation-models/general-motors-funds-energy-conservation-projects-through-energy-performance (last visited Nov. 20, 2025) [hereinafter *General Motors Funds Energy Conservation*].

263. *Id.*

264. The average household uses around 10,500 kilowatt-hours of electricity annually, which is equal to 10.5 megawatt-hours, so the exact math is as follows: 120,000/10.5=11,428.6. *See Use of Energy Explained: Energy Use in Homes*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/energyexplained/use-of-energy/electricity-use-in-homes.php (last updated Dec. 18, 2023).

265. LAND-OF-SKY REG'L COUNCIL, *supra* note 227, at 4 (noting how ESPCs "[preserve] limited budget dollars for other needed services and activities").

266. *General Motors Funds Energy Conservation*, *supra* note 249 (describing how GM doubled sustainability investments from $40 million to $80 million).

267. WHAT IS ESPC?, *supra* note 19, at 1; *Energy Savings Performance Contract*, *supra* note 18.

268. INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 30 ("The technologies employed in most performance contract projects were not very risky, because the technologies had matured and most customers shied away from cutting-edge technologies. The financing of performance contracts was profitable and not very risky.").

269. WHAT IS ESPC?, *supra* note 19, at 1; U.S. DEP'T OF ENERGY: OFF. OF EFFICIENCY & RENEWABLE ENERGY, ENERGY SAVINGS PERFORMANCE CONTRACTING (ESPC): HOW TO FINANCE AN ESPC (2014) [hereinafter HOW TO FINANCE AN ESPC] (describing ESPC-funding opportunities under state treasurer–established "umbrella contracts").

have helped customers realize significant energy savings that they retain in full at the end of the ESPC's term.[270] While the term may be long, ESPCs' lengthy time horizon enables bigger investments with larger potential savings and environmental impact.[271] Aside from direct savings, reduced energy consumption also insulates customers from volatility in energy markets.[272] Energy savings and reduced energy-market risk exposure are important forward-looking benefits, but ESPCs also help address deferred maintenance issues a firm might be facing from a prior lack of maintenance investment.[273]

Partnering with ESCOs also creates several benefits for customers given the firms' technical expertise. ESCOs' central role in executing ESPCs from the initial energy audits to final delivery to periodic maintenance and M&V during the life of the contract represents a centralized process for executing what can be technically complex facility upgrades.[274] Rather than diverting significant resources to overseeing sustainability projects or coordinating with several contractors to do so, the customer outsources project management to the ESCO—a single point of contact and accountability for the projects undertaken.[275] In many cases, the ESCO even goes beyond the technical support described and assists the customer in securing the financing for the project.[276] By offering centralized technical support and improving access to financing through coordination and savings guarantees, ESPCs and the ESCOs that execute them provide customers with low-risk opportunities for achieving their sustainability goals and realizing cost savings through

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270. *See supra* notes 252–262 and accompanying text.

271. SME COMPETITIVENESS OUTLOOK: EMPOWERING THE GREEN RECOVERY, *supra* note 43, at 40 ("[B]igger investments in resource efficiency measures deliver much more significant benefits to both the bottom line and the planet. The more a company is able to invest, the more benefits it receives in the long term. Moreover, measures that are most costly to start are more effective in reducing greenhouse gas emissions.").

272. *See* LAND-OF-SKY REG'L COUNCIL, *supra* note 227, at 4 (listing "[r]educed cost of escalating utilities at contract completion" in addition to energy cost reductions as benefits of ESPCs); *cf.* Catherine Clifford, *How Higher and More Volatile Energy Prices Will Affect the Move to Clean Energy*, CNBC (Mar. 17, 2022), https://www.cnbc.com/2022/03/17/what-higher-volatile-energy-prices-mean-for-clean-energy-transition.html (noting customers' tendency to "look for more efficiency" in their modes of transportation when gas prices rise because of their exposure to "higher price volatility").

273. LAND-OF-SKY REG'L COUNCIL, *supra* note 227, at 1 ("Many local governments have identified deferred maintenance items and needed energy efficiency upgrades, but lack the funds to make improvements."); *Guaranteed Energy Performance Contract Saves County over $27,000 Annually*, CENTRICA, https://www.centricabusinesssolutions.com/us/case-study/guaranteed-energy-performance-contract-saves-county-over-27000-annually (last visited Nov. 20, 2025) (describing a successful ESPC to address a "cooling system . . . utilizing R22 refrigerant which, because of its negative effects on the ozone layer, became illegal in the U.S. in 2020" and "ongoing plumbing maintenance issues in inmate living quarters").

274. *Energy Savings Performance Contract*, *supra* note 18.

275. *Id.*; WHAT IS ESPC?, *supra* note 19, at 1; LAND-OF-SKY REG'L COUNCIL, *supra* note 227, at 4.

276. Floyd, *supra* note 231, at 13.

reliable energy efficiency investments.

3. Limitations

Despite their many benefits, ESPCs will not always be a viable tool for facilitating the cost-saving energy efficiency upgrades needed to reach decarbonization goals. Addressing these limitations, however, is not an indictment of the tool but instead highlights areas ripe for experimentation and exploration by firms, non-governmental organizations (NGOs), and governments seeking to expand decarbonization efforts through nontraditional financing. ESPCs' most significant shortcoming concerning the private SMEs at the center of this Article is performance contracting's historical focus on large, public entities. According to the most recent estimates from the Lawrence Berkeley National Lab,[277] by revenue, large public entities—customers in the "MUSH market," which includes municipalities, universities, schools, and hospitals—comprise roughly 72% of the ESPC market.[278] Federal projects, like the Department of Labor, Department of the Interior, and Department of Defense projects described above,[279] make up 16% of the market.[280] Another 5% center on residential and public housing projects,[281] like the Rockford Housing Authority project described above.[282] Ultimately, only 7% of the market consists of commercial and industrial sector projects, a retreat from these industries' 15% market share in 2006.[283]

The focus on MUSH customers is motivated by two factors. First, ESPCs are best suited for executing large projects with energy-intensive clients. While ESCOs vary in what size projects they will agree to undertake and small ESCOs willing to take on smaller projects appear to be gaining market share,[284] the Department of Energy notes that ESPCs are best suited for million-dollar projects, while some ESCOs prefer projects over $5 million.[285] Similarly, one firm abroad only recommends taking on projects where annual energy expenditures exceed €200,000—around $210,000.[286] While

277. Although published in 2021, the estimates describe the ESCO market as of 2018. STUART ET AL., *supra* note 221, at 25.

278. *Id.* at 26. This appears to be larger than estimates of MUSH's market share in the mid-2000s. *See* INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 17.

279. *See supra* notes 252–255 and accompanying text.

280. STUART ET AL., *supra* note 221, at 26.

281. *Id.*; INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 17.

282. *See supra* note 261 and accompanying text.

283. STUART ET AL., *supra* note 221, at 25.

284. *Id.* at 27 (noting an increase in market share for ESCOs with revenue below $100 million annually from 16% in 2014 to 22% in 2018).

285. *Energy Savings Performance Contract*, *supra* note 18.

286. *See* LAFFONT-ELOIRE ET AL., *supra* note 21.

constraining, the size thresholds are necessary to ensure the returns from the project are fairly predictable and sufficient to justify the significant transaction costs associated with designing, implementing, and monitoring an energy efficiency project.[287]

MUSH customers are also attractive candidates for ESPCs because these entities typically own the facilities they occupy and plan on remaining in them for decades.[288] Industrial and commercial enterprises, especially the latter, are far more likely to lease the spaces where they operate.[289] Owning a space is not a prerequisite to a successful ESPC, but issues arise when the term of the relevant lease is shorter than the term of the ESPC since this introduces more risk into the transaction.[290] The difficulties of executing an ESPC in a rented property are exacerbated by the long lead times for many projects, both in terms of negotiation and eventual execution.[291] After all, energy savings—the ultimate vehicle for repayment under an ESPC—cannot accrue until the energy efficiency measures are implemented and associated equipment is brought online.

SMEs outside the MUSH market are not entirely cut off from performance contracting, but even when they have access to ESPCs, they may not retain all the benefits that, for example, a large municipal client might enjoy. Public entities have broader sources of funding than many private entities, including bonds, tax-exempt lease purchase agreements, or state-level financing contracts.[292] Similarly, SMEs might not be able to leverage the high credit rating of their ESCOs in the same way larger firms

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287. *Energy Savings Performance Contract*, *supra* note 18.

288. *Id.*

289. *Id.* Alternatively, performance contracts could be presented to the owners of commercial real estate, but this sector has historically been reluctant to take on long-term debt that may inhibit their ability to flip a property quickly. INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 33. Although there is some evidence this trend is changing, empirical research suggests landlords are less willing to invest in energy efficiency upgrades since the landlords themselves do not bear the costs of existing energy inefficiencies and they have trouble highlighting efficiency amenities as a means of making their properties more attractive to renters. *Id.*; *see, e.g.*, Ivan Petrov & Lisa Ryan, *The Landlord-Tenant Problem and Energy Efficiency in the Residential Rental Market*, ENERGY POL'Y, 2021, at 1, 2. Increased vacancies in commercial properties since the COVID-19 pandemic, however, might induce commercial landlords to alter this practice and invest in energy efficiency to attempt to distinguish their properties from competitors as they compete for relatively scarce tenants. *See* Jim Tyson, *Commercial Property Vacancy Rate to Peak in 2026 at 24%: Moody's*, CFO DIVE (June 28, 2024), https://www.cfodive.com/news/commercial-property-vacancy-rate-peak-2026-moodys-CRE-delinquency-real-estate/720234/.

290. *Energy Savings Performance Contract*, *supra* note 18.

291. *Id.*

292. HOW TO FINANCE AN ESPC, *supra* note 269; *see* David Roeder, Ecofin Advisors: Director of Sustainable Lending, The Basics of Municipal Leasing, Presentation at the 43rd Annual AGLF Conference (May 10, 2023); *Energy Savings Performance Contracting*, AM. COUNCIL ENERGY-EFFICIENT ECON., https://database.aceee.org/state/energy-savings-performance (last visited Nov. 20, 2025) (summarizing the different ways states' incentives support ESPC use by governments).

might be able to. Many of the ESCOs that engage with SMEs and take on smaller projects are themselves small enterprises that lack the strong credit history prerequisite for supporting the low-cost third-party financing that enables ESPC investments.[293]

4. Opportunities

Reflecting on the limitations of ESPC to date highlights two aspects of the tool where reforms should produce the largest impact: transaction costs and project financing. Directing efforts toward decreasing ESPCs' transaction costs and increasing low-cost financing opportunities will increase accessibility of this tool among firms of all sizes. Since the early days of performance contracting, market participants have been acutely aware of the limits that high transaction costs put on the industry. This was most prominently felt when firms negotiated M&V terms and subsequently fulfilled those monitoring obligations. In the early 1990s, M&V was overly complex and costly. At the time, state-of-the-art M&V procedures included "real-time monitoring of essentially every circuit in every customer facility in the program for the life of the project, with the data telemetered to ESCO offices and consolidated into monthly reports and invoices."[294] M&V in this era typically comprised around 15% of total project costs.[295] Recognizing that the protocols "were overkill" that "were expensive to implement over measured technologies with fairly well understood consumption patterns," the Department of Energy, National Association of Energy Service Companies (NAESCO), and ASHRAE (formerly the "American Society of Heating, Refrigerating and Air-Conditioning Engineers") partnered to develop the International Performance Monitoring and Verification Protocol (IPMVP).[296] The IPMVP's principle innovation was its assignment of M&V protocols based on the riskiness of the specific energy efficiency technology employed, taking care to ensure the cost and rigor of M&V procedures aligned with the risk that the technology would fail to deliver anticipated savings.[297]

Firms utilizing the IPMVP have leveraged its "stipulated savings" terms to reduce M&V costs even further,[298] but a renewed effort by the Department of Energy, NAESCO, ASHRAE, or some other NGO or government actor to incorporate new technology into the IPMVP could further reduce M&V

293. LAFFONT-ELOIRE ET AL., *supra* note 21.
294. INTRODUCTION TO ENERGY PERFORMANCE CONTRACTING, *supra* note 213, at 30.
295. *Id.*
296. *Id.* at 30–31.
297. *Id.* at 31.
298. *Id.* at 31–32.

costs. Increasing digitalization of the energy sector with digital building controls, automation, and consumption analytics will likely improve estimates of potential energy savings for proposed projects, in addition to streamlining M&V after a project is completed.[299] Utilities' rollout of smart metering technology nationwide, which enables real-time consumption monitoring at the facility level, and the increasing prevalence of active energy-management systems are two additional examples of technologies that have the potential to reduce M&V costs if leveraged.[300] To realize these benefits, however, ESCOs and the clients they serve must be confident in the procedures that incorporate these technologies into the M&V terms of their ESPCs. Standardizing M&V protocols with these new technologies in mind by updating the IPMVP could breed such confidence.

Transactions costs can also arise from the complexity of the ESPC as a contractual document and the process of formulating such a contract. Here too, NGOs have demonstrated the value of standardization. The Building Owners and Managers Association, Clinton Climate Initiative, real estate companies, and ESCOs partnered to create a toolkit for performance contracting to streamline the process for forming and executing an ESPC.[301] The toolkit includes "standard documents and contract language vetted by top energy service and real estate companies that are intended to streamline the project development process."[302] The Department of Energy similarly led a public-private partnership for developing model ESPC documents, collaborating with representatives from state and local governments, NGOs, ESCOs, banks, and other organizations.[303] With these resources available, governments, ESCOs, NGOs, and firms should tap into their networks to ensure that the non-MUSH firms most likely to utilize these resources know

299. *ESCO Contracts*, *supra* note 20.

300. *Id.* In fact, smart meters are increasingly being utilized across the globe. Adarsh Krishnan, *Smart Electricity Meter Market 2024: Global Adoption Landscape*, IOT ANALYTICS (Feb. 21, 2024), https://iot-analytics.com/smart-meter-adoption/.

301. BLDG. OWNERS & MANAGERS ASS'N INT'L, BOMA ENERGY PERFORMANCE CONTRACTING MODEL [BEPC] (2015); *see Energy Savings Performance Contract*, *supra* note 18 ("Efforts are currently underway to further standardized the contracting process for ESPCs and expand their appeal beyond the MUSH and government sectors. For example, the BOMA Energy Performance Contract model aims to address the limits of the traditional approach by providing standardized documentation and processes.").

302. BLDG. OWNERS & MANAGERS ASS'N INT'L, *supra* note 301, at 4.

303. *See Model Documents for an Energy Savings Performance Contract Project*, U.S. DEP'T OF ENERGY, http://web.archive.org/web/20241101120019/https://www.energy.gov/scep/slsc/model-documents-energy-savings-performance-contract-project (last visited Nov. 20, 2025) (compiling model ESPC documents, covering everything from an initial solicitation to a final ESPC); *About Energy Savings Performance Contracting Model Documents*, U.S. DEP'T OF ENERGY, https://web.archive.org/web/20241003200322/https://www.energy.gov/scep/slsc/about-energy-savings-performance-contracting-model-documents (last visited Nov. 20, 2025) (thanking partners who contributed to the project).

they are available.[304]

Financing is an important part of even simplified ESPCs whose limited access has stunted growth of the ESPC market; increasing access to low-cost financing for ESPCs would expand the reach of this tool to new businesses, ideally SMEs. One benefit of the savings guarantee in many ESPCs is its ability to reduce financial risk of the ESPC by shifting technical performance risks away from the borrower, which drives down financing costs. If both the ESCO and the borrower have relatively poor credit, as is the case for many SMEs and the small ESCOs most likely to serve them, then financing costs may still be too high to justify an ESPC.[305] Expansion of the burgeoning energy savings insurance market would alleviate this problem by reducing the risk associated with an energy efficiency project beyond what is possible with the ESCO-backed savings guarantee.[306] Associated insurance costs, however, would need to be smaller than the financing savings the insurance is supposed to generate, which may not be the case today given the limited number of financial institutions offering this insurance product.[307]

III. CATALYZING DEEP DECARBONIZATION IN SMALL- AND MEDIUM-SIZED ENTERPRISES

Ambitious climate goals require immediate and substantial investments in decarbonization, but these goals will remain beyond reach if decarbonization efforts are limited to the large firms. Small- and medium-sized enterprises (SMEs) must be a part of the effort. The financial, reputational, and relational benefits of sustainable supply chain financing (SSCF) and energy saving performance contracts (ESPCs) demonstrate the value these tools create for large and small firms alike, creating a strong economic case for more widely employing SSCF and ESPCs to finance decarbonization efforts. Notwithstanding their many benefits and the opportunities and efforts that are underway to increase their utility and availability, stakeholders should think beyond SSCF and ESPCs traditional

304. *See Energy Savings Performance Contract*, *supra* note 18 (describing standardization efforts aimed at expanding ESPCs' reach beyond MUSH and government clients).

305. LAFFONT-ELOIRE ET AL., *supra* note 21 ("Small ESCOs . . . could open the EPC offer to single houses and small condominiums. However, borrowing for ESCOs requires a credit history, which hinders the access of SMEs and small structures to finance. Facilitating the access of small ESCOs to TPF would alleviate this barrier."); *see ESCO Contracts*, *supra* note 20 ("[Energy savings insurance] is particularly useful for ESCOs or smaller enterprises with poor credit or who lack the means to secure third party financing.").

306. *ESCO Contracts*, *supra* note 20 ("Uncertainty associated with the performance of efficiency measures inhibits third-party energy efficiency financing globally. In response, energy savings insurance (ESI) has emerged as a solution offered by a small number of financial institutions, private companies and insurance companies, as a way to reduce the risk of an energy efficiency project.").

307. *Id.*

boundaries and applications to expand their utilization by the SMEs—firms' whose sustainability efforts will be crucial to mitigating the worst effects of global climate change. This Part seeks to fill remaining voids left by SSCF and ESPC by proposing a novel way of combining aspects of the two tools to facilitate their combined use in new and important ways, primarily to facilitate long-term sustainability investments by SMEs.

A. Lessons from Existing Tools

Reflecting on the benefits and limitations of SSCF and ESPCs in their current forms, particularly as they relate to SMEs, several systematic barriers and themes become apparent that should inform modifications and extensions of the tools' use: financing costs, transaction costs, information sharing, interfirm relationships, and time horizons.

As to the first barrier, sustainability investments require capital for firms to execute, and SMEs consistently identify a lack of capital as an inhibitor of their decarbonization efforts.[308] It is less that financing is not conceivably available but that the high cost of financing eats away at the margins that make sustainability investments economical. Borrowers are more likely to access financing and access it at lower cost, however, when they reduce the risk associated with their loans. SSCF and ESPCs are most accessible to firms with inadequate credit on their own when other higher-credit firms play a role in the transaction and assume some of the risk of the financed project. With SSCF, financing risks are reduced because the larger buyer satisfies the account receivable; the large buyer is the debtor. With ESPCs, the energy service companies' (ESCOs') savings guarantees, or analogous energy savings insurance, reduce technical performance risks associated with the financed projects and ensure that realized savings from the investments are sufficient to satisfy loan payments.

Aside from financing costs, transactions costs are another thematic obstacle thwarting more widespread use of SSCF and ESPCs. Both SSCF and ESPCs utilize technological advances to reduce costs. SSCF uses digital platforms to connect FSPs and suppliers seeking trade financing, and ESPCs will likely leverage advances in measurement and management technologies with increasing frequency to reduce transaction costs. Similarly, standardized measurement and verification (M&V) processes historically and the increasing availability of model ESPCs today seek to reduce the transactions costs of this financing tool.

Looking beyond pecuniary themes, the relational aspects of SSCF and ESPCs are central to their success. Using the broader relationships forged by

308. *See Small Businesses Concerned over Navigating Climate Actions*, *supra* note 15.

SSCF and ESPCs to share technical expertise enables SMEs, and other firms lacking sustainability departments and knowledge, to consider how decarbonization efforts fit into their operations. Alongside financing, SMEs cite a lack of expertise as a significant barrier to their engagement in sustainability efforts. To combat this, large firms often utilize trainings, sustainability-resource sharing, and nonfinancial recognition to support decarbonization along their supply chains before initiating SSCF programs to accelerate and financially support sustainability efforts.[309] The value of centralized, technical expertise is even more apparent in the context of performance contracting, where the ESCO acts as a central point of contact for the project—from the initial energy audit through M&V after a project is delivered.

These tools demonstrate the tangible value of relationships beyond resource pooling too. The significant interfirm planning that precedes SSCF programs' rollouts strengthens relationships between buyers and suppliers up and down the value chain—a benefit large buyers are quick to highlight[310]—even though the terms of financing are fairly short when considered in isolation. The financial stability SSCF affords small suppliers by smoothing cashflow also provides large buyers reassurance of the economic health of their supply chains, a concern the 2008 financial crisis originally brought to light. It is true that ESCOs and their customers lack any relationship beyond their contractual ties, allowing them to part ways at the end of the contract term. However, the lengthy terms of some ESPCs demonstrate the central importance of partnering with firms that one can confidently assume will live up to their contractual obligations. ESPCs' ability to provide project support over a lengthy period also has the benefit of enabling long-term decarbonization projects that produce deeper decarbonization benefits—which SSCF has heretofore been unable to deliver, notwithstanding the superior quality long-term trade relationships that SSCF supports.

B. Supply Chain Energy Savings Guarantees

These themes inform ways in which SSCF can be combined with ESPCs to maximize financial returns and emissions reductions from sustainability investments for SMEs, their buyers, and the financial institutions underwriting the investments. This Article proposes a form of ESPC that can be offered to SMEs that supply larger buyers. Smaller ESCOs seem poised to serve this community of SMEs, but small ESCOs' and SMEs' shared credit

309. SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 3 ("Buyers adopt a common set of approaches to engage suppliers on emissions reductions, including trainings, resources, and non-financial recognition. While helpful, these offerings limit the impact that any one buyer can have on a supplier.").

310. *See* SUSTAINABLE SUPPLY CHAIN FINANCE, *supra* note 17, at 7–8, 11.

deficiencies make these arrangements difficult because of financing limitations. Rather than solely relying on larger ESCOs who are hesitant to execute smaller projects or waiting for energy savings insurance markets to mature and become widespread, the credit of the buyer firm should be used to guarantee the energy savings the ESCO anticipates will materialize from successful execution of the ESPC. Leveraging the credit of the buyer firm to reduce technical performance risks should enable smaller ESCOs and SMEs to access the capital necessary for executing ESPCs, which will provide SMEs with new access to a valuable tool for facilitating energy efficiency upgrades and reducing carbon emissions.

Bringing these "supply chain energy savings guarantees" to ESPC markets will undoubtedly require the acquiescence of buyer firms, but buyers' significant interest in developing strong relationships with their suppliers, as evidenced by SSCF programs, suggests such a tool may be feasibly implemented. Whereas ESPCs frequently split upside performance risk between the ESCO and the customer and leave downside risk solely with the ESCO on account of the energy savings guarantee, the novel ESPC component proposed here would use the price in a supplier's supply chain contract with a larger buyer to distribute risk in a similar manner between the supplier (i.e., the ESPC customer), the ESCO, and the buyer.

One way to allocate technical performance risk allocation is to develop a supply chain contract in which the price per unit is bifurcated into energy and non-energy related terms, allowing for a variable energy cost. In practice, the supply chain contract between the supplier and buyer would include an initial energy cost per unit charged to the buyer (based on pre-ESPC energy costs) that falls in proportion to the consumption savings realized from the energy efficiency upgrades after project delivery.[311]

For concreteness, consider a scenario where an ESCO and small supplier sign an ESPC with a supply chain energy savings guarantee from the supplier's larger buyer that helped the supplier access funding for the project. Assume the financing costs are $1 per unit delivered to the buyer and electricity costs $0.25 per kilowatt-hour (kWh). If pre-ESPC energy consumption per unit is 10 kWh and falls to 5 kWh once the efficiency measures are implemented, energy savings amount to $1.25 per unit.[312] The

311. To avoid introducing complexity and risk from fluctuations in energy markets, realized consumption savings may be assessed based on realized reductions in energy consumption, not necessarily the direct cost savings from that reduced consumption. That is, if the product originally required 100 kilowatt-hours (kWh) to produce but falls to 50 kWh, then holding the prevailing price of energy fixed, savings would be assessed as the difference between the total energy costs that would have prevailed with the counterfactual 100-kWh product as compared to the realized 50-kWh product after the efficiency investments are implemented.

312. Mathematically, this looks like the following: (10kWh*$0.25/kWh)-(5kWh*$0.25/kWh)=$1.25.

first dollar in savings will be used to service the loan[313] and the remaining $0.25 per unit may be divided between the supplier-customer, the ESCO, and the larger buyer as the circumstances warrant. Among these three contracting parties, the bulk of the upside risk will likely lay with the buyer because it facilitates access to affordable financing by guaranteeing the energy savings and assuming the associated downside technical performance risks. That is, if energy consumption per unit only falls from 10 kWh to 7 kWh, then the $0.75 in per unit savings would be insufficient to satisfy the loan and the buyer would pay a higher per unit energy cost,[314] increasing the unit price by $0.25 to cover the difference necessary to service the loan.

In this situation, the supplier would still be induced to participate because it bears no downside performance risk while acquiring potential upside risk if cost savings outlast the life of the loan (in which case the $1.25 in savings can be distributed among the supplier and buyer after the loan term concludes through any ongoing supply chain relationship that persists between them) or exceed the amount necessary to service the loan. Participation in such a program may also satisfy sustainability metrics tied to the buyer firm's SSCF program (if it has one), enabling access to additional low-cost capital for new sustainability projects or other investments.[315] Finally, leveraging the existing ESPC model grants smaller suppliers access to much needed sustainability expertise, which has handicapped their decarbonization efforts historically, in a much more tangible way than trainings or sustainability-resource sharing.

The ESCO, for its part, is induced to participate because it gains access to new business that may not otherwise be available without the low-cost financing acquired through the large buyer's savings guarantee, with minimal downside risks since the ESCO no longer needs to assume all the performance risk of the efficiency projects (as it usually would under a traditional ESPC framework).[316] The potential for low-risk, repeat business

313. Here, it is assumed that the loan is used to fund the efficiency projects associated with the ESPC, which includes necessary fees paid to the ESCO under the contract.

314. This result is derived as follows: (10kWh*$0.25/kWh)-(7kWh*$0.25/kWh)=$0.75.

315. It would not be surprising for a buyer to provide supply chain savings guarantees *and* have a SSCF program because the latter can exist at no cost to the buyer firm. When these programs coexist, there is a natural synergy between them because (1) the initial energy audit for the ESPC might identify numerous sustainability measures that are ripe for implementation, even if they cannot be incorporated into the final ESPC, and (2) the improved sustainability of the supplier firm from the ESPC's execution would enable access to additional low-cost capital through the SSCF program that the supplier may use to fund remaining efficiency projects identified during the energy audit.

316. This assumes the administrative costs associated with implementing the program are initially paid for through the loan. Alternatively, to save on financing costs, rather than collecting payment directly from the *loan*, when projected energy savings are sufficiently large ESCOs may choose to be paid directly from the *savings* with increased downside risk if the savings accrued are only sufficient to service the loan, as with shared savings models. *See, e.g.*, *ESCO Contracts*, *supra* note 20 (describing shared savings

grounded in strong ESCO-buyer relationships would likely increase competition among ESCOs by incentivizing existing ESCOs to serve smaller industrial and commercial clients and inviting new ESCOs to enter the market to satisfy the new demand for small-scale ESPCs. ESCOs or sustainability consultants that already have a relationship with the larger buyer firms may also step in to serve this new class of ESPC customers—which would further reduce transaction costs associated with energy audits by leveraging another existing relationship along the supply chain, the relationship between the supplier and the buyer's agents already providing SMEs with sustainability training or other resources.[317]

Finally, the buyer is incentivized to participate because the projects that the ESPC facilitates should generate reductions in the buyer's Scope 3 emissions through low-risk energy efficiency investments, strengthen relationships with its suppliers,[318] and create potential upside risk if energy savings are larger than anticipated or persist beyond the life of the loans. To make supply chain energy savings guarantees viable and ensure deep decarbonization is achievable, however, the length of the buyer-supplier contract terms may need to be extended. This feature may be desirable from the buyer's perspective because such an arrangement serves to secure the buyer's investment in the buyer-supplier relationship, creating long-term economic stability for the supplier and long-term Scope 3 emissions stability for the buyer.[319]

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and guaranteed savings approaches to ESPCs). This has the added upside, however, of preventing perverse incentives on the part of the ESCO, which might be induced to overpromise results if it knows the loan covers its costs and the buyer firm is liable for the cost of the loan independent of the ultimate returns from the energy efficiency investments. The ESCO would face other incentives to remain truthful about projected savings, however, since the buyer firm would be the ESCO's source of future contracts (on account of the buyer's many suppliers), suggesting that cheating these repeat players would not be in the ESCO's long-term best interest.

317. This seems like a natural progression if a large firm works to reduce their own Scope 1 and 2 emissions before leveraging their capital and credit to reduce Scope 3 emissions. Insofar as this assumption holds, it may be the case that the sustainability consultants that the buyer holds out as the supplier's potential ESCO already have strong working relationships with the suppliers. This again highlights the parallel between the supply chain energy savings guarantees proposed here and large firms' ongoing efforts to share their sustainability expertise with SMEs.

318. These relationships are strengthened because the buyer is committing to the suppliers by supporting their long-term sustainability investments but also because the ESCO is likely to be closely related to the buyer because of their repeat interactions through the supply chain–initiated ESPCs that would become more common if the supply chain energy savings guarantee is adopted. This allows the buyer-affiliated ESCO to act as the central conduit for providing sustainability information to the SMEs that need it.

319. That is, if the buyer is taking on risk in part because of potential financial upside risks but also in part because of the reduction in Scope 3 emissions associated with the ESPC's energy efficiency investments, increasing the length of the supply chain relationship solidifies the returns to the buyer from Scope 3 emissions reductions, which continually accrue over the life of the relationship. As noted in the SSCF context, however, some SMEs are hesitant about becoming too reliant on financing from one large

CONCLUSION

There remains much work to be done if aspirational decarbonization goals are going to be achieved. The cumulative impacts of small- and medium-sized enterprises (SMEs) cannot be ignored in this effort. If there is any chance of achieving decarbonization goals, SMEs must be brought into the policy and governance debates surrounding decarbonization.[320] Private environmental governance pressures have already brought SMEs into this dialogue to some extent. Business-to-business pressures levied through the supply chain have also long motivated sustainability in SMEs.[321] But persistent financial and technical barriers still prevent SMEs from fully realizing the economic and environmental benefits of sustainability investments.[322]

Banks, companies, and financial institutions have developed several alternative financing tools with the hope of overcoming some of these limitations. Sustainable supply chain financing (SSCF) offers financial incentives for reaching sustainability goals, helping provide SMEs up the supply chain with access to much needed capital and aiding cash-flow management.[323] Similarly, energy saving performance contracts (ESPCs) leverage energy service companies' (ESCOs') technical expertise and savings guarantees to identify cost-effective energy efficiency investments that functionally pay for themselves, providing a means for cash-strapped organizations to invest in economical and environmentally beneficial energy efficiency upgrades.[324] Of course, in practice these tools have certain flaws that limit their reach and impact. SSCF is only a short-term credit option that offers financing to firms that already have the financial means to invest in sustainability, which only then triggers access to additional, low-cost financing.[325] ESPCs require high-dollar projects to attract one of the large ESCOs that dominate the market and carry out the underlying efficiency projects associated with the contracts. Smaller ESCOs who are more willing

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buyer because it is perceived as limiting the SMEs' ability to expand to serve other buyers. *See* Bancilhon et al., *supra* note 16, at 21. To the extent buyers are able to build rapport with their suppliers and clearly communicate the mutual benefits of ESPCs with supply chain energy savings guarantees and long-term supply chain relationships more broadly, these concerns will be ameliorated. *See id.* at 22. Further, the limited use of the supply chain energy savings guarantee would prevent SMEs from encountering this situation since financing for non-sustainability purposes would need to originate elsewhere. SSCF was concerning to SMEs because the *use* of the financing was unrestricted and made it a potential source of all future financing.

320. *See supra* Part I.A.
321. *See supra* Part I.B.
322. *See supra* Part I.C.
323. *See supra* Part II.A.1.
324. *See supra* Part II.B.1.
325. *See supra* Part II.A.3.

to undertake smaller projects lack the credit to provide energy savings guarantees, or at least guarantees credible enough to have an appreciable impact on financing costs.[326]

Combining aspects of SSCF programs and ESPCs may overcome the tools' individual limitations and assist SMEs in surpassing persistent technical and financial barriers to their decarbonization efforts.[327] By leveraging the relationships that suppliers and buyers forge through the supply chain, large, financially stable buyers are equipped to take over the guarantor role traditionally performed by the ESCO in an ESPC. If a small supplier seeks an ESPC, the larger buyer can step in to offer to add a supply chain energy savings guarantee into an existing supply chain contract, which reduces the financing costs of the ESPC by reducing associated risk and makes performance contracting accessible to the smaller ESCOs who are prepared to take on small-dollar projects.[328] Such a tool reinterprets the structure of a traditional ESPC with SMEs at its center and strong supply chain relationships as a vital enabling characteristic. Although supply chain energy savings guarantees may not be appropriate for every supply chain or every SME, adding this tool to the PEG arsenal supporting decarbonization, alongside SSCF and traditional ESPCs, is an important step toward realizing deep decarbonization in SMEs.

326. *See supra* Part II.B.3.
327. *See supra* Part III.A.
328. *See supra* Part III.B.

NAVIGATING AN ENERGY TRANSITION

Dr. Sarah Mills – April 10, 2025

Christophe Courchesne:

Welcome to the 20th Annual Norman Williams Distinguished Lecture in Land Use Planning and the Law. I am Christophe Courchesne, the interim director of the Environmental Law Center and the director of the Environmental Advocacy Clinic here at Vermont Law & Graduate School. Today we are delighted to welcome members of our community here in South Royalton, as well as those joining us online. We have a wonderful turnout here on a Thursday evening. On behalf of the Environmental Law Center, we are pleased to host the Williams Lecture each spring. Norman Williams came to Vermont Law School in 1975 after a long and distinguished career in public service and teaching, particularly in the area of land use planning. Professor Norman Williams played a key role in founding Harvard Law and Graduate School's Environmental Law Center. The Norman Williams Distinguished Lecture in Land Use Planning and the Law series is a gift of Francis Yates, trustee of Vermont Law School, in memory of both Norman Williams and Anya, J.D. '94, and Charles Yates, J.D. '93.

We would like to extend a very warm welcome to this year's special guest, Dr. Sarah Mills. Dr. Mills is the Director of the Center for Empowering Communities at the University of Michigan's Graham Sustainability Institute and an associate professor of practice in the Urban and Regional Planning program. Her research looks at how renewable energy development impacts rural communities positively and negatively, the disparate reactions of rural landowners to wind and solar projects, and how state and local policies can facilitate and hinder renewable energy development. Her current research projects include studying the adoption of zoning ordinances in rural communities across the Midwest, and the economic impacts of solar on agricultural communities including land-ownership trends. She also has funding from Michigan's State Energy Office in the Department of Environment, Great Lakes, and Energy to develop tools and resources to help communities across the state. These tools incorporate clean energy into their planning and zoning and provide direct technical assistance to communities in setting these policies. Dr. Mills received her doctorate in urban and regional planning at the University of Michigan where her dissertation looked at the intersection of farmland preservation and wind energy development. She has a master's in engineering for sustainable development from the University of Cambridge and a bachelor's degree in mechanical engineering from Villanova University. She grew up on a farm

in Monroe County, Michigan, and now lives in Ann Arbor where she's served on the City Planning Commission since 2014.

Her talk today is on navigating an energy transition. Please join me in welcoming Professor Sarah Mills.

Dr. Sarah Mills:

Thanks a lot! Thank you so much for having me. It is really an honor to be here; it's been a great visit. I got here this afternoon, and I have gotten to meet with faculty and students. I have never been to this part of the state, so thank you again for having me. I am going to talk about navigating an energy transition. First, I'll talk about how this energy transition is really a rural energy future for the United States. Second, I am going to talk about what I spend most of my time on, which is studying community acceptance of renewable energy. I will draw from the academic literature, but I am also going to pull in a bunch of stories from being around those rural communities, largely in Michigan, who have been approached by a developer. I'll share more on helping them understand the pros and cons and how rural communities can use energy development to advance quality of life in their place. That is the mission of the Center for EmPowering Communities that I direct. Finally, I want to close by thinking more about policy, and how we can shape policy in light of what we know about public acceptance.

All right, so the first question is: are we in an energy transition, and, if so, how much energy do we need in that transition? Right now, it is really tricky to know what the future trends are. I'm a planner, but I do not have a crystal ball on where things are going. But I'm going to show you two different slides to suggest that there will be an energy transition, and it's going to implicate rural places. This set of graphs (Figure 1) is from the Energy Information Administration (EIA), and largely they're looking at the current policy in place and the economics of different kinds of energy sources to determine the demand for energy technologies all the way to 2050.[1] This

1. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK (2023) https://www.eia.gov/outlooks/aeo/pdf/aeo2023_narrative.pdf.

data is from 2023, and the EIA is supposed to come out with their next forecast in a couple of months.

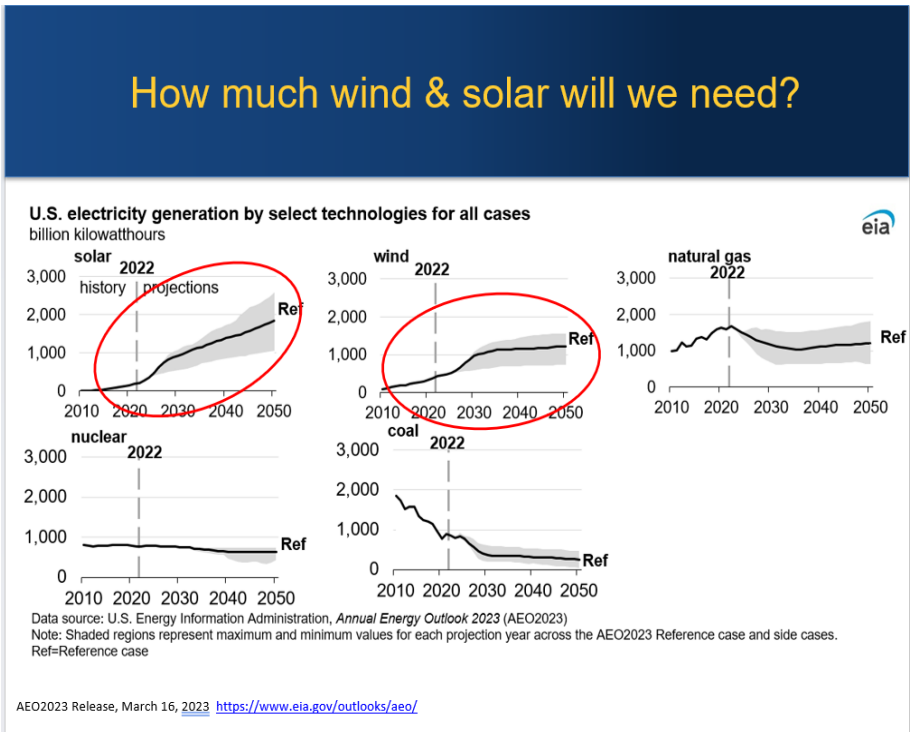

***Figure 1**: EIA Electricity Generation Projections.*[2]

The first thing I want you to notice is, for solar, you can see that on the low side of those projections (the bottom of that gray area), shows effectively a quintupling of our current amount of solar in the country, from less than 250 billion kilowatt hours today to over a thousand billion kilowatt hours in 2050.[3] On the high side, it could be three times that much.[4] So the EIA is projecting—just based on economics—that there's going to be a whole lot more solar. The projections for wind over the next 25 years are slightly less rosy but are still doubling from the amount of wind energy that we have right now, and it could be two times that much.[5] That's only looking at the economics. We know that in a lot of parts of the country, wind and solar are the cheapest forms of energy.

2. *Id.*
3. *Id.*
4. *Id.*
5. *Id.*

If you put this in the context of decarbonization plans, which a lot of states have, these graphs look quite different. This (Figure 2) is pulled from the Net-Zero America study that Princeton conducted a couple of years ago.[6] I circled the reference case on the left because this is effectively a business-as-usual strategy, and it's more or less matching what the EIA would suggest. The little yellow sliver is solar, and they expect that the business-as-usual case for wind is bigger than what the EIA suggests but more or less the same order of magnitude. One of the things that you'll see overall is that in all of these scenarios we have more electricity in the future, and even this may be an underestimate since the study was done before the recent growth in demand from AI. The rest of these graphs are effectively showing what happens if we electrify everything, what happens if renewables get super cheap, and what happens if we try to shift to 100% renewables, shown on the very far right for the figure. And what you can see is that these scenarios show five to twenty times the amount of renewable energy that is currently built if we effectively double down on decarbonization, so quite a bit more.

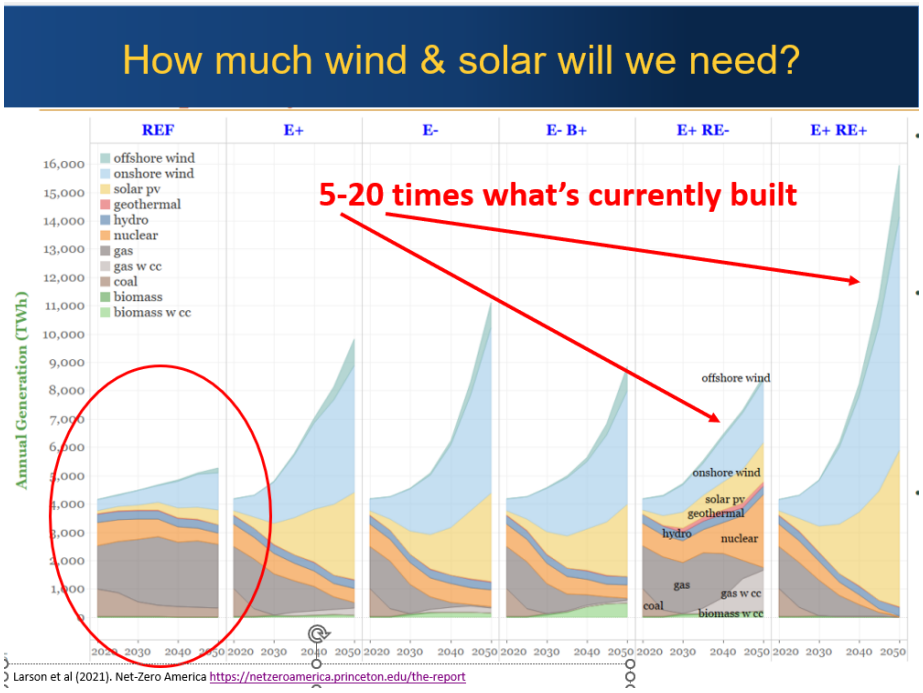

***Figure 2**: Net-Zero America Projections.*[7]

6. ERIC LARSON ET AL., PRINCETON UNIV., NET-ZERO AMERICA: POTENTIAL PATHWAYS, INFRASTRUCTURE, AND IMPACTS 25 (2021).

7. *Id.*

As a land use planner, I love that the Net-Zero America study also includes a map of where we might get this energy and an annex that has some land use calculations.[8] Figure 3 shows a map from one of the net-zero scenarios, and what you can see pulled out in red is the low and the high end of what is expected from those projections in Figure 2. Five to twenty times more wind is resulting in 60 million to 247 million acres of land, and that's for the entire wind farm—that's not for individual wind turbines.[9] The direct impact of a wind turbine, and the access road to get there, accounts for 1% of that acreage. Since those wind turbines have to be spaced out, it could be as much as 247 million acres.[10] For solar, these scenarios would require 3.5 million to 15 million acres.[11] And if you're a Midwesterner like me, what

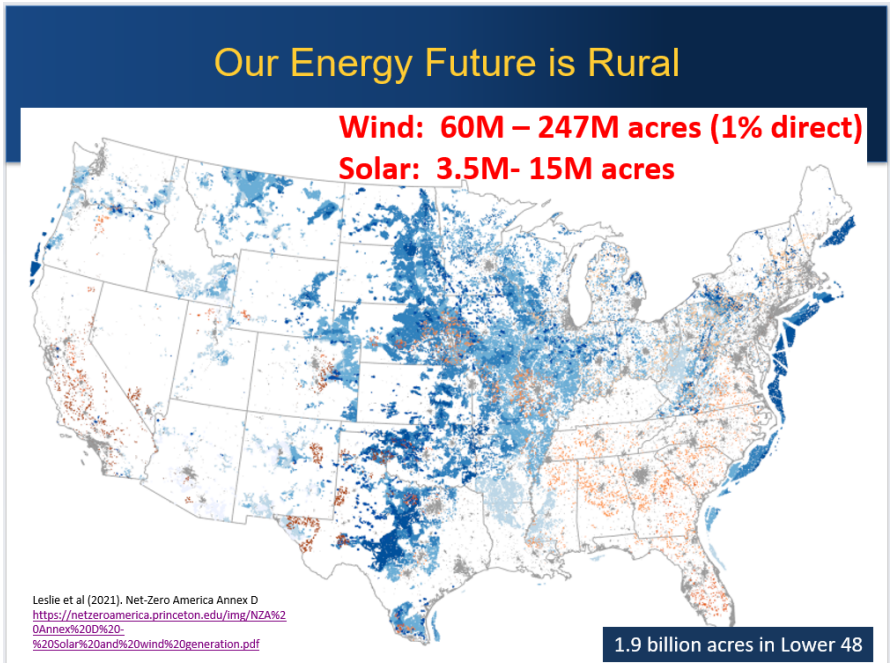

***Figure 3**: Net-Zero America E+ RE+ Constrained 2050 Scenario.*[12]

8. *Id.*
9. *Id.* at 56.
10. *Id.* at 28–29.
11. *Id.*
12. EMILY LESLIE ET AL., PRINCETON UNIV., PRINCETON'S NET-ZERO AMERICA STUDY ANNEX D: SOLAR AND WIND GENERATION TRANSITIONS (2021).

you see from that map is that there's a lot of that development happening in the center of the country, where there are lots of farms and ranchland, and fewer people. What I want you to take away from this map is that our energy future will be rural, even more so than our energy generation past.[13]

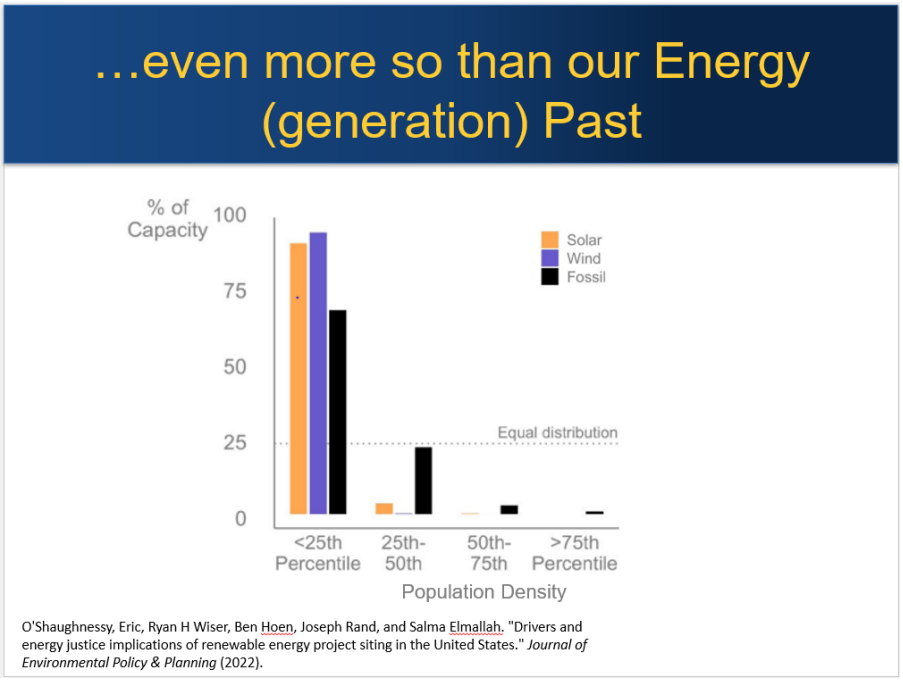

Figure 4*: Location of existing solar, wind, and fossil fuel generating facilities, by population density percentiles.*[14]

And to make that point, I have one more graph (Figure 4). This is a study that came out a couple of years ago looking at the existing solar (in orange), wind (in purple), and fossil energy generation facilities (in black). This is a nationwide study that breaks down each project's location based on population density. The vast majority of solar and wind are in the lowest population density places—the most rural places.[15] The majority of our fossil fuel plants are too—70% are in that lower quartile in terms of population density. But, we do have some fossil fuel infrastructure that is closer to population centers on the fringe of cities.

13. Eric O'Shaughnessy et al., *Drivers and Energy Justice Implications of Renewable Energy Project Siting in the U.S.*, 25 J. ENV'T POL'Y & PLAN. 258, 269 (2023).

14. *Id.* at 258, 269.

15. Eric O'Shaughnessy et al., *supra* note 12, at 265 fig.4.

Yes, there are some old power plants that are closing, and yes, we are replacing them with cleaner sources. But most of what we're doing and what we will do for the next few years is expand the amount of electricity we are generating. Our clean energy infrastructure isn't just matching the geography of our old energy infrastructure: it's energy additions rather than transitions. But the other reason is because of power density.

For the energy nerds in this room, I don't have to explain a megawatt to you, but for those non-energy nerds, I'm not going to explain a megawatt to you. All you need to know is that in this table (Figure 5) I am holding the capacity of that power plant constant. This is for a gigawatt, a thousand megawatts of energy.[16] For a coal plant, generally speaking, a gigawatt requires about 500 acres for the power plant itself.[17] This does not count mining, but the generation part of it, more or less, is five hundred acres.[18] To get that same one gigawatt capacity from a utility scale solar project you need 10 to 20 times as much land—5,000 to 10,000 acres.[19] This is why you can't just close a coal-fired power plant, bring in solar panels to the site, and have the same amount of power going to the grid.

16. Vasilis Fthenakis & Hyung Chui Kim, *Land Use and Electricity Generation: A Life-Cycle Analysis*,13 RENEW. & SUSTAIN. ENERGY REV. 1465, 1466 (2009).

17. *Id.* at 1467; *see* Jessica Lovering et al., *Land-Use Intensity of Electricity Production and Tomorrow's Energy Landscape*, 17 PLOS ONE, Jul. 2022, at 1.

18. Fthenakis & Kim, *supra* note 16, at 1467.

19. *Id.*

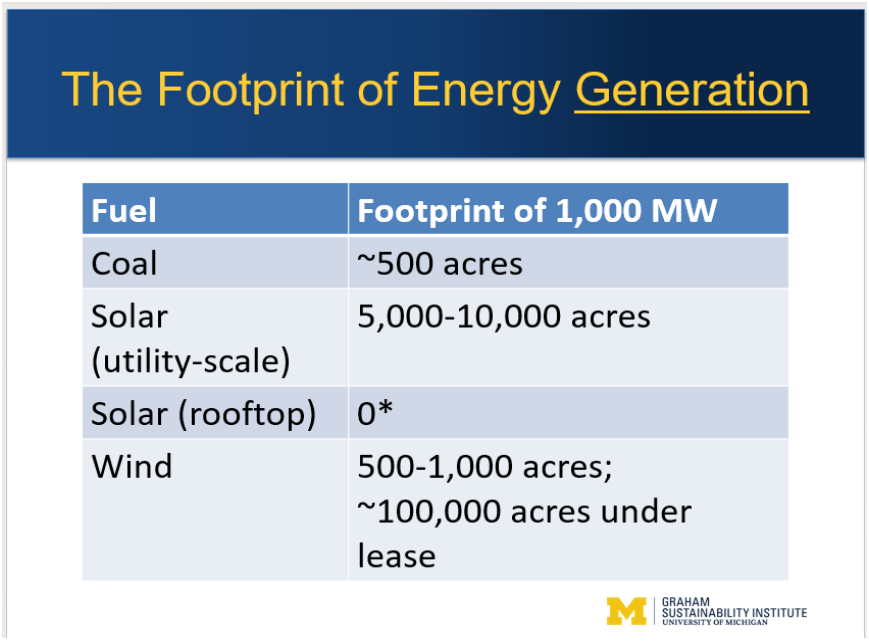

Figure 5*: Comparison of the footprint of electricity generation facilities, by fuel.*[20]

Now, because I'm a planner, I put rooftop solar on the table too. If you've already got a house there, or some kind of commercial building, and you're putting solar panels on the roof or over the parking lot, does that count as using up the land? I would say maybe not. That's not a new consumptive land use, and I'll say that I think we should be doing more of this. Also, we still don't have enough rooftops in the country to get us to where we need to go with rooftop solar alone.[21] There's also economies of scale. That's one of the reasons why, at least for solar, we need to imagine that it's going to take up some land. For wind, there's a difference between total project footprint and turbine footprint. I've got 500 to 1,000 acres for that gigawatt of wind—that's for the turbine itself and the access road to get to it—which is typically no more than 2 acres per turbine. If we're talking about a gigawatt of wind, we're probably talking about 300–400 wind turbines, because modern wind turbines are two and a half to three megawatts a piece.[22] But you can't line all those turbines up cheek to jowl. The way that I explain it to my non-

20. *Id.*

21. PETER GAGNON ET AL., ROOFTOP SOLAR PHOTOVOLTAIC TECHNICAL POTENTIAL IN THE UNITED STATES: A DETAILED ASSESSMENT, NAT'L RENEWABLE ENERGY LAB'Y vii (2016), https://docs.nrel.gov/docs/fy16osti/65298.pdf.

22. OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, U.S. DEP'T OF ENERGY, LAND-BASED WIND MARKET REPORT 27 fig.24 (2023).

engineering students is that they steal wind from each other, so you have to space them out so the wind can recuperate going from one to the next. And so that gigawatt of wind is probably going to extend over an area of about 100,000 acres.[23]

This is why our energy geography is shifting, why we have new sites of energy generation, and why the places that have the land for this are rural. This is where the ruralists among you have a lot of work to do in the future because the energy future is rural.

As I was driving here today, I thought it would be helpful to think about my frame of reference. I come from the Midwest, and wind farms and solar farms in the Midwest look different than they do here in New England. What is considered a big project here in New England is not considered big in the Midwest. It is common for us in the Midwest to have wind farms of 50 to 200 turbines spreading over tens of thousands of acres. One solar farm, Prairie Wolf Solar in Illinois, for example, is 200 megawatts.[24] That's normal for my part of the country. Prairie Wolf Solar is on 1600 acres.[25] Another project, Sunfish Solar, is soon to start construction in my home state[26]. This is a gigawatt solar project which lists its acreage as 6,000 acres, but I think that's just the panel area. There's a similarly-sized project (1.2 gigawatts) in Indiana called Mammoth Solar—named after wooly mammoth bones found nearby—but it literally is mammoth at 13,000 acres.[27] For those of you who don't think in acres, that's like 20 square miles. That is the scale of stuff that I'm going to spend the rest of this lecture talking about.

Now, let's move into Part Two of my talk which is about community responses. I have spent the last ten years trying to understand why we see such different responses to renewable energy projects in rural communities. Here, I am showing two papers that are the ones to read if you wanted a big survey of what's known about 30 years of North American wind energy acceptance research.[28] My colleagues and I just put out data and got a paper

23. LARSON, *supra* note 6, at 27.

24. *Prairie Wolf Solar, LLC*, U.S. GEOLOGICAL SURV., https://energy.usgs.gov/uspvdb/viewer/#13.21/39.55408/-87.97711 (Apr. 2025).

25. *Prairie Wolf Solar*, RES, https://res.us/projects/prairie-wolf-solar/ (last visited Dec. 13, 2025).

26. *Location of Sunfish Solar Farm*, HECATE ENERGY, https://sunfishsolarfarm.com/about/location/ (last visited Nov. 3, 2025).

27. Chris Young, *The $1.5 Billion Mammoth Solar Farm Will Be the Largest in the US*, INTERESTING ENG'G: CULTURE (Nov. 16, 2021), https://interestingengineering.com/culture/15-billion-mammoth-solar-farm-the-largest-in-the-us.

28. Joseph Rand & Ben Hoen, *Thirty Years of North American Wind Energy Acceptance Research: What Have We Learned?*, ENERGY RSCH. & SOC. SCI., July 2017, at 20, 23 (2017).

accepted[29] on perceptions of large-scale solar project neighbors from a nationwide survey that we did on solar energy.[30] What we know from both wind and solar is NIMBYism (not in my backyard) is too simple of an explanation. One of the reasons that we say that it's not NIMBYism is that some of the closest people to these projects have very mixed reactions. It's not like everybody next door is really upset about it. One explanation for this reaction leads into the second bullet, which is that socioeconomic impacts—particularly an individual's financial relationship to the project—matters a lot.

People who have turbines on their property, or people next door to a wind farm who get a check in the mail for free access to the wind that blows over their property, have more positive perceptions of the project. The positivity stems not just from those direct payments, which are included when we talk about socioeconomic impacts. Socioeconomic impacts also include community benefits agreements, donations that developers make, or—we're going to talk a little bit more about this because it's one of my favorite subjects—the property taxes that developers pay for building wind or solar farms. Throughout the literature we find that these socioeconomic impacts are really important. Equally or maybe even more important though are the perceptions of the process: was the process that led to that wind or solar farm being built fairly; did people have an opportunity to participate; did they feel like they were heard when they participated; and also, do they trust the developer, and do they trust the government officials who are making the decisions about that project? These questions are just as important to public acceptance. I'm going to delve into each of those a little bit more in my six observations from my experience in rural communities who are in the process of making decisions about wind and solar, as well as some of the research that we have conducted along the way.

The first observation: energy is rural economic development.[31] My research career started with understanding what people with wind turbines on their property do with the revenue that they receive from hosting those turbines. What I found is that they take that money and they reinvest it in

29. Joseph Rand et al., *More Power to Them: U.S. Large-Scale Solar Neighbors' Support for Additional Solar*, FRONT. SUSTAINABLE ENERGY POL'Y, June 17, 2025.

30. JOSEPH RAND, KARL HOESCH, SARAH MILLS, BEN HOEN, ROBI NILSON, DOUG BESSETTE & JAKE WHITE, BERKELEY LAB., PERCEPTIONS OF LARGE-SCALE SOLAR PROJECT NEIGHBORS: RESULTS FROM A NATIONAL SURVEY 6 (2024).

31. Elizabeth Weise, *Wind Energy Gives American Farmers a New Crop to Sell in Tough Times*, USA TODAY (Feb. 20, 2020), https://www.usatoday.com/story/news/nation/2020/02/16/wind-energy-can-help-american-farmers-earn-money-avoid-bankruptcy/4695670002/.

their farm.[32] They are buying new farm equipment and additional land, and the dollars that go back into their farm are recirculating in the farm economy. This is also true for solar.[33] And, actually, the people who host solar on their property receive checks that are even larger than for wind turbines. In most cases, deciding to host wind or solar on your land or in your community is really an economic development proposition. I have had interviews with people who host wind and solar panels on their property who say, "I do not believe in climate change; I am doing this for economic reasons." Actually, this is a statistic from my dissertation: 69% of the people in Michigan who host wind turbines on their property do not believe that it impacts climate at all.[34] They are hosting because it makes financial sense for their farm.

On the economic development side, though, you'll see this other headline from the Washington Post, that there is not unanimity that solar is good for farmers.[35] Some of the research that I've been doing recently is trying to understand what impact a large-scale solar farm has, not just on the people who host the turbine or the solar panels on their property, but on their neighbors. My colleagues and I have a study that we're wrapping up[36] on understanding whether folks who get those checks in the mail are reinvesting in their farm—like people with wind turbines do—or if they're retiring.[37] And if they're retiring, are they doing what many Michiganders do and going to Arizona or Florida in retirement, or are they staying in place? This matters because we want to know if they are taking their solar lease money with them to Florida or Arizona or if it is recirculating in the local economy. The reality that we find is it's a little bit of both: some farmers use solar lease revenue to diversify farm income and some use solar lease revenue to exit farming. Our next study is digging in even further to understand who owns the land that

32. SARAH MILLS, WIND ENERGY AND RURAL COMMUNITY SUSTAINABILITY, HANDBOOK OF SUSTAIN. AND SOC. SCI. RSCH. 220 (Walter. Leal Filho et al. eds., 2018).

33. Genevieve Bookwalter, *The Next Money Crop for Farmers: Solar Panels*, WASH. POST, (Feb. 22, 2019), https://www.washingtonpost.com/business/economy/the-next-money-crop-for-farmers-solar-panels/2019/02/22/2cf99e8c-3601-11e9-854a-7a14d7fec96a_story.html.

34. Sarah B. Mills, Preserving Agriculture Through Wind Energy Development: A Study of the Social, Economic, and Land Use Effects of Windfarms on Rural Landowners and Their Communities, 84 n.19 (2015) (Ph.D. dissertation, University of Michigan).

35. Alison Knezevich, *Proposed Solar Energy Developments Draw Opposition over Loss of Farmland*, WASH. POST (Jan. 19, 2019), https://www.washingtonpost.com/local/proposed-solar-energy-developments-draw-opposition-over-loss-of-farmland/2019/01/19/f2f6acfa-1b72-11e9-8813-cb9dec761e73_story.html.

36. Michael Craig, Sarah Mills, Papa Yaw Owusu-Obeng, Gilbert Michaud, Hongli Feng, *Bridging Knowledge Gaps in Solar Energy's Impact on Rural Economies*, GRAHAM SUSTAINABILITY INST. UNIV. OF MICH. (July 2025), https://graham.umich.edu/media/files/Bridging-Knowledge-Gaps-Solar-Rural-Economies.pdf.

37. *See id.*; Sarah Mills, Here Come the 1200 Acre Solar Farms. Should We Celebrate or Worry?, Presentation at the University of Michigan (Apr. 12, 2022).

solar projects are on. This is part of an active discussion about what happens when you take 2,000 acres out of agricultural production. Our research interests include whether tenant farmers are involved, how much grain is processed at the grain elevator, if there is less milk getting processed at the dairy co-op, and if incrementally fewer tractors are sold. The last point I want to make about energy being a rural economic development proposition is that it's not just individuals who benefit from renewable energy development; there are also community-wide economic benefits. And I already mentioned the key example of this is property taxes.

This leads us to the second observation I have about community response to large-scale renewables: these tax benefits are rarely visible to residents. Local officials absolutely understand what revenues they are receiving from wind and solar developers—the average resident does not. This observation is based on some research that I did in Michigan[38] where the property taxes that wind developers pay sometimes go to support local schools, but always fund township services and county services.[39] For each of these services I asked residents who live in communities with existing wind farms: did these services improve (in blue in Figure 6), worsen (in orange), or neither (in grey).[40] And most people said there was no change to any of these services as a result of wind development, even though in these places wind developers pay millions of dollars in property taxes each year.[41]

38. Sarah Mills, Rio Mizuno, Natalie Fitzpatrick & Zachary Pritchard, The Invisibility of Wind Turbine Property Tax Benefits in Michigan (Nov. 13, 2020) [hereinafter Wind Tax] (presenting at APPAM Fall Research Conference Panel).

39. Matthew Appel, *Local Property Tax Impacts of Large-Scale Wind and Solar Projects*, UNIV. OF MICH.: GRAHAM SUSTAINABILITY INST. (May 2025), https://graham.umich.edu/media/files/Michigan-Property-Tax-Final.pdf.

40. SARAH MILLS, UNIV. OF MICH.: CTR. FOR LOC., STATE, & URB. POL'Y, VIEWS OF WIND DEVELOPMENT FROM MICHIGAN'S WINDFARM COMMUNITIES (2017).

41. Wind Tax, *supra* note 37.

So what is going on? I care so much about property taxes that you get two more slides on this finding, so buckle up.

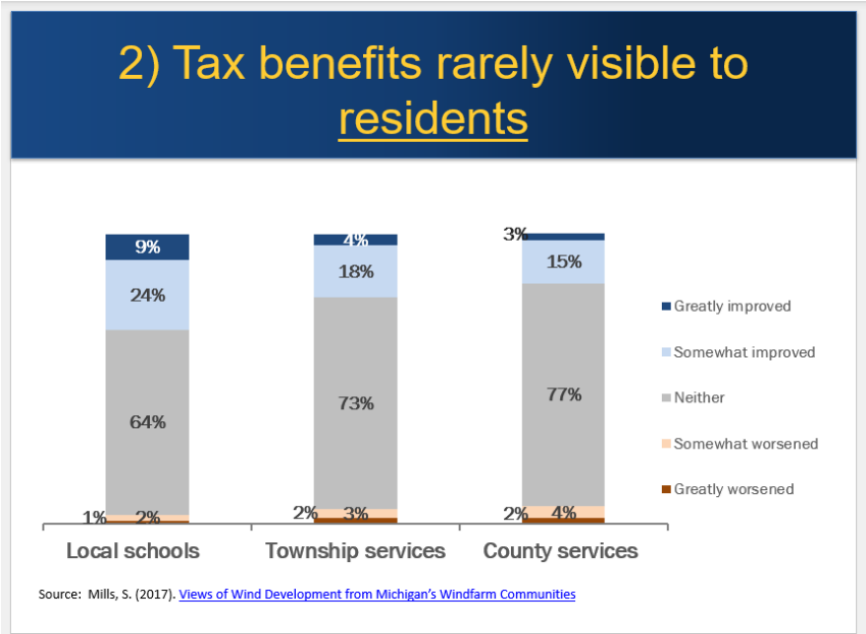

Figure 6*: Percentage of residents of windfarm communities who said local schools, township or county services improved as a result of wind development*[42]

Figure 7 is drawn from the same survey as Figure 6, but hones in on the percentage who said their township services improved.[43] Remember from Figure 6, it was 22% of the sample overall who said township services improved, but now I've taken the data and broken it down by township.[44] Property tax revenue in Michigan largely scales to the number of turbines, so I've arranged this data from Township A and B over on the lefthand side (Figure 7), which each have 5 turbines, all the way over to Township J that has 88 turbines. In Township J, the property-tax revenues quintupled as a result of wind development, and even so, only 28% of people said that they thought township services improved.[45] But what is happening in Township F? Any guesses? We are not passing around the microphone, but you can shout it out.

42. MILLS, *supra* note 39, at 3.
43. *See* Wind Tax, *supra* note 37 (noting that the author rounded the figures to account for minor discrepancies with the source tables).
44. *Id.*
45. *Id.*

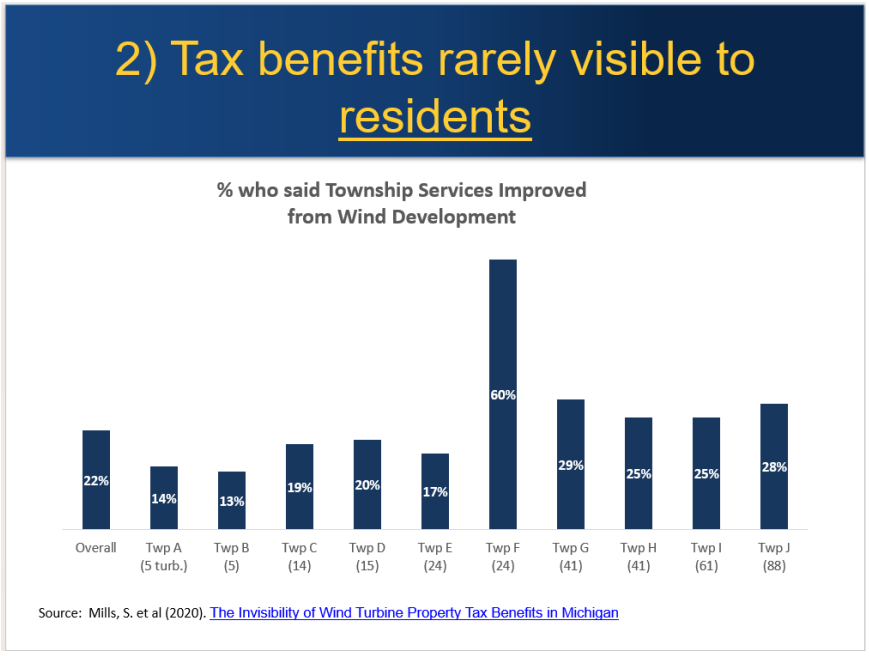

Figure 7*. Percentage of residents who said township services improved as a result of wind development, by township.*[46]

Audience Member:

Community benefits agreements?

Dr. Sarah Mills:

Community benefits agreements isn't the right answer, but it's a good guess though, in part because this kind of predates community benefits agreements just a little bit. Community benefits agreements are a newer thing. I'll tell you: Township F introduced trash collection. It was a new service that they did not have before, so it was easy to answer my question of whether township services improved or worsened.

Let me tell you though why I think this is complicated. First of all, I think it's human nature that people just don't understand what it costs to keep local government services operational. It's just human nature: do you know what it costs to pave a mile of road, or to apply dust mitigation to dirt roads? Unless you are on the county board or the township board, you probably

46. *Id.*

don't. But the other thing that is likely playing a role is that Michigan has an *ad valorum* tax structure—a structure that is common in a lot of states—where the value that a developer pays taxes on is subject to a depreciation schedule. In Michigan, the local government can tax 100% of the wind farm's value in year one, but by year ten you're down to only being able to tax 30% of its value.[47] If you're introducing a new service like trash collection, adding that service only makes sense so long as you've got enough money in year ten to cover the cost of the service. Otherwise, you're going to have to raise everybody's taxes or cancel that service, which is an unpopular move. So in some ways, Township F might have needed to do some additional math; they could definitely afford trash collection in year one and two of the windfarm's operation, but maybe not in those years further out. And if anybody is wondering what the other townships did, they reinvested it in their roads, effectively doing more of what they were already doing. They were applying dust mitigation to their dirt roads a couple more times a year.

Another very nerdy thing—but maybe some of you are interested in this—the county was taking its tax money from wind energy and paying off their OPEB (Other Post-Employment Benefits) liabilities—like retiree healthcare. OPEB accounts are underfunded in a lot of local governments and are problematic. Most people would not see a change in services when the county shores up their OPEB account, but it's putting that county in a much better financial position. It just has the drawback of being invisible to residents. The other thing that happened in Michigan that led to a lot of non-visible services is that this *ad valorem* depreciation table changed three times in four years. And every time local governments got a little bit less from the developer than they did the year before. It was really hard for local government to plan on how to spend the money since they weren't sure what they might receive next year or if they might need to refund taxes to the developer.

The third observation is that the fit of an energy project in a community is linked to why people live there. Michigan has a tourism campaign called "Pure Michigan." On the left you see one of the Pure Michigan ads with wind turbines in the background, and then this is from Facebook: "Is this pure Michigan to you? This is what a Fortune 500 wind company would do to your community." Very different visions of what energy infrastructure means. My colleague Doug Bessette and I have written on this in "Farmers

47. See MICH. DEP'T OF TREASURY, FORM 4565, 2025 WIND ENERGY SYSTEM REPORT (2024); see also Matthew Appel, *Local Property Tax Impacts of Large-Scale Wind and Solar Projects*, *in* UNIV. OF MICH: CTR. FOR EMPOWERING CMTYS., RENEWABLE ENERGY TAX SERIES (May 2025).

vs. Lakers."[48] And what we were trying to do is see if we could explain the different community responses to wind energy. We found you could explain an awful lot of this through looking at data from the U.S. Census and the USDA Census of Agriculture. In places where there are more full-time farmers, you have less opposition to wind energy. Wind energy is just another way for them to make money off of their land. On the other side, the "lakers" are from places that are high on USDA's natural amenity scale.[49] It's a higher natural amenity county if it is not flat and nearer to bodies of water. Much of the Midwest is relatively flat, but in Michigan you are always within six miles of a body of water. This is where people have cottages and cabins and vacation homes: places that are higher on the natural amenity scale. What our research found is that wind energy was much more contentious in these places. This was a change to the visual amenity of their landscape. And we see lots of clashes in Michigan because we have farmers right next to those "lakers," not just those along the Great Lakes, but all of the inland lakes as well.

Now the fourth observation: it's hard to get a straight story on energy. This is what I heard from township supervisors when I was interviewing them for my dissertation. They would have a developer and potentially the landowners who would profit from a proposed wind farm showing up talking only about the positives that this would bring to them. And then they would have residents, and people not even from their community, talking only about how the sky is going to fall, and all the bad things about a wind project.[50] This actually is what started me on what I originally called my wind energy roadshow now funded by the state of Michigan.[51] Blessedly, I've also enlisted other people to come along with me to go and talk about both the positives and the negatives of renewable energy. I'm going to say this now, because I'm going to say it again later, but I think it's really important: every energy source has positives and negatives at the local level, and it makes sense that the people that show up to meetings only want to talk about their side. But the reality is everything comes with trade-offs. In most of the places that I speak, everybody in the room is riled up because usually people are

48. Douglas L. Bessette & Sarah B. Mills, *Farmers vs. Lakers: Agriculture, Amenity, and Community in Predicting Opposition to United States Wind Energy Development*, 72 ENERGY RES. & SOC. SCI., Feb. 2021, at 1, 9.

49. *Id.*; *see* Laura Paul, *Natural Amenities*, USDA: ECON. RSCH. SERV. (May 8, 2025), https://www.ers.usda.gov/topics/rural-economy-population/natural-amenities.

50. Dan Gearino, *The Choice for Rural Officials: Oppose Solar Power or Face Revolt*, INSIDE CLIMATE NEWS (Sept. 30, 2022), https://insideclimatenews.org/news/30092022/solar-power-williamsport-ohio-rural-leaders/.

51. *Renewable Energy Academy*, UNIV. OF MICH.: GRAHAM SUSTAINABILITY INST., https://graham.umich.edu/rea (last visited Nov. 16, 2025).

there with an opinion about wind or solar: either they love it or hate it. And so usually when I come and talk to communities, I end up upsetting everyone in the room because I talk about both the positives and the negatives, so I don't fully support opinions on either side.

The fifth observation is that engagement is critical in both the short and the long term. Within the social science literature, there's this idea of a U-curve of public acceptance. Before construction or before a wind farm or solar farm is proposed, attitudes about the technology are pretty high. Then once a farm is proposed, and people start to think about what it means and where it's going to go, attitudes get lower and lower.[52] When the wind project is under construction, this is when you are at the bottom of that U-curve because there's big, noisy construction activity, fields are ripped up, and there's big equipment on the roads. Then, the theory of the U-curve suggests that once the wind farm or solar farm is up and operational, attitudes return to the initial level. In fact, Doug Bessette and I found that's not the case. We found that instead there are diverging U-curves.[53] More recently, this has also been found in Europe, and authors have created a nice graphic that articulates this.[54] On the one hand, when a project is proposed, it can start out and be so negative that it reaches the valley of death and never gets built. But once a project is built, there are a couple of options. If people have a great experience, they realize that the sky didn't fall, they grow accustomed to the technology, and maybe they're actually even more positive about the technology. On the other hand, if the project gets approved and starts to be constructed, people may learn about negative things that they didn't expect going into it. Or the developer or governmental-approving body didn't do the thing that they said they were going to do and break their promise. If these happen, the public can actually lose trust, not only in the project, but in the technology overall.

Oftentimes in the social science research, we think about how engagement is really important for getting communities to not go in that valley of death—to not reject the project approval. But what we've found is that engagement is also really important, even after the project gets an approval from a local government or from the state government, and throughout construction. What happens once a project is approved can determine the shape of the curve, which is really important if the developer

52. Søren Krohn & Steffen Damborg, *On Public Attitudes Towards Wind Power*, 16 RENEWABLE ENERGY 954, 957–58 (1999).

53. Sarah Banas Mills, Douglas Bessette, & Hannah Smith, *Exploring Landowners' Post-Construction Changes in Perceptions of Wind Energy in Michigan*, 82 LAND USE POL'Y 754, 761 (2019).

54. Geraint Ellis et al., *Dynamics of Social Acceptance of Renewable Energy: An Introduction to the Concept*, 181 ENERGY POL'Y, 2023, at 1, 5.

wants to repower that project. It's also important if the developer wants to send other communities to see an existing project to see if they want to host something similar in their community. You would want host communities to have a good experience. We have mounting evidence here that the U-curve is too simple of an explanation; we shouldn't assume people will learn to live with renewable energy projects.

My sixth and final observation is that bigger is not always better. This is a heading from the Department of Energy's blog post named "Wind Turbines: The Bigger the Better,"[55] and here is another headline announcing the 1.5 billion dollar Mammoth Solar project as the largest in the U.S.[56] I have to tell you that I cringe when I see headlines like these, because I have never been in a community that says: "You know what would make us want this wind farm more? Taller turbines!" Or "You know what, we don't like this solar project you proposed that's one square mile, instead we want you to triple its size." That's not how most communities respond. To be clear, the reason that we're seeing taller turbines and larger solar farms is because there's economies of scale. Taller turbines are able to make wind economically viable in more places because they can access steadier wind speeds higher up. There are economic reasons to do that, but it's not necessarily a community acceptance reason. Unless the economic benefits are shared more with communities, it's dangerous, I think, to assume that bigger is better from a community's perspective.

So I've laid out six observations about community acceptance of renewable energy. What can be done to address these observations, and where does policy fit in? You are all in law school, so you look at laws. I'm not a legal scholar, but I do teach a class about the web of state policies that affect renewable energy deployment. Much of our scholarly policy attention at the state level has been on what I call climate policy: renewable portfolio standards or carbon taxes. But as I see the world, these policies are just a small subset within a web of state policies that effects deployment, and some policy areas—such as tax policy and siting authority—may have an even greater impact on community acceptance of these projects.

What do you do policy-wise with the first observation that energy is rural economic development? First of all, you need to center rural communities in your policymaking. Tactically, you should be thinking about whether a policy reduces local benefits. If it does, it's probably not the right policy. A non-economic way of thinking about this is: does this policy polarize the

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55. Liz Hartman, *Wind Turbines: The Bigger, The Better*, U.S. DEP'T OF ENERGY: OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY (Aug. 21, 2024), https://www.energy.gov/eere/articles/wind-turbines-bigger-better.

56. Chris Young, *supra* note 26.

issue, or how do people in the rural communities that we're going to need to host this infrastructure feel about the policy? A couple of years ago, I published a paper where we looked at renewable portfolio standards that had been put before voters as ballot initiatives in seven different states. [57] We pulled county-level results, and effectively what we found is that the places that have the best potential to host renewable energy projects are the least supportive of a state requirement. That's something that should be kept in mind as we're making policies.

Toward the second observation that tax benefits are rarely visible to residents, there are three key policy takeaways. The first is that federal-style tax cuts don't work. You don't want to cut taxes that would benefit local services. Shifting which taxing units benefit so that the benefits stay as local as possible is something that you might want to consider. For example, if there are any taxes that go to the state government, maybe those are the taxes that you cut or that you funnel back to the local governments, but you don't want to cut local taxes. You could also think about policies that increase tangible local benefits. Some of these may be providing money to local government services that people care about: schools, for example. But it could take a different form, like community benefits agreements or local policies that incentivize the developer to include more neighbors in direct payment schemes.

To address this invisibility issue, my students and I are doing deep dives on the property tax policy in eight Midwestern states right now.[58] We will be posting very nerdy explainers and tax calculators where people can estimate which units of government benefit and by how much. Finally, I also just want to plant the seed that while I've been talking a lot about wind and solar, there are other energy technologies coming—battery storage for example—that states haven't sorted out how they're to be taxed. This is problematic if the key benefit for local governments is in the economic benefits.

To the third observation that fit is linked to why you live here: people who are next to brownfields may view this renewable energy project as a benefit—cleaning up a blighted site. And I actually have a colleague at the University of Michigan Law School, Alexandra Klass, who's talked about repurposed energy and brownfields.[59] I think it's a good idea, but I'm going to give the caveat that we should not assume that a person who has lived near

57. Zachary D. Pritchard & Sarah Mills, *Renewable Energy Requirements on the Ballot: An Analysis of County-Level Voting Results*, 148 ENERGY POL'Y, 2021, at 1, 3.

58. *Local Property Tax Impacts of Large-Scale Wind and Solar Projects*, UNIV. OF MICH.: GRAHAM SUSTAINABILITY INST., https://graham.umich.edu/project/renewable-energy-tax-impacts (last visited Nov. 16, 2025).

59. Alexandra B. Klass & Hannah Wiseman, *Repurposed Energy*, 109 MINN. L. REV. 219, 267 (2024).

a site of pollution in the past wants to live next to another industrial activity. We have public polling data that suggests that this is seen as a generally more feasible, socially acceptable approach.[60] But particularly if brownfield sites are in communities that have borne the burden of pollution in the past, we should not make assumptions of what they want on that site in the future. Beyond brownfield policies, you can take this idea that some communities may be more welcoming than others to inform grid expansion and think of extending transmission to welcoming places. We're going to need to build the grid out in order to have this energy transition, and we often think about building the grid to the places with the best wind and solar resources, which is reasonable and important. But I think we would be even more successful if we also considered expanding the grid in places where we're going to find more farmers and fewer lakers.

To the fourth observation that it's hard to get a straight story about energy, one of the things that we need to do is find and fund trusted voices to provide this information. That might be folks within land-grant extension services, it could be state energy offices, or it could be local government associations. This is a picture from a meeting that I had with extension folks a couple of years ago who were gung-ho because they knew that they were trusted in rural communities; farmers have been turning to them for help on agricultural activities for years.[61] But they also wanted to make sure that they continued to be seen as neutral. For them, that meant that the end goal was not necessarily renewable energy but rural prosperity and the role that renewable energy could play in advancing rural prosperity. Thinking about how these folks—who are trusted in rural communities but may not actually have tons of expertise on energy—can incorporate energy into their work in an authentic way I think is really important.

The fifth observation was that engagement is critical in the short and long-term. I confess that this very much shows my bias as a planner. I think processes must be designed to get negative input early when it can actually influence the project.[62] Whether we're talking about processes for energy or other land uses at the state or local level, usually our required public input comes way too late to actually make a difference, well after the project has already been designed. We need to get that input much earlier so it can change the design of a project. We need to exceed notice requirements. You

60. *Perceptions of Large-Scale Solar Project Neighbors*, *supra* note 29, at 77.

61. *Extension & Renewables Convening*, UNIV. OF MICH.: GRAHAM SUSTAINABILITY INST. (Oct. 2022), https://graham.umich.edu/media/files/Extension-and-Renewables-Convening.pdf.

62. DOUGLAS L. BESSETTE ET AL., UNIV. OF MICH.: GRAHAM SUSTAINABILITY INST., SUPPORTING COMMUNITY-CENTERED SOLAR DEVELOPMENT: A GUIDE TO HOSTING COMMUNITY CONVERSATIONS ABOUT LARGE-SCALE SOLAR DEVELOPMENT 1 (Dec. 2024).

might only be required by law to send notice to people within 300 feet, but in a rural place, sending postcards to everyone doesn't cost that much and lets everyone know what's going on or what's being proposed. I'll just say to this end, I have serious qualms about state-level siting reform and if it reduces local input, which some of it does. It's not just me who has concerns. The National Academy of Sciences did a report at the end of 2023 called "Accelerating Decarbonization in the United States," and I'm going to read this quote to you just in case you can't read this in the back of the room:

> Research demonstrates that the *character and quality* of the process of engaging the public in the context of siting and permitting projects *will affect the pace and scale* of decarbonization . . . . If permitting reform includes significant reductions in meaningful opportunities for public engagement, then such reform would *create a real risk of slowing, rather than hastening*, the process of building out a net-zero infrastructure. [63]

So it's not just me, it's some of the smartest scientists in the country who say this. The emphasis in the quote, though, is mine.

Finally, let's return to the observation that bigger is not always better. We really need policies to take pressure off gigantic projects. We need to make it much easier to build smaller projects and have them get into the grid. We need to compensate them more fairly. This means opportunities not only for distributed generation like rooftop solar, but also for small solar farms that would connect into the distribution grid, like through proposed community solar programs.

My students know I have lots of crazy ideas. My craziest idea right now is this idea of a fair-share model.[64] This is in response to siting reform, which a lot of states are undertaking to try to allow for more renewable energy projects to be built. In most of the proposals, state preemption kicks in only for large projects, so local governments can do kind of whatever they want for small projects, but the largest projects are reserved for the state to make the decisions on. The problem is that the largest projects are the ones that often have the biggest local impact. A project is considered "large" once it

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63. NAT'L ACAD. OF SCIS., ENG'G, & MED., ACCELERATING DECARBONIZATION IN THE UNITED STATES: TECHNOLOGY, POLICY, AND SOCIETAL DIMENSIONS 272, 275 (2024).

64. Sarah Banas Mills, *Principles for Siting Clean Energy in Michigan to Reach MI Healthy Climate Goals*, UNIV. OF MICH.: GRAHAM SUSTAINABILITY INST., https://graham.umich.edu/media/files/Principles-for-Siting-Clean-Energy-in-MI-Climate-Goals-16.pdf (last visited Nov. 16, 2025).

hits a certain threshold, usually 50 megawatts or 100 megawatts, but there is no cap on how big those projects can be. The idea of a fair share is that everybody's got to take some sort of energy infrastructure. If we want to keep our lights on, and if we want to keep data centers operational so we can Google things better, all communities have a part to play, whether they are urban or rural. Everyone should be asked to do something, but no community should be asked to bear the whole burden of keeping the lights on. The concept of a fair share enables a community at some point to say, "We've done our share, and we don't have to take the next project."

I want to close with two final thoughts. The first, I already shared: all energy sources have trade-offs at the local level, and I think that we really need to be realistic and honest about those. The second is that I consider myself a ruralist, and I think that an energy transition is an opportunity to expand urban-rural partnership rather than stoking divides. But I think that how state and federal leaders respond to local opposition and communities saying, "We're not sure about this," is going to be critical to determine whether we achieve that partnership or make that divide larger.

CONSTITUTIONAL CUTTING EDGE: WHERE FEDERAL PLANNING IMPLIED PREEMPTS STATE POWER

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I. CONSTITUTIONAL STAKES AT THE CUTTING EDGE

A "make or break" case moving through the federal courts is altering the Supreme Court's half-century-old non-traversable "bright line." At the federal level[1] horizontally and for 50 states[2] vertically, this legal bright line determines which levels of government control one of the most important technologies in America.[3] This undergirds the entire U.S. economy, and is essential for each of the 16 essential sectors protected by the Department of Homeland Security.[4] This Article analyzes a critical case already altering the United States's legal separation of powers that will directly impact a key part of the U.S. economy,[5] one of the three most important inventions in human history,[6] the most complex machine ever constructed,[7] and the most important sectors of the U.S. economy[8] guarded by the federal government.[9]

Three 2022–2024 Supreme Court decisions *sua sponte*[10] procedurally reconfigured the Constitution's separation of powers. In 2022, the Supreme Court created the unprecedented Major Questions Doctrine, significantly restricting Article II power over the U.S. electric system.[11] Second, the Court ended its 2024 term enjoining executive preemption, or interference with

1. U.S. CONST. art. I–III.

2. U.S. CONST. amend. X.

3. James Fallows, *The 50 Greatest Breakthroughs Since the Wheel*, ATLANTIC (Nov. 2013), https://www.theatlantic.com/magazine/archive/2013/11/innovations-list/309536.

4. *See Energy Sector*, CYBERSECURITY & INFRASTRUCTURE SEC. AGENCY, https://www.cisa.gov/topics/critical-infrastructure-security-and-resilience/critical-infrastructure-sectors/energy-sector (last visited Nov. 20, 2025).

5. STEVEN FERREY, THE NEW RULES: A GUIDE TO ELECTRIC MARKET REGULATION 260–61 (2000) [hereinafter THE NEW RULES].

6. Fallows, *supra* note 3.

7. U.S. DEP'T OF ENERGY: QUADRENNIAL ENERGY REVIEW (QER) TASK FORCE, ENERGY TRANSMISSION, STORAGE, AND DISTRIBUTION INFRASTRUCTURE 3–4 (2015) [hereinafter *Quadrennial Energy Review*].

8. *See* MICHAEL BRUCH ET AL., POWER BLACKOUT RISKS: RISK MANAGEMENT OPTIONS 4 (Markus Aichinger ed., 2011). Electric power underpins the functioning of critical infrastructure, including healthcare, transportation, and military operations. *Id.* at 4, 10. Countries that have functionable and operational electric power systems benefit from economic growth and technological advancements that lift populations out of poverty and enable societal development. *Id.* Reliable electricity access strengthens national security by ensuring that the countries' military and defense infrastructure remain operational and resilient against potential threats. *Id.* at 10. As such, reliable electricity access correlate directly to a higher standard of living and improved quality of life, thereby distinguishing developed countries from developing countries.

9. *See Energy Sector*, *supra* note 4.

10. *See infra* Part II.B.

11. West Virginia v. EPA, 142 S. Ct. 2587, 2609 (2022) (requiring an express, rather than no or implied, delegation from Congress before a federal administrative agency can create a rule or regulation dealing with a major controversial matter, a matter of substantial cost, or of significant national interest).

state power and control.[12] Finally, the Court also finished its 2024 term overruling the most-cited Supreme Court precedent over the last four decades,[13] thereafter ceasing to defer to presidential or federal executive branch legal rules and orders.[14] This Supreme Court legal trifecta procedurally reconfigures the Constitutional bright line, reinterpreting both the Constitution's Supremacy Clause[15] as well as the Dormant Commerce Clause.[16]

This Article analyzes the emerging critical court case on energy and its environmental impacts[17] construing the scope of the Supreme Court's new Major Questions Doctrine.[18] This case also will define the scope of Article II powers now that the *Chevron* doctrine has been overruled.[19] First harnessed by Thomas Edison in 1876, electric power is one of the three most important inventions in human history.[20] The U.S. electric transmission system is deemed the most complex machine ever constructed[21] and is critical to the operation of the American economy.[22] Electric power is an important sector of the U.S. economy[23] and critical for health care,[24] U.S. national defense utilizing electricity-guided weaponry and reconnaissance.[25] The U.S. Department of Homeland Security considers 16 infrastructure sectors "critical," and each require reliable electric power.[26]

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12. Ohio v. EPA, 144 S. Ct. 2040, 2058 (2024) (enjoining the EPA from substituting its federal implementation plans to supersede state implementation plans in 23 states that the federal agency deemed non-compliant for mitigating polluting to downwind states).

13. Loper Bright Enters. v. Raimondo*,* 144 S. Ct. 2244, 2307 (2024) (Kagan, J., dissenting).

14. *Id* at 448. (overruling the 1984 *Chevron* Doctrine).

15. U.S. CONST. art. VI, cl. 2.

16. U.S. CONST. art. I, § 8, cl. 3 ("The Congress shall have Power . . . [t]o regulate Commerce with foreign Nations, and among the several States, and with the Indian Tribes . . . .").

17. *See generally* Transource Pa., LLC, v. DeFrank, 705 F. Supp. 3d 266 (M.D. Pa. 2023).

18. *See* West Virginia v. EPA, 142 S. Ct. 2587, 2616 (2022).

19. *See* Loper Bright Enters. v. Raimondo, 144 S Ct. 2244, 2294 (2024) (Kagan, J., dissenting).

20. Fallows, *supra* note 3.

21. *See Quadrennial Energy Review*, *supra* note 7.

22. THE NEW RULES, *supra* note 5, at 260–61.

23. *See* BRUCH ET AL., *supra* note 8, at 4.

24. *See Powering Health*, U.S. AGENCY FOR INT'L DEV., https://web.archive.org/web/20241224200807/https://www.usaid.gov/energy/powering-health (last visited Nov. 21, 2025) (the current administration has deleted this webpage) ("Health-care facilities require electricity to maintain perishable supplies and power life-saving technologies. Energy is essential for preventing child and maternal deaths, controlling the HIV and AIDS epidemic, and combating infectious diseases and pandemics.").

25. *See generally* U.S. GOV'T ACCOUNTABILITY OFF., GAO-24-106831, WEAPONS SYSTEMS ANNUAL ASSESSMENT: DOD IS NOT YET WELL-POSITIONED TO FIELD SYSTEMS WITH SPEED (2024) (describing that electric-guided weaponry and reconnaissance systems rely heavily on advanced communication networks, highlighting the critical role of electricity-driven infrastructure in modern military operations and society). The Department of Defense has emphasized the importance of reliable energy resources to ensure operational readiness and mission success. *Cf. id*. at 231.

26. *See Energy Sector*, *supra* note 4.

This Article also analyzes the significant legal impacts of a court decision reconfiguring the U.S. Constitution's[27] principles determining control over the nation's most important invention and technology.[28] Part II of this Article first examines the technologies now at issue. Part II.A details how the technology functions. Part II.B analyzes how U.S. statutory law interfaces with this technology and key Supreme Court decisions. Electric power is regulated differently than any other energy source in the United States.

Part III traces the increasingly important *Transource* decision that a state violated the Constitution's Supremacy Clause as well as the Dormant Commerce Clause by exercising traditional state land-use authority protected for the last two centuries. This case determines whether one of the three Third Circuit states[29] can be impliedly preempted from exercising state land-use power and restrained federally to the benefit of the two others.[30] At a time when the president's power to take unilateral executive actions or issue executive orders is advancing to the Supreme Court, this case presents a key issue and test.

Part IV.A analyzes in detail how a non-profit member-controlled organization subject to federal oversight recently convinced federal courts to not follow traditional U.S. law, existing regulatory orders, and Supreme Court precedents affecting U.S. energy. Part IV.B analyzes in detail the affected state's constitutional objections and legal resistance against this regulatory U-turn without prior congressional consent.[31] Part IV analyzes relevant Supreme Court precedent:[32] The Supreme Court's new Major Questions Doctrine,[33] the 2024 Supreme Court *Loper Bright* decision overruling the *Chevron* doctrine,[34] and the Supreme Court's 2024 injunction blocking federal preemption of 23 states' regulation of their own in-state power generation and other emission resources.[35]

Part V examines recent criticism by the Chairman of the agency involved in this pending federal action reorienting U.S. energy and environmental law. Part V concludes by contrasting the legal directions this key case—now moving amid a half-century of contrary Supreme Court precedent affecting this important U.S. invention[36]—now has consequences for a rapid warming

27. *See infra* Part II.B.

28. *See Quadrennial Energy Review*, *supra* note 7 (declaring electricity is at least the third most important invention in history).

29. *About the Court*, U.S. CT. OF APPEALS FOR THE THIRD CIR., https://www.ca3.uscourts.gov/about-court (last visited Nov. 20, 2025).

30. *See generally* West Virginia v. EPA, 142 S. Ct. 2587 (2022).

31. *See infra* Part IV.B.

32. *See infra* Part IV.

33. *See West Virginia*, 142 S. Ct. at 2616.

34. *See* Loper Bright Enters. v. EPA, 144 S. Ct. 2244, 2294 (2024).

35. *See* Ohio v. EPA, 144 S. Ct. 2040, 2058 (2024).

36. *See* Fallows, *supra* note 3.

of the planet.[37]

II. ARRIVING AT A LEGAL PRECIPICE

A. State Versus Federal Power

Obtaining sufficient transmission line capacity to move renewable power reliably throughout U.S. states to reduce climate change will require unprecedented amounts of new infrastructure: 60% more high-voltage transmission infrastructure by 2030. That capacity must triple by 2050 if the U.S. is to meet its climate commitments by connecting sufficient amounts of large-scale wind and solar-electric power to the grid.[38] The capital cost of this amount of new power lines is estimated to be $360 billion by 2030 and $2.4 trillion by 2050.[39] The electric grid is considered the world's most complexly engineered infrastructure: "the grid is sometimes referred to as the world's largest machine; in 2000, the National Academy of Engineering named electrification as the greatest engineering achievement of the 20th century."[40]

The engineering scope and complexity of this challenge is matched by an even more profound constitutionally complex conundrum confronting U.S. law: When state and local levels of government cannot agree on policy direction, which level of government ultimately is in control? An individual case[41] adjudicating this state-federal conflict is unfolding in an important election swing state—Pennsylvania[42]—over this important invention and technology.[43] This case pits Pennsylvania against the U.S. government attempting to allow a non-profit member-controlled corporation to restrict Pennsylvania's Tenth Amendment rights to control its own land-use.[44]

1. The Settled Law

U.S. law treats electric power differently than everything else in the U.S.

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37. *See infra* Part II.B.

38. *See* Lesley Clark et al., *What the Infrastructure Deal Means for Energy*, POLITICO: E&E NEWS (July 30, 2021), https://www.eenews.net/articles/what-the-infrastructure-deal-means-for-energy/.

39. *Id.*

40. *See Quadrennial Energy Review*, *supra* note 7, at 3–4.

41. *See* Transource Pa., LLC v. DeFrank, 705 F. Supp. 3d 266 (M.D. Pa 2023).

42. *See* J. Staas Haught, *What Is a Swing State, and Why Is PA the One to Watch?*, GOERIE (Sept. 19, 2024), https://www.goerie.com/story/news/2024/09/17/what-is-a-swing-state-and-why-is-pennsylvania-the-most-important-one/75261014007/ ("Swing states are those in which no single political party has consistent dominance, meaning their electoral votes can swing either way depending on the election. Pennsylvania is one of the most critical swing states due to its 19 electoral votes.").

43. *See Quadrennial Energy Review*, *supra* note 7.

44. *See infra* Part II.B.

economy, including other forms of energy, as to which level of government exercises regulatory authority. Under the U.S. federalist system of government, there is a complex split on which government—federal, state or local—is in control of electric power and its infrastructure.[45] The federal government regulates all terms and rates of operating the electric transmission system.[46] The federal government regulates all terms and rates of operating the wholesale electric system.[47] States control and regulate all decisions of siting and constructing the transmission system.[48] States regulate all terms and rates of operating the retail electric system.[49]

This split regarding electricity in U.S. law[50] is unparalleled elsewhere in the world, although the basic multi-level federal or state system is somewhat followed by a few major countries.[51] The Supreme Court declared this separation of power as a "bright line" that no case can breach: "Congress meant to draw a bright line easily ascertained, between state and federal jurisdiction," that does not require "case-by-case analysis."[52]

2. Biden Administration Redirection and Constitutional Principles

With the Bipartisan Infrastructure Act in 2021[53] and the 2022 Inflation Reduction Act,[54] as well as a host of new regulations, the Biden administration redirected national policy. These changes fundamentally redirect the economy to use electric power, in lieu of fossil fuels, to achieve net-zero emissions by 2050.[55] These policies massively increase the use of electricity. They would cause electric generation capacity to double, along with transmission infrastructure, once two-thirds of all U.S. cars are electric

45. *See infra* Part II.B.

46. *See infra* notes 145–48.

47. *See infra* note 80.

48. *See infra* note 106.

49. *See infra* note 148.

50. *See infra* Part II.B.

51. *See Field Listing—Government Type*, CIA: THE WORLD FACTBOOK, https://www.cia.gov/the-world-factbook/field/government-type (including significant nations with federalist forms of government, such as the United States, Canada, Mexico, Brazil, Germany, Switzerland, Argentina, Australia, and India).

52. Fed. Power Comm'n v. S. Cal. Edison Co., 376 U.S. 205, 215–16 (1964).

53. *See* Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021) (codified at various non-contiguous sections of the U.S. Code).

54. Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818 (2022) (codified at various noncontiguous sections of the U.S. Code); *see* U.S. DEP'T OF ENERGY: OFF. OF POL'Y, DOE/OP-0018, THE INFLATION REDUCTION ACT DRIVES SIGNIFICANT EMISSIONS REDUCTIONS AND POSITIONS AMERICA TO REACH OUR CLIMATE GOALS 3 (2022).

55. Abi Shiva, *"Building a Better Grid" DOE Initiative Outlines Plan for Nationwide Transmission*, ENV'T & ENERGY INST. (July 7, 2022), https://www.eesi.org/articles/view/building-a-better-grid-doe-initiative-outlines-plan-for-nationwide-transmission.

vehicles.[56]

These laws would rapidly convert building heating to electricity.[57] The increasing use of artificial intelligence resources use massive additional amounts of electricity.[58] The recent shift to the U.S. from China of the bulk of the world's crypto mining uses very large amounts of U.S. electricity.[59] Attempts to rapidly substitute renewable electric generation for traditional power generation[60] are now falling critically behind schedule due to the complex transmission infrastructure issues highlighted below in this case.[61]

The new case analyzed in this Article implicates major pillars of the Constitution. The Supremacy Clause[62] is reconfigured as to whether the President and federal government agencies can take unilateral control over state land-use without delegation from Congress or the state's consent; altering whether the executive branch can claim implied preemption to usurp powers held exclusively by state and local governments since the founding of the nation. Parties raise the Dormant Commerce Clause to block states

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56. *Estimated U.S. Capacity if 66% of All Cars Are EVs by 2050*, REUTERS GRAPHICS (Jan. 2021), https://www.reuters.com/graphics/USA-WEATHER/GRIDS-AUTOS/xegvbwxzlpq/.

57. TRIEU MAI ET AL., NAT'L RENEWABLE ENERGY LAB'Y, ELECTRIFICATION FUTURES STUDY: SCENARIOS OF ELECTRIC TECHNOLOGY ADOPTION AND POWER CONSUMPTION FOR THE UNITED STATES 55 (2018).

58. *See* David Berreby, *As Use of A.I. Soars, so Does the Energy and Water it Requires*, YALEENVIRONMENT360, https://e360.yale.edu/features/artificial-intelligence-climate-energy-emissions (Feb. 6, 2024) ("A.I. use is directly responsible for carbon emissions non-renewable electricity and for the consumption of millions of gallons of fresh water, and it indirectly boosts impacts from building and maintaining the power-hungry equipment on which A.I. runs."). Massachusetts Senator Edward Markey has stated that A.I. comes at the "expense . . . of our planet." *Id.* (quoting *Markey, Heinrich, Eshoo, Beyer Introduce Legislation to Investigate, Measure Environmental Impacts of Artificial Intelligence*, ED MARKEY (Feb. 1, 2024), https://www.markey.senate.gov/news/press-releases/markey-heinrich-eshoo-beyer-introduce-legislation-to-investigate-measure-environmental-impacts-of-artificial-intelligence).
Due to this increase in energy demand, the European Union has enacted the "A.I. Act" which will require A.I. systems "to report their energy consumption, resource use, and other impacts throughout their systems' lifecycle." *Id.* The International Energy Agency states that A.I. data centers' electricity usage will double that of 2022, "1,000 terawatt-hours, roughly equivalent to Japan's current total consumption." *Id.; see* Dara Kerr, *Artificial Intelligence's Thirst for Electricity*, NPR (July 10, 2024), https://www.npr.org/2024/07/10/nx-s1-5028558/artificial-intelligences-thirst-for-electricity (noting that A.I. "is an electricity hog"). Google, for example, has stated that its electricity consumption has doubled over five years due to the electricity demand that powers it's A.I. centers. *Id.*

59. Steven Ferrey, *Cryptocurrency – Legally Navigating The "Highway to Hell"*, 30 U.C. L. ENV'T J. 25, 43 (2024).

60. *See* KATHLEEN SPEES ET AL., BRATTLE GRP., HOW STATES, CITIES, AND CUSTOMERS CAN HARNESS COMPETITIVE MARKETS TO MEET AMBITIOUS CARBON GOALS 8, fig. 3 (2019).

61. *See* Steven Ferrey, *Legal Asynchrony: Constitutional 'Bridges' Inverting Elemental U.S. Technology*, 95 COLO. L. REV. 575, 616–17 (2024); Steven Ferrey, *Reading Between the Lines of the IRA + IIJA Power Gaps*, 41 PACE ENV'T L. REV. 17, 48–49 (2023) [hereinafter *Between the Lines*]; Steven Ferrey, *Dislocating the Separation of Powers State "Thumb" on the Biden Sustainability Initiatives & Law*, 54 ARIZ. STATE L.J. 755, 788 (2002); Steven Ferrey, *Flipped Constitutional Supremacy: Inferior Local Law Blocking Federal Policy*, 23 UTAH L. REV. 65, 95 n. 163 (2023).

62. U.S. CONST. art. VI, cl. 2.

from exercising state transmission infrastructure siting authority that benefits them rather than neighbor states. The Major Questions Doctrine, unveiled recently by the U.S. Supreme Court,[63] applied to restrict federal executive branch regulation regarding electric power infrastructure and climate change, now potentially applies when there is no prior consent or delegation by Congress.

3. Implications for the Future of the Climate

Where the U.S. goes, so goes world climate change. The U.S. is the second largest emitter of greenhouse gases (GHGs),[64] the largest developed country covered by the Kyoto Protocol,[65] and a former member of the Paris Agreement during prior administrations. There is sufficient potential solar and wind power generation capacity that can be placed on U.S. land and water.[66] However, shifting rapidly to renewable power generation now confronts substantially inadequate electric transmission infrastructure to move such new power to consumers.

Based on current practices, temperatures will increase 1.5–2.5° Celsius above historical levels by 2040, and further increase 3–5° Celsius above historic levels by 2100.[67] Nations agreed in the Paris Agreement to limit global temperature increase to below 1.5° Celsius (and absolutely below 2° Celsius);[68] global GHG emissions must peak now in 2025 and be reduced by 43% by 2030.[69] Recommitting the U.S. to the Paris Agreement, in April 2021, President Biden announced a new target to reduce GHG emissions by 50% from 2005 levels by 2030.[70]

Because more than 99% of GHG emissions related to electric power generation are from burning fossil fuels,[71] the Biden Administration pledged

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63. *See generally* West Virginia v. EPA, 142 S. Ct. 2587 (2022).

64. *See Carbon Footprint by Country* 2025, WORLD POPULATION REV., https://worldpopulationreview.com/country-rankings/carbon-footprint-by-country (last visited Nov. 20, 2025).

65. Kyoto Protocol, Dec. 11, 1997, 2303 U.N.T.S. 162.

66. STEVEN FERREY, POWERING THE FUTURE: A LAWYER'S GUIDE TO CLEAN ENERGY 19–51 (Am. Bar Ass'n 2024) [hereinafter POWERING THE FUTURE].

67. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY 16, fig. a (H.O. Pörtner et al., eds. 2022).

68. *See* Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, T.I.A.S. No. 16-1104, art. II(1)(a).

69. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE 101, fig. a (Priyadari R. Shukla et al., eds. 2022).

70. *See* Press Release, White House, FACT SHEET: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies (Apr. 22, 2021).

71. U.S. DEP'T OF ENERGY, TRANSFORMING THE NATION'S ELECTRICITY SYSTEM: THE SECOND INSTALLMENT OF THE QUADRENNIAL ENERGY REVIEW 3-5 (2017).

to replace all U.S. fossil fuel use for electric power generation with renewable energy by 2035.[72] To hold temperature rise below 2° Celsius, the U.S. electric power sector—responsible for slightly less than one-quarter of GHG emissions—is now legally expected to shoulder approximately two-thirds of the reduction of total U.S. GHG emissions.[73] According to researchers the Biden Administration relied upon to enact the Inflation Reduction Act, the U.S. will miss more than 80% of its potential warming emissions reductions if electric transmission lines are not built out quickly.[74]

The next Part of this Article analyzes the key case that will determine whether the federal government can control or mandate this necessary electric infrastructure build-out in time, or whether it will fail.

B. A Federal Judge Overrules a State Judge on State Law

An administrative law judge in, and later the full Commission of, the Pennsylvania Public Utility Commission (PUC), both sequentially denied an application for a new transmission line beginning in West Virginia, travelling through Pennsylvania and ending in Maryland, after determining the project was not needed.[75] States control the rights to use land to host a new transmission line.[76] This line had been included in a plan for future transmission developed by the federally regulated PJM Independent System Operator (PJM ISO), which is a member-controlled non-profit corporation.[77]

PJM ISO is delegated responsibility to exercise federal authority regionally and is regulated by the Federal Energy Regulatory Commission (FERC). PJM administers transmission rates and terms over existing transmission infrastructure to move wholesale power in 13 states from Maryland to Chicago, plus the District of Columbia.[78] PJM also assesses regional needs by methods approved by FERC, which include economic

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72. *See* Patrick Whittle & Cathy Bussewitz, *Biden Faces Steep Challenges to Reach Renewable Energy Goals*, ABC10 (Mar. 3, 2021), https://www.abc10.com/article/news/nation-world/biden-faces-steep-challenges-reach-renewable-energy-goals/507-051c53a3-9d35-4cc6-a0a2-4d47cd465467.

73. *See Electric Power Sector Emissions*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ghgemissions/electric-power-sector-emissions#:~:text=Greenhouse%20gas%20emissions%20by%20economic%20sector%20in%202022.,Metric%20Tons%20of%20CO_2%20equivalent (last updated Mar. 31, 2025) ("Electric power accounted for 24% of emissions. Total Emissions in 2022 = 6,343 Million Metric Tons of CO_2 equivalent.).

74. Jerusalem Demsas, *Not Everyone Should Have a Say*, ATLANTIC (Oct. 19, 2022), https://www.theatlantic.com/ideas/archive/2022/10/environmentalists-nimby-permitting-reform-nepa/671775/.

75. Transource Pa., LLC v. DeFrank, 705 F. Supp. 3d 266, 271–72 (M.D. Pa. 2023).

76. *See infra* Part II.B.

77. *See* Transource Pa., LLC, 705 F. Supp. 3d at 273.

78. *See State Net Import/Export Map (Hourly)*, PJM, https://www.pjm.com/markets-and-operations/state-import-export-map.aspx (last visited Nov. 21, 2025).

analyses.[79] Notwithstanding PJM controlling pricing and terms for moving power in the region, the states within PJM retain the power and authority over the actual physical siting, construction, and permitting for regional energy infrastructure and hardware.[80]

FERC directed ISOs under its authority, including PJM, to make wholesale power supply more competitive through transmission planning and reflect that in FERC- or ISO-established transmission rates.[81] FERC orders require each ISO wholesale power and transmission market to operate competitively in a non-discriminatory manner. First, FERC Order 888 created open-access non-discriminatory transmission access for all electricity produced by independent power producers, whether renewable or nuclear.[82] Second, FERC Order 2003 extended interconnection to the grid, prohibiting transmission facility owners from discriminating.[83] Finally, FERC Order 1000 required ISOs to eliminate discrimination regarding transmission tariffs, but left states discretion on by whom and where transmission was cited or not cited.[84] The purpose of these FERC orders was to cause new and upgraded transmission lines with added capacity to accommodate a larger flow of lower-cost power originated in certain states to move to areas that have traditionally higher-cost local power generation. This entry of lower-cost power would, in theory, lower the average cost of electric power in those higher-cost states.

A transmission developer, Transource, argued that existing transmission "congestion represents a form of rate discrimination."[85] In other words, Transource argued that higher-cost states that had not individually paid for, nor installed enough in-state power generation for themselves, are discriminated against if other states in the region do not add transmission capacity in their states to cause lower-cost power to flow to higher-cost states over the transmission network. Some might think of this as an equity argument to assist states commensurately.[86]

However, these FERC or PJM federal transmission orders operate within a zero-sum metric. As stated by Pennsylvania, other regions which benefit from the current congestion would "no longer have the benefit of [the] lower-

79. *See* Brief of Appellee Transource Pennsylvania, LLC at 12, Transource Pa., LLC, v. DeFrank, 705 F. Supp. 3d 266 (M.D. Pa. 2023) (No. 24-1045) [hereinafter Trial Court Appellee Brief].

80. *See generally* Fed. Power Comm'n v. S. Cal. Edison Co., 376 U.S. 205 (1964).

81. Transource Pa., LLC, v. DeFrank, 705 F. Supp. 3d 266 (M.D. Pa. 2023).

82. *See* 18 C.F.R. § 35.28(c) (1997); *see also* 18 C.F.R. § 385 (1997); *Between the Lines*, *supra* note 61, at 41–42.

83. Nat'l Ass'n of Regul. Util. Comm'rs v. FERC, 475 F. 3d 1277, 1283 (D.C. Cir. 2007).

84. 18 C.F.R. § 35.28 (2011).

85. *Transource Pa., LLC*, 705 F. Supp. 3d at 276.

86. *See* Trial Court Appellee Brief, *supra* note 79, at 11–12.

cost power."[87] Moreover, there is vigorous public disagreement among FERC Commissioners about whether recent FERC transmission orders are actually increasing discrimination by creating an uneven playing field in favor of certain types of technology. In 2024, FERC Order No. 1920 directs the few ISO and Regional Transmission Operator (RTO) transmission providers to submit compliance filings within 10–12 months—an effort to rapidly facilitate additional electric transmission capacity.[88] FERC Commissioner Christie's dissent argued that Order No. 1920 violates the Federal Power Act, "infringing on the authority of states,"[89] and "was built on what may be a foundation of sand known as '*Chevron* deference.'"[90] Christie also asserted that the Federal Power Act inflicts staggering costs on consumers by promoting the transmission projects' construction with trillions of dollars to serve a major policy agenda never passed by Congress, for politically-preferred types of generation policies.[91]

It was not lost on the Pennsylvania PUC that relief of economic congestion on a regional level would likely result in higher utility rates from new lines transmitting otherwise low-cost power from the state.[92] In denying such additional lines to cross Pennsylvania, the Pennsylvania PUC's administrative law judge concluded that "'[e]conomic congestion is not a form of rate discrimination, rather, it is a market-based response to a variety of factors.'"[93]

Transource sued in the Federal District Court for the Middle District of Pennsylvania, claiming the Pennsylvania PUC order was federally preempted and impermissibly discriminatory. Transource argued that: (1) Pennsylvania was conflict preempted by the Supremacy Clause of the Constitution when it issued any order or decision that conflicted with the

87. *Transource Pa., LLC*, 705 F. Supp 3d at 275 (quoting defendants' internal court filing).

88. Building for the Future Through Electric Regional Transmission Planning and Cost Allocation, Order No. 1920, 187 FERC ¶ 61,068 (2024) (to be codified at 18 C.F.R. pt. 35). Transmission providers are required to file compliance filings within 10 months of the effective date of the Final Rule for all compliance requirements except those related to interregional planning coordination, and within 12 months of the effective date for interregional coordination requirements. *Id.* ¶ 12.

89. *Id.* ¶ 30 (Christie, Comm'r, dissenting); *see id.* ¶ 48–49 (by "recast[ing] FERC as a national IRP planner with extraordinary powers to oversee and dictate to all public utility transmission providers in the country . . . detailed instructions on planning transmission that fulfills the current administration's preferred policies as to the types of generation it wants to build, and to charge consumers trillions of dollars for this transmission.").

90. *Id.* ¶ 33 (Christie, Comm'r, dissenting).

91. *See id.* ¶ 3(footnotes omitted); *see also id.* ¶ 30 (Christie, Comm'r, dissenting) ("The [Order] is just a pretext for enacting the current presidential administration's 'net-zero 2035' policy agenda, as well as that of large corporate buyers of preferential power and other special interests."); *id.* ¶ 49 ("[T]he final rule is just a pretext for enacting this administration's 'net zero 2035' policy agenda, as well those of corporate and other special interests.").

92. *See* Transource Pa., LLC v. DeFrank, 705 F. Supp. 3d 266, 276–78, 296 (M.D. Pa. 2023).

93. *Id.* at 276 (quoting the Pennsylvania PUC's decision).

federally-regulated PJM plan for a new transmission line; and (2) the Dormant Commerce Clause of the Constitution was violated when Pennsylvania issued an order that favored in-state Pennsylvania ratepayers retaining their own in-state power while not equally benefiting out-of-state electric ratepayers.[94]

This case showcases issues of first impression that the Supreme Court will need to resolve eventually. This case stress-tests the Supreme Court's "bright line" between federal and state power;[95] concerning one of the most important inventions in U.S. history—electric power.[96] It directly affects the future of what is considered the most significant engineering achievement in history—the U.S. transmission grid.

This case takes on an additional infrastructure dimension with FERC Commissioner Christie, who alleged that this case is related to discrimination in favor of certain types of electric power.[97] Ultimately, this case alone could reconfigure the vertical separation of powers under U.S. law between state Tenth Amendment reserved land-use jurisdiction and federal climate and infrastructure plans. This case effects the future of the U.S. electric power system and who is in control when many states do not agree with the federal government about its needs and future course.

C. Law Regulating the Most Complex Engineered Machine

1. The Machine and Its Future

Our most important engineered machine now confronts the U.S. Constitution, the degree of horizontal separation of powers between both the Executive Branch and Congress, and the vertical separation of powers between state and federal legal control. Punctuating this issue is the evolving scope of the new Major Questions Doctrine applied to the U.S. electric grid:

> Today, the U.S. transmission and distribution system is a vast physical complex of interlocked machines and wires, with a correspondingly complex set of institutions overseeing and guiding it through policies, statutes, and regulations. The U.S. grid delivers approximately 3,857 terawatt-hours [or trillion watt-hours] of electrical energy from electric power generators to 159 million residential, commercial, and industrial customers. This is

94. *Id.*

95. *See* Federal Power Act, Pub. L. No. 66-280, 41 Stat. 1063 (1920).

96. *See Quadrennial Energy Review*, *supra* note 7.

97. *See* Building for the Future Through Electric Regional Transmission Planning and Cost Allocation, *supra* note 88, ¶ 33.

> accomplished via 19,000 individual generators at about 7,000 operational power plants in the United States with a nameplate generation capacity of at least one megawatt (MW). These generators send electricity over 642,000 miles of high-voltage transmission lines and 6.3 million miles of distribution lines. Together with its electric generation component, the grid is sometimes referred to as the world's largest machine; in 2000, the National Academy of Engineering named electrification as the greatest engineering achievement of the 20th century.[98]

Adding to this complexity, electricity demand will expand at unprecedented rates: Electricity is forecast to increase from approximately 20% of primary energy use in the U.S. to 40–50% of all energy use.[99] This increasing amount of power cannot be handled by the existing transmission grid: "transmission line capacity would have to be tripled through 2050 to connect the needed amount of wind and solar power to the grid," the world's most complexly engineered infrastructure.[100] A study determined that the intermediate step "would require a 60% expansion of the U.S. high-voltage transmission network no later than 2030," and capacity to triple by 2050 to move sufficient renewable power generation to the grid.[101] The capital cost of these new power lines stands out—$360 billion by 2030 and $2.4 trillion by 2050.[102]

These changes don't happen in isolation. Electric power is one of the most highly regulated sectors of the U.S. economy. Transmission infrastructure siting and permitting is historically within the exclusive legal jurisdiction of states; some states and municipalities will not sanction new large transmission projects over their lands to transmit power for use in other states.[103] Some states are not convinced that FERC or private ISOs will unfairly charge them for the cost of new regional transmission lines, which

98. *See Quadrennial Energy Review*, *supra* note 7, at 3–4.

99. *See* RESOURCES FOR THE FUTURE, *RFF Live | Future Generation: Exploring the New Baseline for Electricity in the Presence of the IRA*, (YouTube, Feb. 16, 2023), https://www.youtube.com/watch?v=NtBB3CGMTCo.

100. *What the Infrastructure Deal Means for Energy*, *supra* note 38.

101. *See id.*

102. *Id.*

103. *See Transmission Siting and Permitting Efforts*, U.S. DEP'T OF ENERGY: GRID DEPLOYMENT OFF., https://www.energy.gov/gdo/transmission-siting-and-permitting-efforts (last visited Nov. 20, 2025) (providing that "[t]he siting and permitting of interstate and inter-regional high-voltage transmission typically requires action by many different authorities governing the federal, state, local, tribal, and private lands that facilities will pass through"); *Issue Brief: Electric Transmission Infrastructure*, CRES FORUM (July 20, 2023), https://cresforum.org/publications/issue-brief-electric-transmission-infrastructure/ (noting that "states are often reluctant to allow projects to be cited without any direct benefits to the state or its municipalities").

primarily serve to send their low-cost power to other states.[104] FERC on occasion has allocated costs of new transmission projects proportionately to all in a multi-state ISO or RTO without disaggregating more precisely, which consumers are directly benefited.[105]

2. States Through a Different Legal Lens

Digging deeper: Obscured in *Transource*, Pennsylvania finds itself within the PJM 13-state transmission matrix. Prior to the current legal matter, Pennsylvania already exported substantially more megawatt-hours of power from and through its state land than any other state.[106] Pennsylvania already transmits through its state about 65% more exported electricity than the next highest state.[107]

In 2022, conventional technologies in Pennsylvania of natural gas generated 54.5% of all in-state electric power, coal 9.5%, and nuclear power 32% of the state total.[108] The total share of these conventional technologies comprised 96% of all Pennsylvania power generation.[109] Although the percentage of renewable-power generation in neither period in Pennsylvania came close to matching the nationwide percentage; over 20% of U.S. electric-power generation was supplied by renewable technologies.[110]

Neither wind nor solar is as reliable as fossil-fired or nuclear generation throughout all hours of the day. U.S. wind turbine capacity factors (the percentage of the potential output actually realized in output) range from 20–40% of constant generation capacity; with other sources reporting a wider range of 5–50% and averaging 38%.[111] Lazard calculates capacity factor ranges for onshore wind power turbines as 38–55%, offshore wind turbines as 48–52%, and fixed solar panels at 13–23% (depending on where in

104. *See* Lawrence Susskind et al., *Sources of Opposition to Renewable Energy Projects in the United States*, ENERGY POL'Y, June 2022, at 2, 5 (analyzing how several utility-scale renewable energy projects face multiple sources of local opposition).

105. *See* Ill. Com. Comm'n v. Fed. Regul. Comm'n*,* 721 F.3d 764 (7th Cir. 2013).

106. INDEP. FISCAL OFF., PENNSYLVANIA ELECTRICITY UPDATE 1 (2023) (data is from U.S. Department of Energy, Energy Information Administration).

107. *Id.*

108. *Id.*

109. *Id.*

110. *Renewable Energy Pillar,* U.S. DEP'T OF ENERGY, https://www.energy.gov/eere/renewable-energy#:~:text=Renewable%20Energy%20in%20the%20United,that%20percentage%20continues%20to%20grow (last visited Nov. 21, 2025).

111. RENEWABLE ENERGY RSCH. LAB., UNIV. OF MASS. AT AMHERST, WIND POWER: CAPACITY FACTOR, INTERMITTENCY, AND WHAT HAPPENS IF THE WIND DOESN'T BLOW?; *See Wind Energy Factsheet*, UNIV. OF MICH: CTR. FOR SUSTAINABLE SYS. (Sept. 2025), https://css.umich.edu/publications/factsheets/energy/wind-energy-factsheet; Richard Bowers & Owen Comstock, *2020 Could be a Record Year for U.S. Wind Turbine Installations*, U.S. ENERGY INFO. ADMIN. (Nov. 12, 2020), https://www.eia.gov/todayinenergy/detail.php?id=45856.

proximity to the equator the solar panels are located).[112] Solar photovoltaic power panels in a fixed position achieve lower capacity factors than wind power and require even more land to produce the same power output.[113]

Solar and wind technologies now dominate new power construction in the U.S. Wind and solar are 500–1000% less dense energy sources than fossil fuels, and require approximately 400–1000% more land to generate a similar amount of electricity as fossil fuels.[114] "For the energy they produce, wind turbines have a disproportionately large footprint on land. At 72.1 kM2 /tW (square kilometers per terawatt), wind's footprint is bigger than natural gas, or coal or petroleum (at 18.6, 9.7 and 44.7 kM2/tW, respectively)."[115] The comparative footprint for production of electricity by renewable wind, hydro, and conventional solar generation requires more land, compared to fossil and nuclear power generation.[116]

A necessary requirement for more land means more local and state legal control used for siting these technologies. Some states and their municipalities resist additional large transmission projects traversing their land to assist other states.[117] It is never transparent until FERC or ISOs assess such a "pass-through" state a share of the costs of expensive new regional transmission lines, from which the host pass-through state may perceive no demonstrable local benefit.[118] There are hundreds of billions of dollars of costs for new transmission infrastructure that FERC, through regional ISOs or RTOs, must allocate to some states' ratepayers as part of their electric bills

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112. *See* LAZARD, LAZARD'S LEVELIZED COST OF ENERGY ANALYSIS—VERSION 14.0 17 (2020).

113. *What Is Capacity Factor and How Do Solar and Wind Energy Compare?*, WHATNEXTNOW, https://www.whatnextnow.com/home/solar/what-is-capacity-factor-and-how-does-solar-energy-compare (last visited Nov. 21, 2025) (showing solar capacity factors 10–25%, wind turbines 25%, hydroelectric power 40%, coal-fired power 70%, nuclear 89%); Natanael Bolson et al., *Capacity Factors for Electrical Power Generation from Renewable and Nonrenewable Sources*, PNAS, Dec. 20, 2022, at 1 (showing that one W of fossil electricity generation capacity if replaced by solar or wind power because of their lower capacity factors requires installation of four solar photovoltaic panels or two W of wind power).

114. *See* Hannah Ritchie, *How Does the Land Use of Different Electricity Sources Compare?*, OUR WORLD IN DATA (June 16, 2022) (solar photovoltaic power land requirements compared to natural gas-fired power land requirements), https://ourworldindata.org/land-use-per-energy-source; Uma Outka, *The Renewable Energy Footprint*, 30 STAN. ENV. L.J. 241, 243 n. 7 (2011) (citing Robert I. McDonald et al., *Updated Energy Sprawl Numbers for the American Clean Energy and Security Act*, PLOS ONE, Aug. 26, 2009, at 4 (fig. 3))

115. Dustin Solberg, *Wind's Big Footprint: Clean Energy Still Needs Safeguards for Nature*, THE NATURE CONSERVANCY: COOL GREEN SCI. (Nov. 29, 2017), https://blog.nature.org/2017/11/29/winds-big-footprint-clean-energy-still-needs-safeguards-for-nature.

116. *See* Outka, *supra* note 114, at 243 n. 7 (citing McDonald et al., *supra* note 114, at 4 (fig. 3)). Land required was biomass (134,270 acres), wind (17,810 acres), hydropower (13,334 acres), petroleum (11,048 acres), solar thermal (3,787 acres), coal (2,565 acres), geothermal (1, 847 acres), and nuclear power (585 acres). *Id.*

117. *Cf.* Transource Pa., LLC v. DeFrank, 705 F. Supp. 3d 266, 276–78, 296 (M.D. Pa. 2023).

118. *See* Lawrence Susskind et al., *supra* note 104.

for service.[119]

The federal government[120] and certain state governments significantly subsidize wind and solar technologies.[121] States with already stable and reliable internal electric power supply may be skeptical of their state's need for more transmission lines. PJM in *Transource* stated that the purpose of proposed new lines is to relieve transmission congestion.[122] These additional upgraded lines and transmission infrastructure seek to move more power out of Pennsylvania to share even more of the state's reliable fossil- and nuclear-fired power regionally with other states.[123]

PJM states that this greater movement of power will lower the importing states' costs for power by having cheaper power moved to them through or from Pennsylvania.[124] Pennsylvania, in an independent analysis, found that electric consumers will see their costs increase because the federal transmission cost allocations create a zero-sum outcome. Both the Pennsylvania PUC administrative law judge, as well as the full Pennsylvania PUC, found this analysis compelling.[125] Neither PJM nor any other party in the legal proceeding rebutted this fact.[126]

Data from Pennsylvania's Independent Fiscal Office illustrates that Pennsylvania and its neighboring state, West Virginia, have not transitioned as quickly to renewable fuel sources in the past five years as have all 50 U.S. states. Burning fossil fuels to generate electric energy locally emits criteria pollutants that, if in amounts in a region above U.S. EPA standards, can

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119. *See* Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection, 87 Fed. Reg. 26504, 26540 (May 4, 2022) (allocating "costs among public utility transmission providers whose local or regional transmission facilities the new proposed regional transmission facility or facilities would displace in proportion to their share of the total benefits").

120. POWERING THE FUTURE, *supra* note 66, at 119–48 (discussing Inflation Reduction changes to the federal tax code to support renewable energy).

121. *Id.* at 168 (discussing in detail state Renewable Energy Credit); *id.* at 187–88 (discussing in detail metering credits); *see* Steven Ferrey, *Tightening the Legal 'Net': The Constitution's Supremacy Clause Straddle of the Power Divide,* 10 MICH. J. ENV'T & ADMIN. L. 415, 415 (2021) (discussing state net metering); *see also* Steven Ferrey, *Legal History Repeats Itself on Climate Change*, 33 GEO. ENV'T L. REV. 489 (2022) (regarding state Renewable Energy Credits).

122. *See* Trial Court Appellee Brief, *supra* note 79, at 14.

123. *Id.*

124. *See* Transource Pa., LLC v. DeFrank, 705 F. Supp. 3d 266, 288–89 (M.D. Pa. 2023); *see also* Trial Court Appellee Brief, *supra* note 79, at 14–15.

125. *See Transource Pa., LLC*, 705 F. Supp. 3d at 276–77; *see also* Trial Court Appellee Brief, *supra* note 79, at 12–14; Appellants' Reply Brief at 22–23, Transource Pa., LLC v. DeFrank (3d Cir. 2024) (No. 24-1045).

126. *See Transource Pa., LLC*, 705 F. Supp. 3d. at 288–89; *see also* Brief for Amicus Curiae PJM Interconnection, L.L.C. Supporting Appellee and Supporting Affirmance at 9, Transource Pa. LLC v. DeFrank (3d Cir. 2024) (No. 24-1045) [hereinafter PJM Brief].

endanger public health.[127] Nuclear power radiation and spent nuclear fuel also must be managed carefully to protect public health.[128] There is no federal repository for the still-dangerous spent nuclear fuel from electric power reactors;[129] the fuel is now indefinitely stored at or behind nuclear power reactors in Pennsylvania and in other states.[130] By exporting a larger amount of power at prices approved by PJM and FERC, Pennsylvania as a major exporter still remains most proximately affected by any emissions and pollutants expelled from its generation facilities.

The data illustrates that Pennsylvania exported 33.8% of the power it generated in-state.[131] Even though this is a lower percentage than that of in-state power generation exported by West Virginia, Pennsylvania, as a much larger state, exported approximately four times as many megawatts of power in comparison.[132] This is the largest amount of net exported electric power (net equals exports minus imports). Pennsylvania, more than any other state in the nation, functions as the pass-through state "poster-child" in the U.S. electric grid. Interstate transmission lines spanning Pennsylvania allow other bordering states to take advantage of Pennsylvania land. These lines function as a high-voltage electric extension cord to serve non-Pennsylvania electricity consumption needs.[133] Pennsylvania also was regarded as a key swing state in recent presidential elections.[134]

Placing this in larger regional PJM context, Pennsylvania and West Virginia are two states in PJM's 13-state (plus the District of Columbia) constellation, which support the rest of the PJM states with electric power.[135] Data from Pennsylvania's Independent Fiscal Office illustrates the recent export and import status of these states, which have their collective transmission and sale of wholesale power in each of these states, collectively managed by the federally regulated PJM ISO.[136] The data also shows imports by the bordering state of New York.[137] Pennsylvania exported a net 81 million MWh of electric power, and alone supplied 92.5% of the total electricity imports required by all four of largest states bordering

127. *See* STEVEN FERREY, ENVIRONMENTAL LAW: EXAMPLES & EXPLANATIONS 618 (Fig. 12.6), 619 (Fig. 12.7) (9th ed. 2022) [hereinafter ENVIRONMENTAL LAW].

128. *Id.* at 613.

129. *See id.* at 614.

130. *Id.* at 615.

131. INDEP. FISCAL OFF., *supra* note 106, at 1.

132. *Id.*

133. *See* PENN. PUB. UTIL. COMM'N, TRANSMISSION LINE SITING, THE PUC AND THE ROLE OF RESIDENTS (2018); *see generally* PJM, REGIONAL TRANSMISSION EXPANSION PLANNING: PLANNING THE FUTURE OF THE GRID, TODAY (2019) [hereinafter REGIONAL TRANSMISSION EXPANSION PLANNING].

134. *Id.*

135. INDEP. FISCAL OFF., *supra* note 106, at 1.

136. *Id.*

137. *Id.*

Pennsylvania: New York, New Jersey, Maryland, and Ohio. West Virginia alone exports enough power to supply 43% of all the power imports required by Virginia, which does not border Pennsylvania.[138]

Pennsylvania's electric power demand situation is not static; some of the largest corporations in the world are now acquiring new business resources located in Pennsylvania and have chosen to be powered by Pennsylvania's existing in-state conventional baseload power-generation resources. In September 2024, Microsoft Corporation and Constellation Energy announced an agreement to restart Constellation's Unit 1 nuclear reactor at Three Mile Island in Pennsylvania. It was closed in 2019, and will power future Microsoft data centers in Pennsylvania and provide Artificial Intelligence services.[139] In March 2024, Amazon Web Services bought a large data center campus from Talen Energy that can utilize 960 MW and will be powered by the 2,494 MW Susquehanna nuclear plant in Pennsylvania.[140] If new transmission lines are sited to transmit more of Pennsylvania's in-state power to external states, Pennsylvania businesses and consumers could be subject to changing or higher electricity prices. Pennsylvanians could also lose the reliability of these in-state baseload generation sources, which are 96% of Pennsylvania's generation capacity.[141]

Pennsylvania, West Virginia, and Virginia successfully opposed in the federal courts prior additional transmission lines proposed through them to serve states importing electricity.This resulted in the Federal Circuit Court of Appeals in 2009 blocking federal PJM and FERC attempts to federally preempt these states' decisions rejecting additional transmission lines on their land.[142] That decision is cited by both parties in *Transource* regarding additional transmission lines proposed now.[143] However, the *Transource* Court did not follow that precedent.

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138. *Id.*

139. *Constellation to Launch Crane Clean Energy Center, Restoring Jobs and Carbon-Free Power to the Grid*, CONSTELLATION (Sept. 20, 2024), https://www.constellationenergy.com/newsroom/2024/Constellation-to-Launch-Crane-Clean-Energy-Center-Restoring-Jobs-and-Carbon-Free-Power-to-The-Grid.html.

140. Allison Good, *Talen Energy Sells Pa. Datacenter Campus to Amazon Web Services for $650 Million*, S&P GLOBAL (Mar. 4, 2024), https://www.spglobal.com/market-intelligence/en/news-insights/articles/2024/3/talen-energy-sells-pa-datacenter-campus-to-amazon-web-services-for-650m-80711401.

141. INDEP. FISCAL OFF., *supra* note 106, at 1.

142. *See* Piedmont Env't Council v. FERC, 558 F.3d 304, 319–20 (4th Cir. 2009); *see also* Cal. Wilderness Coal. v. U.S. Dep't of Energy, 631 F.3d 1072, 1106–07 (9th Cir. 2011).

143. Transource Pa., LLC v. DeFrank, 705 F. Supp. 3d 266, 290, 295 (M.D. Pa. 2023); s*ee* Appellants' Reply Brief at 13, Transource Pa., LLC v. DeFrank (3d Cir. 2024) (No. 24-1045).

3. The Law

The Tenth Amendment of the Constitution[144] and the Federal Power Act of 1935,[145] provide that local government enjoys exclusive control via its police power to exercise jurisdiction over all electric facility land-use and siting.[146] Moreover, state government has exclusive jurisdiction over the distribution of power (similar to, but distinguished legally from,[147] the transmission of power).[148] Notably, FERC does not have traditional constitutional nor statutory jurisdiction over the siting and construction of interstate transmission facilities—the lines, poles, transformers, and protective equipment that are the physical hardware of the electric grid.[149]

The Constitution does not grant land-use power to the federal government.[150] The Federal Power Act similarly does not grant FERC or the federal government such power. The Act takes the additional prohibitive step of expressly reserving any electric power jurisdiction not expressly allocated to FERC to remain exclusively with the states.[151] Both parties in *Transource* concede these basic facts about reserved siting power to state governments.[152]

The Act provides FERC exclusive federal authority only over transmission transactions, contractual terms, and prices for sales of power over existing physical electric transmission system lines.[153] The Act delegates FERC to exercise exclusive jurisdiction over the "transmission of electric energy in interstate commerce" and over "all facilities for such transmission or sale of electric energy . . . ."[154] This jurisdiction regarding the financial terms of transactions over transmission facilities does not expressly nor impliedly include jurisdiction over the physical siting and construction

144. U.S. CONST. amend. X.

145. *See generally* 16 U.S.C. § 824.

146. *See What FERC Does*, FERC, https://www.ferc.gov/what-ferc-does (last updated June 18, 2025).

147. *See* STEVEN FERREY, LAW OF INDEPENDENT POWER: DEVELOPMENT, COGENERATION, UTILITY REGULATION § 5:10 (2025) [hereinafter LAW OF INDEPENDENT POWER]; *cf.* ENVIRONMENTAL LAW, *supra* note 127, at 609; THE NEW RULES, *supra* note 5, at 23.

148. *See* Pub. Util. Dist. No. 1 of Snohomish Cnty. v. FERC, 471 F.3d 1053, 1058 (9th Cir. 2006), *vacated*, 547 F.3d 1081 (9th Cir. 2008); Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. at 49,842, 49,861 (Aug. 11, 2011) (codified at 18 C.F.R. pt. 35).

149. Transmission Owning and Operating Public Utilities, 76 Fed. Reg. at 49,861.

150. *Cf.* LAW OF INDEPENDENT POWER, *supra* note 147, § 5:10.

151. *Id.*

152. Transource Pa., LLC v. DeFrank, 705 F. Supp. 3d 266, 290 (M.D. Pa. 2023).

153. *See* 16 U.S.C. §§ 824–25.

154. 16 U.S.C. § 824(b); Conn. Light & Power Co., 71 FERC ¶¶ 61,035, 61,149 (1995); Cent. Vt. Pub. Serv. Corp., 84 FERC ¶¶ 61,194, 61,973–75 (1998); Niagara Mohawk Power Corp., 100 FERC ¶¶ 61,019, 61,042 (2002); Entergy Servs., Inc., 120 FERC ¶¶ 61,020, 61,061 (2007); Aquila Merch. Servs., Inc., 125 FERC ¶¶ 61,175, 61,926–27 (2008).

of new or upgraded interstate transmission facilities. The physical assets—lines, poles, transformers, and protective equipment—are not part of the Act's grant of federal jurisdiction.[155]

Federal jurisdiction cannot intrude into state regulation of retail transactions in power nor into exclusive state jurisdiction over decisions on the physical hardware and construction of transmission facilities themselves, unless they are sited on federally-owned lands where states have no jurisdiction.[156] The U.S. Supreme Court held that "Congress meant to draw a bright line easily ascertained, between state and federal jurisdiction," that does not require "case-by-case analysis."[157] It does not make any difference whether a state acts through its legislature or its PUC energy regulatory agency.[158] The Act creates this "bright line"[159] between state and federal jurisdiction with wholesale power sales falling on the affirmative federal side of the line.[160]

Pursuant to the Tenth Amendment, local government exclusively exercises its police power over all electric facility land-use and siting authority.[161] Additionally, the distribution of power, as opposed to the transmission of power,[162] is regulated by the states exclusively.[163] Prior to limited exceptions created by the Biden Administration's 2021 Infrastructure Investment & Jobs Act,[164] but not yet challenged, this hardware and its siting

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155. *Id.*

156. *See* Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. 49,842, 49,955 (Aug. 11, 2011) (codified at 18 C.F.R. pt. 35) (requiring "nondiscriminatory access to transmission" infrastructure by customers). The federal government controls all permitting for development on federal lands. U.S. CONST. art. IV, § 3, cl. 2. The Property Clause gives Congress authority over federal property generally, and the Supreme Court has described Congress's power to legislate under this Clause as "without limitations." Kleppe v. New Mexico, 426 U.S. 529, 539 (1976) (quoting United States v. City & Cnty. of S.F., 310 U.S. 16, 29 (1940)).

157. Fed. Power Comm'n v. S. Cal. Edison Co., 376 U.S. 205, 215–16 (1964).

158. *See* Pac. Gas & Elec. Co. v. State Energy Res. Conservation & Dev. Comm'n, 461 U.S. 190, 215 (1983).

159. *S. Cal. Edison Co.*, 376 U.S. at 215–16.

160. Pub. Util. Dist. No. 1 of Snohomish Cnty. Wash. v. FERC, 471 F.3d 1053, 1066 (9th Cir. 2006), *vacated*, 547 F.3d 1081 (9th Cir. 2008); Pub. Util. Dist. No. 1 of Snohomish Cnty. v. Morgan Stanley Cap. Grp. Inc., 547 F.3d 1081 (9th Cir. 2008), *vacating in light of* Morgan Stanley Cap. Grp. Inc. v. Pub. Util. Dist. No. 1 of Snohomish Cnty., 554 U.S. 527, 553–55 (2008) (criticizing the reasoning of the Ninth Circuit's decision, but nonetheless upholding that FERC has exclusive authority, and responsibility, over wholesale rates).

161. *See What FERC Does*, *supra* note 146.

162. *See* LAW OF INDEPENDENT POWER, *supra* note 147, § 5:10; *see also* ENVIRONMENTAL LAW, *supra* note 127, at 609; THE NEW RULES, *supra* note 5, at 23.

163. *See* Pub. Util. Dist. No. 1 of Snohomish Cnty. v. FERC, 471 F.3d 1053, 1058 (9th Cir. 2006), *vacated*, 547 F.3d 1081 (9th Cir. 2008); Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. 49,842, 49,842 (Aug. 11, 2011) (codified at 18 C.F.R. pt. 35).

164. *See* Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 429 (2021) (codified at various noncontiguous sections of the U.S. Code).

on U.S. land remained within exclusive state or local authority pursuant to the Federal Power Act.[165]

It remains unclear whether the 2025 Trump Administration will support, and its Department of Justice defend, federal assertion of any preemptive authority over state and local reserved authority regarding land-use and transmission. In an April 9, 2025, memo to all federal agencies, captioned "Directing the Repeal of Unlawful Regulations," President Trump directed all agencies to review and repeal any regulations that now appear unconstitutional, exceed statutory authority, or intrude on state jurisdiction, after ten recent Supreme Court decisions.[166] The two most important recent Supreme Court decisions regarding administrative law are *Loper Bright Enterprises v. Raimondo* and *West Virginia v. EPA*.[167] These Supreme Court decisions, recently elevated to leverage repeal of pre-existing federal regulations and orders are analyzed in this Article.

III. THE NEW FEDERAL COURT DECISION

A. Preemption of State Exclusive Jurisdiction?

How did we get to the *Transource* case? As part of its multi-state planning function, PJM included the Transource transmission project in its 2016 regional transmission plan as an efficient, cost-effective project to address persistent congestion identified in forward-looking economic studies.[168] In 2021, pursuant to long-established state siting law, the Pennsylvania Public Utility Commission (PUC) determined that it must independently assess PJM's conclusion that the project will be regionally beneficial.[169] The PUC concluded that the project was not "needed" when applying Pennsylvania's transmission siting law, and denied Transource's application pursuant to state law.[170]

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165. *See* Federal Power Act, Pub. L. No. 66-280, ch. 285, § 19, 41 Stat. 1063, 1073 (1920) (codified as amended at 16 U.S.C. §§ 791–828).

166. Memorandum on Directing the Repeal of Unlawful Regulations, 2025 DAILY COMP. PRES. DOCS. 202500466 (Apr. 9, 2025). The memorandum reference these Supreme Court cases as determining what is illegal: *Loper Bright Enterprises v. Raimondo*, 144 S. Ct. 2244 (2024); *West Virginia v. EPA*, 142 S Ct. 2587 (2022); *SEC v. Jarkesy*, 603 U.S. 109 (2024); *Michigan v. EPA*, 576 U.S. 743 (2015); *Sackett v. EPA*, 598 U.S. 651 (2023); *Ohio v. EPA*, 144 S. Ct. 2040 (2024); *Cedar Point Nursery v. Hassid*, 594 U.S. 139 (2021); *Students for Fair Admissions v. Harvard*, 600 U.S. 181 (2023); *Carson v. Makin*, 596 U.S. 767 (2022); and *Roman Cath. Diocese of Brooklyn v. Cuomo*, 592 U.S. 14 (2020).

167. 144 S. Ct. 2244 (2024); 142 S. Ct. 2587 (2022).

168. Transource Pa., LLC v. DeFrank, 705 F. Supp. 3d 266, 274–75 (M.D. Pa. 2023) (quoting internal court filing).

169. *See Pennsylvania*, STATE POWER PROJECT, https://statepowerproject.org/pennsylvania/ (last visited Dec. 15, 2025).

170. *Transource Pa., LLC*, 705 F. Supp. 3d at 276–77; *see* Opening Brief for Appellants, Transource Pa., LLC v. DeFrank, (3d Cir. 2024) (No. 24-1045), at 14–18 [hereinafter AG Brief].

In December 2023, on appeal of the PUC decision, the Federal District Court found that the PUC's order "clearly overlap[ped] with PJM's regional transmission planning analysis."[171] The Court held that the lower level of government must yield and was preempted by the Federal Power Act because it "pose[d] obstacles to FERC's pursuit of" transmission efficiency.[172] The Court also held that the PUC's denial violated the Dormant Commerce Clause because it was "focused on protecting the interests of Pennsylvanians" and "rooted in economic protectionism."[173]

Both parties in the *Transource* matter conceded[174] that the Constitution does not grant land-use power to the federal government under the Commerce Clause.[175] They also conceded that the Federal Power Act does not grant FERC power over transmission infrastructure siting (absent a recent Biden Administration amendment to Section 216 of the Act applying to high impact corridors not involved in this case), instead expressly reserving to the states any electric power jurisdiction not expressly allocated to FERC.[176] With this admission by both parties, there is no statute nor precedent to find in favor of Transource. Notwithstanding this, federally regulated PJM (a non-profit corporation controlled by its members), supported finding a new implied federal power to supersede traditional state and local jurisdiction.[177]

There are three types of federal preemption: express preemption, implied field preemption, and implied conflict preemption.[178] Starting with field preemption precedent, in *Pacific Gas & Electric Co. v. State Energy Resources Conservation & Development Commission*,[179] the plaintiff utility company challenged a California statute that conditioned the construction of nuclear power plants on findings by a state agency that storage facilities and disposal means for spent nuclear waste were adequate and available. Pacific Gas & Electric Company (PG&E) argued that the Atomic Energy Act[180] impliedly preempted the state statute. Specifically, PG&E claimed that because the federal statute regulates the construction of nuclear plants and is predicated, in part, on radiological health and safety concerns, it comprehensively regulates a field reserved to Congress by the Atomic Energy Act.[181]

171. *Transource Pa., LLC*, 705 F. Supp. 3d at 293.
172. *Id.* at 289, 293.
173. *Id.* at 296.
174. *See id.* at 290–91.
175. *See* LAW OF INDEPENDENT POWER, *supra* note 147, § 5:10.
176. *Id.*
177. *See Transource Pa., LLC*, 705 F. Supp. 3d at 284–90.
178. ENVIRONMENTAL LAW, *supra* note 127, at 188–95.
179. 461 U.S. 190 (1983).
180. 42 U.S.C. § 2011.
181. *Id.* §§ 2011–2013.

The Court found that notwithstanding this implied field preemption of radiological health and safety, it remains within this latter state power that states traditionally govern the need for power facilities, their economic feasibility, cost recovery and allocation, and rates and services.[182] Of note, nuclear power is much more regulated, not only by FERC if it engages in wholesale sales or transmission of wholesale power, but also by: (1) the Nuclear Regulatory Commission (NRC) pursuant to the Atomic Energy Act regarding siting, (2) the Department of Transportation regarding the movement of nuclear fuel,[183] and (3) the Department of Energy (DoE) regarding the federal government taking title to all spent domestic high-level radioactive waste.[184] No similar multi-level, multi-federal-agency statutory regulation affects transmission electric power involved in the *Transource* case.

The transmission plaintiff in *Transource* argued that there is conflict preemption wherever state and/or local government can make a decision on transmission siting that conflicts with federal "plans," notwithstanding that such federal plans have never been found to also impliedly permit siting for future transmission.[185] The *Transource* Federal District Court endorsed this extremely broad implied conflict preemption, now implied in a federal transmission plan, which has never previously constituted or enabled siting of transmission.[186] The Court defined this by quoting a Supreme Court case regarding energy conservation:

> Under Supreme Court precedent, conflict preemption arises where (1) "state and federal laws 'directly conflict,'" *PLIVA, Inc. v. Mensing*, 564 U.S. 604, 617 (2011), or where (2) "the state law stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress." *Oneok, Inc. v. Learjet, Inc*., 575 U.S. 373, 377 (2015) (internal quotations omitted). States cannot "regulate areas where FERC has properly exercised its jurisdiction" or create an "unavoidable conflict." *Oneok*, 575 U.S. at 386, 389 . . . Transource also submits that the PUC's decision is an obstacle to FERC's objective of creating transmission lines which reduce congestion, in turn reducing pricing

182. 461 U.S. 190 (1983).

183. *See* 10 C.F.R. §§ 73.25–73.38 (2025).

184. *See* Nuclear Energy Inst., Inc. v. EPA, 373 F.3d 1251, 1277 (D.C. Cir. 2004).

185. *See also* Brief of Appellee at 25–30, Transource Pa., LLC v. DeFrank, (3d Cir. 2024) (No. 24–1045) [hereinafter Brief of Appellee].

186. Transource Pa., LLC v. DeFrank, 705 F. Supp. 3d 266, 289–94. (M.D. Pa. 2023).

disparities.[187]

The *Transource* Court also stated Transource's assertion that "the D.C. Circuit has stated, '[e]nsuring the proper functioning of the interconnected grid spanning state lines . . . fits comfortably' within the FPA's 'grant of jurisdiction over 'the transmission of electric energy in interstate commerce.'"[188] This may be inapposite: While FERC does have exclusive authority over the operational aspects (rates and terms) of existing transmission lines, it has no authority over the siting and land-use decisions regarding new lines which, for the last 90 years since the enactment of the Federal Power Act, are reserved to exclusive state and local authority.

The *Transource* Court then quoted several Supreme Court decisions that upheld the so-called "Filed Rate Doctrine" cited by the plaintiff to solidify that FERC sets transmission and wholesale "rates" for the operation of the existing transmission system: One is *Nantahala Power & Light Co. v. Thornburg*,[189] another is *Mississippi Power & Light Co. v. Mississippi ex rel. Moore*.[190]

These two Supreme Court cases dealt only with FERC setting rates for wholesale power sales over existing lines and do not in any way address siting or permitting of new transmission infrastructure or lines. Federal law grants federal authority over the former, while reserving the latter jurisdiction over siting to the states.[191] In one sentence, the *Transource* Trial Court importantly acknowledged a lack of support that "[a]lthough Transource has provided a well-reasoned argument, no binding precedent is directly on point."[192] As its lynchpin, the *Transource* Trial Court, without precedents regarding transmission siting authority, concluded "[b]ecause the PUC's decision presents an obstacle to achieving federal objectives, it is conflict preempted and violates the Supremacy Clause."[193]

The Supreme Court has reenforced the presumption against preemption.[194] The *Transource* Court referenced *Rice v. Santa Fe Elevator*

187. *Id.* at 284.

188. *Id.* at 285 (quoting S.C. Pub. Serv. Auth. v. FERC, 762 F.3d 41, 63 (D.C. Cir. 2014)).

189. *Transource Pa. LLC*, 705 F. Supp. 3d at 286; 476 U.S. 953, 966 (1986) ("Once FERC sets . . . a rate, a State may not conclude in setting retail rates that the FERC-approved wholesale rates are unreasonable. A State must rather give effect to Congress' desire to give FERC plenary authority over interstate wholesale rates, and to ensure that the States do not interfere with this authority.").

190. 487 U.S. 354, 371 (1988) (explaining that once a tariff has been filed with FERC and approved, either explicitly by FERC or by operation of law, it has the force of federal law).

191. *See* 16 U.S.C. §§ 824–25.

192. *Transource Pa.*, *LLC,* 705 F. Supp. 3d at 287.

193. *Id.* at 289.

194. Bates v. Dow Agrosciences LLC, 544 U.S. 431, 449 (2005) (quoting Meditronic, Inc. v. Lohr, 518 U.S. 470, 485 (1996)) (describing how the Court has a "duty to accept the reading that disfavors

Corp[195] and *Medtronic Inc. v. Lohr*,[196] holding that in areas of traditional state regulation, the assumption must be that a federal statute will not supplant state law unless Congress made such an intention clear and manifest. The Court, as well as all parties, "acknowledge[d] that the Project is not in a national interest electric transmission corridor, and FERC therefore has no authority to issue a construction permit."[197] This would seem like it should end any debate about a FERC or ISO plan impliedly containing the equivalent of construction permits.

A construction permit is required before one can utilize land that one does not own. If "FERC therefore has no authority to issue a construction permit,"[198] and only state and local government may issue such permissions, that rationale does not exist in the *Transource* record. FERC and its delegate ISOs, such as PJM, cannot extend their statutory authority unilaterally from an administrative order, notwithstanding the Federal Power Act.[199]

The *Transource* Court recharacterized "the issue relat[ing] to whether the PUC decision was an obstacle to achieving federal objectives."[200] That is not what the statute explicitly provides, nor what Supreme Court decisions have held since the statute's enactment. Other statutes, such as the National Gas Act, preempt interstate natural gas pipeline infrastructure siting decisions to be within federal rather than state authority.[201] The Federal Power Act expressly did not do this and courts interpreting the Federal Power

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pre-emption. '[B]ecause the States are independent sovereigns in our federal system, we have long presumed that Congress does not cavalierly pre-empt state-law causes of action'").

195. *See generally* Rice v. Santa Fe Elevator Corp., 331 U.S. 218 (1947).

196. *See generally Medtronic*, 518 U.S. 470 (*abrogated by* Thornton v. Tyson Foods, Inc., 28 F.4th 1016, 1023 (10th Cir. 2022)); s*ee* Wyeth v. Levine, 555 U.S. 555 (2009).

197. *See Transource Pa., LLC,* 705 F. Supp. 3d at 290. Except for that limited federal backstop siting authority under 16 U.S.C. § 824p, the states have exclusive authority over siting, and that includes whether a transmission line is needed. *See* W. & S. Life Ins. Co. v. State Bd. of Equalization of Cal., 451 U.S. 648, 652–53 (1981); Tampa Elec. Co. v. Garcia, 767 So.2d 428, 436 (Fla. 2000).

198. *Transource Pa., LLC*, 705 F. Supp. 3d at 273–74.

199. *Id.* at 290. The District Court found that:

While Defendants concede that FERC had jurisdiction over transmission planning, they argue that the PUC's decision constituted an exercise of its siting authority, a power which Congress has left exclusively to the states. (*Id.* at 9.) Invoking a FERC order, they assert that "[i]t is well-settled that [FERC] does not have authority over the siting and construction of electric transmission facilities." *Id.* (quoting PacifiCorp, 72 FERC ¶ 61,087, 61,488 (1995)). Instead, "[a]ll such matters should be resolved at the state and local level." PacifiCorp, 72 FERC at 61,488. Piedmont Env't. Council v. FERC, 558 F.3d 304, 310 (4th Cir. 2009) (stating that "states have traditionally assumed all jurisdiction to approve or deny permits for the siting and construction of electric transmission facilities."

Id. at 290; *see* Ashira Pelman Ostrow, *Process Preemption in Federal Siting Regimes,* 48 HARV. J. LEGIS. 289, 293–96 (2011). Federal frameworks often require balancing national priorities with traditional state and local controls over construction permitting and land use. *Id.*

200. *See Transource Pa., LLC*, 705 F. Supp. 3d at 289.

201. 15 U.S.C. §§ 717–717w.

Act have not found an implied federal preemption.[202] Moreover, in 2025, while the *Transource* decision was pending, the Sixth Circuit held that a longstanding state law controlling whether in-state utilities transfer control of their transmission facilities to a regional transmission organization (RTO or ISO) is a matter of state jurisdiction— not preempted by the Federal Power Act.[203] Immediately thereafter, somewhat at odds with the federal position in *Transource*, FERC itself cited this decision in a brief it filed in the Seventh Circuit.[204]

B. Violating the Dormant Commerce Clause?

1. The *Transource* Finding

In this *Transource* controversy, a Commerce Clause violation by the Pennsylvania PUC also was alleged by the transmission developer seeking to construct a new interstate transmission line through the state to serve Maryland and other states with imported power.[205] Transource argued that "congestion represents a form of rate discrimination."[206] The Court concluded that the PUC's decision violated the Dormant Commerce Clause because it protects Pennsylvania electric ratepayers from higher transmission rates when their less expensive in-state electric power would not traverse their state over these new transmission lines to serve other states to the east.[207] With this new transmission power export line, Pennsylvania ratepayers would need to pay for more expensive electric power dispatched to fill in this exported gap created in Pennsylvania supply.[208]

The *Transource* Federal Trial Court quoted certain Supreme Court cases distinguishable from key legal and factual elements of the Pennsylvania case at hand:

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202. *Id.*

203. Dayton Power & Light Co. v. FERC, 126 F.4th 1107, 1129 (6th Cir. 2025).

204. Brief for the FERC as Amicus Curiae at 14–15, LSP Transmission Holdings II, LLC v. Huston, 131 F.4th 566 (2025) (Nos. 24-3248 and 24-3249), 2025 WL 348281.

205. *See supra* Part II.B.

206. *See* Transource Pa., LLC, v. DeFrank, 705 F. Supp. 3d 266, 275 (M.D. Pa. 2023).

207. *Id.* at 294–96.

208. *See How PJM Schedules Generation to Meet Demand*, PJM (2024), https://learn.pjm.com/three-priorities/keeping-the-lights-on/how-pjm-schedules-generation-to-meet-demand (last visited Nov. 20, 2025) ("PJM schedules the lowest-cost generation to be available to meet the forecasted electricity usage for the next day plus a reserve amount (electricity supplies that currently are not being used but can be quickly available in the case of unexpected loss of generation)."); *see also* REGIONAL TRANSMISSION EXPANSION PLANNING, *supra* note 134, at 49 ("PJM system operators schedule and dispatch the lowest-cost power resources to generate electricity, regardless of which transmission zone or state it comes from.").

> [W]here a state regulation is 'motivated by simple economic protectionalism,' it will be 'subject to a virtually per se rule of invalidity, which can only be overcome by a showing that the State has no other means to advance a legitimate local purpose.'[209]

While *United Haulers* found that there was economic protection, nonetheless, it upheld the regulation under the Dormant Commerce Clause. *United Haulers* is a case restricting the geographic movement of ordinary trash.[210] Trash enjoys a different legal status than electric power. Trash and solid waste are not significantly regulated by law;[211] electric power is the most regulated item in the U.S. economy.[212]

Legal analysis regarding electric power must start with the Federal Power Act. Precedent traditionally allocates to states legal authority and complete discretion under state law regarding the siting of, and land-use approvals for, transmission infrastructure.[213] The *Transource* Court cited and relied on another Supreme Court case that is not analogous to electric power regulation: "This heightened scrutiny will apply where a state acts with 'discriminatory purpose,' or the regulation 'discriminates against interstate commerce 'either on its face or in practical effect.'"[214]

Bacchus involved a liquor wholesaler who challenged certain locally produced alcohol products exempt from a Hawaii alcohol tax.[215] Factually, *Bacchus* concerned a movable tangible good—alcoholic spirits—which is fundamentally different than electricity, which in many states is considered legally not a good, but rather a service.[216] Electric power is a totally unique thing among U.S. technologies.[217]

The *Transource* District Court advanced to its conclusion based on economic factors, "[q]uite simply, the PUC denied the Project because the PUC wished to maintain low prices for Pennsylvania customers that benefit from congestion."[218] The Federal Power Act provides states discretion regarding what economic factors they may weigh in deciding whether to

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209. *Transource Pa., LLC,* 705 F. Supp. 3d at 294 (quoting United Haulers Ass'n v. Oneida-Herkimer Solid Waste Mgmt. Auth., 550 U.S. 330, 338–39 (2007)).

210. *Id.*

211. *See* ENVIRONMENTAL LAW, *supra* note 127, at 369 (noting that solid waste is not significantly regulated by the Resource Conservation and Recovery Act).

212. POWERING THE FUTURE, *supra* note 66, at 5.

213. *See* LAW OF INDEPENDENT POWER *supra* note 147, at § 5:10.

214. *See Transource Pa., LLC*, 705 F. Supp. 3d at 294 (quoting Green Spring Dairies, Inc. v. Pa. Milk Mktg. Bd., 298 F.3d 201, 210 (3d. Cir. 2002)).

215. Bacchus Imports, Ltd. v. Dias, 468 U.S. 263, 270 (1984).

216. Steven Ferrey, *Unresolved Judicial Conflict and Critical Infrastructure*, 3 TEXAS A&M L. REV. 581, 598 (2016).

217. POWERING THE FUTURE, *supra* note 66, at 12–15.

218. *Transource Pa., LLC*, 705 F. Supp. 3d at 294.

authorize the siting of additional transmission infrastructure.[219] The *Transource* Federal District Court also relied on another Supreme Court case highlighted in the plaintiff's brief:

> Transource likens the PUC's decision to New England Power, in which the Supreme Court held that the 'order of the New Hampshire Commission, prohibiting New England Power from selling its hydroelectric energy outside the State of New Hampshire, is precisely the sort of protectionist regulation that the Commerce Clause declares off-limits to the states.' In that case, the utility commission issued its order to benefit citizens of New Hampshire to the detriment of those in neighboring states who could not have access to the low-cost power.[220]

In the law governing the electric power sector, there is a fundamental legal difference between operation of existing transmission lines and siting or construction of new transmission lines.[221] In *New England Power Co. v. New Hampshire*, the Supreme Court overturned an order of the New Hampshire PUC restricting privately owned renewable electric power generated in New Hampshire to continue as it had in the past from passing over existing transmission lines through the state to Massachusetts and Connecticut customers of the same parent utility. This utility, the New England Electric System and its sister company New England Power Company,[222] owned the generation source in New Hampshire and served customers in all three states simultaneously.[223] This was found to violate the Dormant Commerce Clause.[224] The Supreme Court held:

> [We] consistently have held that the Commerce Clause of the Constitution . . . precludes a state from mandating that its residents be given a preferred right of access, over out-of-state consumers, to natural resources located within its borders or to the products derived therefrom . . . .[A] State is without power to prevent privately owned articles of trade from being shipped and sold in interstate commerce on the ground that they are required to satisfy local demands or

219. *See* Federal Power Act, Pub. L. No. 66-280, ch. 285, § 9(h), 41 Stat. 1063, 1070 (1920) (codified as amended at 16 U.S.C. §§ 791–828).

220. *Transource Pa., LLC*, 705 F. Supp. 3d at 295–96 (quoting New England Power Co. v. New Hampshire, 455 U.S. 331, 339 (1982)).

221. *See* 15 U.S.C. §§ 717–717w.

222. New England Power Co., 455 U.S at 344.

223. *Id.* at 333.

224. *Id.*at 339; *see* U.S. CONST. art. I, § 8, cl. 3.

because they are needed by the people of the State.[225]

This New Hampshire PUC's change in the terms and resultant pricing of wholesale power sales made over existing transmission lines is within federal, not state, jurisdiction. These facts are not present in, and distinct from, the *Transource* matter. Notwithstanding this, the *Transource* Court dismissed Pennsylvania's distinctions about the *New England* case:

> [D]efendants argue this is distinct from other cases which Transource cites, like *New England Power Co. v. New Hampshire*, because that case did not relate to the constitutionality of a state regulation preventing the construction of a utility facility on public land.[226]

However, these are important distinctions vis-à-vis *New England*: First, New Hampshire's PUC blocked an existing generation project from transmitting a utility company's power interstate using already-existing transmission lines. Second, FERC has exclusive federal preemptive authority over interstate wholesale power sales and all interstate power sales and terms. Third, there was no issue of the state siting any new transmission lines or infrastructure, which had that been an issue in *New Hampshire*, as it is in *Transource*, are entirely within state authority.

Each of these facts makes the issue in *New England* totally within federal jurisdiction, preempted, and distinct from the issue in *Transource*. *Transource* had nothing to do with setting the pricing terms for operation of any existing transmission infrastructure; it involved which levels of government have authority over land-use and siting permits necessary for new transmission infrastructure. As noted, FERC holds exclusive authority over the financial operation of existing transmission infrastructure and its terms, but not over new siting of transmission infrastructure.[227]

Not focusing on the jurisdictional issue, considering whether the end justifies the means, the *Transource* Court focused instead on whether new infrastructure, that the federal government has no traditional jurisdiction to site or permit, would improve the transmission system:

> Importantly, the very nature of the Project is to improve the flow of wholesale electricity across state lines to places that currently have less access and therefore higher prices. The Project's sole purpose is to better facilitate commerce across

225. *Id.* (citations omitted) (quoting Philadelphia v. New Jersey, 437 U.S. 617, 627 (1978)).
226. Transource Pa., LLC, v. DeFrank, 705 F. Supp. 3d 266, 295 (M.D. Pa 2023).
227. *See* LAW OF INDEPENDENT POWER *supra* note 147.

> regional and state boundaries. And the PUC's opposition to the Project is rooted in economic protectionism in the form of maintaining the status quo imbalance of access to low-priced electricity.[228]

There is nothing in federal law that states that a state must site and permit additional transmission lines that will cause its most valuable or economically-priced power to exit the state. Even what the District Court characterized as a federally planned "sole purpose" is legally not relevant if such a purpose is *ultra vires* and not within the authority of FERC or the PJM ISO non-profit member-controlled corporation pursuant to the Federal Power Act.[229] The Constitution and federal law have been interpreted expressly to reserve and leave all traditional transmission infrastructure siting authority to the states pursuant to the Tenth Amendment of the Constitution.[230]

Most recently, in *National Pork Producers Council v. Ross*,[231] the Supreme Court rejected arguments that the Dormant Commerce Clause includes an "'almost per se' rule against laws that have the 'practical effect' of 'controlling' extraterritorial commerce."[232]

In the appeal of the *Transource* matter, there is no change imposed on any other states in PJM (such as Maryland or Delaware), as in *Pork Producers*.[233] This decision can support Pennsylvania's position in the *Transource* matter.

2. Dormant Commerce Clause Circuit Court Jurisprudence

The California Low Carbon Fuel Standard (LCFS) was challenged as violating the Dormant Commerce Clause of the Constitution; treating the required agricultural ethanol gasoline additive differently and discriminatorily depending on from which state it originated and the distance it travelled to California filling stations.[234] Plaintiffs alleged that the California Air Resources Board (CARB) rule implicitly discriminated against renewable fuels produced outside California that were in interstate commerce and eventually were sold at California gasoline stations.[235]

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228. *Transource Pa., LLC*, 705 F. Supp. 3d at 296.

229. *Id.*

230. *Id.* at 283.

231. 598 U.S. 356 (2023).

232. *See* Trial Court Appellee Brief, *supra* note 79, at 51.

233. *Id.*

234. *See* Rocky Mountain Farmers Union v. Goldstene, 843 F. Supp. 2d. 1071, 1087 (E.D. Cal. 2011); Rocky Mountain Farmers Union v. Corey, 730 F.3d 1070 (9th Cir. 2013); *see also* Steven Ferrey, *Carbonite Legal Conflict in California*, 5 SAN DIEGO J. CLIMATE & ENERGY L. 95, 112 (2014).

235. *See Rocky Mountain Farmers Union*, 843 F. Supp. 2d. at 1071.

Specifically, the LCFS bases its credit calculations on the distance of shipment of ethanol gas additive fuels to California and assumes associated carbon emissions.[236] These emissions include fossil fuels used to produce electricity in the state where the solid agricultural produce is processed to produce liquid ethanol.[237]

Plaintiffs argued that CARB violated the Dormant Commerce Clause by assigning a higher carbon intensity to fuel from outside California than the chemically identical fuel from inside the state.[238] After the Federal District Court found a Dormant Commerce Clause violation,[239] the Ninth Circuit reversed and applied the balancing test from *Pike v. Bruce Church, Inc*.[240] This is the same test that the *Transource* Trial Court said it was applying in the case now at issue.[241]

Involving interstate transmission of electric energy, two circuit courts found no Dormant Commerce Clause violation when two states originally—now increased to five states with subsidies—[242]discriminated in favor of protecting specific electric generation sited in their states. Challengers, who generated electric power in adjacent states, complained that this discriminated against the electric power generated outside that state and transmitted over interstate transmission infrastructure into the adjacent discriminating states: "Programs in Illinois, New York, New Jersey, and Ohio show ZEC prices ranging from $10.00 per megawatt-hour (MWh) to $17.50/MWh. Connecticut's program allows two [only in-state] generating units . . . to participate in an auction for carbon-free electricity."[243]

Illinois and New York chose to subsidize only their in-state power utilizing a subsidy called Zero Emission Credits (ZECs).[244] The Illinois program was challenged on the grounds that the state had regulated in favor of in-state industries and consumers. The program required utilities to buy ZECs, with the state only granting the sale of ZECs to the two nuclear power

236. *Id.* at 1087.

237. *Id.* at 1088.

238. *Id.*

239. *Id.* at 1081–82. CARB attributed the difference in carbon intensity values to multiple scientific factors in addition to geographic location factors (emissions related to shipping or transportation of fuel). The court relied upon a table of Carbon Intensity values generated by CARB.

240. Pike v. Bruce Church, Inc., 397 U.S. 137 (1970).

241. *See Rocky Mountain Farmers Union*, 730 F.3d at 1078; *see also* Trial Court Appellee Brief, *supra* note 79, at 51.

242. Mark Morey, Five States Have Implemented Programs to Assist Nuclear Power Plants, U.S. DEP'T OF ENERGY: ENERGY INFO. ADMIN. (Oct. 7, 2019), https://www.eia.gov/todayinenergy/detail.php?id=41534#:~:text=Programs%20in%20Illinois%2C%20New%20York,MWh)%20to%20%2417.50%2FMWh.&text=Connecticut%27s%20program%2C%20which%20is%20legislated,auction%20for%20carbon-free%20electricity.

243. *Id.*

244. *Id.*

generation facilities located within its own borders, and not out-of-state nuclear energy facilities whose electric output was sold to Illinois consumers.[245] The Seventh Circuit found that the Illinois ZEC program does not "overtly" or expressly single out or discriminate against out-of-state power under the Dormant Commerce Clause, and was permissible under U.S. law.[246]

The New York complaint proceeded similarly. Out-of-state power plant owners, who sold their power in interstate wholesale markets, unsuccessfully alleged that New York discriminated against out-of-state commerce by selectively granting its ZECs only to its in-state nuclear power plants.[247] In both of these ZEC cases, certiorari was denied by the Supreme Court, making these two decisions the final word on this matter.[248]

These Seventh Circuit and Second Circuit ZEC opinions involving interstate electricity transmission and state discretion to protect in-state electricity consumers are more analogous to the present *Transource* legal issue than *Bacchus*. Regarding new permanent siting of electric transmission infrastructure, the Federal Power Act, several FERC orders, and relevant caselaw have always reserved to state discretion new siting use of their land. The *Transource* decision diverges from these precedents.

3. National Preemptive Corridors Precedent

In the last two decades since enactment of the Energy Policy Act of 2005 (EPAct 2005), prior to 2024 only two NIETCs were designated by DoE to benefit transmission-congested areas, both of which were immediately challenged and judicially overturned and vacated by different federal circuit courts of appeals.[249] The Fourth Circuit in 2009 blocked FERC from acting to "backstop" and granting a federal permit for siting new electric transmission infrastructure under Section 216 of the Federal Power Act.[250] This line planned to carry additional power to New York and other congested eastern states through Pennsylvania, Virginia, and West Virginia when those pass-through states had denied a permit within one year, pursuant to their conventional state siting authority.[251] The Court expressed concern that FERC's preemptive interpretation would eviscerate state energy regulatory

245. Old Mill Creek v. Star, 2017 WL 3008289, at *7 (N.D. Ill. 2017).

246. Elec. Power Supply Ass'n v. Star, 904 F.3d 518, 525 (7th Cir. 2018).

247. *See* Coal. for Competitive Elec. v. Zibelman, 906 F.3d 41, 58 (2d Cir. 2018).

248. *See* Order List, 587 U.S 3 (Apr. 15, 2019), (certiorari denied in Elec. Power Supply Ass'n. v. Star, 18-868; Elec. Power Supply Ass'n. v. Rhodes 18-879).

249. Piedmont Env't Council v. FERC, 558 F.3d 304, 309–10 (4th Cir. 2009); Cal. Wilderness Coal. v. U.S. Dep't of Energy, 631 F.3d 1072, 1106 (9th Cir. 2011).

250. *Piedmont*, 558 F.3d at 309–10.

251. *Id.* at 313.

authority regarding electric transmission infrastructure to "lose jurisdiction unless they approve every permit . . . ."[252]

The Fourth Circuit stated that had Congress intended for FERC to blanket-preempt state jurisdiction over transmission siting, it would have said so explicitly in the Federal Power Act.[253] The language of EPAct 2005 still followed state permitting determinations as long as the state took any action on an application within a one-year period, even if a state denied a permit.[254] The Federal Power Act limits federal authority to only Congress's specific grants: The Fourth Circuit in *Piedmont* held that a state retains its "legitimate use of its traditional powers" and can deny a transmission application.[255] Subsequently, in 2011, with regard to this same Section 216 amendment to the Federal Power Act under EPAct 2005, the Ninth Circuit ruled that the U.S. DoE "failed to properly consult with affected States in conducting the Congestion Study".[256] The study analyzed high priority transmission corridors in mid-Atlantic and southwestern states, and failed to consider the environmental effects of designating NIETCs required by the National Environmental Policy Act.[257]

New Hampshire unilaterally blocked needed new transmission infrastructure to carry additional renewable power from Canada to Massachusetts and Connecticut.[258] Massachusetts selected competitively Northern Pass Transmission to supply 1,090 MW of zero-carbon hydro power produced in Quebec, Canada, to be transmitted through a new 192-mile high voltage direct current (HVDC) transmission line.[259] The HVDC portion of the transmission project would be located entirely in New Hampshire; the costs of the transmission facilities were to be paid for by Massachusetts consumers.[260] A permit for the HVDC portion of the Northern Pass project passing through New Hampshire was rejected by the state energy regulatory agency in New Hampshire because of its adverse impact to natural

252. *Id.* at 314.

253. *Id.*

254. *Id.* at 315.

255. *Id.* at 314–15.

256. Cal. Wilderness Coal. v. U.S. Dep't of Energy, 631 F.3d 1072, 1079 (9th Cir. 2011).

257. *Id.*; *see* 16 U.S.C. § 824p(b)(4).

258. *See* William Pentland, *New Hampshire Blocks Major Transmission Project*, FORBES (Feb. 4, 2018), https://www.forbes.com/sites/williampentland/2018/02/04/new-hampshire-blocks-major-power-transmission-project/?sh=3e432ea07fdb.

259. *Id.*

260. *See* Paul L. Joskow, *Facilitating Transmission Expansion to Support Efficient Decarbonization of the Electricity Sector* 20–21 (MIT Ctr. for Energy & Env't Pol'y Rsch., 2021) (noting that the "HVDC portion of the project was to be located entirely in New Hampshire, though none of the clean energy supplied by Hydro-Quebec would be credited to utilities or consumers in New Hampshire since the counterparties to the contract with Hydro-Quebec and the costs of the transmission facilities were to be credited to and paid for by Massachusetts consumers").

scenery.[261] When challenged, this decision was upheld by the New Hampshire Supreme Court in 2019, and the project was abandoned.[262]

The Biden Administration attempted federal preemption again: The 2021 Infrastructure Improvement and Jobs Act (IIJA) amended Section 216(b)(1)(C) of the Federal Power Act to grant FERC permitting authority when a DoE high-impact transmission corridor plan is not approved by a state energy regulatory authority within one year of a proposal.[263] The IIJA also amended Section 216(e), which grants a permit holder for a line in a NIETC area the right via FERC to acquire the necessary right-of-way by eminent domain. The permit holder must have made good faith efforts to engage with landowners and other stakeholders early in the applicable permitting process, and been denied permission to site a transmission line only on certain NIETC land.[264]

In 2023, FERC started the process to grant new transmission authority in NIETCs pursuant to the revised Section 216 of the Federal Power Act.[265] Necessary pre-permit National Environmental Policy Act (NEPA) compliance, as well as possible similar state law environmental impact review compliance, prior to any new transmission construction is still to be determined. Although this new authority had not been legally tested in the courts at the time the Biden Administration was replaced by the Trump Administration, a critical statutory barrier in any state is apparent. As amended, Section 216 only provides eminent domain for the federal government or its delegates over privately-owned land.[266]

There is no eminent domain power granted over state-owned lands.[267]

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261. *See* Justin Gundlach, *Transmission Siting Woes are Slowing the Clean Energy Transition in New England*, 53 ABA ENV'T, ENERGY, & RES. SECTION TRENDS, July/Aug. 2022, at 6 (explaining how Northern Pass project planned to traverse New Hampshire, but New Hampshire's Site Evaluation Committee blocked the proposal, arguing that the adverse impact to natural scenery and thus tourism made the line unacceptable); *see also* Iulia Gheorghiu, *New Hampshire Supreme Court Strikes Down Appeal for Northern Pass Transmission Permit*, UTILITY DIVE (July 22, 2019), https://www.utilitydive.com/news/new-hampshire-supreme-court-strikes-down-appeal-for-northern-pass-transmiss/559221/ (reporting that the Court unanimously voted to uphold the rejection of Eversource's proposed 192-mile transmission line, Northern Pass).

262. *In re* Appeal of N. Pass Transmission, LLC, 214 A.3d 590, 614 (N.H. 2019).

263. *Id.*; 42 U.S.C. § 4332(2)(C). For FERC to approve the siting of the transmission facilities, the state: (i) has not made a determination on an application by one year after the later of the date on which the application was filed or the date on which the relevant National Corridor was designated; (ii) has conditioned its approval such that the proposed project will not significantly reduce transmission capacity constraints or congestion in interstate commerce or is not economically feasible; or (iii) has denied an application. *Id.*

264. 16 U.S.C.§ 824p(e)(1).

265. Applications for Permits to Site Interstate Electric Transmission Facilities, 88 Fed. Reg. 2770 (proposed Jan. 17, 2023) (codified at 18 C.F.R. pt. 50, 380).

266. *See* Inflation Reduction Act, 16 U.S.C. § 824p(e)(1).

267. *Id.*

Under the Tenth Amendment, states have the power to deny pass-through transmission lines over state-owned land. State-owned land is in critical locations—under major federal or state highways which otherwise could serve as ideal interstate transmission corridors.[268]

The land under river bottoms, streams, and creeks form the boundaries of most states: 44 of the continental 48 states, including every state east of the Mississippi River, have at least part of their boundaries defined by rivers.[269] The "equal footing doctrine," upheld by the Supreme Court in the 21st century,[270] as well as over the prior 175 years,[271] provides that each state owns the bottoms of all navigable waters within its territory. Given this gap

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268. *See* U.S. GOV'T ACCOUNTABILITY OFF., GAO-08-347R, TRANSMISSION LINES: ISSUES ASSOCIATED WITH HIGH-VOLTAGE DIRECT-CURRENT TRANSMISSION LINES ALONG TRANSPORTATION RIGHTS OF WAY 3 (2008) (discussing various state and federal prohibitions on co-locating transmission lines along highways); *see also* 23 C.F.R. § 710 (2025).

269. MICHAEL WIGMORE ET AL., LAW 360, FEDS MAY NEED POWER TO TAKE STATE LANDS FOR NEW GRID 3 (2021) (stating that "[a]ll but four of the lower 48 states, including every state east of the Mississippi River, have at least part of their boundaries defined by rivers").

270. *See* PPL Mont. LLC v. Montana, 565 U.S. 576, 604 (2012). The Court ruled that while Montana owns and may charge for use of riverbeds across the state, that was based upon an infirm legal understanding of this Court's rules of navigability for title under the equal-footing doctrine:

As the Court said in *Brewer–Elliott*: "It is not for a State by courts or legislature, in dealing with the general subject of beds of streams, to adopt a retroactive rule for determining navigability which . . . would enlarge what actually passed to the State, at the time of her admission, under the constitutional rule of equality here invoked."

Id. at 604–05 (quoting Brewer-Elliott Oil & Gas Co. v. United States, 260 U.S. 77, 88 (1922)).

271. *See* Pollard's Lessee v. Hagan, 44 U.S. (3 How.) 212, 230 (1845) (affirming that "[t]he shores of navigable waters, and the soils under them, were not granted by the Constitution to the United States, but were reserved to the states respectively . . . [and] [t]he new States have the same rights, sovereignty, and jurisdiction over this subject as the original states"); *see also* U.S. v. Riverside Bayview Homes, Inc., 474 U.S. 121, 129, 139 (1985) (holding that the Corps definition of waters as including wetlands adjacent to navigable waters, even if not inundated or frequently flooded by the navigable water, was reasonable under the statutory authority); U.S. v. Robison, 505 F.3d 1208, 1222 (11th Cir. 2007) (explaining that under Justice Kennedy's concurrence in *Rapanos*, "a water can be considered 'navigable' under the CWA only if it possesses a 'significant nexus' to waters that 'are or were navigable in fact or that could reasonably be so made'"); North Carolina *ex rel*. N.C. Dep't of Admin. v. Alcoa Power Generating, Inc., 853 F.3d 140, 147 (4th Cir. 2017). The Fourth Circuit noted that the "Supreme Court long ago recognized that the title to a State's navigable waters and their riverbeds vested in the State as an aspect of sovereignty obtained when separating from the British Crown and becoming a State":

[W]hen the revolution took place, the people of each state became themselves sovereign' and that the rights that flowed from that sovereignty upon the subsequent ratification of the Constitution meant that States "hold the absolute right to all their navigable waters, and the soils under them, for their own common use, subject only to the rights since surrendered by the constitution [sic] to the general government."

Id. (quoting Martin v. Waddell's Lessee, 41 U.S. (16 Pet.) 367, 410 (1842)); Furie Petroleum, L.L.C. v. Swepi, LP, 285 So. 3d 91, 96 (La. App. 2d Cir. 2019) ("[A]cknowledging the absolute supremacy of the United States of America over the navigation on the navigable waters within the borders of the state, it is hereby declared that the ownership of the water itself and the beds thereof in the said navigable waters is vested in the state and that the state has the right to enter into possession of these waters when not interfering with the control of navigation exercised thereon by the United States of America.").

in the IIJA, any uncooperative state can still deny needed state permission for any FERC-instigated federal siting of transmission lines over or under state legal interests in land.

The next Part of this Article analyzes the key constitutional positions advanced by all sides in *Transource*, which will define the new separation of powers regarding power.

IV. ON THE RECORD: TRANSOURCE APPEAL

A. Transource and PJM Legal Positions

Applicant Transource argues that the Pennsylvania PUC rejection of the transmission project directly conflicts with the Federal Power Act, which grants FERC exclusive authority over regional transmission planning and wholesale electricity markets.[272] Proposed to mitigate grid congestion between Pennsylvania and Maryland, this line was developed as part of PJM's FERC-approved Regional Transmission Expansion Plan (RTEP), which employs a cost-benefit analysis to identify necessary upgrades to the grid.[273] By denying the project, Transource asserts that Pennsylvania's rejection conflicts with the Supremacy Clause, as it undermines federally established methodologies for addressing regional grid reliability and congestion.[274]

Central to Transource's argument is the Filed Rate Doctrine, under which FERC-approved tariffs have the force of law and preempt state actions that interfere with federal objectives.[275] FERC conceded that no precedent exist creating federal transmission siting authority without state approval, and no precedent is cited where a FERC or ISO tariff ever has conferred land-use approval absent state or local permits.[276] Transource argues that Pennsylvania's decision undermines the uniformity required in regional planning and imposes local considerations that conflict with the broader

272. *See* Brief of Appellee, *supra* note 185, at 26–29.

273. *Id.* at 14, 29–30.

274. *See id.* at 31–32. Case precedents such as *Piedmont Environmental Council v. FERC*, which held that FERC's jurisdiction does not extend to overruling state decisions on siting applications outside designated National Interest Electric Transmission (NIETCs), are interpreted by Transource as supporting their position that state objections are limited to narrowly defined contexts.

275. *See* PJM Brief, *supra* note 126, at 5; Transource Pa. LLC v. DeFrank (3d Cir. 2024) (No. 24-1045). Transource underscores that the Filed Rate Doctrine is not limited to rate-setting but encompasses all mechanisms essential to implementing FERC's regulatory goals. *Id.* By opposing the project's development, the Pennsylvania PUC's actions effectively undermine the federally approved rate structure by preventing cost recovery tied to the project's implementation. *Id.* Transource argues that this violates the Filed Rate Doctrine by creating a de facto barrier to FERC's jurisdictional authority. *Id.*

276. Transource Pa., LLC, v. DeFrank, 705 F. Supp. 3d 266, 287. (M.D. Pa. 2023).

benefits identified in PJM's planning process.[277] However, due to a significant policy shift post-2022, this potentially invokes scrutiny under the Major Question Doctrine.

Transource relies on precedents such as *Mississippi Power & Light Co. v. Mississippi ex rel. Moore*,[278] where the Supreme Court held that states could not contradict FERC-approved rates or policies, and *Hughes v. Talen Energy Marketing, LLC*,[279] which invalidated state measures that disrupted FERC-regulated wholesale power markets.[280] Transource further argues that the Supremacy Clause ensures that state laws and actions conflicting with federal authority are preempted, particularly in cases involving federally regulated energy markets.[281] Additionally, Transource asserts that FERC's cost-benefit analysis identified the project as necessary for addressing congestion costs and improving grid reliability, which the state PUC improperly dismissed by focusing solely on local ratepayer impacts.[282]

PJM, a FERC regulated non-profit member-controlled corporation, joined as amicus curiae, strongly supporting Transource's position that PJM's planning impliedly preempts any state decision, arguing that the Federal Power Act assigns FERC exclusive authority over transmission planning and the operation of wholesale electricity markets.[283] PJM asserted that the state PUC's denial of the project conflicts with FERC-approved RTEP methodologies to mitigate congestion and maintain grid reliability.[284] PJM leans heavily on the Supremacy Clause and related case law, that state energy commissions cannot override federal regulations or the decisions of federal agencies.[285]

PJM, while conceding that states retain authority over siting decisions, argued that the PUC's decision improperly substituted state-level considerations for federally established criteria.[286] PJM argues that states do not have the power to second-guess or veto the fundamental question of need for transmission projects designed to alleviate congestion in a regional

277. *See* Transource Pa. LLC v. DeFrank (3d Cir. 2024) (No. 24-1045).

278. 487 U.S. 354, 377 (1988) (establishing FERC's authority over wholesale electricity rates).

279. 578 U.S. 150, 166 (2016) (portraying Supreme Court rejection of a state action that interfered with FERC's regulation of wholesale electricity prices).

280. *See* PJM Brief, *supra* note 126, at 13–19.

281. *See id.*

282. *See id.*

283. *Id.* at 4.

284. *See id* at 14–17.

285. *See id* at 13–19 (arguing that under the Supremacy Clause, states do not have authority to second-guess FERC's authority over transmission practices and rates—including FERC's implementation of that authority through tariffs that mandate regional transmission planning and specify the criteria to be used for evaluating whether a project is needed to relieve system congestion.); New York v. FERC, 535 U.S. 1, 19–20 (2002); PPL Energyplus LLC v. Solomon, 766 F.3d 241, 253 (3d Cir. 2014).

286. *See* PJM Brief, *supra* note 126, at 13–19.

grid,[287] or address regional planning or grid reliability needs.[288] To reinforce this position, PJM relied on cases like *South Carolina Public Service Authority v. FERC*,[289] which affirmed FERC's authority to regulate regional planning and ensure compliance with federal standards.[290] Additionally, PJM defended its cost-benefit analysis to evaluate the economic and operational benefits of proposed transmission projects against Pennsylvania's consideration of other economic impacts, as a violation of federal law.[291]

B. Pennsylvania's Overlooked State's Legal Position

The Pennsylvania Attorney General's opening brief on appeal emphasized that "States have traditionally assumed all jurisdiction" over transmission line siting, and that Congress "has consented" to such broad state authority, contrary to the Federal Trial Court decision.[292] Pennsylvania asserted that "Congress has not disturbed the States' longstanding historical authority to approve or deny siting permits," and FERC's orders on transmission planning repeatedly acknowledge that states retain exclusively all permitting authority and discretion.[293] Pennsylvania notes that FERC concedes its own official order:

> [I]t is well-settled that [FERC] does not have authority over the siting and construction of electric transmission facilities. (Id. (quoting *PacifiCorp*, 72 FERC ¶ 61,087, 61,488 (1995)).) Instead, "[a]ll such matters should be resolved at the state and local level." *PacifiCorp*, 72 FERC at 61,488. Courts have found that "states have traditionally assumed all jurisdiction to approve or deny permits for the siting and construction of electric transmission facilities." *Piedmont Envtl. Council v. FERC*, 558 F.3d 304, 310 (4th Cir. 2009).[294]

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287. *Id* at 16 (citing Hughes v. Talen Energy Mkgt., 578 U.S. 150, 163 (2016)) (noting that the PAPUC impermissibly "invade[d] FERC's regulatory turf"); *see* Miss. Power & Light Co. v. Mississippi *ex rel*. Moore, 487 U.S. 354, 370–74 (1988); Nantahala Power and Light Co. v. Thornburg, 476 U.S. 953, 966–69 (1986).

288. *See* PJM Brief, *supra* note 126, at 16 (citing *Hughes*, 578 U.S. at 165).

289. S.C. Pub. Serv. Auth. v. FERC, 762 F.3d 41, 57–58 (D.C. Cir. 2014) (reinforcing that state commissions have authority over siting decisions and public need determinations). The Supreme Court denied certiorari in *South Carolina Public Service Authority v. FERC,* thereby the D.C. Circuit opinion is final law and remains as binding precedent within its jurisdiction, and persuasive authority elsewhere. *Id.* This denial reinforces the appellate court's affirmation of state commissions' authority over transmission line siting and public need determinations. *Id.*

290. *See* PJM Brief, *supra* note 126, at 7.

291. *See id.*

292. *See* AG Brief, *supra* note 170, at 24–25.

293. *Id.* at 31.

294. *See* Transource Pa., LLC, v. DeFrank, 705 F. Supp. 3d 266, 290. (M.D. Pa. 2023).

The lower Court sidestepped this precedent, noting "[d]efendants have provided no authority to suggest that public utility commissions are meant to exercise parallel functions as FERC."[295] There is no parallel authority; states have exclusive—rather than parallel or dual—transmission siting authority.[296] FERC has planning authority, without any ability to site new transmission unless in a NIETC under the IIJA which does not include the line at issue in the *Transource* matter, as well as rate authority over transmission operation of existing transmission lines.[297] The State notes that the federal PJM planning process does not provide the same level of public input, binding adjudicatory hearings, or cross-examination and discovery available under the Pennsylvania's PUC's procedure based on the evidence presented and of formal record.[298] Transmission siting is exclusively within state jurisdiction under Supreme Court and federal court precedent, the Federal Power Act, and most importantly the Tenth Amendment of the Constitution.[299]

FERC itself acknowledged in its Order 1000, akin to the D.C. Circuit in *South Carolina Public Service Authority*,[300] that FERC does not have authority over siting, permitting, land-use determinations, or construction decisions for electric transmission lines through a particular state. The Court held that a state can exercise pursuant to its own laws whether a line is necessary or needed by the public,[301] conceding that this project would allow Pennsylvania's cheaper electricity to flow to Maryland, Virginia, and the District of Columbia, causing Pennsylvania consumers to bear a significant cost increase.[302] Congress declared, as a matter of law, that federal regulation of transmission and sale was "to extend only to those matters which are not subject to regulation by the States."[303] For the last 90 years since this statute was enacted, all states retained their traditional authority over the siting of

295. *Id.* at 291.

296. *Id.* at 290.

297. *See supra* Part II.A.

298. *See* Brief of Amicus Curiae Pennsylvania Office of Consumer Advocate et al. in Support of Appellants at 10, Transource Pa., LLC v. DeFrank, No. 24-104 (3d Cir. 2024) [hereinafter PAOCA Brief] ("PJM is not an adjudicatory body where trial-type procedures are envisioned, much less utilized, in its decision-making. Indeed, RTOs were never conceived for such a purpose; they are primarily engineering organizations. If PJM is the arbiter of need and, as the District Court suggests, PJM's decision is determinative of whether the line should be built (JA46), only PJM members will be able to challenge PJM's determination. This is not what Congress intended: in the context of need determinations, outside of the FERC's limited jurisdiction over NIETCs, the only place where due process occurs in the transmission line siting arena is in state-level siting proceedings.").

299. *Id.*

300. S.C. Pub. Serv. Auth. v. FERC, 762 F.3d 41, 57–58 (D.C. Cir. 2014).

301. *See Transource Pa., LLC*, 705 F. Supp. 3d at 290; *see also* AG Brief, *supra* note 170, at 21.

302. *See* Appellants' Reply Brief at 15, Transource Pa., LLC v. DeFrank (3d Cir. Aug. 14, 2024) (No. 24-1045) [hereinafter AG Reply Brief].

303. 16 U.S.C. § 824(a).

transmission lines.[304] Nonetheless, the District Court held that the PUC's decision violated the *Pike* balancing test.[305]

Amici briefs submitted by the Pennsylvania Office of Consumer Advocate (PAOCA) emphasized the importance of preserving state authority over transmission siting.[306] PAOCA highlights that FERC's transmission planning role does not extend to siting or land-use decisions, which remain a cornerstone of state jurisdiction under the Federal Power Act.[307] PAOCA argued that any other interpretation would erode state sovereignty and disrupt the balance of authority intended by Congress's "carefully crafted division of roles that federal and state authorities have observed in authorizing the construction of interstate transmission lines."[308]

Pennsylvania underlines that state siting processes provide critical protections for landowners and local communities, ensuring that decisions account for specific local impacts, such as economic costs and land-use considerations, protections absent in the regional planning process managed by PJM.[309] The State argued PJM's regional planning lacks procedural safeguards, such as public involvement and rigorous evaluation of local impacts, which are fundamental to state siting processes.[310] They quote language from FERC Orders 1000 and 1000-A relied on by PJM, where FERC instead reinforces its own admission recognizing significant legal

304. *See* Piedmont Env't Council v. FERC, 558 F.3d 304, 310 (4th Cir. 2009); PacifiCorp., 69 FERC ¶ 61,099, 61,382 (1994). Jim Rossi, *The Trojan Horse of Electric Power Transmission Line Siting Authority*, 39 ENV'T. L. 1015, 1019 (2009) ("Historically, state and local regulators have focused on determining the 'need' for a power line before giving siting approval . . . .").

305. *See Transource Pa., LLC*, 705 F. Supp. 3d at 297; *see also* AG Brief, *supra* note 170, at 49–55.

306. AG Brief, *supra* note 170, at 31.

307. *See* AG Brief, *supra* note 170; see *also* PAOCA Brief, *supra* note 298, at 5–9. "On the question on who approves siting and construction of transmission facilities" PAOCA quoted FERC's Order 1000, stating:

We acknowledge that there is longstanding state authority over certain matters that are relevant to transmission planning and expansion, such as matters relevant to siting, permitting, and construction. However, nothing in this Final Rule involves an exercise of siting, permitting, and construction authority. The transmission planning and cost allocation requirements of this Final Rule . . . are associated with the processes used to identify and evaluate transmission system needs and potential solutions to those needs. In establishing these reforms, [FERC] is simply requiring that certain processes be instituted. This in no way involves an exercise of authority over those specific substantive matters traditionally reserved to the states . . . it is important to recognize that Order No. 1000's transmission planning reforms are concerned with process; these reforms are not intended to dictate substantive outcomes, such as what transmission facilities will be built and where. We recognize that such decisions are normally made at the state level.

Id. at 5–6. The PAOCA concludes that "[g]iven this background, to the extent the District Court's opinion implies that the transmission line siting should be the province of federal authorities, it must be rejected." *Id.* at 7.

308. *See* PAOCA Brief, *supra* note 298, at 17; *see also* AG Reply Brief, *supra* note 302, at 25.

309. *See* AG Brief, *supra* note 170, at 32–33.

310. *Id.*

distinction between federal planning authority and state siting jurisdiction.[311] Pennsylvania's rejection of the project is defended as a valid exercise of state authority, particularly given concerns over increased costs for Pennsylvania consumers and concerns about PJM's cost-benefit analysis.[312]

Furthermore, Pennsylvania contends that granting federal preemption over state siting decisions, as sought by Transource and supported by PJM, would upset the balance of federal and state authority established under the Federal Power Act to ensure states' ability to safeguard local interests and manage their land use effectively.[313] Pennsylvania cites *Piedmont Environmental Council v. FERC*; courts have consistently recognized the clear distinction between FERC's planning authority and states' exclusive control over siting decisions.[314]

V. PENDING UNRESOLVED SUPREME COURT CONSTITUTIONAL CONFLICTS

A. Affirmed

In late 2025, the Third Circuit Court of Appeals unanimously affirmed the District Court decision in *Transource*.[315] The Court neglected to decide as to whether there was a Dormant Commerce Clause violation. The opinion does not provide any authority for finding dual federal and state authority to site new transmission infrastructure, or for implied conflict preemption authority for federal siting or construction authority:

> We agree that the task of approving construction in a particular place falls to state authorities. This is clear from the FPA [Federal Power Act] . . . .FERC moreover has repeatedly reaffirmed that its regulations are not intended to intrude upon states' traditional siting authority. Even Transource agrees that "states retain authority over siting and construction." That is not the end of the inquiry, however. Implied conflict preemption occurs when states act in ways that impede the federal government from carrying out federal objectives, "even when [s]tates exercise their traditional authority."[316]

If federal plans impliedly preempt state authority here—where such state authority is statutorily allocated exclusively to states—then any plan of the

311. *Id.* at 5–6.

312. *See* AG Reply Brief, *supra* note 302, at 21–23; *see also* PAOCA Brief, *supra* note 298, at 11–15; *see generally* AG Brief, *supra* note 170, at 44–49.

313. *See* AG Reply Brief, *supra* note 302, at 7.

314. *See id.* at 13; *see also* PAOCA Brief, *supra* note 298, at 8–9.

315. *See generally* Transource Pa., LLC v. DeFrank, 156 F.4th 351 (3rd Cir. 2025).

316. *Id.* at 378 (footnotes omitted) (quoting Brief of Appellee, *supra* note 185, at 15).

president or a federal agency might potentially preempt anything state or local government has jurisdiction over. *Transource* is no ordinary pedestrian dispute. It invokes and challenges interpretation of two primary Articles of the U.S. Constitution that establish and maintain separation of powers concerning the most complex engineered technology supporting the U.S. economy—the electric transmission grid. The interconnection of renewable power resources is related to mitigation of climate change.

Transource is the 21st century legal "canary in the coal mine," signaling and determining who will now control U.S. power over power, amid accelerating constitutional tension between federal planning and state authority controlling the nation's electric infrastructure. At stake is more than new transmission lines for particular regions; this case redraws the Supreme Court's immovable "bright line" and separation of powers.[317] Transource and PJM initiated litigation, arguing that under the Supremacy Clause and the Filed Rate Doctrine, state actions that frustrate or obstruct any FERC-planned transmission projects anywhere, as a case of first-impression should be impliedly preempted.[318]

PJM is tasked with functioning as a neutral regulator, embroiled as amici supporting Transource. In response, Pennsylvania countered that the Federal Power Act expressly states that it preserves and does not interfere with exclusive Tenth Amendment authority over siting all transmission infrastructure, which FERC admits in its various orders.[319] Pennsylvania further asserts that Congress has never clearly granted FERC or PJM authority to unilaterally change this legal separation, violating the Major Questions Doctrine.[320]

This case constitutes an inflection point. Since federal regulation began in 1935, federal courts have never sanctioned any implied federal preemptive siting of transmission infrastructure when states do not grant permits for land use. This consistent lack of federal authority included the proposed but never state co-approved Palo Verde-Devers No. 2 line to serve California (opposed in Arizona), the Trans-Allegheny Line to serve the Mid-Atlantic Region (opposed in Pennsylvania, Virginia, and West Virginia), as well as opposition to lines by and through New Hampshire to serve adjacent New England states.[321] Challenges from states and other interested stakeholders will continue,[322] as the DoE proceeds designating 10 new proposed high-

317. *See* Federal Power Act, Pub. L. No. 66-280, ch. 285, 41 Stat. 1063 (1920) (codified as amended at 16 U.S.C. §§ 791–828).

318. *See supra* Part IV.A.

319. *See supra* Part IV.A.

320. *See generally* West Virginia v. EPA, 142 S. Ct. 2587 (2022).

321. *See supra* notes 249–252 (states that contested new transmission facilities in the last two decades).

322. *See* Piedmont Env't Council v. FERC, 558 F.3d 304 (4th Cir. 2009).

priority NIETC transmission corridors to site lines.[323]

The District[324] and Circuit Court[325] in *Transource* declared that the proposed new Pennsylvania transmission line does not qualify for and is not entitled to the new IIJA Section 216 NIETC preemption. Even if subject to this exception, without prior state permission, state-owned land cannot be taken by federal eminent domain for transmission infrastructure upgrades or use.[326] The Supreme Court will need to decide whether federal agencies or private non-profit ISO entities can alter its almost century-old *"*bright line."[327] The Court has shown no presumption in favor of implied federal preemption without congressional agreement this century. In *Murr v. Wisconsin*, the Supreme Court deferred to local judgment on the enforcement and interpretation of local zoning laws regulating new construction on, or use of, land.[328] The Supreme Court held that states retain "traditional and primary power over land and water use."[329]

B. Implied Federal Supremacy

What has altered is a much different federal energy and utility policy rapidly implemented through executive branch actions and orders. Deploying discretion, President Trump rather than facilitating more transmission infrastructure to support renewable energy, as the Biden Administration did through the Infrastructure Investment & Jobs Act[330] and the Inflation Reduction Act,[331] terminated such support the One Big Beautiful Bill Act.[332] President Trump stated "We're not going to do the wind thing," during his

323. *See Biden-Harris Administration Announces Initial List of High-Priority Areas for Accelerated Transmission Expansion*, U.S. DEP'T OF ENERGY (May 8, 2024), https://www.energy.gov/articles/biden-harris-administration-announces-initial-list-high-priority-areas-accelerated.

324. Transource Pa., LLC v. DeFrank*,* 705 F. Supp. 3d 266, 289–90 (M.D. Pa. 2023).

325. Transource Pa., LLC v. DeFrank, 156 F.4th 378–79 (3rd Cir. 2025).

326. *See supra* notes 266–267.

327. *See* Fed. Power Comm'n v. S. Cal. Edison Co., 376 U.S. 205, 215–16 (1964).

328. *See* Murr v. Wisconsin, 582 U.S. 383, 397–400 (2017).

329. *See* Solid Waste Agency v. U.S. Army Corps of Eng'rs, 531 U.S. 159, 174 (2001) (noting that "the States' traditional and primary power over land and water use" raises "federalism questions").

330. *See* Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, § 40105, 135 Stat. 429 (2021) (codified at various noncontiguous sections of the U.S. Code).

331. *See* Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818 (2022) (codified at various noncontiguous sections of the U.S. Code).

332. *See* An Act To Provide for Reconciliation Pursuant to Title II of H. Con. Res. 14, Pub. L. No. 119-21, 139 Stat. 72 (2025) (rolling back renewable energy tax credits); Exec. Order No. 14,315, 90 Fed. Reg. 130 (July 7, 2025); *see also The "One Big Beautiful Bill" Act – Navigating the New Energy Landscape*, SIDLEY (July 15, 2025), https//www.sidley.com/en/insights/newsupdates/2025/07/the-one-big-beautiful-bill-act-navigating-the-new-energy-landscape.

inaugural parade, "[b]ig ugly windmills, they ruin your neighborhood."[333] Notwithstanding Supreme Court decisions, the Third Circuit created new implied federal preemption of other statutory and constitutional law in *Transource*, notwithstanding express contrary statutory provisions.

In April 2025, FERC Chairman Christie noted key stakeholders' failure to honor prior admitted requirements directly at issue in the pending *Transource* case:

> "[A]s Willy Loman's wife said in Death of a Salesman, 'attention must be paid.'" . . . Virginia (AEP-VA) also sought and received approval from the Virginia Commission to join PJM. As with Dominion's order of approval, AEP's approval order incorporated a Stipulation that included" that state law still required: " . . . a certificate of public convenience and necessity prior to commencing to construct an electric generation facility or transmission facilities.
> AEP is one of the owners of Transource." The position asserted by Transource is ". . . vigorously opposed by all the states as expressed by the National Association of Regulatory State Commissioners (NARUC)."[334]

The current administration also is attempting to reduce any federal role and defer more to state authority regarding energy planning and siting.[335] President Trump directed all agencies to review and repeal "without notice and comment, where doing so is consistent with the 'good cause' exception in the Administrative Procedure Act . . . when that process would be 'impracticable, unnecessary, or contrary to the public interest,'" and any regulations that now appear unconstitutional or exceed statutory authority or

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333. *See* Brad Plumer, *U.S. Wind Power Faces Huge Challenges After Trump Orders a Crackdown*, N.Y. TIMES (Jan. 21, 2025), https://www.nytimes.com/2025/01/21/climate/wind-power-executive-order-trump.htm; *see also* Sam Meredith, *Renewable Giants Shrug Off Trump's Anti-Wind Policies: 'Electrification Is Absolutely Unstoppable'*, CNBC (Jan. 22, 2025), https://www.cnbc.com/2025/01/22/renewable-energy-giants-shrug-off-trumps-anti-wind-policies.html (explaining that President Trump temporarily suspended new or renewed leases for offshore and onshore wind projects and halted the leasing of wind power projects on the outer continental shelf).

334. *See* E-11: Chairman Christie's Concurrence in PJM/Transource, ER25-612, (FERC Apr. 17, 2025), https://www.ferc.gov/news-events/news/e-11-chairman-christies-concurrence-pjmtransource-er25-612 (statement of Chairman Christie on Docket No. ER25-612-000).

335. *See* Unleashing American Energy, Exec. Order No. 14,154, 90 Fed. Reg. 8353 (Jan. 29, 2025) (requiring deregulation of actions burdening energy resource development); Temporary Withdrawal of All Areas on the Outer Continental Shelf From Offshore Wind Leasing and Review of the Federal Government's Leasing and Permitting Practices for Wind Projects, 90 Fed. Reg. 8363 (Jan. 20, 2025) (ceasing and ordering review of federal wind leasing and permitting).

intrude on state jurisdiction to implement recent Supreme Court decisions.[336] The first of those Supreme Court decisions in President Trump's order are two Supreme Court decisions on energy discussed in this Article: *Loper Bright Enterprises v. Raimondo*[337] and *West Virginia v. EPA*.[338] The Trump Administration also issued an executive order for the Department of Justice to investigate states that are overreaching their authority regarding the interstate movement of all types of energy.[339] These executive orders collectively refocus federal energy policy regarding upgraded electric transmission infrastructure, which is a prerequisite to successfully siting new large-scale electric generation to serve an unprecedented current increase in demand for U.S. power.[340]

Land-use control in the American legal system is predominately a local, rather than federal, exercise of legal jurisdiction.[341] Local land-use regulation enjoys broad court deference and is overturned by the judiciary only if there is no rational purpose supporting enactment of the local or state ordinance.[342] In the last three years, there is now a Major Questions Doctrine further restricting Executive Branch action and arising from a case regarding regulation of electric power and climate issues.[343]

336. Memorandum on Directing the Repeal of Unlawful Regulations, 2009 DAILY COMP. PRES. DOC. 00466 (Apr. 9, 2025).

337. 144 S. Ct. 2244 (2024).

338. 142 S Ct. 2587 (2022); *see supra* Part II.

339. *See* Protecting American Energy from State Overreach, Exec. Order No. 14,260, 90 Fed. Reg. 15513 (Apr. 14, 2025).

340. *See supra* Part II.C.1.

341. *See* Ecogen, LLC v. Town of Italy, 438 F. Supp. 2d 149, 157 (W.D.N.Y. 2006) (quoting Greene v. Town of Blooming Grove, 879 F.2d 1061, 1063 (2d Cir. 1989)); *see also* John R. Nolan, *Historical Overview of the American Land Use System: A Diagnostic Approach to Evaluating Governmental Land Use Control*, 23 PACE ENV'T L. REV. 821, 821–22 (2006).

342. *See e.g.*, *Ecogen LLC*, 438 F. Supp. 2d at 156 ("In order to prevail on its substantive due process claim, Ecogen must establish that the Moratorium, at least insofar as it prohibits Ecogen's construction of a substation, bears no rational relationship to any legitimate governmental purpose.").

343. West Virginia v. EPA, 142 S. Ct. 2587 (2022).

COMPARISON OF U.S. GMO REGULATION AND E.U. GMO REGULATION: WHAT ARE THE POSSIBLE EFFECTS OF THE FEBRUARY 2024 E.U. VOTE TO DEREGULATE GMOS ON THE ENVIRONMENT?

Ryan Kenneally[*] & Sarah O'Farrell[**]

ABSTRACT

The United States and the European Union have developed drastically different approaches to regulating genetically modified organisms due to variance in public attitude and policy priorities. However, over time, the regulatory systems of the United States and the European Union with respect to genetically modified organisms have adopted similar regulatory elements and thus, have grown in alignment. This Article outlines the two regulatory systems, explains the scientific underpinnings of genetically modified organisms, and ultimately argues that the United States and European Union systems are slowly becoming more alike than previously conceptualized. Furthermore, this Article argues that the February 2024 European Union proposal to deregulate certain genetically modified organisms is another major instance of increasing alignment.

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I. INTRODUCTION

Climate change is one of the most pressing issues our world faces today.[1] As a result of human activity, Earth's average temperature rose nearly 1ºC since 1850,[2] and is projected to continue rising in temperature. Even if greenhouse gas (GHG) emissions halted today, the long-term effects of already-emitted GHGs will be felt by future generations.[3] These effects include heatwaves, droughts, floods, catastrophic weather events, sea level rise, and more—many of which are already occurring.[4] Our society needs solutions both to limit GHG emissions and adapt to the effects of climate change. Scientists propose genetically modified organisms (GMOs) as a tool to aid in the mitigation and adaptation of climate change.[5] Specifically, some scientists and public policy experts have suggested that GMOs will help support agricultural systems as conditions worsen due to climate change.[6]

The usage of GMOs as a tool to fortify agricultural systems has not been accepted universally. However, "[b]etween 1996 and 2002, the number of acres planted with [genetically engineered] crops worldwide increased over thirty-four times, from 4.25 to 146.8 million acres," showing that GMOs are widely used in our modern agricultural system.[7] The United States (U.S.) has embraced GMOs and developed a framework to regulate them, which largely allows GMO crops to be grown and consumed.[8] In fact, as of April 2025, over 90% of corn, cotton, and soy grown in the U.S. came from genetically

1. G.A. Res. 77/276, at 1(Mar. 29, 2023).
2. IPCC, GLOBAL WARMING OF 1.5 °C 36 (2018).
3. *Id*. at 8.
4. *Id*. at 13.
5. Nicholas G. Karavolias et al., *Application of Gene Editing for Climate Change in Agriculture*, 5 FRONTIERS SUSTAINABLE FOOD SYS. 685801, Sept. 2021, at 1, 2.
6. Emma Kovak et al., *Genetically Modified Crops Support Climate Change Mitigation*, 27 TRENDS IN PLANT SCI. 627, 629 (2022).
7. Maria Lee-Muramoto, *Reforming The "Uncoordinated" Framework for Regulation of Biotechnology*, 17 DRAKE J. AGRIC. L. 311, 324 (2012).
8. Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23302, 23302–03 (June 26, 1986).

engineered seed stock.[9] In contrast, the European Union (E.U.) regulates GMOs much more strictly and errs on the side of disallowing GMO products.[10] As of 2015, the U.S. had approved over 100 GMO crops with a single engineered trait, whereas the E.U. had approved less than 40.[11] Similarly, in 2013, where the U.S. cultivated over 70 million hectares of GMO crops, the E.U. collectively cultivated less than 0.1 million hectares.[12]

This divergence in regulatory structures is widely discussed in the literature.[13] The 2003 World Trade Organization (WTO) dispute between the U.S. and E.U. regarding the E.U.'s moratorium on approving new GMO foods highlights the separate regulatory approaches.[14] The U.S., Canada, and Argentina challenged the E.U.'s ban on procedural grounds; however, it was clear that the U.S. pushed back on the E.U. regulations based on, at least partially, the U.S.'s pro-GMO stance and desire to increase agricultural exports.[15] Ultimately, the WTO panel determined that the E.U.'s moratorium violated its trade agreements.[16] Yet, the WTO still permitted the E.U. to enforce strict policies against GMO usage, many of which continue to be in effect today.[17]

Despite historical differences, this Article argues that the U.S. and E.U. GMO regulatory systems are becoming more similar over time. For example, in 2016, the U.S. enacted a GMO labeling law,[18] a practice the E.U. has followed since 2003.[19] Moreover, in February 2024, the E.U. Parliament voted to create two categories of GMO crops and to deregulate one entire

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9. *Adoption of Genetically Engineered Crops in the United States*, U.S. DEP'T OF AGRIC.: ECON. RSCH. SERV., https://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-united-states/recent-trends-in-ge-adoption (last updated Jan. 1, 2025).

10. M.J. Peterson, *The EU-US Dispute over Regulation of Genetically Modified Organisms, Plants, Feeds, and Foods*, INT'L DIMENSIONS ETHICS EDUC. SCI. & ENG'G, June 2010, at 1, 4.

11. Jessica Lau, *Same Science, Different Policies: Regulating Genetically Modified Foods in the US and Europe*, HARV. UNIV.: SCI. IN THE NEWS (Aug. 9, 2015), https://sites.harvard.edu/sitn/2015/08/09/same-science-different-policies/.

12. *Id.*

13. *See, e.g.,* Lee Ann Jackson & Kym Anderson, *What's Behind GM Food Trade Disputes*? 4 WORLD TRADE REV. 203, 203 (2005).

14. Peterson, *supra* note 10, at 4.

15. MARK A. POLLACK & GREGORY C. SHAFFER, WHEN COOPERATION FAILS: THE INTERNATIONAL LAW AND POLITICS OF GENETICALLY MODIFIED FOODS 182–83 (2009).

16. Peterson, *supra* note 10, at 4.

17. *Id.*

18. National Bioengineered Food Disclosure Standard, Pub. L. No. 114-216, 130 Stat. 833 (2016).

19. Chantal Bruetschy, *The EU Regulatory Framework on Genetically Modified Organisms (GMOs*), 28 TRANSGENIC RES. 169, 170 (2019); Regulation 1829/2003, of the European Parliament and of the Council of 22 Sept. 2003 on Genetically Modified Food and Feed, O.J. (L 268) 1.

category.[20] If implemented, this deregulation would increase the amount of GMO crops grown and available for purchase in the E.U., and make the agricultural system more similar to that of the U.S.[21] This Article seeks to review the GMO regulatory systems of the U.S. and E.U., and analyze the possible impacts of the February 2024 E.U. vote to understand if the deregulation is an instance of convergence.

Part II provides background on scientific information of GMOs, including an explanation of the benefits and drawbacks of GMOs in the environmental realm.[22] Part III describes the emergence of the U.S. GMO regulatory framework, and explores how the framework exists today. Part IV explores how GMOs have historically been regulated in the E.U. and how the February 2024 E.U. Parliament vote would change the regulatory system. Finally, Part V analyzes the E.U. vote using the U.S. as a comparison case to understand if the deregulation would produce more similar regulatory systems.

II. SCIENTIFIC BACKGROUND ON GMOS

Humans have been altering organisms and ecosystems for tens of thousands of years prior to the invention of modern genetic engineering techniques.[23] The expansion of early *Homo sapiens* drove extinctions of ancient megafauna and caused genetic shifts in populations that were hunted and gathered, profoundly changing ecosystems.[24] With the advent of agriculture in at least 28 distinct regions of the globe,[25] 10,000–12,000 years ago, plants and animals began to change through the process of artificial selection.[26] Early farmers, despite having no knowledge of DNA or the laws of Mendelian inheritance,[27] genetically altered species via artificial selection

20. European Parliament Press Release, New Genomic Techniques: MEPs Want to Ban All Patents for NGT plants (Jan. 24, 2024).

21. *See id.*

22. This Article will focus only on the environmental impacts of GMOs; however, GMOs have many diverse impacts, including on consumer health, animal health, and farmworker rights.

23. Mercer Martin, *A New Neocolonial Threat: The Harmful Impact of European GMO Policy on African Food Security*, 26 DRAKE J. AGRIC. L. 365, 368 (2021).

24. Christopher Sandom et al., *Global Late Quaternary Megafauna Extinctions Linked to Humans, Not Climate Change*, 281 PROC. R. SOC. B., July 2014, at 1, 1.

25. Rachel Meyer et al., *Patterns and Processes in Crop Domestication: An Historical Review and Quantitative Analysis of 203 Global Food Crops*, 196 NEW PHYTOLOGIST 29, 42–43 (2012).

26. Michael B. Kantar et al., *The Genetics and Genomics of Plant Domestication*, 67 BIOSCIENCE 971, 973 (2017).

27. Mendelian inheritance describes how traits are inherited by offspring in discrete units called genes or alleles, following predictable patterns and rules, based on the observations of Gregor Mendel. Strome et al., *Clarifying Mendelian vs Non-Mendelian Inheritance,* 227 GENETICS, May 2024, at 1, 3.

by propagating organisms with desirable traits such as larger fruit or seed sizes, better flavor, and reduced toxicity.[28] In the process, they drove dramatic biological changes in these organisms such as altered chromosome counts, reproductive cycles, structural features, and specialized metabolite composition.[29] Through artificial selection, humans have produced the crops and livestock that exist today,[30] and many such as "corn, rice, potatoes, milk cows, and pigs . . . would be unrecognizable to our ancestors wGbegan and continued the artificial selection process millennia, centuries, or even decades before us."[31]

Early farmers also practiced cross-breeding and hybridization, in which they mated similar species with desirable traits. In this manner, an entirely new organism could be created with the desirable characteristics of both parent species. However, this process could take decades and was not always successful.[32] In the 1940s, scientists realized they did not need to rely upon the slow process of natural mutation that is a cornerstone of Darwinian evolution.[33] Instead, scientists began using mutagens, radiation or chemical agents that induce DNA mutation, to rapidly generate numerous new mutations, ranging from single nucleotide polymorphisms (SNPs), a change of just one G, C, A, or T DNA base pair, to large-scale rearrangements of the genome.[34] Though most of these mutations were not desirable, those that were could be cross-bred into crop lines. Over 3,400 crop varieties have been produced in this manner to date.[35] Notably, crops produced using some types of mutagens are not excluded from organic labeling in many countries, and are allowed under the United States Department of Agriculture's (USDA's) National Organic Program and are not regulated as GMOs in the EU.[36]

In the 1980s, crop geneticists began to apply their new understanding of genetics and molecular biology techniques to greatly accelerate the process of traditional breeding. They used newly developed methods to screen

28. *See* Meyer et al., *supra* note 25, at 31.

29. *See id*.

30. Martin, *supra* note 23, at 368.

31. *Id.*

32. *Id.*

33. Liqiu Ma et al., *From Classical Radiation to Modern Radiation: Past, Present, and Future of Radiation Mutation Breeding*, 9 FRONT. PUB. HEALTH, Dec. 2021 at 1,3.

34. *Id.*

35. *Mutant Variety Database*, INT'L ATOMIC ENERGY AGENCY, https://nucleus.iaea.org/sites/mvd/SitePages/Home.aspx (last visited Dec. 2, 2025).

36. Nat'l Organic Standards Bd., Formal Recommendation of Excluded Methods Determination to The National Organic Program (April 28, 2022); *see* TARJA LAANINEN, EUR. PARL. RSCH. SERV., NEW PLANT-BREEDING TECHNIQUES: APPLICABILITY OF EU GMO RULES, at 2 (2019).

organisms for desirable traits earlier in their development, reducing the workload, space requirements, and cost of traditional breeding in a process called "Marker-Assisted Breeding" (MAB).[37] This practice is now widespread in both conventional and organic agriculture around the world.[38]

While scientists created the first genetically modified organism in 1973 by moving DNA from one bacterium to another, it was not until the 1990s that increased scientific understanding and improved techniques allowed scientists to more precisely and efficiently modify the traits of organisms.[39] The 2012 development of CRISPR, a landmark gene editing technology that won the Nobel Prize in 2020, greatly enhanced the speed and accuracy of genetic modification.[40] A genetically modified organism (GMO) is any non-human organism (animal, plant, or microorganism) in which DNA has been modified by scientists or bioengineers.[41] Some of these modifications could not have occurred naturally or as a result of traditional mating techniques; for example, if scientists inserted a gene from one organism into the genome of another species when the two would not have naturally bred. However, other GMOs contain subtle modifications to the organism's genome—such as substitutions, insertions, or deletions of only one DNA base among billions—resulting in an organism that is otherwise identical to naturally occurring species. These subtle mutations frequently occur naturally as well,[42] meaning that many GMOs can be effectively impossible to distinguish from naturally occurring organisms when sequenced.[43]

Consumers, media, and regulators often discuss GMOs as if all GMOs are the same, but GMOs can vary drastically from one another in their construction methods, intended purpose, and potential impacts on environmental and human health. To better understand the benefits and adverse impacts of GMOs, it is important to first understand the different types of GMOs.

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37. Giora Ben-Ari & Uri Lavi, *Marker-Assisted Selection in Plant Breeding*, *in* PLANT BIOTECHNOLOGY AND AGRICULTURE 163, 164 (Arie Altman & Paul Michael Hasegawa eds., 2012).

38. *Id.* at 164.

39. Karavolias et al., *supra* note 5.

40. Gavin J. Knott & Jennifer A. Daudna, *CRISPR-Cas Guides the Future of Genetic Engineering*, 361 SCI. 866, 866 (2018).

41. *Genetically Modified Organisms*, NAT'L GEOGRAPHIC: EDUC. https://education.nationalgeographic.org/resource/genetically-modified-organisms/ (last visited Dec. 2, 2025).

42. René Custers et al., *Genetic Alterations That Do or Do Not Occur Naturally; Consequences for Genome Edited Organisms in the Context of Regulatory Oversight,* 6 FRONTIERS BIOENGINEERING AND BIOTECHNOLOGY, Jan. 2019, at 1, 3–5 (2019).

43. *Id*.

A. Categories of GMOs

GMOs are created for a variety of purposes and can be placed into categories based on the purpose of the modification. Some modifications address agricultural issues—where scientists edit DNA to address changing climate concerns, increase food security, or adjust crops to perform better in different landscapes. These modifications include: increasing stress tolerance; managing pests and pathogens; increasing yield; and enhancing the nutritional value of GMO crops and foods.[44] However, other modifications are made to create economic benefits or be novelty creations. Each category of GMO will be briefly described and discussed below.

In many instances, GMO crops are created to increase abiotic stress tolerance.[45] Abiotic stresses, such as drought, salinity, or flooding, pose severe threats to agriculture and are expected to increase in severity due to climate change.[46] Gene editing has proved to be an effective tool in increasing crop tolerance to abiotic stress.[47] For example, rice has been engineered to be more tolerant of drought and high temperature conditions,[48] and alfalfa has been modified to be more resistant to high salinity soils.[49]

Scientists have also created GMOs in order to boost pathogen and pest resistance among plant and animal populations.[50] For instance, cucumbers have been successfully modified to resist viral infections.[51] Similarly, CRISPR technology has been used to increase the resistance of citrus fruits to the devastating citrus canker disease.[52] GMOs can similarly be designed to be pest resistant, which may reduce pesticide use on modified crops. Most notably, nearly 40% of all GMO crops have been engineered to produce a

44. Karavolias et al., *supra* note 5, at 3–15.

45. *Id*. at 3–6.

46. *Id*.

47. *Id*.

48. *Id*. at 3; R.S. Caine et al., *Rice with Reduced Stomatal Density Conserves Water and Has Improved Drought Tolerance Under Future Climate Conditions*, 221 NEW PHYTOLOGIST 371, 371 (2019).

49. Ai-Ke Bao et al., *Overexpression of the Arabidopsis h+-PPase Enhanced Resistance to Salt and Drought Stress in Transgenic Alfalfa (Medicago sativa L.)*, 176 PLANT SCI. 232, 232 (2009).

50. Karavolias et al., *supra* note 5, at 6.

51. J. Chandrasekaran et al., *Development of Broad Virus Resistance in Non-Transgenic Cucumber Using CRISPR/Cas9 Technology*, 17 MOLECULAR. PLANT PATHOLOGY 1140, 1140 (2016).

52. Karavolias et al., *supra* note 5, at 10; Hongge Jia et al., *Modification of the PthA4 Effector Binding Elements in Type I CsLOB1 Promoter Using Cas9/sgRNA to Produce Transgenic Duncan Grapefruit Alleviating XccΔpthA4: dCsLOB1.3 Infection*, 14 PLANT BIOTECHNOLOGY J. 1291, 1292 (2016).

bacterial protein that makes them resistant to insect pests.[53]

Some GMOs have been edited to increase yields.[54] As climate change alters landscapes, many agricultural lands are projected to decrease in productivity while the global population rises.[55] To ensure food security, humankind will need to increase yield-per-acre on land already cultivated or cultivate additional lands, which will decrease biodiversity, threaten protected habitats, and harm endangered species. Scientists have edited wheat plants to increase yield without increasing land use by producing wheat plants with "significantly elevated grain weights and size."[56] On average, GMO crops have yields 21% greater than non-GMO crops.[57]

A final broad category of GMOs created to address agricultural problems is the crops and foods edited to enhance nutrition.[58] In 2019, 690 million people worldwide suffered from undernourishment or insufficient consumption of calories.[59] Thus, in addition to modifications to increase yield and increase disease resistance, scientists are also creating GMOs specifically to "increase desirable nutritional metabolites, reduce anti-nutrients, and alter macronutrients" to benefit human health.[60] For example, scientists have modified tomatoes to significantly increase the amount of lycopene which has antioxidant properties linked to various beneficial health effects,[61] and have also engineered cassava to produce 99% less toxic cyanide than unmodified varieties.[62]

Organisms have also been edited for agroeconomic purposes. For instance, Arctic Apples are genetically modified to resist browning, which enhances its marketing appeal.[63] This type of modification can also help reduce food waste as products are less likely to be thrown out for possessing

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53. Michael S. Koch et al., *The Food and Environmental Safety of Bt Crops*, 6 FRONT. PLANT SCI., Apr. 2015, at 1, 2.

54. Karavolias et al., *supra* note 5, at 12.

55. *Id.* at 11.

56. *Id*. at 12.

57. Wilhelm Klümper & Matin Qaim, *A Meta-Analysis of the Impacts of Genetically Modified Crops*, 9 PLOS ONE, Nov. 2014, at 1, 4.

58. *Id*.

59. KLAUS VON GREBMER ET AL., 2020 GLOBAL HUNGER INDEX: ONE DECADE TO ZERO HUNGER LINKING HEALTH AND SUSTAINABLE FOOD SYSTEMS 3 (2020).

60. Karavolias et al., *supra* note 5, at 14.

61. Xindi Li et al., *Lycopene is Enriched in Tomato Fruit by CRISPR/Cas9-Mediated Multiplex Genome Editing*, 9 FRONT. PLANT SCI., Apr. 2018, at 1, 10.

62. Kirsten Jørgensen et al., *Cassava Plants with a Depleted Cyanogenic Glucoside Content in Leaves and Tubers: Distribution of Cyanogenic Glucosides, Their Site of Synthesis and Transport, and Blockage of the Biosynthesis by RNA Interference Technology*, 13 PLANT PHYSIOLOGY 363, 364 (2005).

63. Nash Dunn, *What to Know About GMOs,* GENETIC ENG'G & SOC'Y CTR. (Sept. 29, 2021), https://ges.research.ncsu.edu/2021/09/what-to-know-about-gmos/.

undesirable characteristics.[64] Crop geneticists have engineered many crops to be resistant to herbicides. This modification allows farmers to more freely use herbicides to reduce weeds without harming their crops, greatly reducing costs of production.[65]

Additionally, some companies have created novelty GMOs, such as the GloFish, a "bright red fluorescent zebra fish that contains inserted genetic constructs from a sea coral, which cause the fish to glow under certain kinds of light."[66] GMOs created for novelty purposes are not typically found in agricultural products.[67]

B. Environmental Benefits of GMOs

Proponents of GMOs assert that gene editing techniques can be a tool to bolster our agricultural systems in the face of climate change.[68] Shifting weather patterns and increased global temperatures have reduced agricultural output, and one study estimates that one in six species could go extinct as the result of climate change.[69] Nearly half of the world's habitable land is used for agriculture,[70] and expanding agricultural lands are the leading cause of global deforestation.[71] Altered agricultural practices thus represent a large opportunity for addressing climate change. GMO advocates highlight the benefits of GMO usage for sustainability—such as increasing yields or losing fewer crops to disease—and the beneficial economic results associated with more consistent production of food.[72] In addition to these positive consequences, GMO crops can also have specific positive impacts on the environment.

For example, GMO crops can help prevent the conversion of additional land to agriculture by increasing yield and bolstering resistance to disease,

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64. Kate Hall, *How GMOs Help Us Reduce Food Waste & Its Environmental Impact,* FORBES (Nov. 18, 2016), https://www.forbes.com/sites/gmoanswers/2016/11/18/gmos-help-reduce-food-waste/#6e50c8676546.

65. Leonard P. Gianessi, *Economic Impacts of Glyphosate Resistant Crops*, 64 PEST MGMT. SCI. 346, 346 (2008).

66. Int'l Ctr. for Tech. Assessment v. Thompson, 421 F. Supp. 2d 1, 4 (D.D.C. 2006).

67. *See, e.g.*, *id.* at 5.

68. Karavolias et al., *supra* note 5.

69. *Id.*; Mark C. Urban, *Accelerating Extinction Risk from Climate Change*, 348 SCI. 571, 571 (2015).

70. Erle C. Ellis et al., *Anthropogenic Transformation of the Biomes, 1700-2000*, 19 GLOB. ECOLOGY AND BIOGEOGRAPHY 589, 603 (2010).

71. Philip G. Curtis et al., *Classifying Drivers of Global Forest Loss*, 361 SCI. 1108, 1109 (2018). Agriculture also accounts for 25–30% of global greenhouse gas emissions.

72. Melvin Oliver, *Why We Need GMO Crops in Agriculture*, 6 MO. MED. 492, 499 (2014).

which can help preserve natural ecosystems and prevent increasing greenhouse gas (GHG) emissions from the agricultural sector.[73] Many studies indicate that as global populations are projected to increase, we will need to correspondingly produce more food.[74] According to the U.N. Food and Agriculture Organization, we will need to produce 60% more food by 2050 to meet global demand.[75] Rather than dedicating additional land to agricultural operations, GMO advocates say current farms can be made more efficient by using GMO crops.[76] In this manner, less land needs to be converted to agricultural use, which can help protect biodiversity, preserve protected habitats, and prevent harm to endangered species. Furthermore, natural ecosystems such as forests act as large carbon sinks, and converting such ecosystems into agricultural land would result in a large release of carbon dioxide into the atmosphere.[77] The agricultural sector currently accounts for 26% of GHG emissions globally, and by increasing the land dedicated to agricultural production, we would certainly increase the GHG emissions emanating from the agricultural sector by expanding operations.[78] GMOs can also be engineered to require fewer resources. For example, scientists have engineered multiple varieties of GMO cotton that require less water than their non-GMO counterparts.[79]

Additionally, with the creation of GMO crops that exhibit pesticidal properties, less pesticides need to be used for plant cultivation.[80] Pesticides can cause wide-ranging negative impacts on ecosystems and human health, given that pesticides are designed to be "inherently toxic."[81] Pesticides can also leach into soils and waterways, causing environmental harm outside the

73. *Id*. at 502.

74. Karavolias et al., *supra* note 5, at 11.

75. Jose Graziano Da Silva, *Feeding the World Sustainably*, 49 UN CHRON. 15, 15 (2012).

76. Joan Conrow, *New Study: GMO Crops Reduce Pesticide Use, Greenhouse Gas Emissions*, ALL. FOR SCI. (July 27, 2020), https://allianceforscience.org/blog/2020/07/new-study-gmo-crops-reduce-pesticide-use-greenhouse-gas-emissions/.

77. Marcela Angel, *Protecting and Enhancing Carbon Sinks: Natural Climate and Community Solutions*, MIT: CLIMATE PORTAL (May 4, 2021), https://climate.mit.edu/posts/protecting-and-enhancing-natural-carbon-sinks-natural-climate-and-community-solutions.

78. Hannah Ritchie, *Food Production Is Responsible for One-Quarter of the World's Greenhouse Gas Emissions*, OUR WORLD IN DATA (Nov. 6, 2019), https://ourworldindata.org/food-ghg-emissions.

79. Babar Hussain & Sultan Mahmood, *Development of Transgenic Cotton for Combating Biotic and Abiotic Stresses*, *in* COTTON PRODUCTION AND USES: AGRONOMY, CROP PROTECTION, AND POSTHARVEST TECHNOLOGIES 527, 529 (Shakeel Ahmad & Mirza Hassanuzzaman eds., 2020).

80. *See* Karavolias et al., *supra* note 5.

81. UNEP, ENVIRONMENTAL AND HEALTH IMPACTS OF PESTICIDES AND FERTILIZERS, AND WAYS TO MINIMIZE THEM, at iv (John Smith ed., 2022).

area of application.[82] Pesticidal GMOs mitigate some of these negative externalities because insecticidal compounds are within the plant itself and primarily impact insects eating plant tissue. Thus, pesticidal GMOs minimize non-target species damage compared to spray-application of conventional pesticides.[83] Overall, GMO crops need 37% less pesticide application than non-GMO varieties to successfully manage pests.[84]

C. Environmental Drawbacks of GMOs

Opponents of GMOs have noted a variety of environmental concerns with the development and proliferation of GMOs in our agricultural and food systems.[85] However, the overwhelming consensus among scientists is that GMO foods are just as safe for people and the environment as traditional crops.[86] Scientists remark that the main problem with artificial genetically modified organisms is the relative lack of information available in the public domain, which leaves the public apprehensive and skeptical about the consequences of GMOs.[87] While some of the concerns may be overblown, others present risks that scientists and policymakers need to account for and acknowledge. For example, GMOs can pose real threats to ecosystems through transgene escape, reduced genetic diversity, destruction of insect populations, and increased resistance to pesticides and herbicides.[88]

Transgene escape refers to the process by which genetically modified plant genes spread into different plants, organisms, or ecosystems.[89] For example, the genetically modified genes of a GMO could spread into wild populations, or into non-GMO agricultural areas through pollen.[90] Once modified genes have escaped, there could be ecological ramifications from altering natural plant populations—the modified organisms could displace

82. *Id.* at 18–19.

83. Steven E. Naranjo, *Impacts of Bt Crops on Non-Target Invertebrates and Insecticide Use Patterns*, 4 CAB REVS., Jan. 2009, at 1, 3.

84. Klümper & Qaim, *supra* note 57, at 1.

85. *See, e.g.*, JOHN FAGAN ET AL., GMO MYTHS AND TRUTHS 12 (2d ed. 2014).

86. THE NAT'L ACAD. OF SCIS., ENG'G & MED., GENETICALLY ENGINEERED CROPS: EXPERIENCES AND PROSPECTS 19 (2016); *see* EUR. COMM'N, A DECADE OF EU-FUNDED GMO RESEARCH (2001-2010), at 20 (2010).

87. Ram B. Singh et al., *Genetically Modified Organisms and Foods: Perspectives and Challenges*, *in* FUNCTIONAL FOODS AND NUTRACEUTICALS IN METABOLIC AND NON-COMMUNICABLE DISEASES 493, 502 (2022).

88. Aristidis M. Tsatsakis et al., *Environmental Impacts of Genetically Modified Plants: A Review*, 156 ENV'T RSCH. 818, 819–27 (2017).

89. *Id*. at 819.

90. *Id*.; Singh et al., *supra* note 83, at 494.

non-modified varieties thereby reducing overall genetic diversity.[91] Reduced genetic diversity in turn lowers an ecosystem's ability to respond and adapt to change.[92] However, transgenic crops are often not competitive with native populations outside of an agricultural setting and their transgenic elements may not confer any survival benefits, causing the escaped transgenes to become less common over time.[93] Yet, there are many notable examples of transgene escape where the transgenic elements persisted in the environment, and more robust systems are needed to detect and contain transgene escape events.[94]

Additionally, GMOs designed to resist pests can have wider-ranging ecological implications.[95] For example, by killing or starving the insects that feed on the crops, the organisms that feed on the insects will also be negatively impacted such that an entire ecosystem could be damaged and key ecosystem services may be diminished.[96] Still, the nature and extent of GMO crops on ecosystem health is highly variable and context-dependent, and thus cannot be easily generalized.[97]

Furthermore, some critics are concerned that GMOs lead to increased pesticide and herbicide use. For example, Roundup Ready Alfalfa was developed to be resistant to an herbicide, which permits an increased use of the herbicide without impacting the alfalfa crop.[98] Over time, common weeds evolve to become more resistant to the herbicides applied, and larger doses of herbicide are required to effectively manage weeds, increasing the extent of negative downstream effects of herbicide use. For instance, global glyphosate herbicide use increased 15-fold from 1996 to 2014 after the advent of Roundup Ready crops.[99] On the other hand, concerns that GMOs will increase pesticide use are largely unsupported by data, as many studies have found that GMOs require less pesticide application than non-GMO

91. Tsatsakis et al., *supra* note 84, at 823.

92. Kishan Birader, *Genetic Diversity and the Adaptation of Species to Changing Environments,* 11 J. BIODIVERSITY & ENDANGERED SPECIES, May 2023, at 1.

93. Steven E. Travers et al., *Persistence of Genetically Engineered Canola Populations in the U.S. and the Adventitious Presence of Transgenes in the Environment*, 19 PLOS ONE, May 2024, at 1, 2.

94. Gerhart U. Ryffel, *Transgene Flow: Facts, Speculations and Possible Countermeasures*, 5 GM CROPS & FOOD 249, 252–53 (2014).

95. UNEP, *supra* note 77, at 19.

96. *Id.* at 35.

97. Dennis Engist et al., *The Impact of Genetically Modified Crops on Bird Diversity*, 7 NAT. SUSTAINABILITY 1149, 1149 (2024).

98. Ctr. for Food Safety v. Vilsack, 718 F.3d 829, 831 (9th Cir. 2013).

99. Charles M. Benbrook, *Trends in Glyphosate Herbicide Use in the United States and Globally*, 28 ENV'T SCIS. EUR., Feb. 2016, at 1, 1.

crops.[100]

Ultimately, GMOs have the potential to have both positive and negative impacts on the environment, but it is crucial to consider the purpose and type of GMO when analyzing environmental impacts and avoid generalizations.

III. HOW ARE GMOS REGULATED IN THE UNITED STATES?[101]

In the United States (U.S.), the federal government is primarily responsible for monitoring and regulating biotechnology products, including genetically modified organisms (GMOs).[102] Authority to regulate GMOs is coordinated and shared among three federal agencies: the Food and Drug Administration (FDA), the U.S. Department of Agriculture (USDA), and the Environmental Protection Agency (EPA).[103] These federal agencies predominantly regulate genetically engineered foods and crops according to the characteristics of the product.[104] This Part will first trace the history of GMO regulation in the U.S., and then explain the current U.S. GMO regulatory system.

A. Historical Origins of the U.S. Regulatory System

Modern biotechnology methods arose in the 1970s with the development of the recombinant DNA (rDNA) technique which allowed scientists to modify a species' genetic material.[105] With the discovery that the genetic traits of organisms could be modified, concern grew among the public as well as among scientists engaged in GMO research.[106] In fact, scientists took the lead on developing self-imposed guidelines for rDNA research to combat growing fears regarding genetic modification.[107]

At the 1973 Gordon Conference on Nucleic Acids—after presentations

100. Klümper & Qaim, *supra* note 57, at 4.

101. This Article was conceptualized and written prior to the Trump Administration taking office. The Trump Administration has stated its commitment to decreasing environmental regulation, and changes are expected to occur in the regulatory systems of the Environmental Protection Agency, Food and Drug Administration, and Department of Agriculture. However, the exact regulatory changes remain unclear at this time.

102. Dough Farquhar & Liz Meyer, *State Authority to Regulate Biotechnology under the Federal Coordinated Framework*, 12 DRAKE J. AGRIC. L. 439, 440 (2007).

103. Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23302, 23303 (June 26, 1986); Christine C. Vito, *State Biotechnology Oversight: The Juncture of Technology, Law, and Public Policy*, 45 ME. L. REV. 329, 335 (2018).

104. Lee-Muramoto, *supra* note 7, at 334.

105. Farquhar & Meyer, *supra* note 102, at 441.

106. Vito, *supra* note 103, at 332.

107. Farquhar & Meyer, *supra* note 102, at 441.

revealed the discovery that DNA could be spliced and recombined—the conference participants voted to ask the National Academy of Sciences and the Institute of Medicine to form a committee to consider the risks posed by rDNA research and propose guidelines on the research.[108] In its request, the conference expressed "deep concern" about the possibility that genetically modified DNA could be hazardous to the public.[109] However, the conference participants noted that rDNA research could also help mitigate human health issues.[110] Subsequently, a small committee was convened to discuss methods for mitigating the dangers and maximizing the benefits of rDNA.[111] In 1974, this committee published four recommendations regarding rDNA research, including: (1) placing a moratorium on certain categories of experiments; (2) carefully weighing any experiments linking animal DNA to plasmid or phage DNA; (3) for the National Institute of Health (NIH) to establish an advisory committee formulating guidelines for rDNA research; and (4) holding an international meeting among leading scientists to discuss the danger of rDNA research.[112]

In 1975, the Asilomar Conference on Recombinant DNA was held in response to the fourth recommendation, which featured participation from leading international molecular biologists.[113] The Asilomar Conference highlighted the array of opinions among the scientific community,[114] but ultimately concluded with overwhelming support that research on rDNA continue with appropriate safeguards.[115] The Conference concluded that, "the standards of protection should be greater at the beginning and modified as improvements in the methodology occur and assessments of the risks change."[116] Specifically, the Asilomar Conference determined that due to the potential risks, containment should be an essential consideration in the experimental design and that the effectiveness of the containment should match the estimated risk as much as possible.[117] Additionally, the Asilomar Conference determined that certain experiments that pose serious risks

108. Donald S. Fredrickson, *Asilomar and Recombinant DNA: The End of the Beginning*, *in* BIOMEDICAL POLITICS 258, 271 (Kathi E. Hanna ed., 1991).

109. *Id.* at 271–72.

110. *Id.* at 272.

111. *Id.*

112. *Id.* at 273.

113. *Id.* at 274; Vito, *supra* note 103, at 332.

114. Fredrickson, *supra* note 108, at 282.

115. Paul Berg et al., *Asilomar Conference on DNA Recombinant Molecules*, 188 SCI. 991, 991 (1975).

116. *Id.* at 991–92.

117. *Id.* at 992.

should not be performed.[118] The NIH adopted the Asilomar conclusions to serve as interim rules for U.S. laboratories.[119]

The Asilomar conclusions have been criticized for allowing the scientific community to self-govern and produce standards that rely on those experimenting with genetic modification to simply proceed with caution, until they determine the technology is safe.[120] Despite these critiques, the guidelines agreed to were the primary standard for research and monitoring in the U.S. biotechnology industry until 1986.[121]

Meanwhile, in 1980, the Supreme Court set the stage for the prominence of the biotechnology industry by ruling that a living, human-made micro-organism could be patented.[122] Microbiologist Chakrabarty filed a patent application for his invention of a "human-made, genetically engineered bacterium [ ] capable of breaking down multiple components of crude oil."[123] However, the patent examiner rejected the claim for the bacteria because micro-organisms are "products of nature" and therefore not patentable.[124] In *Diamond v. Chakrabarty*, the Court interpreted U.S. patent laws to have a wide scope, holding that the micro-organism "plainly qualifies as patentable" because the genetically modified bacterium has "markedly different characteristics from any found in nature and one having the potential for significant utility."[125] Furthermore, the Court held that the microbiologist's discovery was "not nature's handiwork, but his own."[126] The Court's ruling provided the burgeoning biotechnology industry—a research and capital intensive enterprise—with economic security to invest in and develop GMOs.[127]

After the *Diamond* decision, and throughout the 1980s, the U.S. served as a leader in the biotechnology industry. But as genetically engineered crops became available on the market, public pressure mounted for federally imposed regulations to replace the system of self-governance under the

118. *Id.* at 993.

119. Fredrickson, *supra* note 108, at 283; Farquhar & Meyer, *supra* note 102, at 441.

120. Adam Briggle, *Asilomar Conference*, ENCYCLOPEDIA.COM, https://www.encyclopedia.com/science-and-technology/biology-and-genetics/cell-biology/asilomar-conference (last updated May 14, 2018).

121. Farquhar & Meyer, *supra* note 102, at 441.

122. Diamond v. Chakrabarty, 447 U.S. 303, 318 (1980).

123. *Id.* at 305.

124. *Id.* at 306.

125. *Id.* at 309–10.

126. *Id.* at 310.

127. Vito, *supra* note 103, at 330.

Asilomar conclusions.[128] The Reagan Administration was worried about hindering biotechnology research and development, so it opted to incorporate agricultural biotechnology and GMO regulation into existing federal laws, rather than enact new legislation.[129] Thus, in 1986, the White House Office of Science and Technology Policy established a coordinated framework for the regulation of biotechnology.[130] The Ninth Circuit indicated the purpose of this coordinated framework was to "construct a framework that would not impair the competitiveness or innovativeness of the United States' biotechnology industry."[131] This framework, which is still utilized today, is described in the next Part.

B. Current U.S. Regulatory System

In 1986, the Coordinated Framework for Biotechnology Regulation (Coordinated Framework) was created as the "comprehensive federal regulatory policy for ensuring the safety of biotechnology research and products."[132] Pursuant to the Coordinated Framework, the FDA, USDA, and EPA work together to "ensure that GMOs are safe for human, plant, and animal health."[133] In broad terms, the FDA regulates most human and animal food, including GMO foods, and ensures that GMO products meet safety standards.[134] The USDA protects U.S. agriculture from pests and diseases by formulating regulations to ensure GMO plants do not cause harm to other plants.[135] Lastly, the EPA focuses on protecting human health and the environment through the regulation of pesticides, including pesticidal substances incorporated into GMO plants.[136] Due to the overlapping nature of the agencies' jurisdiction, determining which laws apply and which agency governs depends on the nature of the organism and the product's

128. Farquhar & Meyer, *supra* note 102, at 441.

129. Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23302, 23302 (June 26, 1986); Farquhar & Meyer, *supra* note 102, at 441.

130. *How GMOs Are Regulated in the United States*, U.S. FOOD & DRUG ADMIN., www.fda.gov/feedyourmind (last updated July 9, 2024).

131. Ctr. for Food Safety v. Vilsack, 718 F.3d 829, 833 (9th Cir. 2013).

132. Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23302 (June 26, 1986).

133. *How GMOs Are Regulated in the United States*, *supra* note 130.

134. *Id*.

135. *Id*.

136. *Id*.

intended use.[137]

Depending on the characteristics of the GMO, it may be regulated by more than one federal agency.[138] However, it is possible that one product can be subject to regulation by all three agencies:

> For example, for plant technology, the USDA will regulate a potato developed to contain a higher-solids content for field testing safety. In addition, the potato developer must complete a consultation process with the FDA. If the potato contains a known allergen, or other additive that is not [generally recognized as safe] GRAS, the FDA must approve that food additive. Additionally, if a potato has insect protection, the EPA will be involved in the regulatory process, along with the USDA and the FDA.[139]

Alternatively, depending on agency interpretation, a product could bypass the entire regulatory system.[140] For instance, the GloFish—a genetically engineered "bright red fluorescent zebra fish" created through the insertion of genetic material from sea coral—is available for purchase but is not regulated by the FDA, USDA, or EPA.[141] In 2003, the company that engineers GloFish, Yorktown Technologies, L.P., contacted the FDA to understand how the FDA would regulate the genetically modified fish.[142] In the FDA's interpretation, regulation of GloFish would be inappropriate "[b]ecause tropical aquarium fish are not used for food purposes, they pose no threat to the food supply . . . In the absence of a clear risk to the public health, the FDA finds no reason to regulate these particular fish."[143]

Following the FDA's decision not to regulate, Yorktown Technologies began selling GloFish commercially in the U.S.[144] Numerous non-profit organizations filed suit against the FDA and other governmental agencies, alleging in part that the FDA arbitrarily and capriciously denied regulatory

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137. Farquhar & Meyer, *supra* note 102, at 456–57; *see Regulation of Biotech Plants: How the Federal Government Regulates Biotech Plants*, U.S. DEP'T OF AGRIC., https://www.usda.gov/farming-and-ranching/plants-and-crops/biotechnology/regulation-biotech-plants (last visited Dec. 2, 2025).

138. *Regulation of Biotech Plants*, *supra* note 137.

139. Farquhar & Meyer, *supra* note 102, at 456–57.

140. *See* Farquhar & Meyer, *supra* note 102, at 457; *see, e.g.,* Int'l Ctr. for Tech. Assessment v. Thompson, 421 F. Supp. 2d 1, 4 (D.D.C. 2006).

141. *Thompson*, 421 F. Supp. 2d at 4.

142. *Id*.

143. *Id*. at 5.

144. *Id*.

jurisdiction over GloFish.[145] However, in a 2006 opinion, the D.C. District Court affirmed that the "FDA is simply exercising its discretion not to take enforcement actions against these particular fish."[146] The FDA's refusal leaves the genetically modified fish unregulated on the U.S. market, especially considering the EPA does not have statutory authority over the GloFish, given that the fish contains no pesticides, and the USDA does not have statutory authority because the fish is not livestock.[147] Critics argue that the GloFish creates a precedent for loose regulation of genetically modified pets, and highlights a loophole in U.S. regulation.[148]

Despite possibilities for overlapping jurisdiction or instances where no agency has authority, the Coordinated Framework maintains that the FDA, USDA, and EPA each have a distinct and primary responsibility in the U.S. biotechnology regulatory system.[149]

1. The U.S. Food and Drug Administration

The FDA is the federal agency "responsible for ensuring the safety and proper labeling of all plant-derived food and feed, including those developed through genetic engineering."[150] The FDA regulates based on the safety and nutritional characteristics of food, not on the method used to produce the food.[151] On the FDA's website, the agency supports its regulatory approach and states that, "[t]his regulatory approach is supported by more than 25 years of experience in this area demonstrating that as a class, foods from genetically engineered plant varieties don't present different or greater safety concerns than their non-genetically engineered counterparts."[152]

The FDA derives its authority to regulate GMOs from the Food, Drug, and Cosmetic Act (FDCA).[153] Under the FDCA, the FDA requires all food

145. *Id*.

146. *Id*. at 7.

147. Farquhar & Meyer, *supra* note 102, at 457.

148. *Id*.

149. *Regulation of Biotech Plants*, *supra* note 137.

150. *Id.*; *accord* Brian Sylvester, *Building the Regulatory Conversation on Cellular Agriculture*, LAW360 (Oct. 30, 2018), https://www.law360.com/articles/1096770/building-the-regulatory-conversation-on-cellular-agriculture.

151. *Food from New Plant Varieties*, U.S. FOOD & DRUG ADMIN., https://www.fda.gov/food/food-ingredients-packaging/food-new-plant-varieties (last updated Dec. 16, 2024); Lee-Muramoto, *supra* note 7, at 338; *New Plant Variety Regulatory Information*, U.S. FOOD & DRUG ADMIN., https://www.fda.gov/food/food-new-plant-varieties/new-plant-variety-regulatory-information (last updated Dec. 16, 2024).

152. *Food from New Plant Varieties, supra* note 151.

153. *Regulation of Biotech Plants*, *supra* note 137; *see* Sylvester, *supra* note 150; Federal Food, Drug, and Cosmetic Act, 21 U.S.C. §§ 342(a)(1), 348. Note that the FDA also derives power to regulate

and feed to pass the same safety standards, regardless of whether the crops are produced through conventional breeding techniques or are GMOs.[154] Per Section 402(a)(1),[155] the FDA has the authority to remove a food from the market if it is "adulterated," meaning it has "any poisonous or deleterious substance that may render it injurious to health."[156] Thus, if a GMO product is adulterated, the FDA can remove the product from circulation and sanction the company responsible for marketing the product.[157] Additionally, Section 409[158] regulates food additives—which must receive premarket approval—unless the substance is generally recognized as safe (GRAS).[159]

Anyone selling food in the U.S., including GMO-developers, are responsible for complying with all applicable laws. In addition, the FDA has set up two voluntary systems to work with GMO-food developers to ensure that the products are safe for human and animal consumption.[160] The first program, the Plant Biotechnology Consultation Program, was established to "help ensure that any safety or other regulatory issues associated with food from a new plant variety are resolved prior to commercial distribution."[161] In the consultation process, the FDA reviews a myriad of characteristics to ensure the GMO food is safe and nutritious, including, the use of the bioengineered food, the function of the GMO modification, and information comparing the composition or characteristics of the GMO food to that of similar non-GMO foods.[162] As of 2017, "to the best of [the] FDA's knowledge, all [genetically engineered] food crops intended for marketing have been the subject of a consultation or other relevant premarket processes

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GMOs from the Public Health Service Act. *See* EXEC. OFF. OF THE PRESIDENT, MODERNIZING THE REGULATORY SYSTEM FOR BIOTECHNOLOGY PRODUCTS: FINAL VERSION OF THE 2017 UPDATE TO THE COORDINATED FRAMEWORK FOR THE REGULATION OF BIOTECHNOLOGY 9 [hereinafter MODERNIZING THE REGULATORY SYSTEM]; Ctr. for Food Safety v. Vilsack, 718 F.3d 829, 833 (9th Cir. 2013) (explaining that the FDA has authority under FDCA, but the FDCA "does not contain any provisions that specifically address genetically modified plants").

154. *New Plant Variety Regulatory Information*, *supra* note 151.

155. Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 342(a)(1).

156. MODERNIZING THE REGULATORY SYSTEM, *supra* note 153, at 15.

157. *Id.*

158. Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 348.

159. Manufacturers themselves, not the FDA, determine when a food additive is GRAS. If something is deemed GRAS, the manufacturer does not need to notify the FDA. Substances Generally Recognized as Safe, 81 Fed. Reg. 54960, 54963 (Aug. 17, 2016); MODERNIZING THE REGULATORY SYSTEM, *supra* note 153, at 16.

160. *Programs on Food from New Plant Varieties*, U.S. FOOD & DRUG ADMIN., https://www.fda.gov/food/food-new-plant-varieties/programs-food-new-plant-varieties (last updated Dec. 16, 2024).

161. MODERNIZING THE REGULATORY SYSTEM, *supra* note 153, at 17.

162. *Id.*

prior to marketing," despite the consultation process not being legally required.[163] If the FDA identifies a safety or regulatory issue, it works with the company to address the problem. Once all safety issues are resolved, the FDA approves the product for placement on the market.[164]

The second program, the Early Food Safety Evaluation Program (EFSEP), evaluates new non-pesticidal plant proteins intended for use in food.[165] EFSEP focuses on assessment of new GMO plants that could result in "inadvertent, intermittent, low-level presence" of new proteins in the food supply.[166] Due to this limited focus, EFSEP is not a substitute for the consultation process under the voluntary Plant Biotechnology Consultation Program, because that consultation process aims to assess the commercialization of a GMO product—not the low-level presence of a new protein in food.[167]

2. The U.S. Department of Agriculture

The USDA has broad power to regulate agricultural research and products.[168] Within the USDA, the Animal and Plant Health Inspection Service (APHIS) is "responsible for protecting agriculture from pests and diseases."[169] APHIS, which acts under the Animal Health Protection Act (AHPA) and Plant Protection Act (PPA), oversees the movement and release of GMOs that could pose a risk to plant and animal health.[170] The PPA provides APHIS with authority over GMO "plant pests."[171] The PPA defines "plant pests" to be:

> [A]ny living stage of any of the following that can directly or indirectly injure, cause damage to, or cause disease in any

163. *Id.*

164. *Programs on Food from New Plant Varieties*, *supra* note 160.

165. Guidance for Industry: Recommendations for the Early Food Safety Evaluation of New Non-Pesticidal Proteins Produced by New Plant Varieties Intended for Food Use, 71 Fed. Reg. 35688 (June 21, 2006).

166. *Programs on Food from New Plant Varieties*, *supra* note 160.

167. *Id.*

168. Farquhar & Meyer, *supra* note 102, at 446.

169. *Regulation of Biotech Plants*, *supra* note 137; MODERNIZING THE REGULATORY SYSTEM, *supra* note 153, at 22.

170. *Biotechnology Regulatory Services*, U.S. DEP'T OF AGRIC.: ANIMAL & PLANT HEALTH INSPECTION SERV., https://www.aphis.usda.gov/biotechnology (last updated Oct. 30, 2025); MODERNIZING THE REGULATORY SYSTEM, *supra* note 153, at 22.

171. 7 C.F.R. § 340.2 (2025); 7 C.F.R. § 360 (2025); MODERNIZING THE REGULATORY SYSTEM, *supra* note 153, at 23–24.

> plant or plant product: (A) A protozoan; (B) A nonhuman animal; (C) A parasitic plant; (D) A bacterium; (E) A fungus; (F) A virus or viroid; (G) An infectious agent or other pathogen; (H) Any article similar to or allied with any of the articles specified in the preceding subparagraphs.[172]

If a GMO is determined to be a plant pest, it becomes subject to APHIS regulations, such as the requirement to obtain a permit from APHIS for the movement of the GMO.[173] The Biotechnology Regulatory Services in APHIS implements the APHIS regulations and regulates the "introduction of certain organisms development using genetic engineering that may pose a risk to plant health."[174]

When an organism is deemed by APHIS not to be a plant pest, APHIS no longer has regulatory authority over the plant, as highlighted in *Center for Food Safety v. Vilsack*.[175] In that case, APHIS determined it did not have the authority to regulate Roundup Ready Alfalfa (RRA), a genetically modified plant engineered to be resistant to the herbicide Roundup.[176] Monsanto, the developer of both Roundup and RRA, modified RRA so that farmers could utilize the Roundup herbicide on fields without killing the alfalfa crop.[177] APHIS conducted an assessment of RRA and determined that it was not a "plant pest" under the PPA, and accordingly stopped regulating the modified crop.[178] The Ninth Circuit affirmed APHIS's deregulation, recognizing that "[o]nce the agency concluded that RRA was not a plant pest, it no longer had jurisdiction to continue regulating the plant."[179] *Center for Food Safety v. Vilsack* illustrates how APHIS does not consider concerns such as transgenic contamination (mixing of genes between modified and unmodified crops) and increased herbicide use.[180]

In 2016, Congress passed the National Bioengineered Food Disclosure Standard (NBFDS) to require the USDA to establish national, required

172. Plant Protection Act § 403(14), 7 U.S.C. § 7702.

173. 7 C.F.R. § 340.5 (2025).

174. *Biotechnology Regulations*, USDA: ANIMAL & PLANT HEALTH INSPECTION SERV., www.aphis.usda.gov/biotechnology/regulations (last updated Nov. 17, 2025).

175. Ctr. for Food Safety v. Vilsack, 718 F.3d 829, 834 (9th Cir. 2013).

176. *Id.* at 831–32.

177. *Id.* at 831.

178. *Id.* at 832.

179. *Id.*

180. *See id.* at 839.

standards for labeling genetically modified food.[181] Beginning in 2022, companies were required to label bioengineered food in accordance with the disclosure standards.[182] To keep these labeling requirements uniform, the disclosure law included a preclusion provision so no state could enact "any requirement relating to the labeling or disclosure of whether a food is bioengineered . . . that is not identical to the mandatory disclosure requirement under the [NBFDS]."[183] With this new labeling law, the U.S. now requires GMO labeling similarly to the European Union's regulatory system.

3. The U.S. Environmental Protection Agency

The EPA is tasked with protecting human health and the environment by "ensuring that a plant derived from biotechnology expressing pesticidal traits produces no unreasonable adverse effects upon man and the environment."[184] The EPA derives authority to regulate GMOs and genetically modified pesticides principally through the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA),[185] but also through the FDCA and the Food Quality Protection Act.[186] The EPA also regulates the use of genetically engineered microorganisms under the Toxic Substances Control Act.[187]

The predominant focus of the EPA's regulation of GMOs arises under FIFRA's mandate to control pesticides.[188] Plants can be genetically modified to include pesticidal substances; for example, the plant exhibits pest-fighting traits to become resistant to insects, weeds, or diseases.[189] The EPA regulates those pesticidal substances under FIFRA as "plant-incorporated protectants"

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181. National Bioengineered Food Disclosure Standard; List of Bioengineered Foods, 88 Fed. Reg. 83305 (Nov. 29, 2023) (to be codified at 7 C.F.R. pt. 66); 7 C.F.R. § 66.3(a)(1) (2025).

182. 7 C.F.R. § 66.13(c) (2025).

183. 7 U.S.C. § 1639b(e); Kao v. Abbott Lab'y Inc., No. 17-cv-02790-JST, 2017 WL 5257041, at *1, *4 (N.D. Cal. Nov. 13, 2017).

184. *Introduction to Biotechnology Regulation for Pesticides*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/regulation-biotechnology-under-tsca-and-fifra/introduction-biotechnology-regulation-pesticides (last updated Oct. 1, 2025).

185. *Id.*; 40 C.F.R. §§ 152.1(a), 174.1 (2025).

186. *Introduction to Biotechnology Regulation for Pesticides*, *supra* note 184; 40 C.F.R. §§ 152, 174 (2025).

187. *Overview of Biotechnology Under TSCA*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/regulation-biotechnology-under-tsca-and-fifra/overview-biotechnology-under-tsca (last updated Nov. 4, 2025).

188. *Regulation of Biotech Plants*, *supra* note 137.

189. *Introduction to Biotechnology Regulation for Pesticides*, *supra* note 184.

(PIPs).[190] FIFRA regulates the registration, distribution, sale, and use of pesticides in the U.S.[191] In 2001, the EPA promulgated a final rule on PIPs and stated that, "[t]he substances plants produce for protection against pests, and the genetic material necessary to produce these substances, are pesticides under [FIFRA], if humans intend to use these substances for 'preventing, repelling or mitigating any pest."[192]

Under FIFRA, a pesticide must be registered with the EPA in order to be sold or distributed in the U.S.[193] Prior to registration of a pesticide or PIP, an applicant must demonstrate that the pesticide or PIP, "will not generally cause unreasonable adverse effects on the environment," when used in accordance with the label directions.[194] In reaching a decision to register a pesticide, the EPA requires "extensive studies examining numerous factors, such as: risks to human health, nontarget organisms and the environment; potential gene flow; and the need for insect resistance management plans."[195] A PIP is only permitted to be used on human food or livestock feed crops if EPA scientists—with input from academia, industry, other federal agencies, and the public—determine that the PIP would "not pose unreasonable risk to human health and the environment during their time-limited registration."[196] The EPA can also impose conditions for the pesticide or PIP's use during the registration process.[197]

In sum, the EPA regulates bioengineered plants that are modified to include substances that act as pesticides or aid a plant's resistance to

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190. *Id.*

191. *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Federal Facilities*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/enforcement/federal-insecticide-fungicide-and-rodenticide-act-fifra-and-federal-facilities (last updated Jan. 31, 2025).

192. Regulations Under the Federal Insecticide, Fungicide, and Rodenticide Act for Plant-Incorporated Protectants (Formerly Plant Pesticides), 66 Fed. Reg. 37772, 37772 (July 19, 2001) (to be codified at 40 C.F.R. pts. 152, 174); 40 C.F.R. § 174 (2002);; *see* 40 C.F.R. § 152.15 (2001).

193. *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Federal Facilities*, *supra* note 191.

194. *Id.*; FIFRA defines "unreasonable adverse effects on the environment" as:

(1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under section 346a of title 21.

7 U.S.C. § 136(bb).

195. *Overview of Plant Incorporated Protectants*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/regulation-biotechnology-under-tsca-and-fifra/overview-plant-incorporated-protectants (last updated Dec. 31, 2024); *see Overview of Risk Assessment in the Pesticide Program*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/overview-risk-assessment-pesticide-program (last updated Jan. 31, 2025).

196. *Overview of Plant Incorporated Protectants*, *supra* note 195.

197. *Regulation of Biotech Plants*, *supra* note 137.

disease.[198]

4. U.S. State Laws

Although the federal government is the primary regulator regarding the health and safety of GMOs, state and local governments also have laws regulating genetically engineered crops and animals.[199] For example, Alaska, California, Maryland, Michigan, and Mississippi, each enforce laws relating to genetically modified fish.[200] State legislation on GMOs varies, with some states focusing on a consumer's right-to-know, and others adopting economic incentives for the biotechnology industry.[201] In short, states have a variety of attitudes regarding GMOs, and approach regulation differently. For instance, 33 states have a mandatory or voluntary labeling guidelines for agricultural or food products.[202] Yet, essentially all U.S. states (all, except Nevada and South Dakota), provide some state tax incentive to support bioscience companies.[203] However, states and localities are limited in their ability to enact legislation under the federal preemption doctrine. In *Atay v. County of Maui*, the Ninth Circuit held that a Maui County ordinance banning the cultivation and testing of genetically engineered plants was expressly preempted by the PPA to the extent that the banned GMOs are regulated by the USDA.[204]

IV. HOW ARE GMOS REGULATED IN THE EUROPEAN UNION?

Compared to the United States' (U.S.) regulatory system which involves voluntary consultation processes, and only mandated GMO labeling in 2016, the European Union (E.U.) regulatory system is more cautious about approving GMO usage.[205] This more cautious and regulated approach stems from the precautionary principle employed by the E.U. when assessing matters that pose environmental implications.[206]

198. *How GMOs Are Regulated in the United States*, *supra* note 130.

199. Farquhar & Meyer, *supra* note 102, at 457.

200. *Id.* at 458.

201. *Id.* at 459.

202. Hanna Broaddus, *The Comprehensive List: Where GMOs Are Banned*, CENTRAFOODS (Aug. 2015), https://www.centrafoods.com/blog/the-comprehensive-list-where-gmos-are-banned.

203. COUNCIL OF STATE BIOSCIENCE ASS'NS, THE U.S. BIOSCIENCE INDUSTRY: A POWERFUL ENGINE FOR STATE ECONOMICS 9–10 (2025).

204. Atay v. Maui, 842 F.3d 688, 692 (9th Cir. 2016).

205. *See Programs on Food from New Plant Varieties*, *supra* note 160; *see* National Bioengineered Food Disclosure Standard; List of Bioengineered Foods, 88 Fed. Reg. 83305 (Nov. 29, 2023) (to be codified at 7 C.F.R. pt. 66); *see* Peterson, *supra* note 10, at 4.

206. Peterson, *supra* note 10, at 4.

This Part will first briefly trace the history of E.U. GMO regulations and then explore the current E.U. GMO regulatory system. Finally, this Part will explore the February 2024 E.U. Parliamentary vote to deregulate certain GMOs.

A. Historical Development of the E.U. Regulatory System

Whereas the U.S. system of GMO control emerged from scientific conferences and was designed to "not impair the combativeness or innovativeness of the United States's biotechnology industry,"[207] the E.U. system developed through a process with more input from civil society groups and prioritized minimizing risk.[208] These civil society groups advocated against the U.S.'s fragmented system of GMO regulation and called for an "overarching, specific legal framework for all types of agricultural applications of genetic technologies . . . because of the 'novelty' of GMOs."[209] The E.U. formed its regulations on GMO cultivation, production, and dissemination in accordance with the precautionary principle.[210] This general principle of law holds that measures should be taken to prevent potential or unknown risks by implementing requirements to avoid the risks.[211] The precautionary principle thus dictates that GMOs as substances with unknown impacts should be regulated strictly.[212] E.U. GMO policies "start from the proposition that [genetically modified] plants, feeds, and foods are significantly different from conventionally-bred ones and those who want to plant or sell them must prove to regulatory agencies that the product is safe."[213] With this proposition, decisionmakers pushed the burden of proof regarding the safety of the GMO onto the developers, who have to meet high safety standards. Correspondingly, Europeans tend to be skeptical

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207. Ctr. for Food Safety v. Vilsack, 718 F.3d 829, 833 (9th Cir. 2013).

208. Angelika Hilbeck et al., *GMO Regulations and Their Interpretation: How EFSA's Guidance on Risk Assessments of GMOs Is Bound to Fail*, 32 ENV'T SCI. EUR. 3 (2020).

209. *Id.*

210. Artem Anyshchenko & Jennifer Yarnold, *From 'Mad Cow' Crisis to Synthetic Biology: Challenges to EU Regulation of GMOs Beyond the European Context*, 21 INT'L ENV'T AGREEMENTS: POL., L. & ECON. 391, 392 (2021).

211. *Id.*

212. MARINE FRIANT-PERRAT, *The European Union Regulatory Regime for Genetically Modified Organisms and Its Integration into Community Food Law and Policy*, *in* THE REGULATION OF GENETICALLY MODIFIED ORGANISMS: COMPARATIVE APPROACHES 79, 84 (Luc Bodiguel & Michael Cardwell eds., 2010).

213. *The EU-US Dispute over Regulation of Genetically Modified Organisms, Plants, Feeds, and Foods,* INT'L DIMENSIONS OF ETHICS EDUC. IN SCI. & ENG'G, https://www.umass.edu/sts/ethics/online/cases/GMO/case.html (last visited Dec. 2, 2025).

about GMOs, with a majority believing that production of bioengineered food should not be supported.[214] Compared to the U.S., the E.U. system imposes stricter regulations on GMOs.[215] Additional context for the E.U.'s restrictive stance on GMOs is found in the crises of the 1980s and 1990s which prompted "many Europeans [to] lose trust in governmental food standards."[216] Specifically, the outbreak of Bovine Spongiform Encephalopathy (BSE), commonly known as mad cow disease, sparked widespread criticism and recognition that the European regulatory system failed to detect and stop the spread of the disease.[217] In fact, the BSE crisis and the associated government failure has been noted to have "significantly affected the attitude of the European public towards [genetically modified] foods,"[218] even though GMOs did not contribute to the spread of BSE.

In response, the E.U. adopted biosafety regulations in 1990 with the enactment of Directive 1990/220.[219] The 1990 Directive incorporated the precautionary principle and required GMO developers to apply to individual member countries of the E.U. to market the GMO product in that country.[220] Each member country had the ability to prohibit the developer from marketing the GMO product in their country.[221]

The 1990 Directive was replaced in 2001 with Directive 2001/18, which sought to modify the regulatory system in response to the crises of the 1990s and growing public skepticism. The new Directive aimed to "ensure a high level of protection for human, animal, and environmental health and a well-functioning EU internal market."[222] The 2001 Directive again incorporated the precautionary principle by explicitly stating, "[t]he precautionary principle has been taken into account in the drafting of this Directive and must be taken into account when implementing it."[223] Furthermore, in direct response to growing public mistrust, the 2001 Directive sought to increase transparency, requiring that "the public is consulted by either the

214. Martin, *supra* note 23, at 373.

215. Peterson, *supra* note 10, at 4–10.

216. Anyshchenko & Yarnold, *supra* note 210, at 395.

217. *Id.* at 394.

218. Cass R. Sunstein, *Precautions Against What? The Availability Heuristic and Cross-Cultural Risk Perception*, 57 ALA. L. REV. 75, 76 (2005).

219. Council Directive 90/220, 1990 O.J. (L 117) 1, 15 (EC).

220. DIAHANNA LYNCH & DAVID VOGEL, THE REGULATION OF GMOS IN EUROPE AND THE UNITED STATES: A CASE-STUDY OF CONTEMPORARY EUROPEAN REGULATORY POLITICS 7 (2001).

221. *Id.*

222. Bruetschy, *supra* note 19, at 169.; *see* Commission Declaration 2001/18, 2001 O.J. (L 106) 1, 39 (EC).

223. *Id.* at 1.

Commission or the Member States during the preparation of measures and that they are informed of the measures taken during the implementation of this Directive."[224]

The 2001 Directive strengthened the risk assessment process for GMOs by requiring analysis of impacts such as the indirect, cumulative, and long-term environmental and health risks posed by GMOs.[225] In accordance with the precautionary principle, Directive 2001/18 required that a pre-market risk assessment of GMO crops be conducted before a GMO substance could be placed on the market.[226]

The E.U. crystallized their pre-market authorization process for GMO products in Regulation (EC) 1829/2003.[227] The Regulation lays out the procedure by which GMO developers can apply for authorization to market their GMO products in the E.U.[228] First, the developer must submit an application to the individual E.U. country in which the developer wants to market the product.[229] The country informs the European Food Safety Authority (EFSA), which has six months to assess the application.[230] The EFSA is an independent scientific committee that evaluates GMO foods to assess safety risks.[231] Regulation 1829/2003 states that:

> [G]enetically modified food and feed should only be authorised [sic] for placing on the Community market after a scientific evaluation of the highest possible standard, to be undertaken under the responsibility of the [EFSA], of any risks which they present for human and animal health and, as the case may be, for the environment.[232]

A GMO can only be authorized for placement on the E.U. commercial market upon a finding that there are not "adverse effects on human health, animal health or the environment."[233] Based on the EFSA's risk assessment, the European Commission or a committee of E.U. country representatives

224. *Id.*
225. *Id.* at 19.
226. Martin, *supra* note 23, at 375; Hilbeck et al., *supra* note 208.
227. Regulation No. 1829/2003, 2003 O.J. (L 268) 1, 6–12 (EC).
228. *Id.* at 7.
229. *Id.*
230. *Id.* at 7–8.
231. Lau, *supra* note 11.
232. Regulation No. 1829/2003, 2003 O.J. (L 268) 1, 2 (EC).
233. *Id.* at 7.

determine whether the application should be granted or denied.[234] After being approved either by the European Commission or via a majority decision of E.U. member states, a GMO could be placed on the market as a food product with proper labeling.[235]

Prior to 2015, an E.U. member state could only ban the use of an approved GMO if new evidence, not examined during the original approval process, demonstrated that the GMO posed a risk to human or environmental health.[236] The European Commission requires that the member state submits the new evidence to the Commission to issue a revised approval decision regarding the GMO.[237]

This refusal and reassessment process was not always followed, as demonstrated by the 2011 case of France banning a GMO food product which the European Commission had approved.[238] The EFSA approved the genetically modified corn, but France responded that the GMO posed an environmental health risk.[239] The EFSA affirmed their initial finding, asserting that the overall environmental threat was low and that mitigation policies could be implemented to reduce the risk further.[240] However, France refused to lift its ban.[241] In 2011, the European Court of Justice declared that the French ban was unlawful, yet still France did not lift its prohibition of the genetically modified corn.[242] This case demonstrates that E.U. member states yield significant power to resist GMOs, even if the GMO is approved by the E.U. regulatory system.

In 2015, E.U. member states were provided greater flexibility to lawfully prohibit GMOs in their country through an amendment to the 2001/18/EC Directive.[243] The Directive was amended so that it may be possible for individual countries to ban or restrict GMO cultivation under certain circumstances.[244] Following this amendment, E.U. countries are able to ban or restrict the cultivation and sale of a genetically modified crop on grounds related to environmental policy, agricultural policy, socioeconomic impacts,

234. Lau, *supra* note 11.
235. *Id.*
236. *Id.*
237. *Id.*
238. *Id.*; *France Definitively Bans GM Corn*, PHYS ORG (May 5, 2014), https://phys.org/news/2014-05-france-definitively-gm-corn.html.
239. Lau, *supra* note 11.
240. *Id.*
241. *Id.*
242. *Id.*
243. Directive (EU) 2015/412, 2015 O.J. (L 68) 1, 2.
244. *Id.* at 6.

and/or land-use practices, including cultural traditions.[245] In addition to the robust centralized pre-market approval, the E.U. also enacted strict labeling and traceability requirements in Regulation (EC) 1830/2003 and transparency regulations, which were updated in 2019 by Regulation (EU) 2019/1381.[246]

B. Current E.U. Regulatory System

Today, GMOs in the E.U. are still regulated prior to their use in food and feed.[247] The E.U. regulatory system has three components to ensure robust monitoring and control. First, the E.U. requires pre-market authorization based on a risk assessment.[248] Second, the E.U. utilizes a tracing system to monitor the cultivation and use of GMOs throughout the E.U.[249] Lastly, the E.U. requires companies to label their products if the products contain GMOs.[250]

As of 2019, only 118 GMOs have been authorized for placement on the market in the E.U., and only 0.1% of worldwide GMO crops are produced in the E.U.[251] In contrast, the U.S. Department of Agriculture estimates that 170 million acres of U.S. land is currently used to produce GMO crops.[252] Some have described the strict regulations imposed by the E.U. to function as if the E.U. had completely banned GMO cultivation.[253] Under the strict policies, GMOs can only receive authorization if the EFSA conducts a risk assessment and determines that there is no risk to human health or the environment.[254] All GMOs are required to be assessed by the EFSA, and the public can submit comments on ESFA opinions and risk assessments performed by national-level authorities.[255]

Furthermore, if a GMO is not approved by the EFSA, is approved by the

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245. *Id.* at 1.

246. Council Regulation (EC) 1830/2003, 2003 O.J. (L 268) 24, 26; Council Regulation (EU) 2019/1381, 2019 O.J. (L 231) 1, 6.

247. Commission Declaration 2001/18, 2001 O.J. (L 106) 1, 2 (EC); Regulation No. 1829/2003, 2003 O.J. (L 268) 1, 1–2 (EC).

248. Bruetschy, *supra* note 19, at 169.

249. *Id*.

250. *Id*.

251. *Id.*; ISAAA, Brief 54: Global Status of Commercialized Biotech/GM Crops in 2018: Biotech Crops Continue to Help Meet the Challenges of Increased Population and Climate Change 9 (2018).

252. Gerald Berkowitz, *The Future of GMO Crops,* SCI. GMOS (Oct. 3, 2017), https://gmo.uconn.edu/topics/the-future-of-gmo-crops/.

253. Martin, *supra* note 23, at 374.

254. Regulation No. 1829/2003, 2003 O.J. (L 268) 1, 8 (EC).

255. Bruetschy, *supra* note 19.

European Commission, and is permitted to be sold in an E.U. member state, the GMO product is still subject to traceability and labeling policies which aim to "ensure that relevant information on GMOs is available for operators and consumers."[256] All GMOs need to be labeled to indicate the presence of GMO ingredients, unless the GMO "presence in conventional product[s] is not more than 0.9% per ingredient and it is unavoidable or adventitious."[257] The E.U. has a zero-tolerance policy for the presence of unauthorized GMOs.[258]

Currently, all GMOs in the E.U. are regulated using this three-part centralized system of pre-market approval, traceability, and labeling.[259] In 2018, the European Court of Justice ruled that plants created through CRISPR and similar technologies, which can make small changes to DNA that could have occurred naturally, are nonetheless subject to E.U. regulation as GMOs.[260] Following the Court's determination, some began advocating that GMOs made with these new technologies—referred to as new genomic technologies (NGTs)—should be exempt because "unlike transgenic plants created by introducing foreign genes, [crops edited with NGTs] just have tweaks to their natural genes."[261] In response to this advocacy, as well as other calls for reform based on concern that the E.U.'s "demanding regulatory framework for GMOs ha[d] contributed to very few such crops being approved in Europe for planting," the European Council requested that the European Commission study the NGTs.[262] The European Commission's Report determined the current GMO regulatory system stifled GMO and agricultural innovation.[263] Subsequently, in 2023 the European Commission submitted a proposal to the European Parliament to deregulate GMOs produced using NGTs.[264]

256. *Id.*
257. *Id.*
258. Council Directive 2001/18/EC, 2001 O.J. (L 106) 1, 2; Regulation No. 1829/2003, 2003 O.J. (L 268) 1, 7 (EC).
259. Bruetschy, *supra* note 19, at 169.
260. Erik Stokstad, *European Parliament Votes to Ease Regulations of Gene-Edited Crops*, SCI. (Feb. 7, 2024), https://www.science.org/content/article/european-parliament-votes-ease-regulation-gene-edited-crops.
261. *Id.*
262. *Id.*
263. *Id.*
264. *Id.*

C. February 2024 Vote

On February 7, 2024, the European Parliament adopted the European Commission's first-reading position "to support a simplified registration for plant varieties produced using NGTs that are deemed to be equivalent to conventional varieties, while retaining stricter controls for others that are not" with 307 votes for, 263 votes against, and 41 abstentions.[265] The proposal would create two categories.[266] Category 1 GMOs are those "considered equivalent to conventional plants,"[267] in that it "differs from the parent plant by no more than 20 genetic modifications."[268] The types of acceptable modifications are described in detail: They allow for small insertions of novel sequences, large deletions and inversions of the DNA sequence, and large insertions if the new sequence is found in the natural breeding pool of the crop.[269] Notably, modifications intended to increase herbicide resistance would not be considered for Category 1 classification.[270] Category 2 is defined simply as all other varieties of GMOs not included in Category 1.[271] Category 1 foods would not be subject to GMO labeling requirements, but their seeds would still need to be labeled as genetically modified for traceability.[272] Category 1 plants would also not be allowed on organic farms.[273] For Category 2 plants, the proposal aims to steer their intended uses toward sustainability, offering regulatory incentives such as accelerated risk assessment and enhanced pre-submission advice.[274] In essence, the proposal would "exempt NGTs from GMO legislation if the changes could have been made (albeit much more slowly) with conventional breeding."[275]

The European Parliamentary vote to deregulate some GMO crops marks a stark departure from the traditional E.U. GMO regulatory system which

265. IVANA KATSAROVA, EUR. PARLIAMENTARY RSCH. SERV., PE 754.549, PLANTS PRODUCED USING NEW GENOMIC TECHNIQUES 1 (2024).
266. *Id.* at 7.
267. *Id.*
268. *Id.*
269. *Id.*
270. *Id.*
271. *Id.*
272. *Id.* at 8.
273. *Id.*
274. *Id.* at 9.
275. Stokstad, *supra* note 260.

practically functions as a near-ban on GMO cultivation.[276] Some individuals claim that the change in Parliament's opinion can be traced to the improved reputation of biotechnology following RNA vaccines developed in response to the COVID-19 crisis.[277] Others highlight that Parliament's decision to embrace new technology GMOs comes as the impacts of climate change are threatening food production.[278] Many point out that this decision reflects trends in consumer concerns about GMO foods, which have decreased from 63% in 2005 to 27% in 2019.[279] Large agricultural companies, such as Bayer, support the Parliamentary vote and the deregulation of NGTs as a way to "boost competitiveness, sustainability, and food security across Europe."[280] Furthermore, these companies stress that "Europe's plant breeders and farmers urgently need to be enabled to harness the benefits of NGTs to successfully address the pressing agricultural challenges and deliver sustainable solutions."[281]

Meanwhile, anti-GMO groups have labeled the vote a "blow" to food and environmental safety.[282] Groups concerned about NGT-produced GMOs assert that the Parliament vote "positions the EU for even greater deregulation than in the [U.S.]" by eliminating safety checks and "failing to implement liability processes akin to those in the [U.S.]."[283]

CONCLUSION

A. Convergence Over Time

As described throughout this Article, there are many differences between the United States' (U.S.) and European Union's (E.U.) regulatory systems. For instance, while the current E.U. system is process-based,

276. Robert Hodgson, *European Governments Heading Towards GMO Deregulation*, EURONEWS (Feb. 24, 2025), https://www.euronews.com/my-europe/2025/02/24/european-governments-heading-towards-gmo-deregulation.

277. Stokstad, *supra* note 260.

278. *Id.*

279. Mihael Cristin Ichim, *The More Favorable Attitude of the Citizens Toward GMO Supports a New Regulatory Framework in the European Union*, 12 GM CROPS & FOOD 18, 18 (2020).

280. Robert Hodgson, *Parliament Reinforces Support for GMO Deregulation*, EURONEWS (Apr. 24, 2024), https://www.euronews.com/green/2024/04/24/parliament-reinforces-support-for-gmo-deregulation.

281. *Id.*

282. *EU Parliament Vote on New GMOs: a Blow to Food & Environmental Safety*, FRIENDS OF THE EARTH EUR. (Apr. 24, 2024), https://friendsoftheearth.eu/press-release/eu-parliament-vote-on-new-gmos-a-blow-to-food-environmental-safety/.

283. *Id.*

emphasizing the method of creation; the U.S. system is product-based, emphasizing demonstrated characteristics of the modified organism. Further, all genetically modified organisms (GMOs) in the E.U. are required to receive pre-market approval, whereas GMOs in the U.S. are only subject to regulation if specific characteristics exist. Additionally, pre-market authorization is required in the E.U., whereas the U.S. utilizes mandatory authorizations for some GMO characteristics while employing a voluntary consultation process for all GMO developers to receive feedback and preemptively align themselves with regulations. Individual E.U. member states can ban GMO cultivation and sale in the country, whereas U.S. states have limited authority to regulate GMOs pursuant to the preemption doctrine. The E.U. is also skeptical of granting patents to new genomic technologies (NGTs), while patentability is a cornerstone of the U.S. biotechnology sector and has shaped the structure of its regulatory system. Finally, whereas the U.S. policy on GMOs was developed with the intention of supporting and protecting the biotechnology industry, the E.U.'s policy was crafted based on the precautionary principle and amidst European skepticism about the government's regulatory capacity.

GMOs developed rapidly from the objects of laboratory research to the major force in global agricultural innovation. With an absence of legal precedent for the emerging technology, as well as poor general understanding of the complex science of genetic engineering, lawmakers across the world took drastically different approaches in their attempts to regulate the novel field. As time has passed, regulators observed and learned from the strengths and weaknesses of the regulatory frameworks of their own systems and the systems of others, and they are now adopting successful and popular elements of other systems. The U.S. and E.U. have long been regarded as having opposite approaches to GMO regulation, but proposed changes in both regulatory schemes are producing systems that share some key features.

U.S. legislation to impose labeling requirements is one example of alignment of the systems, in which the U.S. borrowed a key element of the E.U.'s approach to GMO regulation. Labeling requirements provide consumers with information regarding their agricultural system and food products, but ultimately burdens individual consumers to understand the implications of the labels in order to make an informed decision.[284] Bipartisan majorities of American consumers, almost 90% in some surveys, support

284. Andrea Freeman, *Transparency for Food Consumers: Nutrition Labeling and Food Oppression*, 41 AM. J.L. & MED. 315, 316 (2015).

labeling of GMO products, believing that people have a right to know what is in their food.[285]

Another large change is the February 2024 E.U. Parliament vote and ongoing European Council negotiations to exempt qualifying Category 1 GMOs from much of the pre-market approval process, which would result in a greater number of GMO products available in E.U. markets. This signifies a notable movement of the E.U. regulatory structure towards the U.S.'s more GMO-friendly approach. Environmental groups in the E.U. assert that the move to deregulate an entire category of GMOs goes further than the U.S. system of GMO regulation because there is no pre-market approval and no liability process.[286] GMOs in the U.S. are governed according to their characteristics rather than on the mere fact that they are genetically modified, and the deregulation of Category 1 GMOs could be interpreted as the E.U. adopting a more similar regulatory style. New GMOs in the E.U. would initially be examined to determine the amount and type of genomic change the GMO underwent, and then according to the characteristics of the GMO. Characteristics of environmental concern, like herbicide resistance, would be exempt from Category 1 classification, indicating a partial shift to product-based versus process-based regulation. The proposed shift in E.U. regulations is still more process-based than the U.S. system in that only a subset of genetic modification techniques are eligible for deregulation—marking a substantial shift from the continent's former stance. Additionally, new E.U. proposals exclude Category 1 NGTs from the "safeguard clause" that member states could use to prohibit a GMO within their borders, indicating a shift toward the U.S. system.

In totality, given the shifts in U.S. and E.U. GMO regulations, the systems seem to be converging to allow more GMO crops with labels—a deregulation-and-labeling approach. This convergence could be the result of watching and learning from each other's regulatory systems. The U.S. could have adopted labeling requirements that provide consumers with additional information after seeing how companies in the E.U. included GMO labels on their packages and consumers' positive responses. Similarly, the E.U. may have watched the U.S. biotechnology industry innovate new technologies with enhanced yields and sustainability benefits and wanted to reduce the

285. *Americans Support GMO Food Labels But Don't Know Much About Safety of GM Foods*, UNIV. OF PA.: ANNENBERG PUB. POL'Y CTR. (July 18, 2016), https://www.annenbergpublicpolicycenter.org/americans-support-gmo-food-labels-but-dont-know-much-about-safety-of-genetically-modified-foods/.

286. Katsarova, *supra* note 265, at 10.

limitations placed on its own biotechnology industries in light of climate change. However, policymakers may be hesitant to simply deregulate GMOs. Thus, partial deregulation coupled with labeling allows policymakers to strengthen food systems and boost the competitiveness of biotechnology companies while also providing more information to consumers opposed to GMOs.

B. Implications of the Deregulation-and-Labeling Approach

Ultimately, it is unclear that the arising, converged system of deregulation-and-labeling protects the environment. Even with proposed updates to the E.U. system, many regulations hinge upon process-based versus product-based reasoning, meaning that the potential environmental impact of a new crop variety is not the dominant factor considered in the level of risk assessment and regulation applied. While many GMOs do not have negative environmental impacts, and many even have positive environmental impacts, allowing GMOs into the agricultural system without thorough environmental assessments poses a significant risk. In contrast, the U.S.'s product-based approach, regulating organism characteristics, may be preferred for environmental protection because potential harm to the environment is considered equally rigorously regardless of the process used to create the product. For example, in the E.U. proposal, a plant with natural insect-resistance genes enhanced through NGTs in a manner that could have resulted through conventional breeding would not be regulated as a GMO, and may consequently have a reduced depth and scope of environmental risk assessment. Conversely, in the U.S., the same plant would be reviewed by the EPA to consider the environmental impacts of the enhanced pesticidal properties. However, current E.U. proposals indicate there will be a sliding scale of risk assessment for Category 1 NGTs, though the details and criteria have not yet been finalized. Further, they offer regulatory benefits for Category 2 NGTs with intended sustainability benefits, indicating that they intend to try and steer biotechnology companies toward sustainability-focused efforts. This is not the case in the U.S. system, in which sustainability-oriented GMOs are not similarly incentivized to guide industry efforts.

During his first term, U.S. President Donald Trump attempted to significantly deregulate GMOs, reducing the requirements for environmental

risk assessment, before being blocked by the courts.[287] Furthermore, the U.S. Department of Agriculture under the Trump Administration exempted many NGT GMOs categorically from the regulation process on the basis that they could have occurred naturally, including modifications such as targeted deletions, single base pair mutations, and insertions of DNA from the plant's gene pool.[288] Although the new framework was struck down by the courts, exemptions approved before the December 2024 court ruling remain in place.[289] Project 2025, which many believe to be the unofficial playbook for Trump's second term, describes a desire to "adopt policies to remove unnecessary barriers to approvals and the adoption of biotechnology" in agriculture and to "repeal the federal labeling mandate," indicating continued interest in GMO deregulation.[290] Future regulatory changes by the second Trump administration may seek to reinstate exemptions for certain types of NGT GMOs. This would be a large shift from the historical U.S. approach—shifting focus away from product-based thinking and toward process-based regulation—and would be a major convergence between the U.S. and developing E.U. regulatory systems. The U.S. system, already imperfect in its ability to prioritize the environment, may soon be even less well-structured to do so.

Despite their respective strengths and weaknesses, the regulatory systems of both the U.S. and E.U. fall short of encompassing the full biological complexity and diversity of the products that they regulate. The labeling requirements of both regulatory frameworks are insufficient because they do not convey meaningful information about the extent or intention of the genetic modification. For example, an NGT GMO with only a single base pair change and no altered traits is subject to the same labeling standards as an organism with dozens of genes spliced in from distantly related species. Yet the potential impacts of these two types of changes are vastly different. Further, traditional agricultural practices that create interspecies hybrids—giving rise to common foods like sweet corn and Meyer lemons—can change up to 50% of an organism's DNA. By contrast, NGT genetic modifications may alter as few as one in one billion DNA base pairs, yet only the latter

287. Nat'l Fam. Farm Coal. v. Vilsack, 758 F. Supp. 3d. 1060, 1065 (N.D. Cal. 2024).

288. Michael Ward et al., *An InSECURE Future: Court Ruling Guts USDA Regs on Genetically Engineered Plants*, MORRISON FOERSTER: LIFE SCIS. & HEALTHCARE (Dec. 19, 2024), https://lifesciences.mofo.com//topics/an-insecure-future-court-ruling-guts-usda-regs-on-genetically-engineered-plants.

289. *Id*.

290. Daren Bakst, *Department of Agriculture*, *in* MANDATE FOR LEADERSHIP: THE CONSERVATIVE PROMISE 289, 307 (Paul Dans & Steven Groves eds., 2023).

requires labeling. Thus, labeling requirements do not actually inform consumers about how much their foods differ from naturally occurring varieties. The GMO labeling requirement under both regulatory systems also do not indicate the functional implications of the genetic modification. GMOs modified to have increased herbicide-tolerance are exposed to much higher levels of herbicides than GMOs modified to enhance traits like drought resistance, yet consumers wishing to minimize herbicide exposure will be unable to differentiate the two products under current labeling requirements.

In addition, labeling requirements alone cannot produce healthy or safe food systems and are often not the main factor influencing a consumer's choice to purchase a food product. A 2023 study found that implementation of mandatory labeling requirements produced a negligible change in consumption habits.[291] Moreover, even the best-informed consumers cannot act as a substitute for government regulation to create a safe, environmentally-sound agricultural system. Thus, the current labeling requirements provide consumers with little meaningful information about what they are actually purchasing and its implications for human and environmental health.

Additionally, the U.S. and E.U.'s potential decisions to reduce regulation of NGT GMOs ignores the large impact that subtle NGT modifications, such as single base pair substitutions, can have on an organism. For example, an organism created by deleting a single gene with older technologies would be regulated as a GMO, whereas a deletion of the same gene produced by NGT would not be regulated despite the fact that the functional modification of both organisms is the same. In contrast, the U.S. system of looking only at characteristics leaves large loopholes; for example, allowing novelty GMOs to go unregulated even though these can also pose risks of transgene escape.

In conclusion, the E.U. and U.S. systems of GMO regulation have partially converged over time and share some key attributes; however, both regulatory systems have gaps in their ability to regulate GMOs in full accordance with science, and the deregulation-and-labeling approach the jurisdictions are converging towards is not optimized to maximally protect the environment or inform consumers.

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291. Aaron Adalja, *GMO and Non-GMO Labeling Effects: Evidence from a Quasi-Natural Experiment*, 42 MKTG. SCI. 233, 234 (2023).

PLANTED IN POWER: HOW INTELLECTUAL PROPERTY LAW AND MARKET CONCENTRATION CHANGED THE SEED INDUSTRY

"If we will not endure a king as a political power[,] we should not endure a king over the production, transportation, and sale of any of the necessaries of life."

-Senator John Sherman[1]

1. 21 CONG. REC. S2457 (1890) (statement by Sen. John Sherman).

INTRODUCTION

A seed is the beginning of agriculture. For centuries, farmers have been saving seeds from one harvest to plant for the next season.[2] This practice allowed farmers to develop and preserve locally adapted crops and choose their best harvest for the following year. However, consolidation and expansion of intellectual property (IP) rights in the seed industry have fundamentally changed this tradition. These changes have created a system where farmers are increasingly dependent on four powerful seed companies, who can impose stringent restrictions on seed use through licensing agreements that prohibit saving and researching seeds.

The seed industry's transformation began in earnest with the passage of the Plant Varieties Protection Act (PVPA) in 1970.[3] Before the PVPA, seed breeding and crop improvement were primarily public endeavors driven by universities and government research programs.[4] The PVPA marked a significant shift, granting private companies the right to obtain Plant Variety Protection Certificates (PVPCs), which provided exclusive rights to their seed varieties.[5] Crucially, these certificates still allowed farmers to save seed and conduct research, preserving some degree of independence for agricultural producers.[6] However, subsequent legal developments eroded these farmer exemptions, culminating in the Supreme Court's 1980 decision in *Diamond v. Chakrabarty*, which extended patent protections to genetically modified organisms—eventually including seeds.[7]

In the years following *Diamond v. Chakrabarty*, the seed industry underwent rapid consolidation, with just four companies—BASF, Corteva, Syngenta, and Bayer—now controlling over 70% of the U.S. soybean market, 80% of the corn market, and 90% of the cotton market.[8] These companies enforce their IP rights through restrictive licensing agreements, often called "Technology Use Agreements," which farmers must sign before

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2. A. Bryan Endres, *State Authorized Seed Saving: Political Pressures and Constitutional Restraints*, 9 DRAKE J. AGRIC. L. 323, 324, 326 (2004).

3. 7 U.S.C. § 2543.

4. Paulina B. Jenney, Keeping What You Sow: Intellectual Property Rights for Plant Breeders and Seed Growers 7 (May 2022) (Masters professional paper, University of Montana) (on file with University of Montana).

5. 7 U.S.C. §§ 2543–2544.

6. *Id.*

7. 447 U.S. 303 (1980) (establishing the subject matter eligibility of living organisms).

8. BASEL MUSHARBASH, FARM ACTION, "KINGS OVER THE NECESSARIES OF LIFE": MONOPOLIZATION AND THE ELIMINATION OF COMPETITION IN AMERICA'S AGRICULTURE SYSTEM 45 (2024).

purchasing seed.[9] These contracts prohibit seed saving and research, regardless of IP rights.[10] The result is a legal landscape prioritizing corporate control over farmers' rights and consumer choices.

This Note examines the legal implications of this changing market. It argues that these agreements constitute contracts of adhesion, leaving farmers with little bargaining power and undermining the public interest objectives of the PVPA. Part I provides background on the historical practice of seed saving, the establishment of the PVPA, the expansion of IP protections to seeds, and the consolidation of the seed industry. Part II analyzes the legal framework that underpins the current system, including the constitutional basis for IP protections, key Supreme Court decisions, and the enforcement of licensing agreements through contract law. Part III considers the role of antitrust law in addressing the market consolidation that exacerbates these issues, highlighting the potential for enforcement under the Sherman Act and the Federal Trade Commission Act. Finally, Part IV explores policy solutions, including improved labeling requirements to increase transparency around IP protections, enhanced antitrust enforcement to reduce market concentration, and state-level initiatives to protect farmers' rights.

The effects of these issues extend far beyond individual farmers. A few multinational corporations are threatening a resilient and sustainable food system which depends on diverse plant varieties.[11] Rebalancing the legal and economic dynamics of the seed industry is essential to protecting farmers' autonomy, fostering innovation, and ensuring the long-term health of global agriculture.

I. BACKGROUND: FROM THE TRADITION OF SAVING SEED TO LICENSING

Today, farmers do not own the seed they use. Instead, they license the technology from one of four companies every spring.[12] Intellectual property (IP) protection for seeds began to encourage innovation but has evolved into a limiting system seed manufacturers control.[13] Seed companies have continued their overreach through contracts with farmers to maintain control

9. EMILY SPIEGEL ET AL., VT. L. & GRADUATE SCH.: CTR. FOR AGRIC. & FOOD SYS., SEEDS FOR RENT: THE FARMERS' GUIDE TO TECHNOLOGY USE AGREEMENTS 4 (2025).

10. *Id.* at 18.

11. Claire Kelloway, *USDA Report Highlights Harms of Seed Consolidation and Restrictive IP*, FOOD & POWER (Mar. 23, 2023), https://www.foodandpower.net/latest/usda-seeds-report-3-23.

12. SPIEGEL ET AL., *supra* note 9, at 4.

13. *See infra* Part I.E.

over agriculture's fundamental block—the seed.[14] This Section provides an overview of the history of seed saving, initial legislation to protect the tradition, and case law altering extending IP protections resulting in the implementation of private contracts to close any gaps in companies' seed ownership.

A. Saving Seed is a Centuries-Old Tradition.

Farmers have been saving seed to replant for next season's crop for centuries before the seed industry began acquiring IP rights on their seed traits.[15] Seed saving is the practice of selecting seed from one season's crop to use for future planting.[16] Farmers choose seed from plants with the most desirable traits, and with a steady accumulation of advantageous genes, more productive plants grow.[17] These traits include drought resistance, disease endurance, germination times, and other plant qualities.[18] Indigenous cultures have developed sophisticated methods for collecting, storing, and replanting seed for centuries.[19] The seed industry is often divided into two seed markets: commodity seeds and specialty crop seeds. Commodity seeds include corn, soy, wheat, and cotton which are grown on a larger scale.[20] Specialty crop seeds include fruits, vegetables, and other crops grown on smaller acreage.[21]

Agribusinesses, U.S. land-grant universities, and farmers have invested in seed research and seed saving to increase production.[22] Since 1935, yields

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14. *See infra* Part II.B.

15. *See* Keith Fuglie & James M. MacDonald, *Expanded Intellectual Property Protections for Crop Seeds Increase Innovation and Market Power for Companies*, U.S. DEP'T OF AGRIC.: ECON. RSCH. SERV. (Aug. 28, 2023), https://www.ers.usda.gov/amber-waves/2023/august/expanded-intellectual-property-protections-for-crop-seeds-increase-innovation-and-market-power-for-companies.

16. *See* R. DOUGLAS HURT, AMERICAN AGRICULTURE: A BRIEF HISTORY 4 (Purdue Univ. Press rev. ed. 2002).

17. JACK KLOPPENBURG, JR., FIRST THE SEED: THE POLITICAL ECONOMY OF PLANT BIOTECHNOLOGY, 1492–2000, at 2 (Univ. of Wis. Press, 2d ed. 2004) (1988).

18. Kelloway, *supra* note 11.

19. FIRST NATIONS DEVELOPMENT INSTITUTE, SEED SAVING & SEED SOVEREIGNTY 1 (2015) ("Many [I]ndigenous communities developed highly-evolved systems of seed saving that often included optimal season times for seed saving, seed-saving rotations, containers and storage units that lasted for hundreds of years, processes that considered pollination patterns and systems, and associated cultural meaning to the different stages of the seed-saving process.").

20. 7 U.S.C. § 9011.

21. Specialty Crops Competitiveness Act of 2004, 7 U.S.C. § 1621.

22. Keith Aoki, *Seeds of Dispute: Intellectual Property and Agricultural Biodiversity*, 3 GOLDEN GATE UNIV. ENV'T L.J. 79, 85 (2009). A U.S. land grant university is an institution that receives federal funding historically to promote education in agriculture, military tactics, and mechanical arts as established by the Morrill Acts of 1862 and 1890. *Land-Grant University FAQ*, ASS'N OF PUB. & LAND-GRANT UNIVS., https://www.aplu.org/about-us/history-of-aplu/what-is-a-land-grant-university/#:~:text=What%20is%20a%20land%2Dgrant,Grant%20Status%20Act%20of%201994 (last visited Nov. 28, 2025).

of crops such as corn and soy have doubled primarily due to refined genetics.[23] Before 1970, public universities had been doing most crop breeding.[24] Farmers primarily saved their seed and periodically bought new seed to adopt a different variety or strengthen genetics.[25] Cultivators have long been involved in changing seed traits. Farmers could purchase newer varieties then continue to seed save with the assistance of public universities' genetically modified seeds.[26] Public institutions and farmers were primarily altering seed genetics until Congress incentivized private innovation.[27] Initially, Congress incentivized private development of seed genetics while maintaining the right of farmers to save seed.[28]

B. The Plant Varieties Protection Act

With the expansion of seed technology, Congress passed the Plant Varieties Protection Act (PVPA) in 1970.[29] Farmers continued to save the seed for subsequent plantings, leaving private companies with little incentive to research and develop new seed traits.[30] Private industries were granted a limited exclusivity period for new crop varieties after the passage of the PVPA, similar to those with Plant Variety Protection Certificates (PVPCs).[31] In the years preceding the PVPA, the President's Commission on the Patent System acknowledged "the valuable contribution of plant and seed breeders, [but it did] not consider the patent system the proper vehicle for the protection of such subject matter."[32]

Ultimately, the PVPA required a carve-out in the PVPCs to allow farmers to continue saving seed for next season's use.[33] Plant breeders still had the right to use the protected seed in their programs if the new variety was distinct enough from the original.[34] The PVPA aligned the interests of the seed industry, which sought compensation for its technology, with those

23. KLOPPENBURG, *supra* note 17, at 5.
24. Fuglie & MacDonald, *supra* note 15.
25. *Id.*
26. Aoki, *supra* note 22, at 85.
27. *Id.* at 86.
28. 7 U.S.C § 2543; *see* Jessica Lynd, *Gone with the Wind: Why Even Utility Patents Cannot Fence in Self-Replicating Technologies,* 62 AM. UNIV. L. REV. 663, 673–74 (2013).
29. Aoki, *supra* note 22, at 89.
30. HURT, *supra* note 16, at 3.
31. Jenney, *supra* note 4, at 6.
32. PRESIDENT'S COMM'N ON THE PATENT SYS., "TO PROMOTE THE PROGRESS OF . . . USEFUL ARTS" IN AN AGE OF EXPLODING TECHNOLOGY 13 (1966).
33. 7 U.S.C. § 2543.
34. AGRIC. MKTG. SERV., U.S. DEP'T OF AGRIC., MORE AND BETTER CHOICES FOR FARMERS: PROMOTING FAIR COMPETITION AND INNOVATION IN SEEDS AND OTHER AGRICULTURAL INPUTS 71 (2023) [hereinafter MORE AND BETTER CHOICES REP.].

of farmers and seed breeders, who sought to preserve their traditional rights to save and work with seeds. However, the IP protections continued to expand for the seed industry as companies sought market control.

C. The Expansion of Intellectual Property Protections

After the PVPA's passage, the Supreme Court expanded IP protections to biotechnology in *Diamond v. Chakrabarty*.[35] The Court held, "A live, human-made micro-organism is patentable subject matter . . . ."[36] In the wake of this case, the United States Patent and Trademark Office (USPTO) could grant utility patents for living organisms.[37] This holding became important for seed companies which wanted exclusive control over the profits of seed traits such as drought and chemical resistance.[38] The United States is one of only four countries that allow IP protection for plants.[39] By 2001, the USPTO had granted 1,800 utility patents for plants, plant parts, and seed.[40]

The Supreme Court solidified *Chakrabarty*'s application to the seed industry in *J.E.M. AG Supply, Inc. v. Pioneer Hi-Bred International, Inc.*.[41] The Court held that the PVPA "contains no statement that PVP certificates were to be the exclusive means of protecting sexually reproducing plants."[42] This holding allowed seed companies to seek utility patents and PVPCs for their seed traits. In *J.E.M AG Supply, Inc.*, Justice Breyer and Justice Stevens argued in their dissent: "The Court has advanced no sound reason why Congress would want to destroy the exemptions in the PVPA that Congress created. And the Court's reading would destroy those exemptions."[43] Farmers opposed to utility patents on seed traits knew this holding would fundamentally change farming and give companies total control over a less diverse number of seeds.[44]

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35. 447 U.S. 303 (1980).

36. *Id.* at 305, 318.

37. SPIEGEL ET AL., *supra* note 9, at 4.

38. Kelloway, *supra* note 11.

39. MORE AND BETTER CHOICES REP., *supra* note 34, at 30 (adding that other countries include Japan, Australia, and South Korea).

40. J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124, 127 (2001).

41. *Id.* at 124.

42. *Id.* at 141.

43. *Id.* at 155 (Breyer, J. and Stevens, J., dissenting).

44. Brief for Am. Corn Growers Ass'n & Nat'l Farmers Union as Amici Curiae Supporting Petitioners, J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124 (2001) (No. 99–1996), WL 490944.

The USDA has found it difficult to track down specific IP information—a PVPC and/or utility patent—for a particular seed trait.[45] Seed variety names and numbers linked to the IP protection result in a lack of transparency between the product farmers receive and the IP information of each trait in the seed.[46] In addition, because there is minimal clarity about which IP protection follows the seed, companies require growers to sign private agreements for seed prohibiting all seed saving and research regardless of IP protections. Enforcing these contracts furthers the market power of large seed companies who control the majority of crop seed, agricultural chemical sales, and contribute to the issues of a concentrated market.[47]

D. Enforcement of Licensing Agreements

Growers must sign private contracts, often called licensing agreements, which include onerous terms and conditions.[48] Every licensing agreement by key seed companies includes an overall prohibition on seed research or seed saving, essentially making these contracts as effective as a utility patent on seed saving.[49] Several cases have solidified seed companies' rights to enforce these provisions against farmers. In *Monsanto v. Scruggs*, family farmers argued they should be able to save seed under the doctrine of patent exhaustion in which the first sale of a good exhausts the patent rights of the holder.[50] The Third Circuit held this was not applicable because Monsanto was not selling a seed but only licensing the use to farmers.[51]

In *Monsanto v. McFarlin*, a farmer saved the Monsanto seed and replanted it the following season.[52] The farmer argued the patent could not extend to the second generation of seed, but the Third Circuit held that the

45. MORE AND BETTER CHOICES REP., *supra* note 34, at 35–36.

46. *Id.* at 37–38.

47. Keith Fuglie, *Two Companies Accounted for More than Half of Corn, Soybean, and Cotton Seed Sales in 2018–20*, U.S. DEP'T OF AGRIC.: ECON. RSCH. SERV. (Oct. 2, 2023), https://ers.usda.gov/data-products/charts-of-note/chart-detail?chartId=107516.

48. Debra L. Blair, *Intellectual Property Protection and Its Impact on the U.S. Seed Industry*, 4 DRAKE J. AGRIC. L. 297, 326 (1999).

49. Syngenta Seeds, LLC, *Stewardship Agreement* 1–2 (rev. Feb. 18, 2021), https://www.syngenta-us.com/stewardship/downloads/syngenta_stewardship_agreement_2021%20final.pdf [hereinafter *Syngenta Stewardship Agreement*]; Bayer, *U.S. Technology Stewardship Agreement Terms and Conditions* (2025), https://tug.bayer.com/tsa/united-states/ [hereinafter *Bayer Technology Stewardship Agreement*]; Corteva Agriscience, *Corteva Agriscience Technology Use Agreement*, 2 (2024), https://www.corteva.us/content/dam/dpagco/corteva/na/us/en/files/trait-stewardship/DOC-2024-Sales-Year-Draft-Corteva-TUA-Update-Notification-US.pdf [hereinafter *Corteva Technology Use Agreement*].

50. Monsanto Co. v. Scruggs, 459 F.3d 1328, 1336 (Fed. Cir. 2006).

51. *Id.*

52. *Id.*

Technology Use Agreement was not beyond the scope of Monsanto's patent rights.[53] In this case, the licensing agreement between the farmer and the seed company was considered legitimate, standardizing the industry's authority to use blanket protection for seed saving regardless of IP protections.[54] These licensing agreements grant companies greater IP protection than Congress authorized in the PVPA.[55] They also allow for coverage of traits in seeds without utility patent coverage.[56]

Given the IP component, federal law could have jurisdiction over these licensing agreements between farmers and companies. These licensing agreements are contracts, and contract law treats seeds as goods.[57] Farmers are required to sign licensing agreements with each purchase of seed. Farmers accept the agreement terms by opening a bag, planting a seed, or "continu[ing] use" of a seed.[58] Seed companies may unilaterally change the terms of the agreement at any time, and continued use of the seed—even if planted—constitutes acceptance.[59] Farmers are left with unequal bargaining power in the licensing agreements because of the few choices in the seed market. These contracts offer stronger IP protection than a PVPC or certainty of a utility patent on every trait.

Courts have held that the seed industry cannot be subjected to other interpretations of one-time use restrictions on patented technology. In *Mallinckrodt v. Medipart*, the Federal Circuit held that a medical device with a label allowing purchasers a one-time use was a valid restrictive use of their patent.[60] The Court did not find the medical device company engaged in any "anticompetitive" behavior in its single-use restriction.[61] Thus, this was not a misuse of patent law.[62] However, the seed market is one of the most consolidated industries. In licensing agreements that restrict seed saving, farmers face more anticompetitive players than the defendants in *Medipart*, distinguishing the holding from the reality of the seed industry. Consolidation in the seed industry has only grown in recent years.

53. *Id.* at 1339.
54. Aoki, *supra* note 22, at 104.
55. SPIEGEL ET AL., *supra* note 9, at 9.
56. MORE AND BETTER CHOICES REP., *supra* note 34, at 52.
57. U.C.C. § 2-A103(1)(k) (AM. L. INST. & UNIF. L. COMM'N 2003).
58. *Syngenta Stewardship Agreement, supra* note 49, at 2; *Bayer Technology Stewardship Agreement, supra* note 49; *Corteva Technology Use Agreement, supra* note 49, at 2.
59. *Id.*
60. Mallinckrodt Inc. v. Medipart Inc., 976 F.2d 700, 704 (Fed. Cir. 1992).
61. *Id.* at 708.
62. *Id.* at 709.

E. Consolidation in the Seed Industry

Four companies monopolize the seed industry: BASF, Corteva, Syngenta, and Bayer—also known as the "Big Four."[63] These agribusinesses dominate the commodity seed industry.[64] At the same time, seed prices have skyrocketed. Between 1990 and 2020, seed prices for crops grown with modified traits rose by 463%, substantially surpassing the prices farmers receive for commodities such as corn, soy, and wheat, which have only grown 56% in the same years.[65] Between 1975 and 2022, there were 492 historic mergers in the seed industry, resulting in the Big Four holding 95% of corn IP and 84% of soy IP.[66] The USDA writes:

> Economic theory suggests that some degree of market power . . . is necessary to incentivize private R&D. *However*, too much market concentration may reduce R&D if the lack of competition takes away firms' incentive to innovate. If new product introduction entails high fixed cost . . . , there can be significant barriers to entry for new firms, further limiting competition and potential new sources of innovation.[67]

In 2021, President Biden issued an Executive Order, "Promoting Competition in the American Economy."[68] The Executive Order required the Secretary of Agriculture to "help ensure that the intellectual property system, while incentivizing innovation, does not unnecessarily reduce competition in seed and other input markets beyond that reasonably contemplated by the Patent Act . . . ."[69] Since the 1990s, when genetically modified traits entered

63. *See generally* BASEL MUSHARBASH, *supra* note 8.

64. *Id.*

65. JAMES M. MACDONALD ET AL., U.S. DEP'T OF AGRIC.: ECON. RSCH. SERV., CONCENTRATION AND COMPETITION IN U.S. AGRIBUSINESS 15 (2023).

66. MORE AND BETTER CHOICES REP., *supra* note 34, at 42, 74.

67. MACDONALD ET AL., *supra* note 65, at 15 (emphasis added).

68. Exec. Order No. 14,036, 86 Fed. Reg. 36987 (July 14, 2021). In August 2025, the Trump Administration revoked this executive order. Exec. Order No. 14,337, 90 Fed. Reg. 40227 (Aug. 19, 2025). However, the Trump Administration is still pursing antitrust litigation in different agricultural industries such as pesticides and farm equipment repairs. *See, e.g.*, *Syngenta and Corteva, FTC v.*, FED. TRADE COMM'N, https://www.ftc.gov/legal-library/browse/cases-proceedings/191-0031-syngenta-corteva-ftc-v (last updated Jan. 12, 2024); *Deere & Company, FTC v.*, FED. TRADE COMM'N, https://www.ftc.gov/legal-library/browse/cases-proceedings/211-0191-deere-company-ftc-v (last updated June 11, 2025).

69. Exec. Order No. 14,036, 86 Fed. Reg. at 36993; *see* 35 U.S.C. §§ 100–103; 7 U.S.C. § 2321.

the seed market, over 200 companies selling commodity seeds have gone out of business or been acquired.[70]

When commodity growers are looking to purchase seed, they are limited to a few companies. Commodity growers must sign their licensing agreements, which have little variety between the terms and conditions. Not only do the Big Four hold most IP protections on their seed traits, but farmers must also adhere to an overarching private agreement not to save seed or conduct seed research despite congressional carve-outs in the PVPA.

As case law and private contracts have chipped away at the historical practice of saving seed in farming, the seed market became more consolidated. However, IP protections and contract law require a deep analysis, along with case law, to understand the legality of seed companies' enforcement of licensing agreements and the effects of market consolidation on consumers.

II. LEGAL ANALYSIS OF INTELLECTUAL PROPERTY LAW IN THE SEED INDUSTRY

U.S. intellectual property (IP) law contributed to and reinforced the commodification of seeds for the Big Four. Congress began incentivizing seed research on a commercial scale beginning in the 1930s. Seed research was incentivized on a commercial scale beginning in the 1930s.[71] Major Supreme Court decisions guaranteed farmers would have little say regarding the development of seeds and become no more than renters of major corporations.[72] This Section further explores the IP protections for the seed industry, which were primarily achieved through case law. In addition, this Section analyzes contract law and the legality of the licensing agreement between farmers and seed companies.

A. Intellectual Property Protections in the Seed Industry

Congress did not intend for the seed industry's current IP protections and contracting schemes.[73] U.S. patent law stems from an express power to

70. PHILIP H. HOWARD, CONCENTRATION AND POWER IN THE FOOD SYSTEM: WHO CONTROLS WHAT WE EAT? 109 (David Goodman & Michael K. Goodman eds., rev. ed. 2021).

71. *See* Endres, *supra* note 2, at 329 ("In response to pressure from the nursery industry to curb competitors' reproduction of valuable plant varieties . . . Congress passed the first *sui generis* intellectual property scheme for plants, the Plant Patent Act of 1930.").

72. *Id.* at 331.

73. 126 CONG. REC. H29941 (1980) (statement of Rep. De La Garza) ("The Plant Variety Protection Act does not restrict farmers or gardeners from growing certain varieties of crops. The act has no regulatory function. It merely gives breeders exclusive rights to try to market their new varieties for a period of time.").

Congress under the U.S. Constitution to promote the "[p]rogress of Science and useful Arts."[74] The United States Patent and Trademark Office (USPTO) regulates IP under the United States Patent Act and grants "utility" patents if the subject is considered novel, nonobvious, and useful.[75] Before *Diamond v. Chakrabarty*, the Commissioner of Patents did not consider plants subject to patent law since they were the "handiwork of nature" and not inventions.[76] With the evolution of genetic engineering in plants, plant breeders could alter the genes in seeds to create indistinguishable characteristics by sight.

The U.S. government has played a key role in seed development. Beginning in the 1860s, the Morrill Act established public land-grant universities for the aid of colleges of "agriculture and mechanic arts" which contributed substantially to seed development for much of the 20th century.[77] In 1862, Congress established the USDA.[78] Until the 1920s, the agency mail-delivered millions of free seeds to farmers to promote agricultural growth.[79] The public sector's investment in seeds deterred large-scale agribusiness from capitalizing on the development and research of new seed technology.

It wasn't until the 1930s that Congress began enacting legislation to incentivize private sector seed research while maintaining the right to seed saving—a cornerstone of agriculture.[80] However, courts continued that momentum by extending IP protections beyond the scope constructed by Congress.

1. Plant Patent Act and Plant Variety Protection Act

Private seed companies quickly began seeking IP protections for genetically altered seeds. Congress responded with the Plant Patent Act (PPA) of 1930.[81] This law only referred to plants that reproduced asexually, not plants—like corn or soybeans—that produced sexually.[82] After lobbying from the American Seed Trade Association, Congress enacted The Plant

74. U.S. CONST. art. I, § 8, cl. 8 (granting Congress the broad power to legislate to "promote the Progress of Science useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries").

75. 35 U.S.C. §§ 101–103.

76. 447 U.S. 303, 310 (1980).

77. 7 U.S.C. § 301; Aoki, *supra* note 22, at 85.

78. Department of Agriculture Organic Act of 1862, ch. 72, 12 Stat. 387 (codified as amended at 7 U.S.C. §§ 2201–2209d). President Lincoln signed the legislation that created the USDA into law, calling it "The People's Department." *USDA Celebrates 150 Years*, U.S. DEP'T OF AGRIC., https://www.usda.gov/about-usda/general-information/usda-celebrates-150-years (last visited Nov. 28, 2025).

79. Aoki, *supra* note 22, at 86.

80. 35 U.S.C. §§ 161, 163.

81. 35 U.S.C. § 161.

82. Blair, *supra* note 48, at 310.

Variety Protection Act (PVPA) in 1970, incentivizing large companies to receive patent-like protections in the form of a "certificate."[83]

The PVPA's purpose was "to encourage the development of novel varieties of sexually reproduced plants and to make them available to the public, providing protection available to those who breed, develop, or discover them, and thereby promoting progress in agriculture in the public interest."[84] Receiving a PVPA certificate meant the holder has a legal right to exclude "others from reproducing, selling, importing, or exporting the protected variety for a period of twenty years."[85] Importantly, Congress allowed the continued use of seed saving and seed research for these new seed varieties in the PVPA, so as not to disrupt the bedrock of agricultural practices.[86] The PVPA's instructions regarding IP protections allowed farmers to continue seed saving practices. However, the Supreme Court essentially overturned these carve-outs in *Diamond v. Chakrabarty*.[87]

2. *Diamond v. Chakrabarty*

Securing utility patents on living organisms was possible after the Supreme Court's major decision in *Diamond v. Chakrabarty*. In *Chakrabarty*, the Court held that a bacterium that broke down crude oil, invented by a scientist working for General Electric, was patentable.[88] Because the bacterium had "markedly different characteristics from any found in nature and [has] the potential for significant utility," the USPTO had the authority to issue IP protections for the living organism.[89]

A utility patent offers much greater protection than a Plant Variety Protection Certificate (PVPC). It allows plant breeders to claim not only the whole plant as their property but also specific components of the plant DNA such as tissue culture, specific plant parts, or genes.[90] The patent owner can exclude others from making or using the subject during the patent term.[91] Unlike the PVPA, there is no farmer exception: "Farmers are no more exempt from the legal obligation to respect the property rights of developers of patented seed than are their corporate competitors."[92] This meant that farmers

83. *Id.*
84. Aoki, *supra* note 22, at 99.
85. *Id.* at 100.
86. 7 U.S.C. § 2543.
87. 447 U.S. 303, 322 (1980) (allowing for living organisms to be patented).
88. *Id.* at 305.
89. *Id.* at 310.
90. Blair, *supra* note 48, at 318.
91. 35 U.S.C. § 101.
92. KLOPPENBURG, *supra* note 17, at 265.

could no longer continue saving seed if a company placed a utility patent on one of the traits. Companies now claimed the qualities they engineered into seeds as their own property and restricted how farmers could use those seed. *J.E.M Ag Supply, Inc. v. Pioneer Hi-Bred International, Inc.* answered the question of whether utility patents could be extended to sexually reproducing plants.

3. *J.E.M Ag Supply, Inc. v. Pioneer Hi-Bred International, Inc.*

In 2001, the Supreme Court applied its understanding in *Chakrabarty* to seeds in *J.E.M Ag Supply, Inc. v. Pioneer Hi-Bred International, Inc*. J.E.M. argued that the USPTO incorrectly granted Pioneer a utility patent for sexually reproducing plants because they lacked congressional approval.[93] Justice Thomas, writing for the majority, held that since the PVPA did not explicitly prohibit the USPTO from issuing utility patents for seeds, Pioneer was free to hold utility patents on the seed traits they developed.[94]

Joined by Justice Stevens, Justice Breyer dissented.[95] Justice Breyer argued the majority erred for three reasons: (1) the plain meaning of the PVPA, PPA, and the United States Patent Act explicitly includes language that specifically protects plants from utility patent coverage; (2) allowing utility patents for seeds creates a conflict with the provision allowing for seed saving and seed research granted to farmers in the PVPA; (3) Congress had enacted the PPA and PVPA to address challenges with protecting plants, which suggests that the United States Patent Act did not intend to apply in such cases.[96]

Justice Breyer and Justice Thomas employed textualist approaches to construe how seeds should apply under Section 101 of the United States Patent Act. Justice Thomas applied the holding in *Chakrabarty* and relied on an expansive definition of "manufacture" and "composition of matter" in Section 101.[97] He argued that genetically modified seeds fit squarely in the USPTO statutory control.[98] Meanwhile, Justice Breyer argued that the statute's plain meaning should be read narrowly to emphasize statutory coherence with existing statutory schemes (the PPA and the PVPA).[99]

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93. 534 U.S. 124, 129 (2001).

94. *Id.* at 144–45; *see* BASEL MUSHARBASH, *supra* note 8 (explaining that Pioneer merged with Dupont to become Corteva Agrisciences in 2019, now controlling nearly 40% of the corn seed market and nearly 40% of the soybean market).

95. *Pioneer Hi-Bred*, 534 U.S. at 147 (Breyer, J. and Stevens, J., dissenting).

96. *Id.* (Breyer, J. and Stevens, J. dissenting).

97. *Id.* at 130.

98. *Id.* at 132.

99. *Id.* at 148 (Breyer, J. and Stevens, J. dissenting).

Chakrabarty and *J.E.M. Ag Supply, Inc.* have solidified the seed industry's legal right to apply utility patents to seed traits despite Congress's attempt to protect farmers from overreaching IP protections. "In enforcing their patent rights, seed companies will have to avoid unnecessarily antagonizing the farmer, who is, paradoxically, both the competitor and customer."[100] These IP protections have given seed companies an unfair upper hand in their seed agreements with farmers. The Amicus Brief submitted to the Court in *J.E.M. Ag. Supply, Inc.* from the National Corn Growers and National Farmers Union provided a lengthy argument against Pioneer.[101] It concluded by saying:

> Congress never envisioned turning the American farmer into a 'poster child' for patent infringement. Instead, it acted to strike a balance with the PVPA by allowing limited intellectual property rights to seed producers in exchange for exemptions that allow farmers and plant breeders to remain more than corporate 'serfs' renting the limited available germplasm from a handful of companies.[102]

IP laws now commonly govern seeds. However, patenting traits is imperfect as a means of total control over how seeds are used and sold. Utility patents become public domain after 20 years unless modifications are made.[103] In addition, the "patent exhaustion doctrine" provides that a patent is "exhausted" after the first legal sale of the patented product.[104] Under this doctrine, the first lawful purchaser of a good with a patent may also use or resell the invention without permission from, or compensation to, the patent holder.[105] For example, if a farmer resells a tractor with patents held by John Deere to a neighbor, the farmer has no obligation to pay or notify John Deere of the sale. By this logic, seeds cannot fit into the patent exhaustion doctrine

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100. KLOPPENBURG, *supra* note 17, at 266.

101. Brief for American Corn Growers Association & National Farmers Union as Amici Curiae Supporting Petitioners, J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred Int'l, Inc., 534 U.S. 124 (2001) (No. 99-1996), 2001 WL 490944.

102. *Id.* at 30.

103. Paulina Jenney*, A Guide to Seed Intellectual Property Rights*, ORGANIC SEED ALL. (June 30, 2023), https://seedalliance.org/publications/a-guide-to-seed-intellectual-property-rights/.

104. Endres, *supra* note 2, at 332.

105. *Id.*; *see* United States v. Univis Lens Co., 316 U.S. 241, 250 (1942) ("The full extent of the monopoly is the patentee's 'exclusive right to make, use, and vend the invention or discovery.' The patentee may surrender his monopoly in whole by the sale of his patent or in part by the sale of an article embodying the invention. His monopoly remains so long as he retains the ownership of the patented article. But sale of it exhausts the monopoly in that article and the patentee may not thereafter, by virtue of his patent, control the use or disposition of the article.").

because they can replicate themselves year after year if replanted. However, the Supreme Court has determined that the patent exhaustion doctrine does not apply to replanting.[106] Seed companies now rely heavily on contracting in the form of Technology Use Agreements to create the "broadest protection" for seeds.[107]

B. Enforcing Licensing Agreements Between Seed Companies and Farmers

Because utility patents are not solely prohibiting farmers from saving seed for future plantings, seed companies have multiple methods for guaranteeing future purchasing. Two ways seed companies contract around IP law are the "bag tag" method and licensing agreements. First, the bag tag is an agreement printed directly on the purchaser's seed package.[108] By opening the bag, the farmer agrees to the terms and conditions.[109] Second, seed companies can secure repurchasing through licensing agreements. Licensing agreements can also stipulate how farmers use seeds.[110] These stipulations may go beyond a seed company's PVPCs or utility patents.[111]

Seed companies have not hesitated to sue farmers to enforce their licensing agreements. In the early years of Monsanto's launch of Round-Up Ready seed, the company warned that it is "vigorously pursuing growers who pirate any brand or variety of its genetically enhanced seed."[112] Monsanto demanded strict compliance with the Technology Use Agreement—which all farmers must sign before purchasing its seed.[113] Monsanto even had a hotline number on its website for neighbors to report farmers they suspected of saving seed.[114] In less than two years, the company had over

106. *See* Bowman v. Monsanto, 569 U.S. 278, 283–89 (2013) (holding that a farmer who buys patented seeds may not reproduce them through planting and harvesting without the patent holder's permission under the patent exhaustion doctrine); Monsanto Co. v. Scruggs, 459 F.3d 1328, 1336 (Fed. Cir. 2006) (holding that saved seed does not fall under the patent exhaustion doctrine because Monsanto was not selling a seed but only licensing the use to farmers).

107. Rita S. Heimes, *Post-Sale Restrictions on Patented Seeds: Which Law Governs?*, 10 WAKE FOREST INTELL. PROP. L.J. 98, 111 (2010).

108. MORE AND BETTER CHOICES REP., *supra* note 34, at 33.

109. *Id.*

110. *See generally* SPIEGEL ET AL., *supra* note 9.

111. *Id.* at 15.

112. KLOPPENBURG, *supra* note 17, at 321. In 2018, Bayer completed a $62.5 billion acquisition of Monsanto. Claire Kelloway, *Bayer-Monsanto Deal Closes as Farmers Warn of Higher Prices and Less Resiliency*, FOOD & POWER (June 7, 2018), https://www.foodandpower.net/latest/2018/06/07/bayer-monsanto-deal-closes-as-farmers-warn-of-higher-prices-and-less-resiliency.

113. ROBERT G. HARTZLER, ET AL., COMPARISON OF DIFFERENT GLYPHOSATE BRANDS IN ROUNDUP READY® SOYBEANS (2002) (explaining that Roundup Ready—used in over 60% of Iowa's soybean acreage—is a gene genetically modified in seeds that produces an enzyme not inhibited by glyphosate making it resistant in weed controlling herbicides).

114. KLOPPENBURG, *supra* note 17, at 322.

250 investigations in 20 states regarding breach of Technology Use Agreements.[115]

The licensing agreements have strictly enforced the seed-saving and seed-research provisions on all seed—not just seeds with IP protections. These agreements have taken advantage of the few options available to farmers for purchasing seed in various terms and agreements.

1. Licensing Agreement Terms and Conditions

Every major seed company requires growers to sign a licensing agreement before purchasing seed each year. These agreements include terms prohibiting all seed saving and seed research, regardless of their PVPC or utility patent status.[116] In addition, the licensing agreements of Corteva, Bayer, and Syngenta allow the company to change the terms of the agreements unilaterally.[117] Corteva's and Bayer's contracts characterize the grower's continued use of the seed as acceptance of any unilaterally changed terms in the licensing agreements.[118] The grower's continued use of the seed is explicitly mentioned as constituting acceptance of the changing terms in Corteva's and Bayer's contracts.[119] Growers also consent to the seed company entering their property, including their seed-storage containers, with varying notice requirements.[120]

Corteva and Bayer require arbitration and force the farmer to waive their right to join a class action lawsuit against them.[121] Syngenta, Corteva, and Bayer require the farmer to pay attorney's fees.[122] These three major seed

115. *Id.*

116. *Syngenta Stewarship Agreement, supra* note 49, at 2; *Bayer Technology Stewardship Agreement*, *supra* note 49; *Corteva Technology Use Agreement*, *supra* note 49.

117. *Id.*

118. *Id.*

119. *Id.*

120. Syngenta does not have any notice requirement. *Syngenta Stewardship Agreement, supra* note 49, at 2. Bayer has a seven-days' notice requirement. *Bayer Technology Stewardship Agreement*, *supra* note 49. Corteva has a three-days' notice requirement and grants access to videos and photos of farming activities. *Corteva Technology Use Agreement*, *supra* note 49, at 2.

121. *Corteva Technology Use Agreement*, *supra* note 49, at 2; *Bayer Technology Stewardship Agreement*, *supra* note 49.

122. *Syngenta Stewardship Agreement, supra* note 49, at 2 ("Grower agrees that Syngenta and any owners of the Patents shall be entitled to recover any costs or expenses, including reasonable attorney's fees, incurred in enforcing its or their rights under this Agreement"); *Corteva Technology Use Agreement*, *supra* note 49, at 2 ("Grower agrees that Corteva and any owners of the patents covered by the Agreement shall be entitled to recover any costs or expenses, including, but not limited to, court costs or reasonable attorneys' fees, it incurs in enforcing its rights under the Agreement if the Grower is determined to be at fault."); *Bayer Technology Stewardship Agreement*, *supra* note 49 ("If Grower is found by any court to have infringed one or more of the United States patents or PVPs covering Bayer Technologies, or otherwise to have breached this Agreement, Grower agrees to pay Bayer, the licensed

companies have choice-of-law provisions that require legal disputes to be settled in the state of the seed companies' choice.[123] Bayer is the only seed company with damages predetermined in its licensing agreements for violations.[124] Seed companies are using contracts to cover holes in their IP protections. The licensing agreements are contracts with unequal bargaining power given the limited choices commodity farmers have for genetically modified seeds.

2. Licensing Agreements Under Contract Law

While the Uniform Commercial Code (UCC) does not define a "contract of adhesion," these licensing agreements would be considered unconscionable contract clauses.[125] A court cannot enforce a contract made "by adverse construction of language, by manipulation of the rules of offer and acceptance or by determinations that the clause is contrary to public policy or to the dominant purpose of the contract."[126] Put simply, a contract that harms public policy is no good. Adhesion contracts frequently involve unequal bargaining power between a large corporation and an individual.[127]

In *Monsanto Co. v. McFarling*, the dissent argued on the point of contract law when it wrote, "[i]t cannot seriously be disputed that by signing the Technology Agreement McFarling became attached to a contract of adhesion."[128] The lopsided contract terms are only amplified when a farmer has few choices for seeds that carry the herbicide resistance so ubiquitous in conventional farming.[129] In the case of *McFarling*, the Missouri farmer had

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Bayer Technologies provider(s), and Dow AgroSciences, as appropriate, their attorneys' fees and costs related to the case plus any other expenses incurred in the investigation of the breach and/or infringement.").

123. *Bayer Technology Stewardship Agreement*, *supra* note 49, at 3 (generally Minnesota, but it depends on the type of seed purchased); *Corteva Technology Use Agreement*, *supra* note 49, at 4 (Iowa); *Syngenta Stewardship Agreement*, *supra* note 49, at 2 (Minnesota).

124. $250 per unit of soybean seed, $1,000 per unit of herbicide tolerant cotton seed, $2,000 per unit of insect protected/herbicide tolerant cotton seed, $50 per bushel of wheat seed. *Bayer Technology Stewardship Agreement*, *supra* note 49.

125. J.W. Looney & Anita K. Poole, *Adhesion Contracts, Bad Faith, and Economically Faulty Contracts*, 4 DRAKE J. AGRIC. L. 177, 191 (1999).

126. U.C.C. § 2-302 cmt. 1(AM. L. INST. & UNIF. L. COMM'N 1989).

127. 2001 Okla. Op. Att'y Gen. 17, ¶ 2–3 (2001); *see, e.g.,* Mullis v. Speight Seed Farms, Inc., 505 S.E.2d 818, 821 (Ga. Ct. App. 1998) (finding that a farmer did not have equal bargaining power against a seed company in the agreement on the seed label).

128. Monsanto Co. v. McFarling, 302 F.3d 1292, 1300 (Fed. Cir. 2002) (Clevenger, J., dissenting).

129. *Adoption of Genetically Engineered Crops in the United States - Recent Trends in GE Adoption*, U.S. DEP'T AGRIC.: ECON. RSCH. SERV., https://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-united-states/recent-trends-in-ge-adoption/ (last updated Jan. 1,

to submit to a jurisdiction of Monsanto's choosing, agree to Monsanto's damages, bear the costs of Monsanto's legal fees, and refrain from replanting any seed even if there were no IP protections.[130] Although a patent holder has every right to institute a licensing agreement with terms most favorable to them, the terms in this case were one-sided instead of bargained for.

3. Contracts of Adhesion in Agriculture

To determine if a contract of adhesion is enforceable, one may need to consider unconscionability. Section 2-302 of the UCC set out this understanding:

> If the court as a matter of law finds the contract or any clause of the contract to have been unconscionable at the time it was made the court may refuse to enforce the contract, or it may enforce the remainder of the contract without the unconscionable clause, or it may so limit the application of any unconscionable clause as to avoid any unconscionable result.[131]

In two cases at the South Dakota Supreme Court, seed contracts were found unconscionable under UCC Section 2-302 because the farmer was unable to bargain for more favorable terms and conduct seed research to test the seed.[132] In *Hanson v. Funk Seeds International*, the Court found the bag tags contained a warranty disclaimer and limitations of remedy language to be unconscionable.[133] The Court declared: "One-sided agreements whereby one party is left without a remedy for another party's breach are oppressive and should be declared unconscionable."[134] Similarly, in *Schmaltz v. Nissen*, the Court again found the terms of disclaimers on warranties and limitation of damages on the seed bag unconscionable.[135] Three of the Big Four disclaim warranties in their licensing agreements.[136] This means these seed

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2025) (as of 2024, over 90% of U.S. corn, soybeans, and cotton are produced using seeds with genetic engineering).

130. *McFarling*, 302 F.3d at 1299–300.

131. U.C.C. § 2-302(1) (AM. L. INST. & UNIF. L. COMM'N 1989).

132. Looney & Poole, *supra* note 125.

133. Hanson v. Funk Seeds Int'l, 373 N.W.2d 30, 35 (S.D. 1985).

134. *Id.* (citing Rozeboom v. Northwestern Bell Tel. Co., 358 N.W.2d 241 (S.D. 1984)).

135. Schmaltz v. Nissen, 431 N.W.2d 657, 657 (S.D. 1988).

136. *Syngenta Stewardship Agreement*, *supra* note 49, at 2; *Bayer Technology Stewardship Agreement*, *supra* note 49; *Corteva Technology Use Agreement*, *supra* note 49, at 2.

companies are protected from legal action if the seed does not perform as the farmer expects.

This Section analyzed the enforcement and controlling law of the licensing agreements. Given the little market choice, farmers could challenge these contracts as contracts of adhesion. However, there are also federal challenges to the seed market under antitrust and consumer protection law.

III. LEGAL ANALYSIS UNDER ANTITRUST AND CONSUMER PROTECTION LAWS

In 1973, U.S. Secretary of Agriculture Earl Butz told family farmers to "get big or get out."[137] Decades later, federal antitrust enforcers are attempting to reign in the effects of a market dominated by big players. In 2024, the Federal Trade Commission (FTC) and the Department of Justice (DOJ) have brought antitrust cases against large agribusinesses such as John Deere, Syngenta, Corteva, and AgriStats.[138] The concentration of the seed industry, the skyrocketing prices, and the restrictive licensing agreements raised many red flags. This Section will analyze how the market became so concentrated and address the different federal antitrust statutes applicable to the seed industry.

A. Consolidation in the Seed Industry

Following the legal shift allowing seed companies to place utility patents on seeds, genetically modified seeds flooded the market. Within ten years, roughly 52% of corn, 79% of cotton, and 87% of soybean acreage in the United States were planted with genetically engineered seeds now eligible for heightened intellectual property (IP) protections.[139] After companies leveraged their patent power to monopolize the seed market, a series of

137. Peter Welte, *Considering the Lessons of Earl Butz*, AGWEEK (Apr. 1, 2018), https://www.agweek.com/opinion/considering-the-lessons-of-earl-butz.

138. *Justice Department Sues Agri Stats for Operating Extensive Information Exchanges Among Meat Processors*, DEP'T OF JUST. (Sept. 28, 2023), https://www.justice.gov/opa/pr/justice-department-sues-agri-stats-operating-extensive-information-exchanges-among-meat; *FTC, States Sue Deere & Company to Protect Farmers From Unfair Corporate Tactics, High Repair Costs*, FED. TRADE COMM'N (Jan. 15, 2025), https://www.ftc.gov/news-events/news/press-releases/2025/01/ftc-states-sue-deere-company-protect-farmers-unfair-corporate-tactics-high-repair-costs; *FTC and State Partners Sue Pesticide Giants Syngenta and Corteva for Using Illegal Pay-to-Block Scheme to Inflate Prices for Farmers* FED. TRADE COMM'N, (Sept. 29, 2022), https://www.ftc.gov/news-events/news/press-releases/2022/09/ftc-state-partners-sue-pesticide-giants-syngenta-corteva-using-illegal-pay-block-scheme-inflate.

139. Rebecca Bratspies, *Owning All the Seeds: Consolidation and Control in Agbiotech*, 47 ENV'T L. 583, 589 (2017).

mergers started.[140] Mergers between what was formerly the "Big Six" became the "Big Four" in the span of roughly one year.[141] Dow and DuPont merged into a new $130 billion company called Corteva in December 2015.[142] Two months later, ChemChina purchased Syngenta for $4.3 billion.[143] Finally, that fall, Monsanto accepted a $66 billion merger with Bayer.[144] BASF is the only company that has not engaged in a mega-merger. However, BASF is the most likely absorber of any subsidiaries the other companies must divest to obtain merger approval from antitrust enforcers.[145]

Farmers' choices for licensing agreements are largely limited to Corteva, Bayer, and Syngenta. By expanding their IP protections, commodity farmers have little choice in choosing seed for each year's planting. The industry has only grown more consolidated since *J.E.M. Supply Inc.*, *McFarling*, and *Scruggs*.[146] The market has been under tight scrutiny from the DOJ and FTC for antitrust violations of the Sherman Act and the Clayton Act.[147] To address the harmful effects of consolidation, a few avenues of antitrust law may apply, such as Section 5(a) of the FTC Act and Section 2 of the Sherman Act.[148]

B. Consumer Protection Violations for Unfair or Deceptive Acts

The FTC has the federal authority to protect farmers from heavily concentrated market players wielding broad authority in their licensing agreements. Seed companies can enforce unconscionable terms while gathering more seed IP rights. The FTC may "prosecute any inquiry

140. *Id.*

141. *Id.* at 584, 608; Amos Stromberg & Philip H. Howard, *Recent Changes in the Global Seed Industry and Digital Agriculture Industries,* PHILIP HOWARD (Jan. 2023), https://philhoward.net/2023/01/04/seed-digital/.

142. Bratspies, *supra* note 139, at 584.

143. *Id.*

144. *Id.*

145. *Id.* at 585.

146. *See generally* Fuglie, *supra* note 47 (describing that concentration can be traced to the expansion of intellectual property rights to private companies for seed improvements in the 1970s and 1980s).

147. In 2001, the DOJ investigated violations of Section 7 of the Clayton Act regarding Monsanto's acquisitions of DeKalb. In 1998, the DOJ Antitrust Division investigated Monsanto's proposed acquisition of DeKalb Genetics Corporation under violation of Section 7 of the Clayton Act. Douglas Ross, Special Couns. for Agric., U.S. Dep't of Just.: Antitrust Div., Antitrust Enforcement and Agriculture, Address Before the Organization for Competitive Markets, at 7–8 (July 20, 2001). In 2018, the DOJ filed a complaint against Bayer for their acquisition of Monsanto under Section 7 of the Clayton Act. United States v. Bayer AG & Monsanto Co.; Proposed Final Judgment and Competitive Impact Statement, 83 Fed. Reg. 27652, 27652 (June 13, 2018).

148. 15 U.S.C. § 45(a); 15 U.S.C. § 2.

necessary to its duties in any part of the United States."[149] Congress authorized the agency "to gather and compile information concerning, and to investigate from time to time the organization, business, conduct, practices, and management of any person, partnership, or corporation engaged in or whose business affects commerce."[150]

Section 5(a) of the FTC Act provides that "unfair or deceptive acts or practices in or affecting commerce . . . are . . . declared unlawful."[151] An act or practice is "unfair" if it "causes or is likely to cause substantial injury to consumers which is not reasonably avoidable by consumers themselves and not outweighed by countervailing benefits to consumers or to competition."[152]

The licensing agreements that seed companies require farmers to sign to purchase seed generally forbid saving seed or conducting research on the seed. The agreement covers any seed—with or without a patent.[153] In addition, even if a farmer wishes to create a generic seed to avoid re-signing and repurchasing seed every year, it is nearly impossible to find IP protections on individual seed traits.[154] Given farmers' few choices for commodity seed, the seed industry unfairly wields its market power by creating ambiguity around IP protections on the seed's traits.

149. 15 U.S.C. § 43.

150. *Id.* § 46(a)(1).

151. *Id.* § 45(a)(1).

152. *Id.* § 45(n).

153. MORE AND BETTER CHOICES REP., *supra* note 34, at 36. One plant breeder interviewed by the USDA for the More and Better Choices stated:

[C]ompanies might sometimes exploit the lack of transparency to extend the scope of their patent beyond what the application claimed. For example, some plant breeders we interviewed noted that companies have acquired patents on traits such as disease resistances, then retroactively claimed to have IP rights on varieties that contain those traits, even though the varieties have been on the market for many decades. A plant breeder and founder of an independent seed company commented that he has encountered bag tags on an heirloom variety that was not protected by any form of IP at all. He wrote that this practice, "in the absence of a publicly available list of patented varieties, creates the impression that 'everything is patented' . . . This leads to people restricting their own fair use of public domain varieties, a kind of self-censorship, for fear of legal consequences."

Id.

154. In one public comment to the USDA a plant breeder wrote:

There is often also no indication of the presence of a patent on the seed packaging or in the description of the variety in a seed catalog. There is often not even any information about the existence of a patent on the website of the breeder of the variety . . . Sometimes the patent applications refer to the variety only by internal firm numbers or codes, and there is no mention anywhere of the name that the variety is actually to be sold to the public under. In these cases, even if a prospective plant breeder spends weeks looking up and reading patents on the crop of interest, there is no way they can tell whether the varieties they are hoping to use to breed from are patented or not.

Id.

C. Antitrust Violations in the Seed Market

This Section will analyze possible antitrust violations in the seed market. A lack of transparency, higher prices for consumers, and loyalty programs that penalize independent seed retailers from offering generic brands to farmers, demonstrate possible indicators of market abuse. Section 2 of the Sherman Act makes it unlawful for any person to "monopolize, or attempt to monopolize" commerce.[155] The statute fails to define "monopolize." Instead, the Sherman Act expects "courts to give shape to the statute's broad mandate by drawing on the common-law tradition."[156] The Supreme Court defined monopolization as both "(1) the possession of monopoly power in the relevant market and (2) the willful acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident."[157] Section 2 of the Sherman Act is not meant to penalize monopolization of a market. Instead, the Act is meant to protect competition, which would be ineffective if large firms were required to "lie down and play dead" once it achieved market success.[158]

In one of the first monopolization cases before the Supreme Court, *Standard Oil Co. of N.J. v. United States*, the Court observed that the Act does not prohibit monopolies in the concrete.[159] In the Second Circuit, Judge Hand re-emphasized *Standard Oil*'s point in *United States v. Aluminum Co.*: that mere "size does not determine guilt."[160] What determines guilt under Section 2 is: unfairly achieved monopoly power that creates higher consumer prices, poorer quality goods and services, and reduced output.[161] Additionally, a monopoly's existence can slow innovation.[162]

1. Rising Prices and Lack of Transparency

While the Big Four's monopolization of the seed industry is not a per se violation of the Sherman Act under Section 2; its harm to competition and consumers is. Higher prices for seed, specifically for genetically modified seed, and the lack of diversity in the seed-breeding industry harms the industry. Amidst the concentration in the industry, commodity seed prices

155. 15 U.S.C. § 2.
156. Nat'l Soc'y of Pro. Eng'rs v. United States, 435 U.S. 679, 688 (1978).
157. United States v. Grinnell Corp., 384 U.S. 563, 570–71 (1966).
158. Goldwasser v. Ameritech Corp., 222 F.3d 390, 397 (7th Cir. 2000).
159. Standard Oil Co. of N.J. v. United States, 221 U.S. 1, 62 (1911).
160. United States v. Aluminum Co. of Am., 148 F.2d 416, 429 (2d Cir. 1945).
161. RICHARD A. POSNER, ANTITRUST LAW 9–32 (2d ed. 2001).
162. *Id.* at 20.

have risen faster than the price of selling commodities.[163] Between 1990 and 2020, the average price farmers paid for seed rose by 270%, compared with commodity price inflation of 56%.[164] For crops planted predominately with genetically modified seed, such as corn, soybeans, and cotton, prices rose by an average of 463%.[165] Companies have justified higher seed prices by investing in research and development into higher-yielding seeds. They claim that the burden of higher prices for farmers results in a long-term benefit for seed innovation.[166]

However, the licensing agreements that dictate price of seed lack transparency.[167] The American Antitrust Institute, in a public comment, wrote these "technology fees, which in the past were a line item on the bill, are now rolled into the total cost of the seed."[168] A more significant cost is passed onto the consumer without clear reasoning.

2. Loyalty Programs and the Loss of Choices

The seed market has lost independent seed retailers, leaving farmers with fewer buying choices.[169] Rebate systems used by large companies and the variability of seed traits make it difficult for farmers to compare seed costs over time.[170] In addition, the Big Four's loyalty programs and incentives attempt to "box out competition and protect brand loyalty."[171] Bayer has used bundling programs to punish independent seed retailers from selling competitive products.[172] For example, a 2018 Bayer bundling program took away corn rebates to independent seed retailers if that company "isn't loyal."[173] The Big Four's market power means independent retailers are not able to sell generic products to farmers without being penalized.[174] As of September 2022, the FTC and ten partner states filed a complaint against Corteva and Syngenta alleging that their so-called "loyalty" programs violate

163. MACDONALD ET AL., *supra* note 65, at 15.

164. *Id.*

165. *Id.*

166. *Id.*

167. MORE AND BETTER CHOICES REP., *supra* note 34, at 47.

168. Am. Antitrust Inst., Comment Letter on Competition and the Intellectual Property System: Seeds and Other Agricultural Inputs (Mar. 17, 2022), at 13.

169. MORE AND BETTER CHOICES REP., *supra* note 34, at 49.

170. Comment Letter on Competition and the Intellectual Property System: Seeds and Other Agricultural Inputs, at 13.

171. MORE AND BETTER CHOICES REP., *supra* note 34, at 50.

172. Comment Letter on Competition and the Intellectual Property System: Seeds and Other Agricultural Inputs, at 13.

173. Indep. Pro. Seed Ass'n, Comment Letter on Competition and the Intellectual Property System: Seeds and Other Agricultural Inputs (June 15, 2022), at 18.

174. *Id.*

Section 5(a) of the FTC Act, Section 3 of the Clayton Act, and Sections 1 and 2 of the Sherman Act.[175] The complaint asserts these programs block and restrict generic competition from pesticide markets, leaving farmers to pay elevated prices for crop protection.[176] These same companies could be subject to further antitrust action in the seed market for implementing similar practices in their crop protection market.

The seed industry has unfairly monopolized a market by charging farmers higher prices, offering fewer options from where they can buy seed, and enforcing one-sided licensing agreements. The major seed companies rationalize these injustices by asserting legal ownership over traits in seeds—arguably ones that originate in nature. This private ownership of seeds replaced publicly financed institutions, like the USDA or land-grant universities, which provided their seed inventions freely to farmers.[177] Seed prices have risen, and the fees for licensing the technology have been rolled onto the consumer. Meanwhile, independent seed retailers are struggling to offer generic seed options without the Big Four's retaliation in the form of loyalty programs.

IV. STRENGTHENING POLICIES FOR A MORE TRANSPARENT AND DIVERSE SEED MARKET

There are many layers of intellectual property (IP) protections, varieties, and brand names of seeds. This has made it extremely difficult for farmers and plant breeders to decipher which seed they purchase, and the IP protections attached to it. This is especially true since the Federal Seed Act is loosely enforced by the USDA and has not been updated by Congress to include IP disclosures.[178] This Section explores stronger enforcement and amendments to the Federal Seed Act (FSA) to clarify the legal rights of those hoping to do plant research and seed saving. In addition, this Section addresses how a more transparent and fair seed market will create a stronger, more resilient food system.

A. Intellectual Property Transparency Through the Federal Seed Act

IP protections, such as utility patents and Plant Variety Protection Certificates (PVPCs), expire.[179] After expiration, the innovation becomes

175. Complaint at 2, Fed. Trade Comm'n v. Syngenta Crop Prot. AG, 711 F. Supp. 3d 545 (M.D.N.C. 2024) (No. 1:22-cv-00828).

176. Complaint at 2, *Syngenta Crop Prot. AG*, 711 F. Supp. 3d (No. 1:22-cv-00828).

177. Aoki, *supra* note 22, at 86–89.

178. MORE AND BETTER CHOICES REP., *supra* note 34, at 39–40.

179. *Id.* at 34.

public and can be further developed and modified.[180] Technically, farmers and plant breeders can legally use varieties and traits that are no longer protected by IP rights and those that never had IP protections in the first place. However, it is difficult to assess the outdated seed if the seed company takes the variety off the market, if there are licensing agreements barring any seed research, or if accessing the information about the specific IP mechanisms applied to each type of seed is complicated to find.[181]

The use of multiple IP mechanisms becomes even more confusing to farmers, plant breeders, and retail buyers when seed companies sell seed in bulk and retailers repackage it.[182] The variety names and numbers used in commercial sales may be different from those used in applications for utility patent protection. This obscures the link between the patent and the marketed product.[183]

Labeling and seed packaging from different companies marketing the same variety further complicates the search for IP rights that apply to a particular variety.[184] Seed companies that intentionally keep their IP protections veiled may be subject to Section 5 of the Federal Trade Commission (FTC) Act for unfair or deceptive practices.[185]

The FSA controls interstate and foreign commerce of seeds.[186] The FSA has specific requirements for seed labeling to prevent the misrepresentation of seeds.[187] Amended in 1958, the FSA's primary labeling requirements include information on the seed, such as kind and variety identification.[188] Under the FSA, label requirements ensure that farmers can access all legally required information. To ensure farmers have crucial information, such as which brand and variety they are purchasing and the IP information for that seed, the FSA must be strongly enforced by the USDA and updated by Congress to include patent and other IP disclosures.

B. Biodiversity in the Seed Industry

Addressing IP issues and anticompetitive behavior in the seed industry directly establishes a resilient seed system. Resiliency is "generally

180. Jenney, *supra* note 4, at 40.
181. MORE AND BETTER CHOICES REP., *supra* note 34, at 36–37.
182. *Id.* at 37.
183. *Id.*
184. MACDONALD ET AL., *supra* note 65, at 37.
185. 15 U.S.C. § 45(a)(1).
186. 7 U.S.C. §§ 1551–1611.
187. *Id.*
188. *Id.*

understood as the ability to recover from or adapt to change."[189] Our food system must adapt to different environmental conditions, weather events, and diseases.[190] Fair competition will empower companies of varying sizes to emerge and create resiliency in the seed market. Agriculture globally has lost around 75% of crop genetic diversity in the last century.[191] In the United States, two seed companies, Bayer and Corteva, accounted for 72% of planted corn acres and 66% of planted soybean acres from 2018 to 2020.[192] This steep decline in agricultural biodiversity goes hand in hand with the consolidation of the seed industry. More players in the seed industry are crucial to keep our food system resilient.[193]

A policy fix to the FSA could provide more transparency to seed breeders and farmers. By updating the seed labels with the patent number, other market players could genetically modify seed traits without the fear of patent infringement or roadblocks of untangling brands, varieties, and patent assignees. Finally, there is a strong policy argument that concentration in the seed industry is not only resulting in illegal practices, but also harming national security. Genetic biodiversity of crops is crucial to combat a changing climate and evolving plant threats.

CONCLUSION

The evolution of intellectual property (IP) protections in the seed industry and rapid consolidation have contributed to a system that has given farmers and consumers alike higher prices, fewer choices, and less agricultural biodiversity. With the expansion of IP protections for major companies and the enforcement of restrictive licensing agreements, seed companies have circumvented farmer protections originally envisioned in the Plant Varieties Protection Act and used market dominance to dictate terms that harm consumers.

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189. Julie Dawson, Address at Proceedings of the 8th Organic Seed Growers Conference, Building Resilient Seed Systems: Implications for Germplasm Conservation, Plant Breeding, and the Organic Seed Community, at 136 (2016).

190. *Id.*

191. CYDNEE V. BENCE & EMILY J. SPIEGEL, A BREED APART: THE PLANT BREEDER'S GUIDE TO PREVENTING PATENTS THROUGH DEFENSIVE PUBLICATION 6 (2019).

192. MACDONALD ET AL., *supra* note 65, at 11.

193. A larger global food sovereignty movement has erupted, advocating for people's rights to save and share seed, particularly those in global seed banks and shielded by patents. In the United States, there has also been a growing number of seed libraries as part of this movement. Integrated into public libraries, these local seed banks boast varieties that have been micro-climatized to their respective regions. *See* Bridget Shirvell, *Public Libraries Are Making It Easy to Check Out Seeds—and Plant a Garden*, CIVIL EATS (Apr. 25, 2022), https://civileats.com/2022/04/25/public-libraries-are-making-it-easy-to-check-out-seeds-and-plant-a-garden/.

The interplay between IP law and antitrust law has left farmers with little bargaining power and few market choices. To address these issues, agencies must enhance enforcement of Section 5 of the Federal Trade Commission Act and Section 2 of the Sherman Act to correct monopolistic practices and promote competition within the seed industry. In addition, greater enforcement and strengthening of the Federal Seed Act would provide the transparency needed for more diversity in the seed-breeding industry.

Senator John Sherman stood before his colleagues in Congress in 1890, determined to free the American economy from the grip of anticompetitive practices and entities.[194] Monopolization is inconsistent with our form of government. If we should not "submit to an emperor, we should not submit to an autocrat of trade."[195] Today, a cornerstone industry in our country—agriculture—is struggling to live up to Senator Sherman's interpretations. For a strong and resilient agricultural system, anticompetitive practices need to be corrected to protect farmers and consumers from exploitation.

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194. 21 CONG. REC. S2457 (1890) (statement of Sen. John Sherman).

195. *Id.*

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SOD AND SWAMP BUSTED: CITIZEN ENFORCEMENT OF MANDATORY CONSERVATION COMPLIANCE IN THE FARM BILL

"The soil is the great connector of lives, the source and destination of all. It is the healer and restorer and resurrector, by which disease passes into health, age into youth, death into life. Without proper care for it we can have no community, because without proper care for it we can have no life."

-Wendell Berry[1]

1. WENDELL BERRY, THE UNSETTLING OF AMERICA 90 (Counterpoint Press 2015) (1977).

INTRODUCTION

Soil sustains life.[2] Like many farmers, legislators have long recognized the importance of this natural resource.[3] Congress continues to encourage—and in some cases requires—soil conservation through various Farm Bill programs.[4] Such a vital resource, however, needs more protection, and soon.[5] Although soil may appear robust and plentiful, it is "the fragile product of thousands of years of formation."[6] Moreover, what took thousands of years to form can blow away in an instant during a drought or wash away in a flood.[7] In other words, the soil is vulnerable to erosion from climatic events that occur with increasing frequency, making all life increasingly vulnerable.[8] However, not all soil is equally vulnerable. The Natural Resources Conservation Service (the Agency) targets some areas as "highly erodible" when the soil in those areas erodes at excessive rates.[9] In what is known as the "Sodbuster" provision, the Farm Bill requires producers with highly erodible soil to conserve it.[10]

Additionally, in what is known as the "Swampbuster" provision, the Farm Bill requires producers with wetlands to protect them.[11] Distinct from highly erodible soils, the Agency designates an area as a "wetland" when it contains hydric or periodically saturated soil and plants capable of surviving

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2. *See What Is Soil?*, USDA: NAT. RES. CONSERVATION SERV., https://www.nrcs.usda.gov/resources/education-and-teaching-materials/what-is-soil (last visited Nov. 29, 2025); *see also* DONALD WORSTER, DUST BOWL: THE SOUTHERN PLAINS IN THE 1930S 12–13 (1979) ("'Earth' is the word we use when [soil] is there in place, growing the food we eat, giving us a place to stand and build on. 'Dust' is what we say when it is loose and blowing on the wind. Nature encompasses both—the good and the bad from our perspective, and from that of all living things. We need the earth to stay alive, but dust is a nuisance, or, worse, a killer.").

3. *See* Soil Conservation and Domestic Allotment Act, Pub. L. No. 74-46, § 1, 49 Stat. 163, 163 (1935) ("[T]he wastage of soil . . . is a menace to the national welfare . . . .").

4. *See* 16 U.S.C. § 3831 (2018).

5. *See* Dede Sulaeman & Thomas Westhoff, *The Causes and Effects of Soil Erosion, and How to Prevent It*, WORLD RES. INST. (Feb. 7, 2020), https://www.wri.org/insights/causes-and-effects-soil-erosion-and-how-prevent-it.

6. *Id.*

7. *See, e.g.*, PAUL DICKSON, BILL OF RTS. INST., THE DUST BOWL 1 (describing how, in 1934, a 1,500-mile-long by 600-mile-wide dust storm carried 300 million tons of soil out of the Great Plains); Benjamin P. Warner et al., *Farming the Floodplain: Ecological and Agricultural Tradeoffs and Opportunities in River and Stream Governance in New England's Changing Climate*, CASE STUD. ENV'T, 2017, at 1, 1 (discussing the increasing risks of flooding on agricultural land).

8. *See* MARGARET K. WALSH ET AL., U.S. DEP'T OF AGRIC., CLIMATE INDICATORS FOR AGRICULTURE 1 (2020).

9. U.S. DEP'T OF AGRIC., RISK MANAGEMENT AGENCY FACT SHEET: CONSERVATION COMPLIANCE – HIGHLY ERODIBLE LAND AND WETLANDS (2015) [hereinafter CONSERVATION COMPLIANCE FACT SHEET].

10. 16 U.S.C. § 3811(a) (2018).

11. *Id.* § 3821(a).

in that soil.[12] Wetlands are essential in maintaining environmental and economic well-being by providing natural flood and erosion control and enhancing the water supply.[13] Despite the many benefits of wetlands, "since the founding of our Nation," landowners, assisted by and including the Federal Government, have cut wetland acreage in half.[14] Further destruction of our Nation's wetlands continues "by hundreds of thousands of acres each year."[15] Yet the Agency's enforcement of these mandatory conservation compliance provisions is incomplete.[16] When enforcement of other environmental legislation fell short, Congress created citizen suits.[17]

This Note discusses the Farm Bill as a piece of environmental legislation. Through a comparative analysis, it distinguishes the Farm Bill from other environmental legislation. Then, it examines the potential for a citizen suit as an enforcement mechanism in the Farm Bill's conservation title. Part I explains how farm bill coalitions evolve to create modern farm bills and outlines the ongoing difficulty enforcing mandatory conservation compliance. Part II compares mandatory conservation compliance with environmental legislation and examines essential elements of existing citizen suit provisions. Lastly, Part III explains how citizens would enforce mandatory conservation compliance, addresses counterarguments, and differentiates other solutions. By implementing a citizen suit provision in the next Farm Bill, the public can help with this severely underenforced environmental protection.

12. 7 C.F.R. § 12.2(a) (2023).

13. 16 U.S.C. § 3901(a)(5) (2018) ("[W]etlands enhance the water quality and water supply of the Nation . . . ."); *Id.* § 3901(a)(6) ("[W]etlands provide a natural means of flood and erosion control . . . thereby protecting against loss of life and property.").

14. *Id.* § 3901(a)(7)–(8).

15. *Id.* § 3901(a)(7).

16. *See* NAT'L SUSTAINABLE AGRIC. COAL., ENFORCEMENT OF CONSERVATION COMPLIANCE FOR HIGHLY ERODIBLE LANDS 3–4 (2018); *see also* U.S. GOV'T ACCOUNTABILITY OFF., GAO-03-418, AGRICULTURAL CONSERVATION: USDA NEEDS TO BETTER ENSURE PROTECTION OF HIGHLY ERODIBLE CROPLAND AND WETLANDS 14 (2003) [hereinafter 2003 AGRICULTURAL CONSERVATION REPORT] (documenting the lack of enforcement of mandatory conservation compliance).

17. Jeffrey G. Miller, *Private Enforcement of Federal Pollution Control Laws Part I*, 13 ENV'T L. REP. 10309, 10311. Moreover, the idea of citizen participation is deeply embedded within environmentalism. *See* RACHEL CARSON, SILENT SPRING 13 (1962) ("We urgently need an end to these false assurances, to the sugar coating of unpalatable facts. It is the public that is being asked to assume the risks . . . . The public must decide whether it wishes to continue on the present road . . . .").

I. PUTTING THE PIECES OF THE FARM BILL TOGETHER

The Farm Bill is an omnibus, multiyear legislative package governing multiple aspects of our agriculture and food systems.[18] For such far-reaching legislation, the common name—the Farm Bill—is somewhat misleading and oversimplifies what is at stake.[19] A divide separates the consumer and the farmer, highlighting a "paradox in farm policy: we all eat, but very few of us produce [] food."[20] Further, everyone pays taxes, but farmers receive federal assistance, which widens the divide and leaves room for misinformation and misunderstanding.[21] This Part attempts to narrow that divide by explaining and interpreting the Farm Bill's evolution. Next, it will analyze current Farm Bill programs. Finally, it examines the mandatory conservation compliance provisions and their effects on conservation.

A. The Forming and Evolution of Farm Bill Coalitions

Understanding the current Farm Bill requires a look back at its historical origins. Beginning with the Agricultural Adjustment Act of 1933 (AAA), Congress enacted 18 reiterations of the Farm Bill and several auxiliary acts woven into modern farm bills.[22] The Farm Bill began as price support for commodity growers in response to the Great Depression.[23] Two years later, Congress—facing another national emergency with the Dust Bowl[24]—passed the Soil Conservation and Domestic Allotment Act (1935 Act).[25] In passing the 1935 Act, Congress sought "to provide for the protection of land

18. RENÉE JOHNSON & JIM MONKE, CONG. RSCH. SERV., RS22131, WHAT IS THE FARM BILL? 1 (2023) (explaining how the omnibus and multiyear nature of the Farm Bill gives Congress, policymakers, and stakeholders an opportunity to "comprehensively and periodically address agricultural and food issues").

19. Michael Pollan, *You Are What You Grow*, N.Y. TIMES MAG. (Apr. 22, 2007), https://www.nytimes.com/2007/04/22/magazine/22wwlnlede.t.html.

20. JONATHAN COPPESS, THE FAULT LINES OF FARM POLICY: A LEGISLATIVE AND POLITICAL HISTORY OF THE FARM BILL 1 (2018) [hereinafter THE FAULT LINES OF FARM POLICY].

21. *Id.*

22. JOHNSON & MONKE, *supra* note 18, at 1 n.1, 3 fig.1, 4.

23. Agricultural Adjustment Act of 1933, Pub. L. No. 73-10, 48 Stat. 31, 31 ("To relieve the existing national economic emergency by increasing agricultural purchasing power . . . .").

24. WORSTER, *supra* note 2, at 4 ("The Dust Bowl came into being during the 1930s, as fulvous dirt began to blow all the way from the plains to the East Coast and beyond."); *see* CRAIG COX & SOREN RUNDQUIST, ENV'T WORKING GRP., GOING, GOING, GONE!: MILLIONS OF ACRES OF WETLANDS AND FRAGILE LAND GO UNDER THE PLOW 6 (2013) ("[T]he Dust Bowl—a massive ecological disaster that devastated a large swath of the United States during the 1930s as a result of persistent drought combined with poor farming practices on fragile land that had once been covered with grass.").

25. This is not considered a "Farm Bill" legislation, but is essential to understanding the development of the conservation coalition and their role in future farm bills. Soil Conservation and Domestic Allotment Act, Pub. L. No. 74-46, 49 Stat. 163 (1935).

resources against soil erosion" and established the Soil Conservation Service.[26]

In short order, the Great Depression and the Dust Bowl spawned two coalitions with interest and influence in farm legislation negotiations.[27] The first was the farm coalition focused on price and production controls.[28] Not far behind was the conservation coalition focused on changing practices to reduce soil erosion.[29] The coalitions were, and still are, comprised of members of Congress and lobbyists from various agriculture interest groups.[30]

Three years after Congress passed the AAA, in 1936, the Supreme Court held that Congress overstepped its bounds and struck it down.[31] Specifically, the Court held that the AAA was a "forbidden infringement of state power."[32] Congress's response to this decision amid two national emergencies was to weave together the AAA and the 1935 Act into the Soil Conservation and Domestic Allotment Act of 1936.[33] Around this same time, dust blew into Washington, D.C. from the Great Plains.[34] With this event, conservation support grew within Congress and the public.[35]

Utilizing the general support for conservation, the farm coalition could couch price and production controls as conservation by adjusting payments to farmers based on their farming practices.[36] Two years later, Congress passed the Agricultural Adjustment Act of 1938.[37] This Farm Bill "provide[d] for the conservation of national soil resources and . . . an adequate and balanced flow of agricultural commodities."[38]

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26. *Id.* at 163–64.

27. JOHNSON & MONKE, *supra* note 18, at 4.

28. THE FAULT LINES OF FARM POLICY, *supra* note 20, at 48.

29. *Id.*

30. JOHNSON & MONKE, *supra* note 18, at 1 ("[S]takeholders . . . involved in the debate on farm bills, includ[e] national farm groups; commodity associations; state organizations; nutrition and public health officials; and advocacy groups representing conservation, recreation, rural development, faith-based interests, local food systems, and certified organic production.").

31. United States v. Butler, 297 U.S. 1, 80 (1936) (Stone, J. dissenting).

32. *Id.*

33. Soil Conservation and Domestic Allotment Act of 1936, Pub. L. No. 74-461, 49 Stat. 1148, 1148 ("To promote the conservation *and* profitable use of agricultural land resources . . . .") (emphasis added).

34. THE FAULT LINES OF FARM POLICY, *supra* note 20, at 47.

35. *Id.* at 48.

36. *Id.* at 49.

37. Agricultural Adjustment Act of 1938, Pub. L. No. 75-430, 52 Stat. 31.

38. *Id.*

In 1941, rainfall returned to the Great Plains.[39] The drought ended due to natural climatic variations, not because of policies to control production.[40] However, as the rains fell, so too did conservation support. With conservation no longer in the national spotlight, the farm coalition primarily dominated subsequent farm bills.[41] These farm bills focused on price controls, and conservation took a back seat.[42] During this non-drought period, Congress enacted farm bills that encouraged farmers to produce commodities by promising stable prices, but the result was increased erosion and loss of income for farmers.[43]

Again, in the 1950s, the rainfall stopped, bringing another drought adding to farmers' disadvantage.[44] Congress responded by passing the Soil Bank Act.[45] Under the Soil Bank Act, Congress created the "Conservation Reserve Program," which paid farmers annually if they agreed to take land out of production and devote that land to conservation.[46] Although hopes were high for the Soil Bank Act, it created fractures within the farm coalition shortly after its enactment due to disparate treatment among commodity growers.[47]

The farm coalition continued to fracture for years, leaving farm bill negotiations at an impasse.[48] However, what seemed to be an impediment created an opportunity to form a new coalition unifying urban and rural communities and farm and non-farm interests—the nutrition coalition.[49] The

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39. W. A. Mattice, *The Weather of 1941 in the United States*, 1941 MONTHLY WEATHER REV. 360, 361 (explaining that 1941 was "outstanding for heavy [precipitation]," particularly around the Great Plains); WORSTER, *supra* note 2, at 227.

40. *See generally* NAT'L OCEANIC & ATMOSPHERIC ADMIN., CLIMATE VARIABILITY VS. CLIMATE CHANGE (2018) (explaining that climate variability includes droughts and multi-year changes in precipitation patterns).

41. THE FAULT LINES OF FARM POLICY, *supra* note 20, at 68.

42. Agricultural Act of 1948, Pub. L. No. 80-897, 62 Stat. 1247, 1247 ("[T]o stabilize prices of agricultural commodities . . . ."); Agricultural Act of 1949, Pub. L. No. 81-439, 63 Stat. 1051, 1051 (using the same language).

43. Agricultural Act of 1956, Pub. L. No. 84-540, 70 Stat. 188, 188 ("Congress . . . [found] that . . . production of excessive supplies of agricultural commodities depresses the prices and income of farm families . . . and brings about soil erosion, depletion of soil fertility, and too rapid release of water . . . .").

44. John D. Wiener et al., *Bite Without Bark: How the Socioeconomic Context of the 1950s U.S. Drought Minimized Responses to a Multiyear Extreme Climate Event*, 11 WEATHER & CLIMATE EXTREMES 80, 80 (2016).

45. § 102, 70 Stat. at 188.

46. *Id.* § 107.

47. THE FAULT LINES OF FARM POLICY, *supra* note 20, at 112; William S. Eubanks, *A Rotten System: Subsidizing Environmental Degradation and Poor Public Health with Our Nation's Tax Dollars*, 28 STAN. ENV'T L.J. 213, 221 (2009).

48. THE FAULT LINES OF FARM POLICY, *supra* note 20, at 124; Eubanks, *supra* note 47, at 221.

49. THE FAULT LINES OF FARM POLICY, *supra* note 20, at 124.

nutrition coalition lobbied for Congress to pass the Food Stamp Act,[50] and in 1964, Congress did so.[51] Its goal in passing the Food Stamp Act was "to strengthen the agricultural economy" and to improve "nutrition among low-income households."[52] The Food Stamp Act increased demand for domestic agricultural commodities; however, with the fracturing of the farm coalition and enough support to stand on its own, Congress enacted it separate from other farm legislation.

Nine years later, Congress passed the Agriculture and Consumer Protection Act of 1973.[53] For the first time, the farm, conservation, and nutrition coalitions merged efforts and, in doing so, formed the components of modern farm bills.[54] Support from a wide variety of stakeholders strengthens the Farm Bill.[55] Further, the support enables Congress to renew, and sometimes add, programs on a multiyear basis that assist farmers, increase conservation, and ensure adequate nutrition.[56]

B. What the Farm Bill Looks Like Today

To grasp the importance and magnitude of modern farm bills it is crucial to explore their fundamental components. Additionally, it is important to know the current state of the Farm Bill. Congress enacted the most recent Farm Bill (2018 Farm Bill) on December 20, 2018.[57] For many of the 2018 Farm Bill provisions, Congress set an expiration date of September 30, 2023.[58] Since 2023, however, instead of the traditional renegotiating process in which Congress creates a new farm bill, Congress continues to simply extend the 2018 Farm Bill.[59]

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50. *Id.*

51. Food Stamp Act of 1964, Pub. L. No. 88-525, 78 Stat. 703, 703.

52. *Id.*

53. Agriculture and Consumer Protection Act of 1973, Pub. L. No. 93-86, 87 Stat. 221, 221.

54. Title I of the Agriculture and Consumer Protection Act of 1973 covers "Payment Limitations" for farmers; Title X covers the "Rural Environmental Conservation Program" and amends the Food Stamp Act. Agriculture and Consumer Protection Act of 1973, Pub. L. No. 93-86, 87 Stat. 221, 221, 241.

55. JOHNSON & MONKE, *supra* note 18, at 1.

56. *Id.*

57. Agriculture Improvement Act of 2018, Pub. L. No. 115–334, 132 Stat. 4490.

58. JOHNSON & MONKE, *supra* note 18, at 1.

59. JIM MONKE ET AL., CONG. RSCH. SERV., R47659, EXPIRATION OF THE 2018 FARM BILL AND EXTENSION FOR 2025 3 (2024) [hereinafter EXPIRATION OF THE 2018 FARM BILL]. As of this writing, Congress has not passed a new farm bill. *Id.* However, in July of 2025 Congress passed the Budget Reconciliation Law (Pub. L. No. 119–21) which made changes to the nutrition, farm support, and conservation titles. MEGAN STUBBS, CONG. RSCH. SERV., IF13114, AGRICULTURAL CONSERVATION AFTER ENACTMENT OF THE FY2025 BUDGET RECONCILIATION LAW (P.L. 119–21) 1 (2025). It remains to be seen what future farm bills will look like, especially since the enactment of P.L 119–21 fractured the farm bill coalition, which supports its passage. *See infra* notes 66–68 and accompanying text. Most

The Farm Bill authorizes both mandatory and discretionary spending programs.[60] However, the majority of Farm Bill programs consist of mandatory spending and, thus, must fall within the budget projected by the Congressional Budget Office.[61] For the 2018 Farm Bill, the projected total budget was $428 billion throughout its five-year span.[62] The three major Farm Bill coalitions support programs that account for 99% of the mandatory budget outlays in the Farm Bill.[63] The nutrition title comprised 76%, the farm titles (crop insurance and commodity support) comprised 16%, and the conservation title comprised 7%.[64]

Congress combines these three main titles into one Farm Bill, backed by conflicting interests.[65] In doing so, Congress creates a structural tension that forces conflicting interests to negotiate.[66] However, this structure is like a house of cards. If any of the major coalitions were to leave negotiations or reject the outcome, the Farm Bill could come crashing down.[67] Essentially, without support from each coalition, the Farm Bill may fail—leaving the public, farmers, and conservationists empty-handed and hungry.[68]

Comprising the most significant percentage of mandatory spending is the nutrition title.[69] The Food Stamp Program, created by the Food Stamp Act of 1964, evolved into the Supplemental Nutrition Assistance Program (SNAP).[70] SNAP provides monthly grocery assistance for eligible low-income households.[71] The 2018 Farm Bill reauthorized SNAP, and it remains the most prominent domestic food assistance program.[72] Participation in the

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recently, Congress extended the 2018 Farm Bill through September 30, 2026. H.R. 5371, 119th Cong. (2025).

60. JOHNSON & MONKE, *supra* note 18, at 4; *see generally How Much Has the U.S. Government Spent This Year?*, FISCALDATA.TREASURY.GOV, https://fiscaldata.treasury.gov/americas-finance-guide/federal-spending/ (last visited Nov. 29, 2025) (explaining that mandatory spending is mandated by laws, while discretionary spending is spending Congress and the President approve each year during the appropriations process).

61. JOHNSON & MONKE, *supra* note 18, at 4.

62. *Id.*

63. *Id.* at 5.

64. *Id.*

65. *See id.* at 1 ("In recent years, more stakeholders have become involved in the debate on farm bills, including national farm groups; commodity associations; state organizations; nutrition and public health officials; and advocacy groups representing conservation, recreation, rural development, faith-based interests, local food systems, and certified organic production.").

66. *Id.*

67. *See id.* (detailing the various stakeholders that come together to form the farm bill coalition).

68. *See id.*; *see also* EXPIRATION OF THE 2018 FARM BILL, *supra* note 59, at 1.

69. JOHNSON & MONKE, *supra* note 18, at 5.

70. RANDY ALLISON AUSSENBERG & CARA CLIFFORD BILLINGS, CONG. RSCH. SERV., IF11087, 2018 FARM BILL PRIMER: SNAP AND NUTRITION TITLE PROGRAMS 1 (2019); Food Stamp Act of 1964, Pub. L. No. 88-525, 78 Stat. 703.

71. JOHNSON & MONKE, *supra* note 18, at 11.

72. AUSSENBERG & BILLINGS, *supra* note 70, at 1.

program controls SNAP's spending.[73] However, participation varies based on changes in requirements and economic conditions.[74] Moreover, the number of participants and the specific foods participants purchase with assistance impact conservation within agriculture.[75]

Similarly, the commodities Congress chooses to support and how much support it offers affect conservation.[76] The Farm Bill's crop insurance and commodity support programs comprise 16% of mandatory spending.[77] These programs include Federal Crop Insurance, Price Loss Coverage (PLC), and Agriculture Risk Coverage (ARC).[78] Congress reauthorized PLC and ARC programs for commodity crops through the 2024 crop year.[79] Congress also reauthorized the Federal Crop Insurance program in the 2018 Farm Bill and expanded it to include more specialty crops, cover crops, and crops and grasses used for grazing.[80]

The conservation title comprises 7% of mandatory spending.[81] In other words, Congress budgeted $29.3 billion over five years for conservation programs.[82] While this may seem like a large sum, soil erosion's impact costs farmers an estimated $100 million per year in lost income, and that figure accounts only for the cost to farmers.[83] The Farm Bill authorizes the United States Department of Agriculture (USDA) and the Natural Resources Conservation Service (NRCS) to administer several conservation programs.[84] Congress organized these programs into the following categories: working lands programs, land retirement programs, easement programs, partnership and grant programs, and mandatory conservation compliance.[85] Just as the Dust Bowl catalyzed Congress to incorporate

73. *Id.*
74. *Id.*
75. *See* Eubanks, *supra* note 47, at 240–51.
76. *Id.*
77. JOHNSON & MONKE, *supra* note 18, at 5.
78. *Id.* at 9–10.
79. 7 U.S.C. §§ 9015–9016 (2018).
80. *Id.* § 1508.
81. JOHNSON & MONKE, *supra* note 18, at 5.
82. *Id.* at 5 tbl.1.
83. Sulaeman & Westhoff, *supra* note 5; *see* Laurie Ristino & Gabriela Steier, *Losing Ground: A Clarion Call for Farm Bill Reform to Ensure a Food Secure Future*, 42 COLUM. J. ENV'T L. 59, 90 (2016) ("From 1995 to 2014, nearly $35 billion in taxpayer dollars were spent on [Conservation Reserve Program] payments.").
84. 16 U.S.C. § 3801 (2018). The NRCS is an agency within USDA, formerly named the Soil Conservation Service. *Who We Are – History of NRCS*, USDA.: NAT. RES. CONSERVATION SERV., https://www.nrcs.usda.gov/conservation-basics/conservation-by-state/north-dakota/who-we-are-history-of-nrcs (last visited Nov. 29, 2025).
85. MEGAN STUBBS, CONG. RSCH. SERV., R47478, AGRICULTURAL CONSERVATION AND THE NEXT FARM BILL 1 (2023).

conservation in the 1938 Farm Bill,[86] increasing environmental awareness was a basis for Congress passing the 1985 Farm Bill.[87] With the 1985 Farm Bill, Congress mandated conservation compliance on farms with highly erodible lands or wetlands. These mandatory conservation programs are colloquially known as Sodbuster and Swampbuster and are viewed as "the gateway to USDA programs."[88] Farmers must comply with the Sodbuster and Swampbuster provisions to receive certain USDA benefits.[89]

C. The Lack of Enforcement in Mandatory Conservation Compliance Programs

The Farm Bill includes many conservation programs; however, enforcing the mandatory programs remains a challenge. Most conservation programs pay farmers and ranchers who voluntarily implement conservation practices.[90] Yet, if a producer farms on land that NRCS determines is either highly erodible or a wetland, then that producer must self-certify that they are complying.[91] Because USDA requires compliance, the Sodbuster and Swampbuster programs lend themselves to enforcement through a private right of action—or a citizen suit provision. However, the mandatory conservation compliance programs do not have a citizen suit provision. Within the statute, Congress grants authority to the Secretary of Agriculture "to determine whether a person has complied."[92] Further, the Secretary cannot "delegate [the authority] to any private person or entity."[93]

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86. JOHNSON & MONKE, *supra* note 18, at 4.

87. Linda A. Malone, *A Historical Essay on the Conservation Provisions of the 1985 Farm Bill: Sodbustin, Swampbusting, and the Conservation Reserve*, 34 KAN. L. REV. 577, 578 (1986).

88. Food Securities Act of 1985, Pub. L. No. 99-198, 99 Stat. 1354, 1504–08; Jacqui Fatka, *USDA Rule on Wetland Determinations 'Falls Short'*, FEEDSTUFFS (Aug. 28, 2020), https://www.feedstuffs.com/agribusiness-news/usda-rule-on-wetland-determinations-falls-short- (quoting former NRCS Chief Kevin Norton).

89. Jonathan Coppess, *Reviewing USDA's Revised Conservation Compliance Regulation*, FARMDOCDAILY (May 1, 2015), http://farmdocdaily.illinois.edu/2015/05/reviewing-usda-revised-conservation.html [hereinafter *Revised Conservation Compliance Regulation*] (providing examples of benefits for which farmers would be ineligible, including farm commodity, conservation program payments, and crop insurance premium subsidy).

90. STUBBS, *supra* note 85, at 1.

91. *Revised Conservation Compliance Regulation*, *supra* note 89; CONSERVATION COMPLIANCE FACT SHEET, *supra* note 9. For a producer on highly erodible land or a wetland to remain eligible for other Farm Bill benefits, they fill out form AD-1026. U.S. DEP'T OF AGRIC., APPENDIX TO FORM FOR AD-1026 HIGHLY ERODIBLE LAND CONSERVATION (HELC) AND WETLAND CONSERVATION (WC) CERTIFICATION [hereinafter APPENDIX TO FORM FOR AD-1026]. Basically, the producer self-certifies that they follow the law and allow the NRCS to investigate their farm and they remain eligible for benefits. *Id.*

92. 16 U.S.C. § 3811(b) (2018).

93. *Id.*

In 1990, five years after Congress codified the Sodbuster and Swampbuster programs, the United States Government Accountability Office (GAO) issued a report on mandatory conservation compliance programs.[94] In their report, GAO found that USDA's criteria for implementing the conservation programs "do not protect all erodible lands or wetlands."[95] The report suggests that USDA lower its standards for what it considers highly erodible land.[96] Additionally, the report suggests that the Agriculture Stabilization and Conservation Service's monitoring system needs to "ensure that all USDA farm program participants . . . are included . . . for sampling participants' compliance."[97] Following this report, the USDA reorganized.[98] The Agriculture Stabilization and Conservation Service dissolved, and its responsibilities transferred to NRCS and Farm Service Agency jointly.[99]

Despite Congress amending the 1985 bill and USDA reorganizing, the omnibus nature of the Farm Bill and its limited budgetary outlays constrain the effectiveness of conservation compliance.[100] The continuing concern over soil erosion and wetland conversion led GAO to issue another report in 2003.[101] In it's 2003 report, GAO shared a significant finding: "[A]lmost half of the [NRCS's] field offices do not implement the conservation provisions . . . "[102] Additionally, GAO reported that since the program's inception, "reductions in soil erosion and wetland conversions have leveled off . . . , and in some areas of the country, soil erosion has even increased."[103]

Since creating the conservation compliance programs, Congress has included them in every farm bill reiteration with slight modifications.[104] In most of the modifications to the Sodbuster and Swampbuster programs, Congress or USDA add exemptions and qualifications.[105] For example, in

94. U.S. GOV'T ACCOUNTABILITY OFF., GAO-B-240470, FARM PROGRAMS: CONSERVATION COMPLIANCE PROVISIONS COULD BE MADE MORE EFFECTIVE (1990).

95. *Id.* at 3.

96. *Id.*

97. *Id.* at 39.

98. *Agency History*, USDA: FARM SERV. AGENCY, https://www.fsa.usda.gov/about-fsa/history-and-mission/agency-history/index (last visited Nov. 29, 2025).

99. *Id.*

100. *See* NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 3–4.

101. 2003 AGRICULTURAL CONSERVATION REPORT, *supra* note 16, at 7.

102. *Id.* at 14.

103. *Id.* at 38.

104. *See* STUBBS, *supra* note 85, at 3.

105. 7 C.F.R. § 12.5 (2023); 16 U.S.C. § 3812(b) (2018) (exempting land that was cultivated prior to Dec. 23, 1985); 16 U.S.C. § 3822 (2018) (exempting wetlands converted prior to Dec. 23, 1985); Ristino & Steier, *supra* note 83, at 90–91.

2011, USDA issued a final rule that revised the "good faith" exemption.[106] The exemption applies to producers who, in USDA's estimation, are acting in good faith and are either in the process of complying with a conservation plan or are in some way mitigating the environmental harm.[107] To meet the exemption now requires a "higher level of concurrence within USDA."[108] Also, USDA reduced the benefit farmers can recieve to match the seriousness of the violation.[109] None of the exemptions or qualifications, however, increase the efficacy of the programs.[110] In other words, more exemptions means more eroded land and more converted wetlands without penalty.

Still, mandatory conservation compliance programs within the Farm Bill remain plagued by a lack of enforcement.[111] A 2016 Office of the Inspector General Report found that NRCS had not supplied its state offices with sufficient guidance for erosion on highly erodible lands.[112] Moreover, the report found that NRCS guidance led to "inconsistent compliance determinations," which spiraled to "incorrect interpretation of compliance rules" and confusion among producers.[113] Even after this report, USDA enforcement data showed deficiencies in implementation and enforcement.[114]

II. THE FARM BILL AS ENVIRONMENTAL LEGISLATION

Though often not recognized as such, the Farm Bill plays a critical role in environmental protection, similar to legislation from the 1970s like the Clean Air and Clean Water Acts.[115] Moreover, throughout the history of the Farm Bill, environmental disasters—like the Dust Bowl—have molded farm bills to include conservation programs.[116] Despite these programs, soil erosion has increased in some areas, largely due to under-enforcement.[117]

106. Highly Erodible Land and Wetland Conservation, 76 Fed. Reg. 82075 (proposed Dec. 30, 2011) (codified at 7 C.F.R. pt. 12).

107. 7 C.F.R § 12.5 (2023).

108. Highly Erodible Land and Wetland Conservation, *supra* note 106, at 82075.

109. *Id.*

110. Ristino & Steier, supra note 83, at 90.

111. Ristino & Steier, *supra* note 83, at 110.

112. U.S. DEP'T OF AGRIC., OFF. OF INSPECTOR GEN., AUDIT REP. 50601-0005-31, USDA MONITORING OF HIGHLY ERODIBLE LAND AND WETLAND CONSERVATION VIOLATIONS (2016).

113. *Id.*

114. *See* NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 3.

115. Miller, *supra* note 17, at 10311 n.12.

116. JOHNSON & MONKE, *supra* note 18, at 4.

117. *See* 2003 AGRICULTURAL CONSERVATION REPORT, *supra* note 16, at 7; *see also* NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 5–6 (providing tables of conservation compliance violation data state by state and explaining how inconsistent implementation led to the vast discrepancies in reporting violations).

Lack of enforcement was a concern for legislators while writing amendments to the Clean Air Act in 1970.[118] To quell this concern, legislators proposed "[a]uthorizing citizens to bring suits for violations" as a way to motivate enforcement.[119] After legislators preserved this private right of action in the Clean Air Act, citizen suits became "almost ubiquitous" in existing and new environmental legislation.[120] Just as citizen suits have aided the enforcement of other environmental legislation, so too can a citizen suit provision bolster the enforcement of mandatory conservation compliance. This Part will first compare mandatory conservation compliance with the Clean Air and Clean Water Acts. Then, it will examine how citizen suits operate to support enforcing environmental legislation.

A. How Mandatory Conservation Compares to the Clean Air and Clean Water Acts

The Clean Air and Clean Water Acts possess several similarities to the mandatory conservation compliance provisions. Broadly, all three operate to protect a particular environmental medium: the Clean Air Act protects air,[121] the Clean Water Act protects water,[122] and mandatory conservation compliance protects soil.[123] The Clean Air and Clean Water Acts authorize the Environmental Protection Agency (EPA) to establish ambient air and water quality standards.[124] Just as these statutes establish standards for their respective mediums, mandatory conservation compliance establishes quality standards for the soil. In other words, the Sodbuster and Swampbuster provisions authorize the Natural Resources Conservation Service (NRCS) to establish conservation standards on highly erodible lands and wetlands.[125]

Similarities continue when comparing some of the mechanisms the Clean Air and Clean Water Acts use to achieve their desired standards. The Clean Air Act uses state implementation plans.[126] Air quality standards are set at the federal level.[127] Then, states decide how to implement those

118. Miller, *supra* note 17, at 10311 n.11 ((discussing legislators concern for enforcement agencies' inevitable lack of sufficient resources to address violations) (citing to S. REP. NO. 91-1196, at 36–39 (1970), *as reprinted in* NRDC v. Train, 510 F.2d 692, 723 (D.C. Cir. 1974))).

119. S. REP. NO. 91-1196, at 36–39, *as reprinted in NRDC*, 510 F.2d at 723.

120. Miller, *supra* note 17, at 10311.

121. 42 U.S.C. § 7401(b) (2018).

122. 33 U.S.C. § 1251(a) (2018).

123. 16 U.S.C. §§ 3811, 3822 (2018).

124. DAVID B. FIRESTONE ET AL., ENVIRONMENTAL LAW FOR NON-LAWYERS 131 (5th ed. 2014).

125. 7 C.F.R. §§ 12.21, 12.32 (2023).

126. FIRESTONE ET AL., *supra* note 124, at 131.

127. *See* WALSH ET AL., *supra* note 8, at 13.

standards through various local regulations.[128] Finally, EPA approves state implementation plans.[129] If a state fails to submit a plan or EPA does not approve it, that state faces sanctions.[130] Alternatively, the Clean Water Act uses a permitting system.[131] Permits are issued for discharging pollutants into navigable waters.[132] The permits control pollution and, thus, the desired water quality standards by limiting the quantity of pollutants in a given waterway.[133] While there is an exception for existing agricultural operations,[134] anyone who discharges a pollutant from a point source into navigable waters without a permit is subject to penalties.[135]

Similar to the Clean Air Act's state implementation plans, the Sodbuster provision uses farm conservation plans to achieve soil conservation standards on highly erodible lands.[136] At the federal level, NRCS establishes whether the land is highly erodible.[137] Then, producers on highly erodible land must develop a conservation plan specific to their farm.[138] Then, local conservation districts approve the plan under NRCS's guidance and in consultation with the local county Farm Service Agency (FSA) committee.[139]

The Swampbuster provision operates differently to protect the soil.[140] More similar to the Clean Water Act, where an unpermitted discharge constitutes a violation, the Swampbuster provision makes a producer who converts a wetland to grow a commodity ineligible for benefits from other Farm Bill programs.[141] While both provisions contain several exemptions, under the Swampbuster provision, having a conservation plan does not allow a producer to convert a wetland to grow a commodity.[142] For both provisions, the exemptions can be seen as permits. In other words, if a producer meets one of the exemptions, the United States Department of Agriculture (USDA) permits the producer to spend the soil instead of conserving it.[143]

The final step for producers under both mandatory conservation compliance provisions is distinct from the Clean Air and Clean Water Acts.

128. *See id.*
129. 42 U.S.C. § 7410 (2018).
130. *Id.* § 7410(m).
131. 33 U.S.C. § 1342 (2018).
132. *Id.*
133. *See id.*
134. 33 U.S.C. § 1344(f)(1)(A) (2018).
135. *Id.* § 1319.
136. 16 U.S.C. § 3812(a)(2) (2018).
137. 7 C.F.R. §§ 12.20(a), 12.21 (2023).
138. 7 C.F.R. § 12.20 (2023).
139. *Id.*
140. *See* 16 U.S.C. § 3822(a) (2018).
141. *Id.*
142. *Id.*
143. *See id.*

Under these provisions, a producer must self-certify that they follow a conservation plan or are not converting a wetland and sign off on potential NRCS inspections.[144] If a producer does not self-certify or NRCS finds them out of compliance after an inspection, they become ineligible for other Farm Bill benefits.[145] With the unrealistic threat of an inspection, this structure puts a lot of faith in producers.[146] Additionally, asking producers to deny themselves access to Farm Bill benefits they likely need seems unreasonable.

Further examining requirements within the Clean Air Act offers another point of comparison. The Clean Air Act uses a "best available emission reduction technology" requirement to set air quality standards for stationary sources.[147] The Sodbuster provision does as well. In creating a conservation plan to limit soil erosion, the Sodbuster provision uses the "technical guide in use at the time," "available conservation technology," and "practices . . . not currently approved but . . . [that] have a reasonable likelihood of success."[148] Moreover, different industries have different source standards in the Clean Air Act.[149] The best practices for one industry may not apply to another. Similarly, in the Sodbuster Program, a conservation plan must be based on "local resource conditions."[150] In other words, conservation plans for one area might not work in another. Additionally, the Clean Air Act and the Sodbuster Program require considering the costs associated with using the technology.[151]

While the Clean Air and Clean Water Acts provide an environmental benefit to the public, benefits can vary between the Sodbuster and Swampbuster provisions. Producers on highly erodible soil or on wetlands have a natural incentive to protect their land—it is where they grow their livelihoods. When the soil is protected and conserved, the crops are strong, which provides economic and environmental benefits to the producers and the public.[152] Alternatively, producers do not have the same economic

144. *See* APPENDIX TO FORM FOR AD-1026, *supra* note 91.

145. 16 U.S.C. § 3812(a)(2) (2018); Malone, *supra* note 87, at 584 ("The general intent of sodbusting provisions is to discontinue government subsidization of conversion by denying commodity subsidies to producers of program crops grown on highly erodible land.").

146. *See* NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 5.

147. FIRESTONE ET AL., *supra* note 124, at 112.

148. 7 C.F.R. § 12.23 (2023).

149. FIRESTONE ET AL., *supra* note 124, at 113.

150. 7 C.F.R. § 12.23 (2023).

151. *Id.* ("Conservation systems shall be technically and economically feasible; based on local resource conditions and available conservation technology; cost-effective; and shall not cause undue economic hardship on the person applying the conservation system."); FIRESTONE ET AL., *supra* note 124, at 112.

152. *See* BERRY, *supra* note 1, at 90.

benefits to protect wetlands.[153] Instead of an incentive to protect wetlands, in many instances, the producer decides that the more significant economic incentive lies in converting wetlands.[154] For producers in either situation, pressure to meet market demands and to repay loans puts them in the difficult position of weighing financial and environmental benefits.[155] Understandably, a producer might decide on a particular production method or convert a wetland for economic rather than environmental reasons. Moreover, a person experiencing direct adverse effects of erosion or a converted wetland may have a difficult time finding the culprit.[156] However, the decision to destroy a wetland or to expend highly erodible soil impacts everyone—just like the decision to pollute the air or water.[157]

B. How Citizen Suits Work to Enforce Environmental Legislation

The similarities between the Clean Air and Clean Water Acts and the mandatory conservation compliance provisions end when it comes to enforcement. While amending the Clean Air Act in 1970, legislators knew agencies would have difficulty enforcing the Act's provisions.[158] Although discussing a potential violation under the National Environmental Policy Act, the Court also expressed awareness of this restraint.[159] Once legislators enacted the citizen suit provision in the Clean Air Act, it was nearly universal in environmental legislation.[160] However, under mandatory conservation compliance provisions, when production practices erode soil or destroy wetlands, the adversely affected person is at a loss. They are unable to sue the violator because there is no citizen suit provision.[161] When a producer's decisions adversely affect public health and safety, any person adversely

153. *See* 16 U.S.C. § 3901(a) (2018).

154. *See* WALSH ET AL., *supra* note 8, at 1.

155. *See id.*

156. *See infra* Part III.A.2.

157. *See* COX & RUNDQUIST, *supra* note 24, at 3–6.

158. Miller, *supra* note 17, at 10311.

159. Sierra Club v. Morton, 405 U.S. 727, 745–46 (1972) (Douglas, J., dissenting). In his famous dissent, Justice Douglas explains:

Yet the pressures on agencies for favorable action one way or the other are enormous. The suggestion that Congress can stop action which is undesirable is true in theory; yet even Congress is too remote to give meaningful direction and its machinery is too ponderous to use very often. The federal agencies of which I speak are not venal or corrupt. But they are notoriously under the control of powerful interests who manipulate them through advisory committees, or friendly working relations, or who have that natural affinity with the agency which in time develops between the regulator and the regulated.

Id.

160. Miller, *supra* note 17, at 10311 n.12.

161. Alternatively, under the Administrative Procedure Act, anyone "adversely affected or aggrieved by agency action" can sue the offending agency. 5 U.S.C. § 702 (2018).

affected should be able to enforce environmental legislation. Further, with scarce enforcement of mandatory conservation compliance provisions,[162] Congress needs another place to turn.

Exceptions aside, the citizen suit provisions of environmental legislation are "virtually identical."[163] In the Clean Air Act, the citizen suit provision authorizes "any person" to bring a civil action against anyone violating an emission standard.[164] While the Clean Water Act language states "any citizen,"[165] the provision operates similarly: It allows a person adversely affected to bring a civil action against any person violating an effluent standard.[166] Both citizen suits also allow adversely affected persons to sue violators or the administrator if the administrator has failed to perform their required duty.[167]

One common feature of citizen suit provisions is a notice requirement.[168] Within the Clean Air and Clean Water Acts, the notice requirement bars citizens from suing if they do not notify the administrator, the State, and the violator(s) within 60 days.[169] Alternatively, when dealing with a violation of hazardous air emissions or toxic water pollutants, an adversely affected person can commence action immediately.[170] This immediacy demonstrates congressional sentiment that the ability to sue should happen more quickly relative to the infraction's severity.[171]

A close look at the notice requirement of citizen suit provisions in the Clean Air and Clean Water Acts reveals the diligent prosecution bar.[172] The diligent prosecution bar provides two main services. First, it reduces the number of cases brought to court.[173] The diligent prosecution bar achieves this by preventing citizens from suing a violator if the administrator or the

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162. *See* NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 5.

163. Miller, *supra* note 17, at 10311.

164. 42 U.S.C. § 7604(a)(1) (2018).

165. 33 U.S.C § 1365(a), (g) (2018) (defining citizen as "a person or persons having an interest which is or may be adversely affected"); Miller, *supra* note 17, at 10311 n.18 (explaining that the change from "person" to "citizen" was made in the conference committee to reflect the standard expressed in case law that a person must be adversely affected).

166. *Compare* 33 U.S.C. § 1365(a)(1), *with* 33 U.S.C. § 1365(g).

167. *Compare* 42 U.S.C. § 7604(a)(2), *with* 33 U.S.C. § 1365(a)(1)–(2).

168. *Compare* 42 U.S.C. § 7604(b), *with* 33 U.S.C. § 1365(b); Miller, *supra* note 17, at 10312; *see* Martin A. Miller, Note, *Coping with CAFOs: How Much Notice Must a Citizen Give,* 68 MO. L. REV. 959, 969 (2003).

169. *Compare* 42 U.S.C. § 7604(b)(1)(A), *with* 33 U.S.C. § 1365(b)(1)(A).

170. *Compare* 42 U.S.C. § 7604(b), *with* 33 U.S.C. § 1365(b); Miller, *supra* note 17, at 10312 n.25.

171. Miller, *supra* note 17, at 10312 n.25.

172. *Compare* 42 U.S.C. § 7604(b)(1)(B), *with* 33 U.S.C. § 1365(b)(1)(B).

173. *See* Naturaland Tr. v. Dakota Fin. LLC, 41 F.4th 342, 347 (4th Cir. 2022).

State is "diligently prosecuting a civil or criminal case" in court.[174] Second, the diligent prosecution bar indicates to courts that citizen suits are "meant to supplement rather than supplant governmental action."[175] In *Gwaltney of Smithfield, Ltd. v. Chesapeake Bay Foundation, Inc.*, the Supreme Court looked to legislative history and held that citizen suits are proper only when the responsible agencies fail to enforce the provisions.[176] Further, the Court held that the language of the citizen suit provision indicates they are "forward-looking."[177] In other words, citizens cannot sue for "wholly past violations" of the Act.[178]

Debate continues over the standard for what satisfies diligent prosecution.[179] For example, the Fourth Circuit recently issued a decision in *Naturaland Trust v. Dakota Finance, LLC*, in which a citizen brought suit under the Clean Water Act.[180] In *Naturaland*, there was a question about the point at which South Carolina's actions amounted to diligent prosecution.[181] The court concluded that the consent order issued by the State did amount to diligent prosecution; however, the issue boiled down to timing.[182] The court held that because the Naturaland Trust filed its complaint before the South Carolina Department of Health and Environmental Control issued a consent order, the diligent prosecution bar did not preclude Natruraland Trust's claim.[183]

While both citizen suit provisions contain a notice requirement, there is an additional constitutional requirement for any plaintiff to have their day in court—they must also have standing.[184] Meeting this requirement allows a plaintiff to survive a motion to dismiss for lack of subject matter jurisdiction.[185] Put differently, the court must have the authority to hear a case.[186] Under Article III of the Constitution, courts have authority only over actual cases and controversies.[187] Therefore, for a court to have subject matter

174. *Id.* at 346.
175. Gwaltney of Smithfield, Ltd. v. Chesapeake Bay Found., 484 U.S. 49, 60 (1987).
176. *Id.* (citing S. REP. NO. 92-414, at 64 (1971)).
177. *Id.* at 59.
178. *Id.* at 60.
179. Miller, *supra* note 17, at 10312.
180. 41 F.4th 342, 345–46 (4th Cir. 2022).
181. *Id.* at 344–49.
182. *Id.* at 349; *see* 33 U.S.C. § 1319(g)(6)(B)(i) (2018).
183. *Naturaland Tr.*, 41 F.4th at 350.
184. *See* Friends of the Earth, Inc. v. Laidlaw Env't Servs., Inc., 528 U.S. 167, 180 (2000).
185. *See* FED. R. CIV. P. 12(b)(1).
186. *Id.*
187. U.S. CONST. art. III, § 2, cl. 1.

jurisdiction over the case—and a plaintiff to withstand a 12(b)(1) motion to dismiss—the plaintiff must also have standing.[188]

Article III standing requires a plaintiff to show that they have (1) suffered an injury that is concrete and particularized and actual or imminent; (2) their injury is fairly traceable to the defendant's conduct; and (3) that it is likely their injury will be redressed by a favorable decision.[189] In the landmark case *Friends of the Earth v. Laidlaw Environmental Services, Inc.*, the Supreme Court held that the environmental plaintiffs had standing to enforce the Clean Water Act under its citizen suit provision.[190] Friends of the Earth plausibly asserted that it suffered an injury caused by the defendant and that stopping the defendant's impermissible discharge redressed its injury. Courts have upheld citizen suit provisions when a plaintiff meets all the requirements.[191]

Finally, courts may award attorney's fees to successful plaintiffs in the Clean Air and Clean Water Acts' citizen suit provisions.[192] Additionally, citizen suit provisions prevent citizens from collecting penalties associated with the violation.[193] Combining the access to attorney's fees with the restriction on penalties serves a function common to all of the barriers in citizen suit provisions—it prevents a large volume of cases from weighing on the courts.[194] Perhaps even frivolous ones.[195] More importantly, citizen suits grant harmed plaintiffs access to the courts. Further, allowing attorney's fees quells plaintiffs' financial concerns regarding litigation.[196]

188. TransUnion LLC v. Ramirez, 141 S. Ct. 2190, 2205–06, n.1 (2021) ("Congress rarely created "citizen suit"-style causes of action for suits against private parties by private plaintiffs who had not suffered a concrete harm. All told, until the 20th century, this Court had little reason to emphasize the injury-in-fact requirement because, until the 20th century, there were relatively few instances where litigants without concrete injuries had a cause of action to sue in federal court. The situation has changed markedly, especially over the last 50 years or so. During that time, Congress has created many novel and expansive causes of action that in turn have required greater judicial focus on the requirements of Article III.").

189. *Friends of the Earth, Inc.*, 528 U.S. at 180–81.

190. *Id.* at 189.

191. *Id.* at 183, 187; Friends of the Earth v. Carey, 535 F.2d. 165, 172 (2d Cir. 1976) ("Congress made clear that citizen groups are not to be treated as nuisances or troublemakers but rather as welcomed participants in the vindication of environmental interests.").

192. *Compare* 42 U.S.C § 7604(d), *with* 33 U.S.C. § 1365(d); Miller, *supra* note 17, at 10312.

193. *Compare* 42 U.S.C § 7604(g), *with* 33 U.S.C. § 1365.

194. Miller, *supra* note 17, at 10312.

195. *Id.*

196. *See id.* at 10319.

III. THE NEED FOR CITIZEN ENFORCEMENT OF MANDATORY CONSERVATION COMPLIANCE

Agricultural exceptionalism is rampant in environmental legislation.[197] The Clean Air Act calls for states to implement ambient air quality standards; however, states then set thresholds that either "implicitly or explicitly exclude farmers."[198] The Clean Water Act also exempts farmers.[199] Although the Clean Water Act demands discharges from a "point source" to have a permit, the definition of "point source" exempts "agricultural stormwater discharges and return flows from irrigated agriculture."[200] In other words, farmers do not need a permit.[201] Environmental legislation protects the public's right to a healthy and aesthetically pleasing environment.[202] However, when agricultural production practices degrade the environment, injured citizens are left without an opportunity to enforce the Sodbuster or Swampbuster provisions.

While a picturesque farm among rolling hills or across a field may be romanticized in the public sentiment, one cannot deny the negative impacts that farms have on our environment.[203] A citizen suit provision within the Farm Bill's conservation title would help bolster enforcement of mandatory conservation compliance. This Part will first examine how a citizen suit within the Sodbuster and Swampbuster provisions would mirror those in the Clean Air and Clean Water Acts. Then, it will address counterarguments and other solutions while maintaining that a citizen suit would help bolster enforcement and, thus, increase necessary environmental protections.

A. Applying the Citizen Suit Template from the Clean Air and Clean Water Acts to Mandatory Conservation Compliance

Just as Congress empowered adversely affected citizens to become "private attorneys general" in the Clean Air and Clean Water Acts,[204] Congress could empower citizens here. The Farm Bill as a whole has severe environmental impacts.[205] The environmental impacts of mandatory conservation compliance are especially severe because they operate to

197. *See* Eubanks, *supra* note 47, at 249; *see also* Margot J. Pollans, *Drinking Water Protection and Agricultural Exceptionalism*, 77 OHIO ST. L.J., 1195, 1197–98, 1201–02 (2016).

198. Eubanks, *supra* note 47, at 249.

199. 33 U.S.C. § 1362(14) (2018).

200. *Id.*

201. *See id.*

202. *See* Sierra Club v. Morton, 405 U.S. 727, 734 (1972).

203. *See* Eubanks, *supra* note 47, at 240–51.

204. Miller, *supra* note 17, at 10309.

205. Eubanks, *supra* note 47, at 240–51.

protect soil—a life-sustaining natural resource.[206] Allowing citizens to enforce the Sodbuster and Swampbuster provisions could require producers to follow a conservation plan or to not destroy wetlands.[207] Therefore, citizen suit provisions increase environmental protection.[208] A citizen suit would grant federal court jurisdiction to any person adversely affected by the National Resource Conservation Service's (NRCS's) failure to enforce the Sodbuster or Swampbuster Programs or by the violator of one of these programs. This Part examines two legal barriers to citizen suits as applied to mandatory conservation compliance: (1) the requirements and components of providing notice, and (2) standing.

1. Providing Notice of the Alleged Violation to All Parties

Any citizen attempting to sue under a citizen suit within the Sodbuster and Swampbuster provisions would have to give notice. Like the Clean Air and Clean Water Acts, the potential plaintiff could not commence their action until they notified NRCS, the local county Farm Service Agency committee, and the violator.[209] This procedural process of notifying the affected parties allows time for compliance without the need for litigation.[210] Essentially, notice serves as another filter, preventing an onslaught of cases and promoting judicial efficiency.[211]

Unlike the Clean Air and Clean Water Act citizen suit provisions, here, a citizen suit would clarify what meets the definition for commencing an action within the diligent prosecution bar.[212] The Sodbuster provision already calls for NRCS to communicate directly with producers to create a conservation plan.[213] Similarly, in the Swampbuster provision, NRCS determines if an area is a wetland by going directly to the area and communicating its findings to producers. If a diligent prosecution bar were included as it is in the Clean Air and Clean Water Acts, arguments would arise that NRCS is already diligently prosecuting.[214] In other words, the conservation plan and the communications from that process arguably meets the definition of commencing an action. However, neither NRCS nor the Farm Service Agency diligently prosecutes conservation plan violations;

206. *See* BERRY, *supra* note 1, at 90.
207. *See* 16 U.S.C. § 3811 (2018); *see also* 16 U.S.C. § 3822 (2018).
208. *See* 2003 AGRICULTURAL CONSERVATION REPORT, *supra* note 16, at 42.
209. *See* 42 U.S.C. § 7604(b) (2018); *see also* 33 U.S.C. § 1365(b) (2018).
210. Miller, *supra* note 17, at 10312.
211. *See id.*
212. *See* Naturaland Tr. v. Dakota Fin. LLC, 41 F.4th 342, 348 (4th Cir. 2022).
213. 16 U.S.C. § 3812(g) (2018).
214. *See Naturaland Tr.*, 41 F.4th at 348.

they merely determine whether mandatory conservation compliance is required of a producer.[215] Producers then self-certify that they comply with NRCS approved conservation plans.[216] Under the Administrative Procedure Act, producers have access to judicial review.[217] Producers can sue NRCS if NRCS rejects the producers conservation plan or determines the producer's land is a wetland.[218] Alternatively, a citizen suit would open the doors to anyone adversely affected by agency inaction or by a violator of the provisions.

Nothing happens when producers do not follow an approved conservation plan.[219] NRCS reviews an average of 1% of highly erodible land and wetland determinations annually.[220] The site inspections that are carried out are applied inconsistently because of a lack of guidance for field offices.[221] Concern at the prospect of these realities—not enough agency resources or motivation—is precisely the concern that led Congress to create citizen suits in environmental legislation.[222] NRCS is already stretched thin.[223] It is time for citizens to heed the call once again to help enforce these essential provisions.[224]

However, lawsuits should not be a citizen's own financial burden.[225] That is why, here, a citizen suit provision would award successful plaintiffs attorney's fees.[226] Nor should a lawsuit be motivated by an opportunity for personal gain.[227] As such, a citizen suit provision would direct penalties payments to the government—not the individual.[228] This award and penalty structure is common in other citizen suit provisions. Here, as it does elsewhere, the award structure would provide courts with a lower caseload by preventing frivolous claims.[229]

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215. *See* 7 C.F.R. §§ 12.20(a), 12.21 (2023).

216. APPENDIX TO FORM FOR AD-1026, *supra* note 91.

217. *See, e.g.*, Boucher v. USDA, 934 F.3d 530, 547 (7th Cir. 2019); *see also* Maple Drive Farms v. Vilsack, 781 F.3d 837, 848 (6th Cir. 2015); Clark v. USDA, 537 F.3d 934, 939 (8th Cir. 2008).

218. *See, e.g.*, *Boucher*, 934 F.3d at 547; *see also Maple Drive Farms*, 781 F.3d at 848; *Clark*, 537 F.3d at 939.

219. *See* NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 5.

220. *See id.*

221. *See id.*

222. Miller, *supra* note 17, at 10309 n.1.

223. *See* NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 1.

224. *See* CARSON, *supra* note 17, at 13 ("We urgently need an end to these false assurances, to the sugar coating of unpalatable facts. It is the public that is being asked to assume the risks . . . . The public must decide whether it wishes to continue on the present road . . . .").

225. Miller, *supra* note 17, at 10312.

226. *See id.*

227. *See id.*

228. *See id.*

229. *See id.*

2. "Standing" Up for Mandatory Conservation Compliance

If a citizen wishes to sue someone violating the Sodbuster or the Swampbuster provisions, they must plausibly assert standing.[230] While the standing doctrine also applies to those suing under the Clean Air and Clean Water Acts, proving the elements of standing in those situations is clearer.[231] In other words, citizens can more readily show the particular violation of air or water quality standards resulted in an injury and that their injury was caused by the violation.[232]

The second element of standing, causation, may give a plaintiff difficulties. One reason for the difficulty is transparency. NRCS reviews a dismal 1% of producers that it covers under the mandatory conservation compliance provisions annually.[233] In some states, there is no enforcement data.[234] Fundamentally, for a citizen to show that a particular violation caused their injury, they would need to know where the violation occurred. A plaintiff would likely struggle to show causation without adequate transparency and increased reporting of violations.

Even in the absence of increased reporting and transparency, there are instances where a citizen suit would be beneficial. Say, hypothetically, there is a producer who is the neighbor of a second producer. That second producer knows that their neighbor converted an NRCS-designated wetland. Further, after periods of heavy rain, the second producer notices soil washing from the neighbor's property to their own and an increase in flooding. This second producer knows—just as well as Congress, if not better than—that wetlands provide a natural form of flood and erosion protection.[235] However, without a citizen suit provision, the second producer is unable to find a readily accessible remedy under the mandatory conservation compliance provisions. They would have to wait and hope that the neighboring producer falls into the 1% of NRCS-reviewed sites.[236]

Additionally, a plaintiff may struggle to show causation because of the temporal delay between the violation and the injury.[237] Other factors, such as floods and droughts, further separate the violation and the injury.[238] In other

230. *See* TransUnion LLC v. Ramirez, 141 S. Ct. 2190, 2207 (2021).

231. *See* Friends of the Earth, Inc. v. Laidlaw Env't Servs., Inc., 528 U.S. 167, 174–75 (2000).

232. *See id.*

233. NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 5.

234. *Id.*

235. 16 U.S.C. § 3901(a)(6) (2018) ("[W]etlands provide a natural means of flood and erosion control . . . thereby protecting against loss of life and property.").

236. *See* NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 5.

237. *See* COX & RUNDQUIST, *supra* note 24, at 3–6.

238. *See* WALSH ET AL., *supra* note 8, at 49.

words, when compared to Clean Air and Clean Water Act violations, here, the injuries appear more disconnected.[239] An example of this disconnect is found in the Dust Bowl.[240] The Dust Bowl spawned from poor growing practices as well as a period of drought.[241] Producers plowed and left highly erodible soils uncovered growing season after growing season.[242] However, public citizens were injured only after several years of this unsustainable practice.[243] Further, the injury occurred in combination with natural forces.[244]

Despite the disconnect, people can still plausibly allege that a mandatory conservation compliance provision violation caused their injury.[245] Moreover, standing analysis mainly focuses on the injury.[246] In this case, producers risk injury to life and property by violating mandatory conservation compliance.[247] Congress found that soil and wetlands are vital parts of the human environment.[248] Therefore, a plaintiff should be able to trace their injury to the expending of soil or the destruction of a wetland.

Standing and notice are two important legal barriers that apply to citizen suits. When Congress and the courts implement them in citizen suits, they legitimize citizen-plaintiffs claims. Additionally, both barriers promote judicial efficiency by preventing a non-injured plaintiff from bringing a frivolous claim.[249] Judicial efficiency further serves to legitimize the legal system and increase the public support of it.[250] Enacting a citizen suit privision for mandatory conservation compliance, with the same barriers, can bestow these same benefits.

B. Exploring a Distinction and Another Avenue Available for Action

While mandatory conservation compliance provisions compare to the Clean Air and Clean Water Acts in many ways, there are distinctions. One significant distinction is that a producer violating mandatory conservation compliance becomes ineligible for federal benefits.[251] Alternatively, violators of the Clean Air and Clean Water Acts pay

239. *See* Friends of the Earth, Inc. v. Laidlaw Env't Servs., Inc., 528 U.S. 167, 175–76 (2000).
240. *See* COX & RUNDQUIST, *supra* note 24, at 3–6.
241. *Id.*
242. *Id.*
243. *Id.*
244. *Id.*
245. *Id.*
246. *See* TransUnion LLC v. Ramirez, 141 S. Ct. 2190, 2205–06, 2206 n.1 (2021).
247. *See* COX & RUNDQUIST, *supra* note 24, at 3–6.
248. 16 U.S.C. § 3901(a)(6) (2018).
249. Miller, *supra* note 17, at 10311.
250. *See id.*
251. *See Revised Conservation Compliance Regulation*, *supra* note 89.

penalties.[252] Given this distinction, a better comparison of mandatory conservation compliance could be to other federal benefit programs.[253] Moreover, other federal benefit programs do not contain citizen suit provisions.

However, simply because other federal benefit programs do not contain citizen suit provisions does not mean mandatory conservation compliance should go without one. Similar to mandatory conservation compliance, when an agency denies an individual or an entity a federal benefit, that individual or entity can sue the agency.[254] For most federal benefit programs this is the only action necessary because the person injured by not getting the benefit is that person.[255] When examining the environmental impacts of other federal benefit programs, mandatory conservation compliance stands out because injuries occur beyond the beneficiary.[256] Moreover, comparing the harms attributable to the various federal benefit programs reveals why mandatory conservation compliance will benefit from a citizen suit provision.[257] Aside from mandatory conservation compliance, it is difficult to imagine a situation where someone wrongly receives a federal benefit and receiving that benefit directly harms someone else.

In response to deficient enforcement data, the National Sustainable Agriculture Coalition, a conservation proponent, suggests that NRCS needs to be more transparent in informing the public of violations.[258] Further, Congress could "make enforcement more uniform and accountable" by amending the Farm Bill to "require NRCS to conduct spot checks on five percent of farms in each state."[259] These policy proposals would require more funding for conservation compliance.[260] However, with so many competing interests in Farm Bill negotiations, more funding is hard to secure.[261] With this in mind, a citizen suit will be a better option because it will not require additional funding. In fact, successful citizen suits could

252. Miller, *supra* note 17, at 10312.

253. *See* PATRICK A. LANDERS ET AL., CONG. RSCH. SERV., R46986, FEDERAL SPENDING ON BENEFITS AND SERVICES FOR PEOPLE WITH LOW INCOME: FY2008-FY2020 4–5 (2021).

254. *See, e.g.*, Boucher v. USDA, 934 F.3d 530, 553 (7th Cir. 2019) (holding that the NRCS determination that Boucher was producing an agricultural commodity on land that was previously a wetland was arbitrary and capricious); *see also* Maple Drive Farms v. Vilsack, 781 F.3d 837, 858 (6th Cir. 2015) (holding USDA acted outside of the applicable regulations); Clark v. USDA, 537 F.3d 934, 943 (8th Cir. 2008) (relying on agency deference to uphold the denial of relief by the lower court).

255. *See* George v. McDonough, 142 S. Ct. 1953, 1957 (2022) (discussing the ways in which a veteran can seek review of a benefits denial).

256. *See id.*; *see also* Eubanks, *supra* note 47, at 241–50.

257. *See* WALSH ET AL., *supra* note 8, at 1; *see also* Eubanks, *supra* note 47, at 241–50.

258. NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 8.

259. *Id.*

260. *Id.*

261. *See* JOHNSON & MONKE, *supra* note 18, at 1.

allow for increased transparency by identifying violators and increased funding by directing penalties to NRCS.[262]

CONCLUSION

In conclusion, mandatory conservation compliance provisions wound up in the Farm Bill to protect a vital natural resource—soil. Penalty structures aside, the Clean Air and Clean Water Acts compare to mandatory conservation compliance in that they all share a common goal: protecting the environment. In the Clean Air and Clean Water Acts, Congress empowers citizens to enforce this goal as long as they meet statutory and constitutional requirements. By enacting a citizen suit provision within mandatory conservation compliance, Congress can empower citizens to help enforce another environmental protection.

With the multiyear nature of the Farm Bill, the debate over what to include or exclude in the newest reiteration continues. Congress failed to enact a new farm bill in 2023, 2024, and 2025 after the 2018 Farm Bill expired. By simply extending the 2018 version year after year, Congress is putting off the inevitable. Legislators must get to work and soon decide what a new farm bill looks like. Although, Congress has declined to include a citizen suit provision for mandatory conservation compliance since Congress enacted it in the 1985 Farm Bill, the opportunity to enact a citizen suit provision is available with each Farm Bill negotiation, which happen when the existing Farm Bill (or its extension) expires. Given extreme under-enforcement of conservation compliance and increasing climatic variation, the need for citizen suit provision grows more and more with each passing year. Congress must act soon before it is too late.

-Andrew Hockenberry[*]

262. *See* NAT'L SUSTAINABLE AGRIC. COAL., *supra* note 16, at 8.

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A PINT FOR A BUSHEL AND A PECK: AN AGRICULTURAL FUND FOR CLIMATE ADAPTATION AND MITIGATION

Nicole Renna*

INTRODUCTION

Conventional agriculture in the United States is synonymous with an abuse and overuse of resources—from clearcutting forests for grazing animals and extracting water from ever-fragile ecosystems, to over-relying on chemical pesticides and overapplying fertilizers. Many agricultural policies foster the over-production of commodity crops like corn, wheat, and cotton, while undervaluing domestic production of "variety" crops like fruits and vegetables. These broad generalizations have some nuances; however, broadly speaking, the United States' attitude about agriculture is "get big or get out."[1]

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1. An aphorism by Earl Butts, Secretary of Agriculture from 1971–1976, who paved the way for major consolidation and industrialization at the expense of family farms and environmentally

Despite its bounty, the American agricultural sector relies heavily on the U.S. government for support. The 2018 Farm Bill budgeted billions of dollars in direct payments to farmers, primarily in the form of commodity insurance programs.[2] These programs fund commodity crop production and disproportionally assist large farms in concentrated areas across the U.S.[3] Socially disadvantaged farmers—especially those who do not own land, farm large acreages, or grow commodity crops—have difficulty accessing sufficient government subsidies.[4] Moreover, the longstanding policy of American agricultural exceptionalism largely absolves the industry of environmental degradation.[5] The field runs wild to the detriment of the American farmers, entire ecosystems, and the climate. As a counterbalance, a broad tax on agriculture would push growers towards better climate-conscious practices, while producing a revenue stream that would aid American farmers in their times of need.

This Article explores existing policy incentives for climate-conscious agricultural practices and proposes a sweeping taxation schema on agriculture to better address the climate crisis. It first addresses the state of agricultural harms to the environment with a broad breakdown of greenhouse gas emissions from farming. This involves a case example of a major source of greenhouse gas emissions directly connected to fossil fuel use: synthetic nitrogen-based fertilizer. It then discusses existing U.S. governmental assistance programs within the Department of Agriculture focused on conservation efforts, and highlights the Inflation Reduction Act's impact on climate-conscious policies. Finally, inspired by proposed carbon tax legislation in the U.S. and an enacted agricultural tax in Denmark, this paper

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conscious farming. *See* Noah Wurtz, *Butz's Law of Economics*, AGRARIAN TR. (Jan. 23, 2023), https://www.agrariantrust.org/butzs-law-of-economics.

2. JIM MONKE, CONG. RSCH. SERV., IF12233, FARM BILL PRIMER: BUDGET DYNAMICS 2 (2024).

3. NAT'L SUSTAINABLE AGRIC. COAL., UNSUSTAINABLE: STATE OF THE FARM SAFETY NET 15–20 (2024).

4. *Id.* at 7. "Socially Disadvantaged Farmer" is a statutory term. *See* 7 U.S.C. §§ 2003, 2279; *see also* RENÉE JOHNSON, CONG. RSCH. SERV., R46727, DEFINING A SOCIALLY DISADVANTAGED FARMER OR RANCHER (SDFR): IN BRIEF (2021).

5. A long-standing policy protecting agricultural production at all costs. For more information about exemptions for critical labor standards, *see* Autumn L. Canny, *Lost in A Loophole: The Fair Labor Standards Act's Exemption of Agricultural Workers from Overtime Compensation Protection*, 10 DRAKE J. AGRIC. L. 355 (2005). For the expansion of right-to-farm laws preventing nuisance complaints against concentrated animal feeding operations, *see* Danielle Diamond et al., *Agricultural Exceptionalism, Environmental Injustice, and U.S. Right-to-Farm Laws*, 52 ENV'T L. REP. 10727–47 (2022). For exemptions from environmental laws, *see* Ryan Levandowski, *Polluting 'til the Cows Come Home: How Agricultural Exceptionalism Allows CAFOs Free Range for Climate Harm*, 33 GEO. ENV'T L. REV. 151, 153 (2020).

proposes a tripartite tax schema to create a climate mitigation fund for farmers and incentives for adaptive climate-conscious practices.

I. CLIMATE CHANGE AND AMERICAN AGRICULTURE

The consequences of climate change on ecosystems are frightening, as is the projection of food security in the coming decades.[6] As global heat increases, heatwaves and droughts follow.[7] Poultry and livestock are susceptible to stress from excessive heat and humidity—dairy cows are particularly susceptible due to their high metabolism.[8] Heat stress not only harms the animals, but reduces their production of meat, milk, and eggs.[9] Unexpected freezes, elongated dry spells, and relentless floods kill crops and damage farm infrastructure.[10] Climate change is shifting water availability, from essential precipitation contributing to surface water (i.e., winter snow and summer rain) to the quality of that water from contaminated runoff (i.e., contamination from industrial zones or fields with excessive fertilizer).[11] The ecological costs are high, as are economic costs. The U.S. alone experienced 27 "billion-dollar" disaster events in 2024 with damages surpassing $180 billion.[12] By 2049, climate change will cost $38 trillion per year globally.[13]

Amidst this snapshot of threats to domestic food production, American agriculture is a hearty contributor to its own demise. The Environmental Protection Agency estimates that 10.5% of U.S. greenhouse gas emissions in 2022 were from the agricultural sector.[14] While carbon dioxide emissions hover around 11.6%, methane emissions accounted for 41.7%, and nitrous

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6. *See* Rachel Bezner Kerr et al., *2022: Food, Fibre, and Other Ecosystem Products*, *in* CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY 713, 717 (H.O. Pörtner et al. eds., 2022); *see also* June-Yi Lee et al., *2021: Future Global Climate: Scenario-Based Projections and Near-Term Information*, *in* CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS 553, 557 (Valérie Masson-Delmotte et al. eds., 2021).

7. *See* Veronika Eyring et al., *2021: Human Influence on the Climate System*, *in* CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS 423, 449 (Valérie Masson-Delmotte et al. eds., 2021).

8. NIGEL KEY ET AL., U.S. DEP'T OF AGRIC.: ECON. RSCH. SERV., ERR-175, CLIMATE CHANGE, HEAT STRESS, AND U.S. DAIRY PRODUCTION 3–15 (2014).

9. *Id.* at 1.

10. *Billion-Dollar Weather and Climate Disasters: Events*, NOAA: NAT'L CENTERS FOR ENV'T INFO., https://www.ncei.noaa.gov/access/billions/events (last visited Nov. 30, 2025).

11. ELIZABETH MARSHALL ET AL., U.S. DEP'T AGRIC.: ECON. RSCH. SERV., ERR-201, CLIMATE CHANGE, WATER SCARCITY, AND ADAPTATION IN THE U.S. FIELDCROP SECTOR 4 (2015).

12. *Billion-Dollar Weather and Climate Disasters: Events*, *supra* note 10.

13. Seth Borenstein, *New Study Calculates Climate Change's Economic Bite Will Hit About $38 Trillion a Year by 2049*, AP (Apr. 17, 2024), https://apnews.com/article/climate-change-damage-economy-income-costly-3e21addee3fe328f38b771645e237ff9.

14. *Climate Change*, U.S. DEP'T AGRIC.: ECON. REVENUE SERV. (June 2, 2025), https://www.ers.usda.gov/topics/natural-resources-environment/climate-change/.

oxide accounted for 46.6% of emissions.[15] This is alarming because carbon dioxide is noxious enough on its own, and methane is nearly 30 times as powerful as carbon dioxide (though it remains in the atmosphere for only ten years post-emission).[16] Nitrous oxide, on the other hand, has approximately 273 times the warming power of carbon dioxide, and it remains in the atmosphere for more than 100 years.[17] Nitrous oxide emissions have increased 40% from 1980 to 2020.[18]

There is a myriad of ways the agricultural sector emits greenhouse gases into the atmosphere. Tractors, trucks, and other machinery use diesel and gasoline. Washrooms and temperature-sensitive storage require electricity, which is derived mostly from fossil-fuels.[19] Carbon dioxide emissions rise from the destruction of healthy soil by over-tilling and over-treating, as well as deforestation to make space for livestock and commodity crops.[20] An issue that has caught the American imagination is "cow burps," as methane is a natural byproduct of ruminants' digestive processes.[21] Improperly treated and stored manure also produces methane.[22] All of these emissions are direct consequences of the combustion of fossil fuels, human manipulation of the landscape, and the result of natural biological phenomena.[23]

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15. *Id.*

16. *Understanding Global Warming Potentials*, U.S. ENV'T PROT. AGENCY (Jan. 16, 2025), https://www.epa.gov/ghgemissions/understanding-global-warming-potentials.

17. *Id.*

18. *Nitrous Oxide Emissions Grew 40 Percent from 1980 to 2020, Accelerating Climate Change*, NOAA: RSCH. (June 12, 2024), https://research.noaa.gov/nitrous-oxide-emissions-grew-40-percent-from-1980-to-2020-accelerating-climate-change/ [hereinafter *Accelerating Climate Change*].

19. Fossil fuels still compose just over 60% of U.S. electricity. *Electricity Explained: Electricity Generation, Capacity, and Sales in the United States*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/energyexplained/electricity/electricity-in-the-us-generation-capacity-and-sales.php (last updated July 16, 2024).

20. *Sources of Greenhouse Gas Emissions*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#:~:text=Management%20of%20agricultural%20soils%20accounts,4%20and%20N2O (last updated Mar. 31, 2025); *see generally* U.S. Env't Prot. Agency, *Chapter 5, Agriculture*, *in* Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2022 (2024) [hereinafter *Inventory of U.S. Greenhouse Gas Emissions*].

21. *See, e.g.*, *Inventory of U.S. Greenhouse Gas Emissions*, *supra* note 20, at 5-1; Christopher Booker & Sam Weber, *Cow Burps Are a Major Contributor to Climate Change – Can Scientists Change That?*, PBS NEWS (Mar. 6, 2022), https://www.pbs.org/newshour/show/cow-burps-are-a-major-contributor-to-climate-change-can-scientists-change-that; Paul Hond, *How Farm Animal Burps Are Fueling Global Warming*, COLUM. MAG.: SCI. & TECH. (Apr. 17, 2024), https://magazine.columbia.edu/article/how-farm-animal-burps-are-fueling-global-warming.

22. *Inventory of U.S. Greenhouse Gas Emissions*, *supra* note 20, at 5-2.

23. The intensity by which the U.S. produces animals for meat and dairy is compounding the emissions of methane far beyond sustainable practices and therefore stretches the "natural" qualifier. Concentrated animal feeding operations produce excessive amounts of methane. For more information, *see* Lisa Held, *Methane from Agriculture Is a Big Problem. We Explain Why,* CIV. EATS (Oct. 6, 2021), https://civileats.com/2021/10/06/methane-from-agriculture-is-a-big-problem-we-explain-why/.

Agriculture's greenhouse gas emissions are not limited to direct emissions; its greenhouse gas footprint also involves petrochemicals. Petrochemical feedstocks—chemicals and compounds made from petroleum oil, natural gas, and coal—carry environmental detriments and impact the climate, despite not being direct sources of greenhouse gas emissions through combustion.[24] Plastics and fertilizers are two major substances made from petrochemicals. Combined, they contribute 7.4% of global greenhouse gas emissions in upstream production and processing.[25]

Plastics are commonplace in the agricultural sector—like most economic and social sectors. Seeds and pesticides use plastic packaging, and irrigation systems are flushed with plastic piping and hoses.[26] Farmers use plastic trays for seeding, plastic netting for row cover, and plastic facing for greenhouses.[27] Even organic farms use plastics, especially when using landscape fabric for weed control in lieu of synthetic pesticides.[28] Although plastic does not emit greenhouse gases in its final form, it does lead to major ecological issues such as polluting and leaching into soil and waterways, both as large refuse and microplastics contaminating our bodies.[29] Demand for plastics is only increasing, as is the demand for synthetic nitrogen-based fertilizers.[30] Plastic's ubiquity across industries and its complex lifecycle expands beyond the scope of this paper.[31] Because global nitrous oxide emissions primarily come from the use of nitrogen-based fertilizer in the agricultural sector, this Article focuses on synthetic nitrogen-based fertilizers.[32]

A. Fertilizer 101

Crop growth requires a medley of essential nutrients that need to be replaced through crop rotation or by application of organic or synthetic

24. CTR. FOR INT'L ENV'T L., EMISSIONS UNLEASHED: THE CLIMATE CRISIS AND AMERICA'S PETROCHEMICAL BOOM 9 (2024).

25. *Id.*

26. *See* FOOD & AGRIC. ORG. OF THE U.N., ASSESSMENT OF AGRICULTURAL PLASTICS AND THEIR SUSTAINABILITY: A CALL FOR ACTION 2 (2021).

27. *Id.* at 12 tbl. 3.

28. *Id.*

29. Stephanie Dutchen, *Microplastics Everywhere*, HARV. MED. (Spring 2023), https://magazine.hms.harvard.edu/articles/microplastics-everywhere.

30. INT'L ENERGY AGENCY, OECD, THE FUTURE OF PETROCHEMICALS: TOWARDS MORE SUSTAINABLE PLASTICS AND FERTILIZER 3 (2018).

31. However, reduction of plastic use on farms can factor into the proposed tax deduction schemas. *See infra* Section I.C.

32. *Sources of Greenhouse Gas Emissions*, *supra* note 20.

fertilizers.[33] Synthetic fertilizers are made through industrial processes that create highly concentrated nutrients essential for plant growth, such as nitrogen, phosphorus, and potassium.[34] Many synthetic fertilizers are blends that include all three nutrients.[35] Organic fertilizers include compost, manure, and bones, which consist of these essential nutrients (and much more) in lower concentrations.[36]

Synthetic fertilizers are incredibly efficient; they are cheaper than organic fertilizer for the value of nutrients compared to the amount necessary for crop growth.[37] Unfortunately, synthetic fertilizers are often overused, which leads to leaching into groundwater, runoff into surface water, and emission from the soil to the air.[38] This overuse reduces water quality and can lead to soil acidity—an environment inhospitable to many crops.[39]

This Article focuses on the negative environmental impacts of nitrogen-based fertilizer as one example, but there are two other notable mass-produced fertilizers that have negative impacts on the climate as well. Phosphorus fertilizers are derived from phosphate rock, either through mining and grinding the rock into a fine powder, or by treating the rock with ammonia.[40] Potassium fertilizers are made from potash (potassium-containing ore), which is mined and refined into potassium chloride.[41] Both phosphorous rock and potassium ore require mining and processing,[42] which emits greenhouse gases from forces exerted to conduct the mining itself.[43]

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33. For crop rotation generally, *see* SUSTAINABLE AGRIC. RSCH. AND EDUC, PLANT & LIFE SCIS. & EDUC., CROP ROTATION ON ORGANIC FARMS: A PLANTING MANUAL 93 (Mohler & Johnson eds., 2009).

34. *Fertilizers & Pesticides*, U.S. DEP'T AGRIC.: ECON. RSCH. SERV., https://www.ers.usda.gov/topics/farm-practices-management/fertilizers-pesticides/ (last updated Nov. 13, 2025).

35. *Id.*

36. Kim Pokorny, *Choosing the Right Fertilizer for Your Garden*, OR. STATE UNIV: EXTENSION SERV. (Mar. 2025), https://extension.oregonstate.edu/news/choosing-right-fertilizer-your-garden.

37. Vassilis D. Litskas, *Environmental Impact Assessment for Animal Waste, Organic and Synthetic Fertilizers*, 4 NITROGEN 16 (2023).

38. *Fertilizers & Pesticides*, *supra* note 34.

39. KEITH O. FUGLIE ET AL., U.S. DEP'T AGRIC.: ECON. RSCH. SERV., EIB-268, WORLD AGRICULTURAL PRODUCTION, RESOURCE USE, AND PRODUCTIVITY, 1961–2020, at 19–20 (2024).

40. Stephen M. Jasinski, *Phosphate Rock*, *in* U.S. GEOLOGICAL SURVEY, MINERAL COMMODITY SUMMARIES 2025, at 134 (2025); *see also* Daniel E. Kaiser & Paulo Pagliari, *Understanding Phosphorous Fertilizers*, UNIV. OF MICH. EXTENSION, https://extension.umn.edu/phosphorus-and-potassium/understanding-phosphorus-fertilizers#water-soluble-619560 (last updated 2018).

41. Jasinski, *supra* note 40, at 138.

42. Nat'l Mins. Info. Ctr., *Potash Statistics and Information*, USGS, https://www.usgs.gov/centers/national-minerals-information-center/potash-statistics-and-information (last visited Nov. 29, 2025).

43. Antione Allanore & Elizabeth Gribkoff, *Mining and Metals*, MIT CLIMATE PORTAL (Oct. 19, 2020), https://climate.mit.edu/explainers/mining-and-metals.

B. Ecosystem and Climate Impacts of Nitrogen-Based Synthetic Fertilizer

The most common nitrogen-based fertilizers are produced using the Haber-Bosch process,[44] where nitrogen is extracted from the air and combined with hydrogen (usually derived from natural gas) under high pressure and temperature in the presence of a catalyst.[45] This produces ammonia, which is further processed into stable compounds like urea or ammonium nitrate.[46] Both are extremely effective fertilizers.

The Haber-Bosch process relies heavily on natural gas and the production process itself emits carbon dioxide.[47] In 2010, 451 million metric tons of carbon dioxide were emitted by the production of ammonia alone.[48] By 2018, this jumped to 1.25 billion tons.[49] As of 2021, ammonia production accounts for over 2% of global emissions, and its supply chain alone accounts for just over a fifth of agricultural emissions.[50]

When applied to fields, microbes in the soil break down the nitrogen fertilizer, creating nitrous oxide as a byproduct.[51] As stated above, nitrous oxide is a potent greenhouse gas with a global warming potential nearing 300 times that of carbon dioxide.[52] Synthetic fertilizers are economically advantageous over organic fertilizers: they do not take as much time to produce and are highly concentrated.[53] However, they are systematically over-applied to farmland, with nitrous oxide emissions and other negative

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44. For more detailed information, *see* VACLAV SMIL, ENRICHING THE EARTH: FRITZ HABER, CARL BOSCH, AND THE TRANSFORMATION OF WORLD FOOD PRODUCTION (2001).

45. Leigh Krietsch Boerner, *Industrial Ammonia Production Emits More CO_2 Than Any Other Chemical-Making Reaction. Chemists Want to Change That*, C&EN (June 15, 2019), https://cen.acs.org/environment/green-chemistry/Industrial-ammonia-production-emits-CO2/97/i24.

46. *How Fertilizers Are Made*, FERTILIZERS EUR., https://www.fertilizerseurope.com/fertilizers-in-europe/how-fertilizers-are-made/ (last visited Nov. 29, 2025).

47. Giuliana Viglione, *Q&A: What Does the World's Reliance on Fertilisers Mean for Climate Change?*, CARBON BRIEF (July 11, 2022), https://www.carbonbrief.org/qa-what-does-the-worlds-reliance-on-fertilisers-mean-for-climate-change/.

48. Boerner, *supra* note 45.

49. INST. FOR AGRIC. AND TRADE POL'Y, GREENPEACE INT'L, GRAIN, NEW RESEARCH SHOWS 50 YEAR BINGE ON CHEMICAL FERTILISERS MUST END TO ADDRESS THE CLIMATE CRISIS 1 (2021).

50. Gosia Wozniacka, *The Greenhouse Gas No One's Talking About: Nitrous Oxide on Farms, Explained*, CIV. EATS (Sept. 19, 2019), https://civileats.com/2019/09/19/the-greenhouse-gas-no-ones-talking-about-nitrous-oxide-on-farms-explained.

51. *Id*.

52. *Accelerating Climate Change*, *supra* note 18.

53. Litskas, *supra* note 37, at 16.

side effects[54] vastly outperforming the value of the fertilizers themselves.[55] Moreover, the growing use of synthetic fertilizers since the Green Revolution[56] of the 1950s has undercut food sovereignty worldwide, interrupted regenerative practices, and poses an ever increasing threat to sustainable and secure food systems in the future.[57]

II. EXISTING CONSERVATION PROGRAMS AND THE INFLATION REDUCTION ACT

There is little in the way of regulations around the amount of fertilizer a farmer may distribute on their land; however, there are programs through the U.S. Department of Agriculture (USDA) funded primarily through the Farm Bill, with additional funding from the Inflation Reduction Act (IRA) that assist farmers who voluntarily shift their practices. Domestic subsidies can support farmers' efforts to change their practices for the betterment of their land, businesses, and the environment at large. There are government programs and support for nutrient management efforts to reduce excessive fertilizer use, as well as programs to help farmers shift towards more sustainable models entirely (i.e., USDA Organic). The following provides an insight into a brief history of the U.S. federal government's support of conservation efforts, available programs through the USDA, and a mention of the IRA's contribution to climate-conscious practices in agriculture.

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54. Including eutrophication of waterways from leaching and runoff. *See Sources and Solutions: Agriculture*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/nutrientpollution/sources-and-solutions-agriculture (last updated Mar. 20, 2025).

55. From impacts to climate change to toxic algal blooms to nitrate-related illnesses, *see Four Reasons Why the World Needs to Limit Nitrogen Pollution*, UN ENV'T PROGRAMME (Jan. 16, 2023), https://www.unep.org/news-and-stories/story/four-reasons-why-world-needs-limit-nitrogen-pollution.

56. The Green Revolution is characterized as a time of rapid changes in industrialized agriculture in the post-WWII era, including repurposing chemical infrastructure to create fertilizer instead of bombs. It is also characterized as a time of breeding high-output crops that fed hundreds of thousands of people, but only through overdependence on chemical fertilizers. *See Fueling the Green Revolution*, U.S. DEP'T AGRIC.: AGRIC. RES. SERV. (Oct. 18, 2023), https://www.ars.usda.gov/oc/timeline/green/; *see also* Ray Offenheiser, *The Green Revolution: Norman Borlaug and the Race to Fight Global Hunger*, PBS AM. EXPERIENCE (Apr. 22, 2025), https://www.pbs.org/wgbh/americanexperience/features/green-revolution-norman-borlaug-race-to-fight-global-hunger/.

57. *See* Michael Fakhri (Special Rapporteur), *Interim Report of the Special Rapporteur on the Right to Food*, at 3–12, U.N. Doc. A/76/237 (July 27, 2021).

A. The Farm Bill

The Farm Bill is comprehensive legislation governing agricultural and food policy in the United States.[58] It is not one piece of legislation, but an omnibus law that is painstakingly assembled and codified approximately every five years.[59] The Agriculture Improvement Act of 2018 is the most recent Farm Bill.[60] The Farm Bill originated in 1933 to assist farmers struggling after the First World War and the Great Depression.[61] Its purpose was to stabilize the price of crops by raising prices and subsidizing farmers to reduce production of commodity crops.[62]

Conservation practices within U.S. Agriculture are over 85 years old.[63] Central to U.S. agricultural environmental policy, conservation provisions have evolved significantly to address changing environmental priorities and agricultural practices.[64] Conservation efforts began with the Soil Conservation Act in 1938 to address Dust Bowl-era erosion, creating what is now the Natural Resource Conservation Service.[65]

Sustainable practices beyond Dust Bowl lessons were not brought to the fore until the 1985 Farm Bill introduced the Conservation Reserve Program.[66] This program paid farmers to retire environmentally sensitive land from agricultural production, marking a foundational shift toward integrating environmental stewardship with agricultural policy.[67] The 1996 Farm Bill established the comprehensive Environmental Quality Incentives Program (EQIP),[68] which provided financial and technical assistance for

58. For an excellent overview of the history of the Farm Bill, *see* Jonathan Coppess, THE FAULT LINES OF FARM POLICY: A LEGISLATIVE AND POLITICAL HISTORY OF THE FARM BILL (2018).

59. JIM MONKE & RENÉE JOHNSON, CONG. RSCH. SERV., IF12047, FARM BILL PRIMER: BACKGROUND AND STATUS (2024).

60. The 2018 bill was set to expire after five years (in 2023). Due to political gridlock, Congress extended its provisions three times. Congress implemented the most recent extension on November 12, 2025, through the "Continuing Appropriations, Agriculture, Legislative Branch, Military Construction and Veterans Affairs, and Extensions Act, 2026." *See* H.R. 5371, 119th Cong. (2025). This extension runs through September 30, 2026.

61. *History of the United States Farm Bill*, LIB. OF CONG., https://www.loc.gov/ghe/cascade/index.html?appid=1821e70c01de48ae899a7ff708d6ad8b&bookmark=Farm%20Bills (last visited Nov. 29, 2025).

62. *Id.*

63. *Id.*

64. *Id.*

65. *See* H.R. REP. NO. 74–1973, at 82 (1936).

66. *See* Food Security Act of 1985, Pub. L. No. 99–198, 99 Stat 1354.

67. U.S. DEP'T AGRIC.: FARM SERV. AGENCY, CONSERVATION RESERVE PROGRAM 1 (2025).

68. *See* Federal Agriculture Improvement and Reform Act of 1996, Pub. L. 104–27, 110 Stat. 888.

farmers who voluntarily initiate conservation projects within their farm.[69] The 2002 Farm Bill initiated the Conservation Stewardship Program (CSP)[70] to support farmers who voluntarily engage in preservation of natural resources as they farm.[71] These two main conservation programs for "working lands"[72] are vital components of USDA's conservation efforts and are models for an agricultural tax credit.

1. Environmental Quality Incentives Program

EQIP provides financial and technical assistance to farmers, ranchers, and forest landowners to implement conservation practices that address natural resource concerns.[73] It aims to improve soil, water, plant, air, and animal resources on agricultural and forest lands.[74] Key aspects of EQIP include support for conservation practices such as irrigation efficiency, nutrient management, and habitat improvements.[75] It also includes special initiatives to address specific resource concerns, like the Air Quality Initiative, which enumerates practices that improve air quality through the reduction of dust and carbon emissions.[76] Moreover, EQIP offers advanced payments and increased rates for socially disadvantaged, beginning,[77] and veteran farmers who are historically underserved within the USDA.[78] EQIP is only available to individuals who own and or have documented control over the land they farm.[79] Payment contracts may not exceed ten years[80] and payments are capped at $450,000 (aggregated between 2019–2023).[81]

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69. MEGAN STUBBS, CONG. RSCH. SERV., R40197, ENVIRONMENTAL QUALITY INCENTIVES PROGRAM (EQIP): STATUS AND ISSUES 1 (2011).

70. *See* Farm Security and Rural Investment Act of 2002, Pub. L. No. 107–71, 116 Stat. 134.

71. *Stewarding Success: Conservation Stewardship Program*, NAT'L SUSTAINABLE AGRIC. COAL. (Oct. 9, 2024), https://sustainableagriculture.net/blog/stewarding-success-conservation-stewardship-program/.

72. Meaning the land is still used for farming rather than removed from agricultural production altogether.

73. U.S. DEP'T AGRIC.: NAT. RES. CONSERVATION SERV., ENVIRONMENTAL QUALITY INCENTIVES PROGRAM (EQIP): IS EQIP RIGHT FOR ME? 1 (2022).

74. *Id.*

75. *Id.*

76. *Air Quality Initiative*, U.S. DEP'T AGRIC.: NAT. RES. CONSERVATION SERV., https://www.nrcs.usda.gov/programs-initiatives/eqip-air-quality-initiative (last visited Nov. 30, 2025).

77. "Beginning" farmer refers to farmers who have not been in operation for more than 10 years. *See* LISA S. BENSON, ET AL, CONG. RSCH. SERV., R48269, BEGINNING FARMERS OR RANCHERS (BFRS): CHALLENGES AND OPPORTUNITIES 1 (2024).

78. IS EQIP RIGHT FOR ME?, *supra* note 73, at 2.

79. U.S. DEP'T AGRIC., FAQ: ENVIRONMENTAL QUALITY INCENTIVES PROGRAM 1 (2017).

80. 7 C.F.R. § 1466.21(b)(2) (2025).

81. *Id.* § 1466.24(a).

2. Conservation Stewardship Program

CSP assists producers in enhancing and maintaining conservation practices on working lands.[82] The program rewards participants who already practice effective conservation and supports the adoption of additional improvements.[83] CSP is open to farmers and ranchers managing working lands, including cropland, pastureland, and nonindustrial private forestland; it is not limited to landowners.[84] The purpose of CSP is to support conservation efforts like improving soil quality, efficient water management, and energy efficiency.[85] Notably, CSP contracts provide annual payments based on performance, enabling producers to implement and maintain advanced conservation activities.[86] Payment contracts periods last for up to five years and are subject to renewals.[87] CSP payments are limited to $200,000 over the contract period.[88]

The 2018 Farm Bill[89] allocated approximately $9.2 billion for EQIP and $7.7 billion for CSP over its five-year span.[90] Originally set to expire at the end of 2023, Congress has extended 2018 Farm Bill provisions twice due to an inability to pass a new Bill.[91] Generally, funding for EQIP and CSP projects would cease upon the original expiration; however, the IRA's additional funding has supported both programs in the interim.[92]

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82. *Conservation Stewardship Program (CSP)*, U.S. DEP'T AGRIC.: NAT. RES. CONSERVATION SERV., https://www.nrcs.usda.gov/programs-initiatives/csp-conservation-stewardship-program (last visited Nov. 29, 2025).

83. *Id.*

84. *Id.*

85. *Id.*; *see* U.S. DEP'T AGRIC., CONSERVATION STEWARDSHIP PROGRAM: FOR CROP GROWERS (2022); U.S. DEP'T AGRIC., CONSERVATION STEWARDSHIP PROGRAM: FOR ORGANIC PRODUCERS (2022).

86. *Conservation Stewardship Program (CSP)*, *supra* note 82.

87. 7 C.F.R. § 1470.21(b)(1).

88. *Id.* § 1470.24(g).

89. Agriculture Improvement Act of 2018, Pub. L. No. 115–334, 132 Stat. 4490.

90. MEGAN STUBBS, CONG. RSCH. SERV., R45698, AGRICULTURAL CONSERVATION IN THE 2018 FARM BILL (2019).

91. Kristine A. Tidgren, *The 2018 Farm Bill Has Expired: What Does That Mean?* IOWA STATE UNIV.: CTR. FOR AGRIC. L. & TAX'N (Oct. 2, 2024), https://www.calt.iastate.edu/blogpost/2018-farm-bill-has-expired-what-does-mean.

92. *Id.*

B. Inflation Reduction Act[93]

The IRA allocated specifically $19.5 billion to enhance various agricultural conservation programs.[94] EQIP received $8.45 billion and CSP received $3.25 billion, aiming to support climate-smart agriculture and forestry practices.[95] This was done by mitigating greenhouse gas emissions, enhancing carbon sequestration, and improving soil health.[96]

In fiscal year 2023, over $2.8 billion was invested to support more than 45,000 contracts through the USDA's Natural Resources Conservation Service, the highest in agency history.[97] In the 2024 fiscal year, allocations included $1.65 billion for EQIP and $472 million for CSP.[98] The USDA announced in October of 2024 plans to allocate up to $7.7 billion from the IRA for climate-smart conservation practices in 2025, marking a significant increase compared to previous years.[99]

As incredible as the IRA has been thus far, it has a ten-year lifespan. Additionally, as amazing EQIP and CSP are, their funding is subject to bipartisan agreement on a massive omnibus bill. The 2018 Farm Bill expired in late 2023.[100] While Congress extended the provisions twice[101]—preventing punitive permanent law provisions from stepping up in its absence[102]—they are two years late in passing a substantive successor. Meanwhile, tens of thousands of farmers are suffering from the U.S. government's chaotic

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93. There have been changes to the Inflation Reduction Act since the first drafts of this Article. The Trump Administration passed an Executive Order on January 20, 2025, directing all agencies to stop disbursing funds allocated by the Inflation Reduction Act. *See Unleashing American Energy,* Exec. Order No. 14,154, 90 Fed. Reg. 8353 (2025). On July 4, 2015, the Congress implemented Pub. L. No. 119-21 (also known as the "One, Big, Beautiful Bill"), which removed tax credits and rescinded funds previously granted through the Inflation Reduction Act (see specifically Section 10601 for adjustments to EQIP and CSP). *See* H.R. 1, 119th Cong. (2025).

94. JIM MONKE ET AL., CONG. RSCH. SERV., IN11978, INFLATION REDUCTION ACT: AGRICULTURAL CONSERVATION AND CREDIT, RENEWABLE ENERGY, AND FORESTRY 1 (2022).

95. *Id.*

96. *Id.*

97. U.S. DEP'T AGRIC., RELEASE NO. 0163.24, FACT SHEET: CELEBRATING TWO YEARS OF THE INFLATION REDUCTION ACT (2024).

98. *Id.*

99. *Press Release: Biden-Harris Administration Makes up to $7.7 Billion Available for Climate-Smart Practices on Agricultural Lands as Part of Investing in America Agenda*, U.S. DEP'T AGRIC.: NAT. RES. CONSERVATION SERV. (Nov. 18, 2024), https://www.nrcs.usda.gov/news/biden-harris-administration-makes-up-to-7.7-Billion-Available.

100. *See* Agriculture Improvement Act of 2018, Pub. L. No. 115–334, 132 Stat. 4490.

101. Further Continuing Appropriations and Other Extensions Act, Pub. L. No. 118–22, § 102, 137 Stat 112, 114–19 (2023); American Relief Act, Pub. L. No. 118–58, § 4101, 137 Stat. 1722, 1767–72 (2024).

102. JIM MONKE ET AL., CONG. RSCH. SERV., R47659, EXPIRATION OF THE 2018 FARM BILL AND EXTENSION FOR 2025, at 5–10 (2024).

cancellation of EQIP and CSP funds and IRA grants in early 2025.[103] Many of these contracts have been revoked as part of the Trump Administration's attack on diversity, equity, and inclusion.[104] Socially disadvantaged farmers—especially Black farmers—are particularly harmed by these cuts.[105]

It is increasingly evident that the support networks in place are not as sturdy as they need to be, especially for historically disadvantaged and small farmers who are essential in feeding the nation. A self-fueling trust for farmers based on a broad tax can provide a reliable pool of funds for these farmers, ensuring support for sustainable practices and insurance in times of climate-fueled crises.

III. A TAX ON AMERICAN AGRICULTURE—BOUNTY FROM BOUNTY

Existing taxes on American agriculture are limited. As of 2024, there were no taxes on American agricultural activity specifically, just standard income tax.[106] An estimated 2.4% of all U.S. farms are subject to corporate taxation.[107] The remaining 97.6% pays only individual income tax.[108] Schedule F of Form 1040 (the standard income tax return) is tailored specifically for individuals, trusts, partnerships, S Corps, and LLCs that cultivate, operate, or manage farms for gain or profit.[109] Schedule F applies to those who own the land or merely rent the land, and accounts for all profits and losses related to farming income.[110] Importantly, the agricultural sector's wealth of government support—primarily price-loss/agriculture-risk coverage payments, insurance subsidies, and cost share payments—must be reported as income.[111]

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103. *Broken Promises: Over 30,000 Farmers Denied Funds*, NAT'L SUSTAINABLE AGRIC. COAL. (Feb. 26, 2025), https://sustainableagriculture.net/blog/trump-denies-over-2-billion-in-payments-owed-to-30000-farmers/.

104. Lisa Held, *USDA Has Begun Canceling Contracts Based on Trump's DEI Order*, CIV. EATS: FOOD POL'Y TRACKER (Feb. 26, 2025), https://civileats.com/2025/02/26/usda-has-begun-canceling-contracts-based-on-trumps-dei-order/.

105. Iris M. Crawford, *Black Farmers Face Setbacks over Trump Budget Cuts: 'We Are in Survival Mode'*, THE GUARDIAN (Mar. 20, 2025), https://www.theguardian.com/environment/2025/mar/20/black-farmers-trump-usda-budget-cuts.

106. Estate taxes and property taxes are irrelevant for the purposes of this paper. Importantly, many farmers are liable for these taxes if they inherit land or own land.

107. TIA M. MCDONALD & RON DURST, U.S. DEP'T AGRIC.: ECON. RSCH. SERV., ERR-328, AN ANALYSIS OF THE EFFECT OF SUNSETTING TAX PROVISIONS FOR FAMILY FARM HOUSEHOLDS 5 (2024).

108. *Id.*

109. *See* U.S. DEP'T OF TREASURY: INTERNAL REVENUE SERV., FARMER'S TAX GUIDE 9 (2024).

110. "Farm" applies to a myriad of growing and raising activity, including livestock, poultry, fruit, and produce. *See* 26 C.F.R. § 1.61–4(d) (2025); 26 C.F.R. § 1.175–3 (2025).

111. Farmers would need to fill out an additional form, 1099-G. *See Lines 4a and 4b – Agricultural Program Payments*, IOWA STATE UNIV.: CTR. FOR AGRIC. LAW & TAX'N, https://www.calt.iastate.edu/lines-4a-and-4b-agricultural-program-payments (last visited Nov. 30, 2025).

Significant portions of the tax code benefit an array of business owners, including farmers. A tax deduction already exists for money expended toward conservation efforts.[112] This Section 175 deduction applies specifically to taxpayers engaging in soil and water conservation expenses before or during the taxpayer's farming activity on the land.[113] It is limited to 25% of the taxpayer's gross income from farming on the portion of land the farmer implemented conservation practices, and can only apply to non-depreciable additions or items.[114] Furthermore, conservation cost-share exclusions are available.[115] The 2017 Tax Cuts and Jobs Act installed permanent provisions increasing the expensing allowance for small businesses to $1 million, and shortening the depreciation of farm equipment from seven years to five.[116]

While raising taxes on corporations and high-income households is gaining popularity, Americans are generally troubled when it comes to paying income tax.[117] Roughly half of American adults feel that they pay more than their fair share.[118] Farmers' disdain may only increase if the 2017 Tax Cuts and Jobs Act's sunset provisions lapse, as farms face a $4.5 billion tax liability.[119] This pales in comparison to the agricultural sector's $222.3 billion gross domestic product contribution to the U.S. economy.[120] Nevertheless, given agriculture's contributory role in climate change, implementing a tax on the agricultural sector is crucial in nudging farmers into better practices, or otherwise charging them a sliver of the ultimate costs.

A. Denmark's Green Tripartite Agreement: An "Agricultural" Tax

In June of 2024, Denmark introduced a carbon tax on agriculture—the first nation in the world to do so.[121] With agriculture contributing to a quarter

112. 26 U.S.C. § 175; 26 C.F.R § 1.175–2(a)(1) (2025).

113. 26 CFR § 1.175–7 (2025).

114. *Id.*

115. 26 U.S.C. § 126(b)(1)(A).

116. *Agriculture and Tax Reform*, FB, https://www.fb.org/issue/tax-reform (last visited Nov. 30, 2025).

117. Andy Cerda, *Most Americans Continue to Favor Raising Taxes on Corporations, Higher-Income Households*, PEW RSCH. CTR. (Mar. 19, 2025), https://www.pewresearch.org/short-reads/2025/03/19/most-americans-continue-to-favor-raising-taxes-on-corporations-higher-income-households/.

118. Anna Jackson, *7 Facts About Americans and Taxes*, PEW RSCH. CTR. (Apr. 9, 2024), https://www.pewresearch.org/short-reads/2024/04/09/7-facts-about-americans-and-taxes/.

119. MCDONALD & DURST, *supra* note 107.

120. KATHLEEN KASSEL ET AL., U.S. DEP'T AGRIC.: ECON. RSCH. SERV., APN-121, SELECTED CHARTS FROM AG AND FOOD STATISTICS: CHARTING THE ESSENTIALS, 2024, at 5 (2024).

121. Lena Hunter, *Denmark Announces World-first Climate Tax on Agriculture – Earmarks Billions for Rewilding*, COPENHAGEN POST (June 25, 2024), https://cphpost.dk/2024-06-

of Denmark's total carbon and carbon equivalent emissions, the nation has entered into a Green Tripartite Agreement with the desire for the government, environmental groups, and the agricultural industry to address climate solutions together.[122] Talks of the agricultural tax started with the goal to make it more expensive for farmers to pollute, thereby covering a broad range of greenhouse gas emissions—including methane from animal production and nitrous oxide from excessive use of synthetic fertilizers.[123]

However, as of November 2024, it appears that the execution of the tax rests only on farmers involved in animal production, rather than all producers.[124] This carbon equivalency tax targets a single facet of the Danish agricultural sector's greenhouse gas emissions.[125] It does not cover other emissions, namely, nitrous oxide emissions that arise from the overuse of synthetic nitrogen-based fertilizers. Nevertheless, the tax is simple: after a basic deduction of 60%, farmers will have to pay $18 per ton of carbon dioxide equivalent emitted each year starting in 2030, and will increase to $44 per ton in 2035.[126] Though the agricultural qualifier to the tax may be somewhat of a misnomer, it does open a revenue stream to fund adaptive and restorative projects related to agriculture.[127]

Other nations are discussing carbon taxes on agriculture as well. The European Union already has a carbon border adjustment mechanism, which puts a tax on the production of carbon-intensive goods.[128] The tax is placed on petrochemical feedstocks and the production of plastics and ammonia—not agricultural production specifically.[129] The European Union Climate Advisory Board has recommended emissions pricing for agricultural and land use sectors.[130] Similar to Denmark, New Zealand floated an agricultural

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25/news/climate/denmark-announces-world-first-climate-tax-on-agriculture-earmarks-billions-for-rewilding/.

122. Tim Searchinger & Richard Waite, *Denmark's Groundbreaking Agriculture Climate Policy Sets Strong Example for the World*, WORLD RES. INST. (Nov. 12, 2024), https://www.wri.org/insights/denmark-agriculture-climate-policy.

123. Lena Hunter, *Explainer: Denmark's CO2 Tax on Farming*, COPENHAGEN POST (Feb. 20, 2024), https://cphpost.dk/2024-02-20/news/climate/explainer-denmarks-co2-tax-on-farming/.

124. *See* Searchinger & Waite, *supra* note 122.

125. *See id.*

126. Orla Dwyer & Yanin Quiroz, *Q&A: How Denmark Plans to Tax Agriculture Emissions to Meet Climate Goals*, CARBONBRIEF (July 7, 2024), https://www.carbonbrief.org/qa-how-denmark-plans-to-tax-agriculture-emissions-to-meet-climate-goals/.

127. Searchinger & Waite, *supra* note 122.

128. *Carbon Border Adjustment Mechanism*, EUR. COMM'N: TAX'N & CUSTOMS UNION (Nov. 4, 2024), https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en.

129. *Id.*

130. EUROPEAN SCI. ADVISORY BD. ON CLIMATE CHANGE, TOWARDS EU CLIMATE NEUTRALITY: PROGRESS, POLICY GAPS AND OPPORTUNITIES: ASSESSMENT REPORT 2024, at 156–67 (2024).

tax relating to livestock emissions; unfortunately, it failed due to political unviability.[131]

Denmark's agricultural tax is ambitious, but it only applies to methane emissions from animal agriculture. Denmark is 16,585 square miles,[132] with approximately 10,112 square miles devoted to agriculture as of 2022.[133] The United States is 3,809,525 square miles[134] with approximately 1,375,158 square miles devoted to agriculture.[135] Although Denmark utilizes more land for farming in relation to its size, the United States is a behemoth in comparison. The vastness of American farmland must be considered when addressing any agricultural tax, not just one subsector (i.e., livestock). Between Denmark's tax on livestock and the European Union's tax on petrochemical feedstocks, some greenhouse gas emissions are "captured" by a tax; however, a true agricultural tax needs to take on an omnibus ambition.

B. Climate Tax Proposals in the U.S.

The 2021–2022 Congress presented three carbon tax bills—H.R. 2307, H.R. 3311, and S. 2085—marking a piqued interest in addressing the climate crisis. Congress introduced the Energy Innovation and Carbon Dividend Act on April 1, 2021.[136] It creates a carbon fee on fuels like oil, natural gas, and coal based on their greenhouse gas emissions. It also includes rebates for carbon sequestration and border adjustments for carbon-intensive imports and exports.[137] The revenue from the fee goes into a Carbon Dividend Trust Fund to cover administrative costs and provide dividend payments to U.S. residents.[138] This Bill specifically exempts agricultural fuel use.[139]

The America Wins Act was introduced on May 18, and imposes an excise tax on the carbon dioxide content of fossil fuels sold by the manufacturer, producer, or importer.[140] The Bill collects revenues into the

131. Lucy Craymer, *New Zealand Ends Plans to Price Agricultural Emissions*, REUTERS (June 10, 2024), https://www.reuters.com/business/environment/new-zealand-ends-plans-price-agricultural-emissions-2024-06-11/.

132. Christian Nokkentved et al., *Denmark*, BRITANNICA (Nov. 26, 2025), https://www.britannica.com/place/Denmark.

133. DANISH AGRIC. & FOOD COUNCIL, DENMARK – A FOOD AND FARMING COUNTRY: FACTS & FIGURES 58 (2023).

134. Adam Gopnik et al., *United States*, BRITANNICA (Nov. 30, 2025), https://www.britannica.com/place/United-States.

135. U.S. DEP'T AGRIC.: NAT'L AGRIC. STAT. SERV., ACH22-3, 2022 CENSUS OF AGRICULTURE HIGHLIGHTS: FARMS AND FARMLAND (2024).

136. H.R. 2307, 117th Cong. (2021).

137. *Id.* §§ 9905, 9908.

138. *Id.* § 9512.

139. *Id.* § 9902(e)(1).

140. H.R. 3311, 117th Cong. § 4691 (2021).

Build America Trust Fund and directs the revenues toward infrastructure projects including transportation, water, health care, housing. It also creates an energy refund program to alleviate costs on low-income households.[141] The Bill includes funding for U.S. Department of Agriculture (USDA) water and waste disposal programs and $1.5 billion toward agricultural research and mitigation, but imposes no burden on the agricultural sector.[142]

The Save Our Future Act, introduced on June 16, imposes a fee on coal, petroleum products, natural gas, and fluorinated greenhouse gas imports.[143] The Bill creates cost mitigation grants to assist in the transition from a high-carbon economy to a low-carbon economy.[144] It includes rebates for rural household energy expenses and attuned assistance for displaced coal workers through 2031.[145] This Bill also imposes fees on greenhouse gas production from other processes, but specifically exempts emissions from any agricultural entity growing crops or raising livestock.[146]

These proposed bills utilize a stick and carrot approach in their climate tax schemas. They all impose a fee on greenhouse gas emissions at some point in the emissions timeline (the stick). And they all create a trust fund to alleviate the transition from carbon intensive economies, ranging from direct payments to research grants (the carrot). Notably, none of these proposed bills include agriculture into their taxation schema. H.R. 3311 names the sector as a beneficiary of funds for conservation and research purposes, while H.R. 2307 and S. 2085 specifically exempt agriculture. This oversight reiterates and reproduces the myth of American agricultural exceptionalism. Although none of these bills progressed beyond introductions to their respective floors, they serve as useful templates for what they include—and what they leave out.

C. "A Pint for a Bushel and a Peck"[147]

A tripartite taxation plan including a blanket tax on all agricultural activity, a set of voluntary deductions, and a trust fund for climate mitigation efforts can fund and reward farmers with conservation and adaptive practices. The *Pint* is a standard tax rate scaled in accordance with the existing typology used by the USDA's Economic Research Service (ERS). The *Bushel* is a trust fund established to provide emergency aid for small

141. *Id.* § 36C.
142. *Id.* § 9512(F), (L).
143. S. 2085, 117th Cong. §§ 4691–4692 (2021).
144. *Id.* § 202.
145. *Id.* § 301.
146. *Id.* § 4693.
147. Please bear the metaphor: there are sixteen pints in a peck and four pecks in a bushel.

family farms from damage resulting from floods, fire, and other natural disasters. It also reserves funds for medium and large family farms to utilize in their transition efforts away from harmful agricultural practices. The *Peck* is a set of deductions that correspond with the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP).

1. The Pint

The tax rate would have three levels based off the ERS designations of gross cash farm income (GCFI). The ERS uses a "family farm" definition to delineate its typology.[148] A family farm is defined as farm ownership of the farm, the occupation of the principal operator, and the farm's annual revenue.[149] There are four primary categories: small family farms with GCFI less than $350,000 (with retirement farms, off-farm occupation, and low sales farming-occupation making less than $150,000 as subcategories); midsize family farms with a GCFI between $350,000 and $999,999; large-scale family farms with a GCFI of $1,000,000 or more; and nonfamily farms, regardless of GCFI, where any operator and related workers bear no familial relation.[150]

The tax rate would correspond with the small, medium, and large income categories. Nonfamily farms would be placed in the small, medium, or large category based on their GCFI, but they would pay a slightly higher rate than the family farms. The tax will apply to all farms making over $150,000 GCFI. This is to avoid adding another barrier of entry for socially disadvantaged, historically underserved, and beginning farmers.[151]

By creating an agricultural tax tied to income, it ensures smoother incorporation into the existing Internal Revenue Code. It also provides a higher degree of administrative feasibility than alternatives because farmers already fill out Schedule F for income made from the farm. Moreover, federal income taxes are well understood by the American public, as everyone needs to file them. When it comes to political viability—any proposed tax has an uphill battle—the American voter can better understand the relationship between the tax and the taxpayer, unlike estate taxes or taxes on intangibles (like greenhouse gases).

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148. CHRISTINE WHITT ET AL., U.S. DEP'T AGRIC.: ECON. RSCH. SERV., ERB-263, AMERICA'S FARMS AND RANCHES AT A GLANCE: 2023 EDITION 1 (2023).

149. *Id.* at 2.

150. *Id.* at 3.

151. *See generally* JESSICA E. TODD ET AL., U.S. DEP'T AGRIC.: ECON. RSCH. SERV., ERB-266, AN OVERVIEW OF FARMS OPERATED BY SOCIALLY DISADVANTAGED, WOMEN, AND LIMITED RESOURCE FARMERS AND RANCHERS IN THE UNITED STATES (2024).

Because one of the many forms farming takes is business, this tax would need to be calculated prior to any business-related deductions (i.e., business related expenses, capital investments, and deductions).[152] Many businesses report low income, despite making high profits because of lenient and creative pro-business tax provisions—like the 2017 Tax Cuts and Jobs Act increase of the small business expense allowance, and favorable depreciation rates.[153] This tripartite tax schema would be rendered moot if agricultural businesses, especially large businesses, could avoid the agricultural tax through simple income tax shelters.

Nevertheless, an alternative would be a property tax, but that may lead to inequities between farms. For instance, a concentrated animal feeding operation uses a small floor plan, compared to a free-range farm where animals can roam, but applying the same tax rate per acre would put the free-range farm at a significant disadvantage. Another example is the use of nitrogen-based fertilizers—the overuse of fertilizers in a 400-acre farm has much more impact on local waterways than the overuse of fertilizers in an 11-acre farm.

Another alternative could be a partitioned carbon equivalent tax. Unfortunately, this has little to no political viability because of how partisan the climate crisis is within American politics. It also may lead to inequities between industries: livestock emits methane through their biological processes; conventional commodity crop production contributes nitrous oxide through synthetic fertilizers; and all farms emit carbon dioxide in the disturbance of soil through tilling. Though it may be better, environmentally speaking, to tax each emission according to its potency, it is not administratively feasible or economically sensible.

Farming is a critical sector. People need to eat. Farming is also a way to conduct business, and it cannot become unviable lest the millions of farms[154] in existence evaporate from the high cost of the taxes.[155] Because all agriculture involves some greenhouse gas emissions, whether they be carbon dioxide, methane, or nitrous oxide, all farms need to be subject to the agricultural tax.

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152. *See* CHRIS NEWMAN, FIRST GENERATION FARMING 38 (2024).

153. *Agriculture and Tax Reform*, *supra* note 116.

154. WHITT ET AL., *supra* note 148, at 4.

155. This is not to ignore a government-owned model of production; that will just lead down a tangent of no return.

2. The Bushel

The revenue of this tax would be secured in a trust fund and serve the American farmer in two major ways. First, with climate change wreaking havoc on weather patterns, floods will increase in some areas while others will languish in droughts. Crises will continue, and this fund would be able to assist in the aftermath. The beneficiaries will be tiered corresponding to the ERS designation but receive the inverse of what they contribute. This means that payouts will be set at a higher rate for small family farms than medium and large family farms. Additionally, although the low-sales small farms would not pay the tax until they surpass the $150,000 threshold, they would nevertheless be beneficiaries of the trust.

Second, the revenue would support conservation efforts. It will subsidize conservation programs for working lands. It could also be a resource for nonemergency mitigation efforts and adaptation research. In assessing the changing climate against growing populations, funding for research and development is necessary to keep such populations fed in the decades to come.[156] Research and development into adaptation measures, as well as insurance for climate-related catastrophes and other mitigation efforts, require stability. Rather than relying on Congress to pass a Farm Bill every five years with the hope that funding will expand for conservation efforts, implementing a tax schema on agricultural production will provide some stability for an immutably crucial industry in the face of climate instability.

3. The Peck

The Peck portion of the tax would sweeten the deal even further. It could include deductions earned by consistently incorporating better practices and apply that against income made from farming. These deductions would correspond with existing EQIP and CSP programs. The deductions do not usurp the programs' purposes. EQIP and CSP are cash-in-hand programs to share the expenses of transitioning from one practice to another. The Peck deductions will reduce the income tax liability of the farm.

Fundamentally, the deductions recognize the consequences of incorporating climate-conscious practices and reward farmers year after year for choosing better practices. For efficient collaboration between EQIP and CSP, the deductions will start upon the expiration of the programs' contracts.

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156. *See generally* JAYSON BECKMAN ET AL., U.S. DEP'T AGRIC.: ECON. RSCH. SERV., ERR-333, CLIMATE-INDUCED YIELD CHANGES AND TFP: HOW MUCH R&D IS NECESSARY TO MAINTAIN THE FOOD SUPPLY (2024).

This will function as a second-wave incentive to maintain climate-conscious practices.

An example of a deduction pertinent to nitrogen-based synthetic fertilizers would be one that follows the implementation of the CSP Nutrient Management 590 Standard.[157] This involves creating a plan with the National Resources Conservation Service around the four Rs of nutrient stewardship: right nutrient source, right rate, right time, and right place. It does not require the elimination of synthetic fertilizers, but it provides farmers with assistance in limiting their use, thereby preventing further degradation of the ecological and environmental value of their land. A farmer may choose to incorporate other practices, like cover cropping and reduced tilling—both of which CSP recognizes as well. A farmer may pledge to cease usage of synthetic nitrogen-based fertilizers altogether or become a USDA-certified organic farm. In any case, these deductions can be stacked.

CONCLUSION

American agriculture needs incentives to incorporate climate conscious practices into existing farms and to maintain better practices in the long term. A carbon equivalency tax on agriculture needs to be implemented, but it must have a larger vision than just greenhouse gas emissions. A tax on agriculture, not greenhouse gases specifically, will be more politically viable, environmentally and economically effective, and more equitably distributed. *The Pint for a Bushel and a Peck* taxation schema would create a trust fund for farmers in vulnerable times to come. Given its rate brackets, the Pint will collect from corporate agri-businesses (who benefit vastly from existing supports) and redistribute the Bushel to small and socially disadvantaged farmers (who are systemically underserved by present funds). The Peck's deductions would also provide enduring incentives for farmers to divorce themselves from poor practices—like the overuse of synthetic nitrogen-based fertilizers, which contribute to ecosystem degradation and climate change.

157. U.S. DEP'T AGRIC., CONSERVATION PRACTICE OVERVIEW: NUTRIENT MANAGEMENT (CODE 590) (2019).