

WOOD PELLETS, CARBON CREDITS, AND WHEN ONE PROBLEM SOLVES ANOTHER

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I. INTRODUCTION	86
II. COUNTING THE CARBON COSTS.....	89
<i>A. Increasing Emissions in the Critical Near-Term</i>	90
<i>B. Residues Make Sense in Theory, Fall Short on the Ground</i>	92
<i>C. But What About BECCS?</i>	93
<i>D. Signs of Change in an Updated RED</i>	95
III. THE EFFECT OF EUROPEAN BIOMASS MARKETS ON U.S. FORESTS	96
<i>A. Local Community Impacts</i>	98
<i>B. Regional Deforestation and Biodiversity Loss</i>	100
<i>C. Increased Global GHGs</i>	103
IV. U.S. POLICY OPTIONS	104
<i>A. Increased Incentives for Sustainability Certification</i> ..	105
<i>B. Removal of Woody Biomass Subsidies</i>	106
<i>C. Connecting Landowners to the Carbon Offset Market</i>	107
V. CONCLUSION	112

I. INTRODUCTION

When it comes to renewable energy sources, not much is more time-tested than wood. Considered to be humanity’s first source of energy, wood was replaced during industrialization with fossil fuels in developing nations.¹ Yet over the past decade, woody biomass has regained traction in international energy markets as a source of heat and electricity, notwithstanding ongoing concerns about its green credentials. For nations racing to abandon coal, forest biomass in the form of wood

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¹ P. Sreevani, *Wood as a Renewable Source of Energy and Future Fuel*, 1992 AIP CONF. PROC., Aug. 2018, at 1.

pellets offers a short-term solution, as coal-fired power plants can be converted into wood pellet burning facilities with relative ease.² The first fully converted plants began opening in the mid 2010s,³ and today, roughly half of the European Union's ("EU") renewable energy comes in the form of forest biomass.⁴ With Germany, Denmark, Finland, and the Netherlands all considering new coal-to-woody biomass conversion projects, and Asian markets beginning to come onboard, analysts have consistently projected increasing demand for wood pellet production over the coming decade.⁵ And that was before the Russian invasion of Ukraine destabilized the European oil and gas supply, making alternative energy sources that much more desirable.⁶

But the wood pellet market has impacts far beyond European borders, where demand for woody biomass has long since outstripped supply. Upwards of ten million metric tons of wood pellets are sourced and manufactured in the American Southeast each year,⁷ with 98% of the U.S. pellets destined for the United Kingdom ("UK") and EU states.⁸ As one of the world's largest exporters of wood pellets, the United States should expect increased pressure on southeastern forests to meet growing European demand. And demand may grow even more rapidly in response to an amendment to the EU's Renewable Energy Directive ("RED") proposed in September 2022, which leaves market incentives in place and instead tightens sourcing restrictions, forbidding harvest from certain

² See CHARLES MOORE, PLAYING WITH FIRE: AN ASSESSMENT OF COMPANY PLANS TO BURN BIOMASS IN EU COAL POWER STATIONS 8 (2019), <https://ember-climate.org/app/uploads/2022/02/Ember-Playing-With-Fire-2019.pdf>.

³ *Biomass Takes Big Step Forward with Huge Coal-to-Biomass Conversion*, PROCESS BARRON (Dec. 7, 2016), <https://processbarron.com/biomass-takes-big-step-forward-huge-coal-biomass-conversion/>; *Our History*, DRAX, <https://www.drax.com/us/about-us/our-history/> (last visited Mar. 7, 2023).

⁴ Michael Norton et al., *Serious Mismatches Continue Between Science and Policy in Forest Bioenergy*, 11 GCB BIOENERGY 1256, 1257 (2019).

⁵ See MOORE, *supra* note 2, at 18 (finding that "[p]roposed coal-to-biomass substitutions [in European] power plants could increase biomass consumption by up to 607 petajoules (PJ) [per annum] . . . [A]pproximately 50% of current biomass consumption in all power and heating plants").

⁶ Stanley Reed, *Europe's Race to Secure New Energy Sources Is on a Knife's Edge*, N.Y. TIMES (July 30, 2022), <https://www.nytimes.com/2022/07/30/business/europe-natural-gas.html> ("This move away from Russian natural gas . . . is sending shock waves through factory floors and forcing governments to seek alternative sources of energy.").

⁷ Gabriel Popkin, *There's a Booming Business in America's Forests. Some Aren't Happy About It.*, N.Y. TIMES (Apr. 19, 2021), <https://www.nytimes.com/2021/04/19/climate/wood-pellet-industry-climate.html>.

⁸ Anna S. Duden et al., *Modeling the Impacts of Wood Pellet Demand on Forest Dynamics in Southeastern United States*, 11 BIOFUELS, BIOPRODUCTS & BIOREFINING 1007, 1008 (2017).

types of forest stocks.⁹ Here in the United States, the nature of landownership and timber regulation makes those restrictions difficult if not impossible to enforce.¹⁰ As such, the amendment should warn of an incoming spike in demand as more European forests are protected from harvest. How policymakers in the United States respond to that spike may have broad implications—for local communities, regional forests and ecosystems, and global greenhouse gas emissions (“GHGs”).

This Note begins with Part II exploring the critiques and defenses of swapping woody biomass for coal as a climate change mitigation measure. In particular, Part II details how subsidization and carbon accounting techniques have spurred the rapid growth of the wood pellet industry in Europe, despite constant criticisms from scientific and environmental activist communities. Next, Part III surveys the impacts of this industry on southeastern American forests and communities while exploring the policies currently in place to regulate wood pellet sourcing and manufacturing in the United States. Finally, in light of the likelihood of increased demand for wood pellets from the Southeast—and this demand’s potentially devastating environmental and economic impacts on the region—Part IV weighs mitigative measures that policymakers and conservationists in the United States might take. Options include increased compliance monitoring, removal of current state and federal subsidies, and, most significantly, connecting more southeastern forests to the growing carbon offset market. Ultimately, while modest wood pellet production may incentivize maintenance of forestlands enough to balance its carbon costs, the lack of restraints on the current market—indeed, its very subsidization—should compel U.S. decision makers to pursue more proactive policies to limit global emissions, protect southeastern forests from overharvest, and shelter southeastern communities from the boom and bust of Europe’s highly flammable wood pellet market.

⁹ The EU vote put forward an amendment to remove subsidies for primary wood stock—otherwise known as virgin forests—sourced for wood pellet production. The vote followed years of sustained pressure from forest advocates, as well as increased reporting on the devastating impacts of industrial sourcing in Europe’s own old-growth forests, such as those in Romania. *See, e.g.,* Alice Hancock & Camilla Hodgson, *EU Vote Exposes Tensions over Use of Forests for Fuel*, FIN. TIMES (Sept. 14, 2022), <https://www.ft.com/content/1668fe0d-3a12-44fb-95fd-5542e53d5639>; Sarah Hurtes & Weiyi Cai, *Europe Is Sacrificing Its Ancient Forests for Energy*, N.Y. TIMES (Sept. 7, 2022), <https://www.nytimes.com/interactive/2022/09/07/world/europe/eu-logging-wood-pellets.html>.

¹⁰ See discussion *infra* Part III for a full exploration of these limitations.

II. COUNTING THE CARBON COSTS

“Wood pellets are made by drying, pulverising [sic] and compacting biomass derived from trees.”¹¹ In theory, they can be sourced from residual wood: limbs, leaves, and bark left behind by commercial logging, and byproducts of other wood product manufacturing.¹² Although wood pellets have been used for decades for residential heating,¹³ the vast majority produced today are manufactured for industrial energy plants.¹⁴ For example, Enviva Biomass, the largest company producing and exporting wood pellets for industrial use in the United States, opened its flagship facility in Ahoskie, North Carolina in 2011 and today boasts eight of the twenty-three wood pellet facilities in operation across the Southeast.¹⁵

Expansion of the woody biomass market grew out of agreeably simple logic. Because trees capture carbon through photosynthesis, the carbon released by burning one tree can be recaptured by planting another. Within that closed loop, biomass works like a carbon-neutral source. Thus, ten years ago, the EU defined forest biomass as a carbon-neutral energy source in its RED, which governs eligibility for renewable energy subsidies in member states.¹⁶ As pressure to decarbonize increased, subsidies for woody biomass climbed. In 2019 alone, more than seventeen billion euros went to woody biomass subsidization.¹⁷ Combined with the fact that the Intergovernmental Panel on Climate Change (“IPCC”) guidelines account for woody biomass emissions only at the point of harvest, omitting carbon released in manufacture, transportation, and combustion, a coal-fired plant that converts to

¹¹ MOORE, *supra* note 2, at 10.

¹² See Brian Kittler, Inge Stupak & C. Tattersall Smith, *Assessing the Wood Sourcing Practices of the U.S. Industrial Wood Pellet Industry Supplying European Energy Demand*, 10 ENERGY, SUSTAINABILITY & SOC’Y, May 2020, at 13, <https://doi.org/10.1186/s13705-020-00255-4> (estimating an 80:20 mix).

¹³ WORLD BIOENERGY ASSOCIATION, PELLETS – A FAST GROWING ENERGY CARRIER 1 (2014), <http://www.worldbioenergy.org/uploads/Factsheet%20-%20Pellets.pdf>.

¹⁴ See Duden et al., *supra* note 8; Roger Drouin, *Wood Pellets: Green Energy or New Source of CO₂ Emissions?*, YALE ENV’T 360 (Jan. 22, 2015), https://e360.yale.edu/features/wood_pellets_green_energy_or_new_source_of_co2_emissions.

¹⁵ Drouin, *supra* note 14; BOUNDLESS IMPACT INVESTING, MEASURING THE ENVIRONMENTAL IMPACT OF WOOD PELLET ELECTRICITY: A CASE STUDY OF ENVIVA 6 (2020) [hereinafter BOUNDLESS], <https://www.envivabiomass.com/wp-content/uploads/Enviva-White-Paper-6-19-2020-Short-shareable-version.pdf>; Popkin, *supra* note 7.

¹⁶ See Norton et al., *supra* note 4, at 1258; Timothy D. Searchinger et al., *Fixing a Critical Climate Accounting Error*, 326 SCIENCE 527, 528 (2009).

¹⁷ Laura Bloomer et al., *A Call to Stop Burning Trees in the Name of Climate Mitigation*, 23 VT. J. ENV’T L. 93, 108 (2022).

biomass can achieve dramatic reductions in their recorded carbon dioxide (“CO₂”) emissions, at a highly subsidized price.¹⁸

A. Increasing Emissions in the Critical Near-Term

For as long as the RED’s woody biomass policies have been in place, scientists and environmental groups have objected to the classification of wood as a carbon-neutral alternative to fossil fuels.¹⁹ Because wood is less dense than coal, it takes more wood to generate a single unit of heat,²⁰ and in 2022, pellets cost two-to-three times as much as coal per ton.²¹ This inefficiency not only raises the fiscal cost, but also the immediate carbon cost. Recent studies have shown that CO₂ emissions from combusting woody biomass for heat are 30% higher than those of coal and 2.5 times that of gas.²² For electricity, burning forest biomass releases 1.5 times the emissions of coal and more than triple the emissions of gas per megawatt-hour.²³ As reporting by employees of the Institute for Governance & Sustainable Development explains, “[i]n 2015, the burning of forest biomass emitted 330–380 million metric tons of CO₂, which researchers estimate is around 100 million metric tons more than would have been emitted by the fossil fuels that bioenergy replaced.”²⁴

Theoretically, this increased release should not matter. So the rationale goes, the next tree planted consumes all the extra carbon that the burned

¹⁸ Darío R. Gómez et al., *Stationary Combustion*, in 2006 IPCC GUIDELINES FOR NATIONAL GREENHOUSE GAS INVENTORIES 2.33 (Simon Eggleston et al. eds., 2006) (“In the reporting tables, emissions from combustion of biofuels are reported as information items but not included in the sectoral or national totals to avoid double counting.”). See also Bloomer et al., *supra* note 17, at 96.

¹⁹ See, e.g., Searchinger, *supra* note 16, at 527.

²⁰ Norton et al., *supra* note 4, at 1257.

²¹ The U.S. Energy Information Administration lists the 2021 average annual sale price at mines as \$61.28 per short ton for bituminous coal and as \$107.08 for anthracite coal. *Coal Explained: Coal Prices and Outlook*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/energyexplained/coal/prices-and-outlook.php> (Oct. 27, 2022). Wood pellets, defined as “Densified Biomass,” cost \$208.31 per ton on average domestically and \$244.19 when sold for export in September 2022. *Monthly Densified Biomass Fuel Report*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/biofuels/biomass/> (Jan. 18, 2023). See also Laurent Segalen & Gerard Reid, *Biomass: From Controversy to Solution*, REDEFINING ENERGY, at 19:21 (Sept. 14, 2020), <https://redefining-energy.com>.

²² Craig Hanson & Janet Ranganathan, *Why Burning Trees for Energy Harms the Climate*, WORLD RES. INST. (Dec. 6, 2017) (citing Jérôme Laganière et al., *Range and Uncertainties in Estimating Delays in Greenhouse Gas Mitigation Potential of Forest Bioenergy Sourced from Canadian Forests*, 9 GCB BIOENERGY 358 (2017)), <https://www.wri.org/insights/insider-why-burning-trees-energy-harms-climate>.

²³ *Id.*

²⁴ Bloomer et al., *supra* note 17, at 109.

tree released.²⁵ But even assuming every tree is replanted, this paradigm ignores the time it takes for absorption to occur.²⁶ Studies estimate that even if only residual wood from other logging processes are used,²⁷ it takes decades to centuries for contemporaneous replanting to recover the excess carbon released by woody biomass as compared to the status quo.²⁸ With trees only from cutting out young growth, or “thinning,” one study found that recovery took forty years.²⁹ With harvests from boreal forests, it could take up to 190 years, as older, slow-growing hardwoods extend the reabsorption timeline even further.³⁰ In every circumstance, burning woody biomass creates a time lag during which atmospheric CO₂ levels are elevated not only above the current status quo, but also miles above renewable alternatives like wind and solar.³¹ That time lag frontloads near-term emissions in a way that scientists have found both dangerous in light of climate tipping points, and fundamentally “incompatible with the urgency of reducing emissions to comply with the objectives enshrined in the Paris Agreement.”³²

In addition to ignoring this time lag, current EU and UK policies for counting emissions undercount the total carbon costs of the woody biomass industry. Following IPCC guidance drafted in 2009, European nations count emissions based on combustion, leaving out the carbon costs in diesel and coal for manufacturing wood pellets and shipping them across the Atlantic.³³ Some studies estimate that these post-harvest, pre-combustion emissions may account for as much as 25% of the total emissions associated with wood pellet burning in Europe.³⁴ Because of carbon counting methods, those emissions do not contribute to any country’s total emissions, making the transition to woody biomass appear more carbon reductive than it actually is.

²⁵ See, e.g., *Biogenic Carbon*, U.S. INDUS. PELLETS ASS’N, <https://theusipa.org/biogenic-carbon> (last visited Dec. 29, 2022) (describing this process as a “stark contrast to carbon from fossil fuels, which releases new, additional carbon into the atmosphere that was previously stored underground”).

²⁶ Norton et al., *supra* note 4, at 1259.

²⁷ See discussion *infra* Part III.B for disputes around whether that assumption can be made.

²⁸ Norton et al., *supra* note 4, at 1259.

²⁹ Bloomer et al., *supra* note 17, at 102.

³⁰ Bjart Holtsmark, *Harvesting in Boreal Forests and the Biofuel Carbon Debt*, 112 CLIMATIC CHANGE 415, 425 (2012).

³¹ Timothy D. Searchinger et al., *Europe’s Renewable Energy Directive Poised to Harm Global Forests*, 9 NATURE COMMUN. Sept. 2018, at 2, <https://www.nature.com/articles/s41467-018-06175-4>.

³² Norton et al., *supra* note 4, at 1257.

³³ Gómez et al., *supra* note 18, at 2.33.

³⁴ William H. Schlesinger, *Are Wood Pellets a Green Fuel?*, 359 SCIENCE 1328, 1329 (2018).

B. Residues Make Sense in Theory, Fall Short on the Ground

The wood pellet industry replies to these critiques about the carbon neutrality of wood pellets in two primary ways. First, the industry claims that the conversation about emissions should be restricted to woody residues—the leftovers of logging and wood manufacturing. Jens Wolf, the General Manager at Enviva Biomass, insisted on the podcast *Redefining Energy* in 2020 that “[t]rees are not chopped down for biomass,” but instead that wood pellets are made from the surplus of other wood sourcing practices.³⁵ Not only are those residues already unable to capture and store more carbon, but also their decay is bound to release stored carbon anyway.³⁶ Indeed, according to logging custom, this “waste wood” is often burned to clear lots for replanting.³⁷

Some scholars agree that under this paradigm, the manufacture and combustion of wood pellets may generate a net benefit in terms of carbon emission reductions, particularly during the transition from coal to cleaner energy sources.³⁸ According to modeling, by increasing the value of surplus wood and, therefore, the value of timber harvesting generally, the wood pellet industry makes keeping land in forest more attractive to landowners—so much more attractive that it could reduce the conversion of forested land into non-forest use and even drive pro-forestation over time.³⁹ In other words, by increasing the profitability of cutting down trees, the wood pellet industry simultaneously increases the incentives for landowners to plant more trees on their property.⁴⁰ This trend has historically borne out in the southeastern United States, where when timber prices go up, forest cover increases in kind.⁴¹ And generally, when forest cover increases, so too does carbon storage potential.⁴²

Evidence suggests, however, that limiting the analysis to residues would not reflect industry realities. Studies have repeatedly found that

³⁵ Segalen & Reid, *supra* note 21, at 03:20.

³⁶ *Forest Carbon FAQs*, U.S. DEP’T AGRIC., <https://www.fs.usda.gov/sites/default/files/Forest-Carbon-FAQs.pdf> (last visited Dec. 29, 2022) (“When some or all parts of a tree decompose after death or burn during fire, the carbon is released back to the atmosphere.”).

³⁷ See *Wood Pellets*, NATURALLY:WOOD, <https://www.naturallywood.com/products/wood-pellets/> (last visited Dec. 29, 2022).

³⁸ See generally Weiwei Wang et al., *Carbon Savings with Transatlantic Trade in Pellets: Accounting for Market-Driven Effects*, 10 ENV’T RSCH. LETTERS, Nov. 2015, <https://iopscience.iop.org/article/10.1088/1748-9326/10/11/114019/pdf>.

³⁹ Robert Abt, Christopher Galik & Justin Baker, *When Burning Wood to Generate Energy Makes Climate Sense*, 78 BULL. ATOMIC SCIENTISTS 152, 154 (2022).

⁴⁰ *Id.* at 154–55.

⁴¹ *Id.* at 154.

⁴² Warren Cornwall, *Is Wood a Green Source of Energy? Scientists Are Divided*, SCIENCE (Jan. 5, 2017), <https://www.science.org/content/article/wood-green-source-energy-scientists-are-divided>.

wood pellet manufacturers in the Southeast source whole trees, including hardwoods and yellow pine.⁴³ According to reporting, Enviva's wood pellet mix, for example, is reportedly 66% direct harvest, with only 20% of materials coming from sawmill residues, and 14% from thinning.⁴⁴ Drax, the second largest wood pellet producer in the United States, approximates that 60% of its production comes from whole trees.⁴⁵ The situation is no better in Europe, where investigative reporting uncovered wood pellet manufacturers sourcing from massive clearcuts of old growth forests in northern Romania.⁴⁶ Indeed, according to studies comparing global demand for wood pellets to woody residue supply, there simply is not enough logging bioproduct to match current consumption, much less the predicted increased demand.⁴⁷

As for increasing tree cover as a result of increased profitability, that, too, may work better in theory than in practice. Satellite imagery analysis in North Carolina reveals a net loss in forest cover within the sourcing areas of wood pellet mills.⁴⁸ This finding suggests that what generally holds true in southeastern timber markets may change when highly subsidized woody biomass is added to the mix.

C. But What About BECCS?

Industry representatives also argue for the green credentials of biomass by pointing to the inclusion of bioenergy with carbon capture and storage ("BECCS") in scientific models of emission-reduction pathways.⁴⁹

⁴³ Alex Thomson, *Fears Biomass Green Revolution Could Be Fueling Habitat Loss*, CHANNEL 4 NEWS (July 5, 2021), <https://www.channel4.com/news/fears-biomass-green-revolution-could-be-fuelling-habitat-loss>; SOUTHERN ENVIRONMENTAL LAW CENTER, *SATELLITE IMAGES SHOW LINK BETWEEN WOOD PELLET DEMAND AND INCREASED HARDWOOD FOREST HARVESTING 1, 3* (2022) [hereinafter SELC], <https://www.southernenvironment.org/wp-content/uploads/2022/03/Biomass-White-Page.pdf>.

⁴⁴ Christine Ro, *The Controversy of Wood Pellets as a Green Energy Source*, BBC NEWS (Jan. 11, 2022), <https://www.bbc.com/news/business-59546278>. Other reporting indicates the percentage of whole tree harvests could be closer to 75%. *Track & Trace*, ENVIVA, <https://www.envivabiomass.com/sustainability/responsible-sourcing/track-trace/> (last visited Jan. 1, 2022).

⁴⁵ DRAX, ANNUAL REPORT AND ACCOUNTS 2020, at 54 (2021), https://www.drax.com/wp-content/uploads/2021/03/Drax_AR2020.pdf.

⁴⁶ Hurtes & Cai, *supra* note 9.

⁴⁷ See Drouin, *supra* note 14 (summarizing that Bob Abt, professor of natural resource economics and management at North Carolina State University, explained that there simply is not enough wood waste to feed the demand for wood pellets).

⁴⁸ SELC, *supra* note 43, at 7.

⁴⁹ CHRISTOPHER CONSOLI, *BIOENERGY AND CARBON CAPTURE AND STORAGE 3* (2019), https://www.globalccsinstitute.com/wp-content/uploads/2019/03/BECCS-Perspective_FINAL_18-March.pdf.

Almost every pathway that scientists suggest could limit warming to 1.5°C relies upon deployment of some form of CO₂ removal, which generally includes BECCS—a carbon removal technology for emissions released by converting organic material into energy are captured and stored, generally underground.⁵⁰ Because some BECCS modeling includes forest biomass, advocates argue that wood pellet combustion has a definitive role in future renewable markets. For example, Drax announced its first BECCS pilot project for its North Yorkshire power generator and anticipates that, at full deployment, their technology can capture sixteen million metric tons of negative emissions per year.⁵¹

Critics of woody biomass are not convinced. First, while it is true that BECCS is included in emission-reduction pathways, its inclusion contemplates many non-forest feedstocks as well, such as sugar cane, which has a significantly shorter growth and carbon capture cycles than trees.⁵² More fundamentally, BECCS has been touted primarily as a means for super-charging truly carbon-neutral fuel sources into tools for carbon sequestration, leading to net negative emissions in the process of energy generation. Given the high emissions and lengthy carbon cycle associated with burning woody biomass, BECCS would serve more as an offset for woody biomass in the near term than as a true carbon capture technology.⁵³ And, given the limited scalability of BECCS currently, it seems unlikely to solve the frontloading problem of burning woody biomass in anticipation of recapture later.⁵⁴

Finally, it is worth noting that even if BECCS were to become deployable at scale tomorrow, all estimates indicate that the technology will remain expensive.⁵⁵ Already, conversions of coal facilities to wood fired plants are expensive—for instance, the conversion of just half of Drax’s 4,000-megawatt coal-fired facility to wood-burning cost \$1.1

⁵⁰ Joeri Rogelj et al., *Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development*, in GLOBAL WARMING OF 1.5°C 93, 121 (Valérie Masson-Delmotte et al. eds., 2019); *Fact Sheet: BECCS*, AM. U. SCH. INT’L SERV., <https://www.american.edu/sis/centers/carbon-removal/fact-sheet-bioenergy-with-carbon-capture-and-storage-beccs.cfm> (June 24, 2020).

⁵¹ *Industrial Use of Heating Wood Pellets Reduces Greenhouse Gas Emissions*, CAN. BIOMASS MAG. (July 30, 2020), <https://www.canadianbiomassmagazine.ca/industrial-use-of-heating-wood-pellets-reduces-greenhouse-gas-emissions/>.

⁵² Mary S. Booth, *Not Carbon Neutral: Assessing the Net Emissions Impact of Residues Burned for Bioenergy*, 13 ENV’T RSCH. LETTERS, Feb. 2018, at 3, <https://iopscience.iop.org/article/10.1088/1748-9326/aaac88/pdf>.

⁵³ See Bloomer et al., *supra* note 17, at 96.

⁵⁴ *See id.*

⁵⁵ *See, e.g.*, Albert C. Lin, *Making Net Zero Matter*, 79 WASH. & LEE L. REV. 679, 749–50 (2022) (“Carbon removal techniques that promise greater storage potential [than afforestation and soil management]—BECCS and DACS—are more expensive and less mature, featuring in a small handful of demonstration projects. BECCS has yet to achieve commercial viability . . .”).

billion to complete,⁵⁶ and the costs of sourcing wood remain high.⁵⁷ Unlike wind and solar, which have become less expensive in recent years, the wood pellet industry has struggled to increase its cost competitiveness over time.⁵⁸ Adding a high-cost carbon capture system to a high-cost converted facility, designed to burn an expensive, inefficient fuel source,⁵⁹ seems destined to make an industry already dependent on subsidies even more reliant.

D. Signs of Change in an Updated RED

Controversy around the climate costs of woody biomass have not gone unnoticed by EU policymakers. Recently, pressure has increased on the UK and EU member states to change how they classify woody biomass and count its emissions. In 2019, the European Academies' Science Advisory Council ("EASAC") published a report criticizing the EU's woody biomass policies as inconsistent with scientific findings that the "lower energy density of biomass and supply-chain emissions were increasing atmospheric CO₂ and thus accelerating the pace of global warming."⁶⁰ In 2021, 500 scientists signed a letter imploring the EU to stop subsidizing wood pellets as a renewable energy source due to its potential to "increase warming for decades to centuries."⁶¹

Responding to pressure from scientists and environmental NGOs, the European Commission's 2022 RED amendment proposals made two shifts. First, the Commission ended subsidies for woody biomass plants producing only electricity beginning in 2027.⁶² However, because the provision excludes heat, critics of woody biomass contend that the amendment will have little effect on demand.⁶³ More significantly, the

⁵⁶ Katherine Tweed, *Cleaner than Coal? Wood Power Makes a Comeback*, SCI. AM. (Oct. 10, 2013), <https://www.scientificamerican.com/article/wood-power-makes-comeback/>.

⁵⁷ MOORE, *supra* note 2, at 10.

⁵⁸ *Id.* at 1, 4.

⁵⁹ Norton et al., *supra* note 4, at 1257 (finding that "replacing coal by biomass for electricity generation is likely to initially increase emissions of CO₂ per kWh of electricity as a result of the lower energy density of wood, emissions along the supply chain, and/or less efficient conversion of combustion heat to electricity").

⁶⁰ EUROPEAN ACADEMIES' SCIENCE ADVISORY COUNCIL, FOREST BIOENERGY, CARBON CAPTURE AND STORAGE, AND CARBON DIOXIDE REMOVAL: AN UPDATE 1 (2019), https://easac.eu/fileadmin/PDF_s/reports_statements/Negative_Carbon/EASAC_Commentary_Forest_Bioenergy_Feb_2019_FINAL.pdf.

⁶¹ Peter Raven, *Letter Regarding Use of Forests for Bioenergy*, WOODWELL CLIMATE RSCH. CTR. (Feb. 11, 2021), <https://www.woodwellclimate.org/letter-regarding-use-of-forests-for-bioenergy/>.

⁶² Takanobu Aikawa, *European Parliament Adopted REDIII*, RENEWABLE ENERGY INST. (Oct. 7, 2022), <https://www.renewable-ei.org/en/activities/column/REupdate/20221007.php>.

⁶³ Bloomer et al., *supra* note 17, at 110.

amendment curtails the subsidization of “primary woody biomass” for wood pellet manufacture.⁶⁴ “Primary woody biomass” includes “roundwood felled or otherwise harvested and removed”—essentially, whole-trees.⁶⁵ However, the amendment makes an exception for trees in fire-prone areas, forests affected by natural disaster, pest- or disease-damaged forests, and trees removed for road-safety purposes.⁶⁶ Thus, while the new directive, if adopted, will eliminate some subsidies to primary sourced trees, critics complain it will “leave a hell of a lot of woody biomass that can still be subsidised [sic]”⁶⁷

The parliamentary committee maintained the controversial fuel source’s “renewable” label,⁶⁸ which wood pellet giants like Enviva celebrated along with the amendment’s limited scope.⁶⁹ Enviva released a statement praising the Council and EU Commission’s “steadfast support” for woody biomass and expressed optimism that any changes going forward will be in the industry’s favor.⁷⁰

The final version of the RED update, “RED III”, will likely be released in 2023 following final negotiations between the EU Parliament, the Council of the EU, and EU Commission.⁷¹ In the meantime, policymakers in the United States might rightly wonder about how the still-subsidized industry’s growth has, is, and soon will impact its southeastern forests, which supply 27% of the woody biomass necessary to meet European pellet demand.⁷²

III. THE EFFECT OF EUROPEAN BIOMASS MARKETS ON U.S. FORESTS

Policymakers in the United States have yet to embrace wood pellets as a green energy source the way that European lawmakers have, but they have not rejected it, either. The U.S. Environmental Protection Agency

⁶⁴ Aikawa, *supra* note 62.

⁶⁵ *Id.*

⁶⁶ *Id.*

⁶⁷ See Hancock & Hodgson, *supra* note 9 (quoting Mary Booth).

⁶⁸ Jennifer Rankin, *EU Limits Subsidies for Burning Trees Under Renewable Energy Directive*, GUARDIAN (Sept. 14, 2022), <https://www.theguardian.com/environment/2022/sep/14/eu-limits-subsidies-for-burning-trees-under-renewable-energy-directive>.

⁶⁹ Justin Catanoso, *EU Votes to Keep Woody Biomass as Renewable Energy, Ignores Climate Risk*, MONGABAY (Sept. 16, 2022), <https://news.mongabay.com/2022/09/eu-votes-to-keep-woody-biomass-as-renewable-energy-ignores-climate-risk/>.

⁷⁰ *European Parliament Continues to Recognize Primary Woody Biomass as a Renewable Source*, ENVIVA BIOMASS (Sept. 14, 2022), <https://www.envivabiomass.com/european-parliament-continues-to-recognize-primary-woody-biomass-as-a-renewable-energy-source/>.

⁷¹ *Id.*

⁷² See Kittler, Stupak & Smith, *supra* note 12, at 1–2.

has not declared biomass zero-carbon in promulgated regulations.⁷³ Congress included language identifying forest biomass as “carbon neutral” in multiple budget riders in the late 2010s;⁷⁴ however, its most recent budget rider concerning woody biomass indicated a slightly altered position.⁷⁵ Instead of directing agencies to develop policies reflective of woody biomass’s “carbon neutrality,” Congress directed agencies to develop policies that “reflect [the carbon benefits from] forest bioenergy and recognize biomass as a renewable energy source.”⁷⁶ This modest shift could indicate responsiveness to concerns about the carbon cost of *forest* biomass, in particular, as it follows a decade of rising criticism from environmental groups against woody biomass. The United States has also not endorsed the conversion of coal-fired plants to wood pellet burning facilities as an emissions reduction measure—at least, not yet.⁷⁷

But the industry receives subsidization in different ways. The federal government awards grants to wood pellet manufacturers under the same “Wood Innovation” program designed to subsidize other sustainability initiatives, like affordable housing complexes built from sustainable mass timber, fuel reduction schemes, and forest resiliency plans.⁷⁸ And Congress recently allocated additional funding to wood pellet sourcing and manufacturing.⁷⁹ At the state level, wood pellet facilities may receive rural economic development grants. For example, in 2014, Enviva’s Sampson County pellet production facility received \$566,925 from the

⁷³ Under the Trump Administration, the EPA released a draft ruling that would have found woody biomass to be a carbon-neutral fuel source, but that rule was revoked by the Biden Administration two days after taking office and has not been renewed, despite some worries from environmentalists. Stephen Lee, *Scientists Fear Trump Wood-Burn Stance to Stay Under Regan EPA*, BL (Apr. 12, 2021), <https://news.bloomberglaw.com/environment-and-energy/scientists-fear-trump-wood-burn-stance-to-stay-under-regan-epa>.

⁷⁴ Bloomer et al., *supra* note 17, at 112.

⁷⁵ Marc Heller, ‘Carbon Neutral’ Scores Another Victory in Omnibus, E&E NEWS (Dec. 22, 2022), <https://www.eenews.net/articles/carbon-neutral-scores-another-victory-in-omnibus/>.

⁷⁶ *Id.*

⁷⁷ Lee, *supra* note 73 (explaining how federal agency head Michael Regan and other U.S. policymakers have avoided a full-throated rejection of the possibility of increasing the currently small (2.3%) market share of wood pellets within the energy sector of the United States).

⁷⁸ 2021 Wood Innovations Grant Recipients, U.S. FOREST SERV., <https://www.fs.usda.gov/science-technology/energy-forest-products/wood-innovation-grants> (last visited Jan. 23, 2023).

⁷⁹ The 2021 Infrastructure Investment and Jobs Act included \$400 million for facilities using byproducts of ecosystem restoration, which could include wood pellet facilities. Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, § 40804(b)(3), (d)(3), 135 Stat. 1105, 1106, 1108 (2021) (codified at 16 U.S.C. § 6592a(b)(3), (d)(3)).

state of North Carolina through a Community Development Block Grant.⁸⁰

Meanwhile, the impact of wood pellet sourcing and manufacturing practices on southeastern forests has given rise to concerns, particularly over impacts on local populations, regional forests, and global emissions.

A. Local Community Impacts

The local footprint of a wood pellet manufacturing plant can include air, water, and noise pollution. Researchers at the Rachel Carson Council summarize the impact on surrounding communities as threefold: (1) the loss of tree cover within a seventy-mile sourcing radius of mills “lead[s] to lower air . . . quality and increased risk of flooding”; (2) the release of particulate matter and other pollutants during manufacturing lowers air quality; and (3) the industry’s emissions exacerbate climate change, the effects of which will be keenly felt by local communities who are statistically likely to be majority low income and minority.⁸¹ Because wood pellet facilities are disproportionately located in these environmental justice communities, many have pointed to wood pellet manufacturing as the latest in a long history of environmental injustices suffered by historically marginalized people in the United States.⁸²

Wood pellet manufacturers have experienced difficulty complying with the Clean Air Act (“CAA”), the U.S. federal regulatory regime for protecting air quality that operates through state-issued emission permits. A 2017 report from the Environmental Integrity Project decried a pattern of nonconformance with CAA requirements among twenty-one wood pellet manufacturing plants studied.⁸³ In some instances, plants were categorized as minor pollutant sources, then given authorization to pollute beyond the minor pollution source limits, allowing plants like Enviva’s Northampton facility to emit at major source levels without facing requirements to upgrade emission control technologies.⁸⁴ Other

⁸⁰ *N.C. Rural Infrastructure Authority Approves Sixth Round of Grants*, N.C. DEP’T COM. (Oct. 23, 2014) [hereinafter *N.C. Rural*], <https://www.commerce.nc.gov/news/press-releases/nc-rural-infrastructure-authority-approves-sixth-round-grants>.

⁸¹ See ALEXANDRA WISNER ET AL., *Executive Summary*, in CLEAR CUT: WOOD PELLET PRODUCTION, THE DESTRUCTION OF FORESTS, AND THE CASE FOR ENVIRONMENTAL JUSTICE (2020), <https://www.sec.gov/rules/petitions/2019/ptn4-741-exb.pdf>.

⁸² See generally Stefan Koester & Sam Davis, *Siting of Wood Pellet Production Facilities in Environmental Justice Communities in the Southeastern United States*, 11 ENV’T JUST. 64 (2018).

⁸³ PATRICK ANDERSON & KERI POWELL, *DIRTY DECEPTION: HOW THE WOOD BIOMASS INDUSTRY SKIRTS THE CLEAN AIR ACT 1* (2018), <https://environmentalintegrity.org/wp-content/uploads/2017/02/Biomass-Report.pdf>.

⁸⁴ See WISNER ET AL., *supra* note 81, at 18.

plants categorized as major sources—like Enviva’s Sampson mill—are in nonattainment.⁸⁵ Recently, Active Energy Group, an international biomass producer, abandoned plans for a wood pellet facility after North Carolina state authorities found that the company altered its emissions estimates to feign compliance with its permit.⁸⁶ The same plant faced a suit from the Winyah Rivers Alliance, a regional conservation non-profit,⁸⁷ alleging unpermitted discharges of wastewater under the Clean Water Act (“CWA”) into the Lumber River.⁸⁸

The wood pellet industry contends that the environmental impact of these violations is outweighed by manufacturing’s general compliance with environmental regulations and requirements.⁸⁹ The industry also argues that the increase in local manufacturing jobs makes the wood pellet industry a boon rather than a burden for historically marginalized communities.⁹⁰ According to the U.S. Industrial Pellet Association, the forest biomass industry provides more than five thousand jobs across the Southeast, where it claims the industry has invested more than \$2 billion in the past decade.⁹¹

Reporting from impacted communities indicates a mix in opinions, with some locals welcoming the arrival of industry and others ruing the noise and air pollution.⁹² However, even with some support among locals, concerns remain about the outsized influence of biomass companies on historically disempowered, low-income communities, where manufacturing plants represent a large portion of local tax

⁸⁵ See ANDERSON & POWELL, *supra* note 83, at 8.

⁸⁶ Lisa Sorg, *Active Energy Selling Lumberton Wood Pellet Site*, PULSE (Mar. 22, 2022), <https://pulse.ncpolicywatch.org/2022/03/31/active-energy-selling-lumberton-wood-pellet-site/#sthash.p5D5ui0s.PPgrSajz.dpbs>.

⁸⁷ *Mission Statement*, WINYAH RIVERS ALL., <https://winyahrivers.org/winyah-rivers-alliance/> (last visited Dec. 29, 2022).

⁸⁸ Kristen Johnson, *Environmental Groups Sue Active Energy for Dumping Toxins into the Lumber River*, FAYETTEVILLE OBSERVER (Mar. 14, 2021), <https://www.fayobserver.com/story/news/2021/03/14/lumberton-nc-active-energy-sued-selc-violations-clean-water-act-toxins-lumber-river/4645181001/>.

⁸⁹ See, e.g., Yana Kravtsova, *Environmental Stewardship at Enviva*, ENVIVA (July 22, 2019), <https://www.envivabiomass.com/environmental-stewardship-at-enviva/>.

⁹⁰ Robert Johansson, *Study Finds Increasing Wood Pellet Demand Boosts Forest Growth, Reduces Greenhouse Gas Emissions, Creates Jobs*, U.S. DEP’T AGRIC. (Feb. 21, 2017), <https://www.usda.gov/media/blog/2015/06/08/study-finds-increasing-wood-pellet-demand-boosts-forest-growth-reduces>.

⁹¹ *Response to CNN’s Biomass Reporting*, U.S. INDUS. PELLETS ASS’N (July 9, 2021) [hereinafter USIPA], <https://theusipa.org/releases-%26-statements#bdaa242f-4f62-4dfa-b1e9-bbe8fb97ecc0>.

⁹² See, e.g., Tested Podcast, *The Past, Present, and Future of Wood Pellets in NC*, WUNC 91.5, at 4:50 (Dec. 13, 2021), <https://www.wunc.org/podcast/tested-podcast/2021-12-13/the-past-present-and-future-of-wood-pellets-in-nc>.

revenue.⁹³ That revenue's relationship to local budgets has the potential to give industry a stronger voice in local permitting decisions than the residents who bear the brunt of a new facility's impact. Indeed, top pellet producers in the U.S. have faced allegations of repeatedly violating public comment requirements under the CAA, which are designed to give local populations a voice in their pollution exposure.⁹⁴

B. Regional Deforestation and Biodiversity Loss

Along with local community impact concerns, several studies indicate that sourcing practices for wood pellets lead to regional loss of forest cover and biodiversity. In an analysis released in 2022, researchers from Clark University studied aerial footage and industry-reported harvest numbers from the primary Enviva wood supply region, which spans the central and eastern Carolinas as well as southeastern Virginia.⁹⁵ They found that despite industry claims to the contrary, “the rate of forest clearing increased markedly after the initiation of pellet mill operations at Northampton, Southampton, and Ahoskie.”⁹⁶ Southern Environmental Law Center (“SELC”) which sponsored the study, points to similar investigations conducted over the previous decade indicating “destructive sourcing practices,” such as the use of whole trees taken from ecologically valuable and biodiverse forests—including hardwood and wetland forests—which host a wide variety of at-risk species in addition to providing ecological benefits to their surrounding areas.⁹⁷ Some scientists contend that even the removal of strictly surplus wood would have detrimental impacts on the biodiversity of soil and ecosystems as compared to leaving the refuse to naturally biodegrade.⁹⁸

The pellet industry flatly contradicts⁹⁹ the allegations of SELC,¹⁰⁰ the Rachel Carson Council,¹⁰¹ and other critics of the wood pellet industry's

⁹³ See *id.* at 6:40, when Ray Jordan, the Assistant Director of Economic Development for Sampson County, North Carolina, described Enviva warmly as the third largest taxpayer in the county.

⁹⁴ See, e.g., ANDERSON & POWELL, *supra* note 83, at 3, 12–13, 25.

⁹⁵ CHRISTOPHER A. WILLIAMS, FOREST CLEARING RATES IN SOURCING REGION FOR ENVIVA PELLET MILLS IN VIRGINIA AND NORTH CAROLINA 2, 4 fig.1 (2022), <https://southernenvironment.sharefile.com/share/view/s322e5dc731984235ab391a16115a7d21>.

⁹⁶ *Id.* at 10. See also *id.* at 25 (“By 2013 to 2015, the 3-mill region saw deciduous forest clearing increase by 1.34 times over that in 2009 to 2012, and by 2016 to 2018 it increased to 1.51 times.”).

⁹⁷ SELC, *supra* note 43, at 3.

⁹⁸ Bloomer et al., *supra* note 17, at 105–06 (noting that “[m]any of the most threatened species depend on resources such as dead wood that are scarce in managed forests”).

⁹⁹ USIPA, *supra* note 91.

¹⁰⁰ SELC, *supra* note 43, at 3.

¹⁰¹ WISNER ET AL., *supra* note 81, at 12.

sourcing practices; further, determining the scope of the sourcing problem is complicated by the nature of landownership in the Southeast, which makes it difficult to trace each tree harvested back to its roots. In the Eastern United States, 81% of timberland is owned by private individuals and non-timber corporations.¹⁰² Across the Southeast, this number is closer to 86%.¹⁰³ Evaluating industry sourcing is further complicated by the fact that forestry management of private land is governed at the state level—if governed at all—creating a patchwork of practices and regimes that yields very little data.¹⁰⁴ Many state programs which require source reporting for timber harvesting include reporting exceptions for sourcing from logging surplus, making manufacturers’ claims even harder to independently verify.¹⁰⁵

In the absence of sustainability regulation, several voluntary programs have evolved to certify the sustainability of wood sourcing practices. Landowners may enroll in federal certification programs, which offer a tax incentive for conforming to established baseline practices for harvesting timber sustainably: for example, the Sustainable Forest Initiative (“SFI”), Forest Stewardship Council (“FSC”), and Programme for the Endorsement of Forest Certification (“PEFC”).¹⁰⁶ Pellet production companies developed their own certificate system for sustainable sourcing for woody biomass in 2013, the Sustainable Biomass Partnership (“SBP”), which applies to suppliers around the world.¹⁰⁷ But SBP certification relies on self-reporting, with no requirements for on-

¹⁰² U.S. FOREST SERVICE, U.S. FOREST RESOURCE FACTS AND HISTORICAL TRENDS 15 (2014) [hereinafter U.S. FOREST RESOURCE FACTS], <https://www.srs.fs.usda.gov/products/marketing/cards/fs-1035.pdf>.

¹⁰³ Brett J. Butler & David N. Wear, *Forest Ownership Dynamics of Southern Forests*, in THE SOUTHERN FOREST FUTURES PROJECT: TECHNICAL REPORT 103, 103 (2013), https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs178/gtr_srs178_103.pdf.

¹⁰⁴ Jody M. Endres, *Barking Up the Wrong Tree? Forest Sustainability in the Wake of Emerging Bioenergy Policies*, 37 VT. L. REV. 763, 786 (2013).

¹⁰⁵ See *id.* at 800.

¹⁰⁶ This Note omits a thorough differentiation between these certification programs as none are currently prevalent in southeastern forests where sourcing for the woody biomass market takes place. See Kittler, Stupak & Smith, *supra* note 12, at 5.

¹⁰⁷ *About Sustainable Biomass Program*, PREFERRED BY NATURE, <https://preferredbynature.org/certification/sbp/about-sustainable-biomass-program> (last visited Dec. 29, 2022). See also *About, SUSTAINABLE BIOMASS PROGRAM*, <https://sbp-cert.org/about-us/> (last visited Dec. 29, 2022).

the-ground audits.¹⁰⁸ And, like its American counterparts, the SBP operates solely as an evaluative tool, not a mechanism of enforcement.¹⁰⁹

EU legislation on woody biomass presumes a level of sustainable forest management—a level which some studies have found is only consistently applied under the most rigorous FSC and PERF certification programs.¹¹⁰ However, studies have found that only a slim minority of wood stocks sourced for use in the pellet sector come from forests covered by any certification standard.¹¹¹ Even when biomass companies are certified under SBP, studies show that the majority of their wood may still come from forests uncertified by any rigorous forest management program.¹¹²

This absence of any pre-existing enforcement apparatus in the U.S. combined with tracing difficulties makes the EU's proposed amendment to RED all the more concerning for southeastern forests. By relying on sourcing restrictions through its "primary forest stock" designation, the RED amendment relies on enforcement and assurance from forest to furnace. But given the long and winding road traveled by U.S.-sourced pellets, such restrictions on sourcing raise serious enforcement challenges in the United States, if for no more nefarious reason than that it is just plain hard.

Wood pellet advocates argue that, despite the limited sourcing from sustainability-certified forests, data indicates that current forestry practices are working in the Southeast. Forested areas in the United States have remained relatively stable since 1910, despite pressures toward industrialization and near tripling of the population.¹¹³ And although the United States exports upwards of ten million metric tons of wood pellets

¹⁰⁸ SUSTAINABLE BIOMASS PARTNERSHIP, SBP FRAMEWORK STANDARD 4: CHAIN OF CUSTODY 2–3 (2015), <https://sbp-cert.org/wp-content/uploads/2018/09/sbp-standard-4-chain-of-custody-v1-0.pdf>. See also *The Sustainable Biomass Program*, DRAX (Mar. 21, 2018), <https://www.drax.com/sustainable-bioenergy/sustainable-biomass-program/>. For a closer look at the SBP and its potential for greenwashing, see, e.g., NATURAL RESOURCE DEFENSE COUNCIL & DOGWOOD ALLIANCE, THE SUSTAINABLE BIOMASS PROGRAM: SMOKESCREEN FOR FOREST DESTRUCTION AND CORPORATE NON-ACCOUNTABILITY (June 2017), <https://www.nrdc.org/sites/default/files/sustainable-biomass-program-partnership-project-ip.pdf>.

¹⁰⁹ See *Frequently Asked Questions: Compliance and Oversight*, SUSTAINABLE BIOMASS PROGRAM, <https://sbp-cert.org/about-us/faqs/> (last visited Dec. 29, 2022).

¹¹⁰ Richard Sikkema et al., *Legal Harvesting, Sustainable Sourcing and Cascaded Use of Wood for Bioenergy: Their Coverage Through Existing Certification Frameworks for Sustainable Forest Management*, 5 FORESTS 2163, 2178 (2014).

¹¹¹ Kittler, Stupak & Smith, *supra* note 12, at 5 (noting the rare exception when vertically integrated companies use sawmill residues sourced from mill-owned forests which have been certified to SFI standards).

¹¹² BOUNDLESS, *supra* note 15, at 4.

¹¹³ See U.S. FOREST RESOURCE FACTS, *supra* note 102, at 7.

per year,¹¹⁴ industry claims that wood pellets make up just 3% of the nation's wood product total, limiting their potential to cause region-wide disruptions to land use.¹¹⁵ So far as they do affect land use, the industry argues the effect is positive. By making forest management more profitable, wood pellets empower landowners to keep their land in forest use.¹¹⁶

This defense may focus too much on the forest and not enough on the trees. First, as noted earlier, research from SELC indicates that what has held true for forest cover region-wide does not hold true in the areas surrounding pellet mills—a serious problem if the industry continues to grow.¹¹⁷ Furthermore, research from the Cary Institute of Ecosystem Studies highlights the ways that conversion of natural forests to managed timber forests or plantations significantly degrades the biodiversity of local landscapes.¹¹⁸ Rather than incentivizing the protection of forests, scholars argue that rising demand for wood pellets drives up the price of wood, incentivizing more harvesting of biologically diverse, old-growth forests.¹¹⁹

Finally, while immediate returns on harvest may go up due to demand for wood pellets, cleared land is generally more vulnerable to non-forest development than forested land.¹²⁰ Overall, given the voluntary nature of forest sustainability programs, nothing prevents landowners from reaping the benefits of harvest and conversion to non-forest use simultaneously. Thus, while market influences and voluntary certificate programs may have been enough to avoid overharvest in the past, evidence suggests they may be insufficient to safeguard forest survival and health in the face of increasing wood pellet demand.

C. Increased Global GHGs

While local and regional concerns abound, a deep concern about what happens after the wood pellets ship underlies even the most highly localized arguments against woody biomass.¹²¹ The carbon debt incurred

¹¹⁴ Popkin, *supra* note 7.

¹¹⁵ USIPA, *supra* note 91.

¹¹⁶ *Id.*

¹¹⁷ See SELC, *supra* note 43, at 5.

¹¹⁸ Schlesinger, *supra* note 34.

¹¹⁹ *Id.*

¹²⁰ See, e.g., *Does Clearing Land Increase Property Value?*, RED DOOR FUNDING (Sept. 15, 2020), <https://www.reddoorfunding.com/does-clearing-land-increase-property-value/>.

¹²¹ See SELC, *supra* note 43, at 9 (closing a report on negative local effects of clearcutting for biomass with a call to end subsidies in Europe in the name of “urgent climate action” to reduce emissions and fortify carbon sinks).

by substituting woody biomass for coal in Europe will have the same effect on global climate change regardless of where the combustion takes place or where the emissions are counted, if they are counted at all. Environmental groups are particularly worried about the “one-two punch” of burning woody biomass for fuel: first, the increase in near-term emissions, and second, the loss of carbon sinks in the form of hardwoods, wetland forests, and other biodiverse ecosystems harvested in the American Southeast.¹²²

Because the European market depends on subsidization,¹²³ many scientists and American conservation groups are continuing to call on the EU to reclassify woody biomass, end its eligibility for zero-carbon funding, and begin counting wood pellet emissions at the point of combustion instead of only at the source.¹²⁴ While regional gas and oil uncertainty may make such a hard turn unlikely in Europe, U.S. policymakers at the state and federal level have options for curbing the negative effects of European industry demand on U.S. markets and, potentially, GHGs if they so choose.

IV. U.S. POLICY OPTIONS

Policymakers and activists in the United States might take several steps to alleviate some of the concerns raised by critics of the woody biomass market. Because southeastern forests supply only a portion of the total wood burned for energy in Europe, such measures would inevitably fall short of the industry-curbing effect of removing subsidies under the RED. But shifts in policy may nonetheless be justified, both to protect standing forests in the vicinity of mills from overharvest and biodiversity loss, and to make the carbon-intensive practice of burning wood for fuel a little less appealing at a moment when Europe is weighing alternative energy sources.¹²⁵

First, by strengthening enforcement of sustainability measures for those forests certified under voluntary U.S. programs, policymakers could at least gather data on the sustainability of wood pellet sourcing in the Southeast. Such data would be helpful in estimating the extent to

¹²² Bloomer et al., *supra* note 17, at 94.

¹²³ This dependence is so great that the U.S. Forest Service describes the wood pellet sector as “entirely policy driven, primarily through the European Union (EU) Renewable Energy Directive.” CONSUELO BRANDEIS ET AL., STATUS AND TRENDS FOR THE U.S. FOREST PRODUCTS SECTOR 3 (2020), https://www.srs.fs.usda.gov/pubs/gtr/gtr_srs258.pdf.

¹²⁴ See, e.g., Raven, *supra* note 61.

¹²⁵ See discussion *supra* Part I.

which European marketeers can, or cannot, appropriately dub U.S. forests as sustainably harvested, non-primary sources under the revised RED.

Next, U.S. policymakers could remove subsidies currently aiding the wood pellet industry. This would free up funds for more credibly renewable energy development as well as send market signals about the limits on woody biomass growth within the U.S. energy landscape.

Finally, and most crucially for near-term forest preservation, forest advocates and policymakers might seek to solve one market problem with another by connecting more southern landowners to the growing carbon offset market. Forest carbon offsets generate nearly as much controversy as wood pellets in environmental circles.¹²⁶ However, given the heightened harvest vulnerability of trees within the seventy-five-mile sourcing radius of U.S. pellet mills, the limited threat of fires in southeastern climates, and historic trends in land use relative to timber prices, many of critics' strongest reservations about forest offsets may be neatly resolved within the wood pellet context.

A. Increased Incentives for Sustainability Certification

In addition to enforcing the requirements of the CAA and CWA, state and federal governments could strengthen incentives for enrolling in voluntary sustainability certificate programs with strong on-the-ground auditing standards. On-the-ground audits are expensive and time intensive, but by relying on independently run forest management programs to inspect and confirm compliance with sustainability requirements, states could promote best practices sourcing and while compiling data on the kinds of wood heading to pellet mills across the country.¹²⁷ Doing so would raise the bar for private forest management generally by increasing transparency and incentivizing sustainable management.

Such an incentive would be consistent with the Biden Administration's policy toward forest management generally. In Executive Order 14072, President Biden announced goals for "Strengthening the Nation's

¹²⁶ See, e.g., Grayson Badgley et al., *Systematic Over-Crediting in California's Forest Carbon Offsets Program*, 28 GLOB. CHANGE BIOLOGY 1433 (2021); Alia Al Ghussain, *The Biggest Problem with Carbon Offsetting Is that it Doesn't Really Work*, GREENPEACE (May 26, 2020), <https://www.greenpeace.org.uk/news/the-biggest-problem-with-carbon-offsetting-is-that-it-doesnt-really-work/>; Lisa Song, *An Even More Inconvenient Truth: Why Carbon Credits for Forest Preservation May Be Worse than Nothing*, PROPUBLICA (May 22, 2019), <https://features.propublica.org/brazil-carbon-offsets/inconvenient-truth-carbon-credits-dont-work-deforestation-redd-acre-cambodia/>.

¹²⁷ For further discussion of why this data is currently lacking, see *infra* Part III.B.

Forests, Communities, and Local Economies,” including by “develop[ing] . . . recommendations for community-led local and regional economic development opportunities to create and sustain jobs in the sustainable forest product sector . . . while supporting healthy, sustainably managed forests in timber communities.”¹²⁸ One of those recommendations might be increasing enrollment in voluntary forest management programs through increased state or federal incentivization geared toward property owners, timber and pellet companies, or both.

However, the current state of participation in such programs suggest that a significant uptick in tax or other incentives would be necessary to overcome the strength of market demand, limiting the potential of such incentives to cause a rapid shift in wood pellet supply.¹²⁹

B. Removal of Woody Biomass Subsidies

Alternatively, U.S. policymakers could reduce supply-side market distortion by eliminating current subsidies for wood pellet manufacturing. At the federal level, this reduction could mean restricting the award of “Wood Innovation” grants to wood pellet manufacturers.¹³⁰ This restricting in turn could send a signal that in the move to a greener national economy, wood pellets should not be expected to play a dominant role. At the same time, it would free up funding for more investment in forest resiliency and sustainable building design, both of which are also covered by the grants.¹³¹

At the state level, eliminating subsidies might involve excluding wood pellet facilities from rural economic development awards, particularly given that some of the same facilities to receive grants have been found in nonattainment under the CAA.¹³² Excluding wood pellet facilities from state subsidy programs could redound to the benefit of other green initiatives at the state and local level, including research and development into shorter life cycle biomass sources.¹³³ Moreover, by eliminating or

¹²⁸ Exec. Order No. 14072, 87 Fed. Reg. 24851. 24852–53 (Apr. 27, 2022).

¹²⁹ See discussion *infra* Part III.B.

¹³⁰ See 2021 Wood Innovations Grant Recipients, *supra* note 78.

¹³¹ See *id.*

¹³² As noted, the Enviva Sampson County pellet production facility, which received \$566,925 from the state of North Carolina through a Community Development Block Grant, *N.C. Rural*, *supra* note 80, was later to be found polluting beyond its permit limits under the CAA. See ANDERSON & POWELL, *supra* note 83, at 8.

¹³³ These might include switchgrass, hemp, and other fast-maturing biofuel sources that require minimal land and water to grow. See, e.g., Brian Barth, *The Next Generation of Biofuels Could Come from These Five Crops*, SMITHSONIAN MAG. (Oct. 3, 2017),

strictly curtailing the subsidization of wood pellet sourcing and manufacture, states could send a market signal to dampen the expectations of loggers and forest landowners within their state.

These subsidies are comparatively small in the context of more than a billion dollars in government funds funneled annually into the wood pellet industry in Europe.¹³⁴ Thus, while symbolically significant, their elimination would therefore be unlikely to materially change the environment for wood pellet manufacturing in the near term.

C. Connecting Landowners to the Carbon Offset Market

Finally, states, local resource managers, and activists should consider the benefits of connecting owners of forested land with a different market that makes trees profitable: the carbon offset market.¹³⁵

The wood pellet and carbon offset markets are doppelgangers in curious ways. Both are touted as tools of emission reduction, and in the abstract, this is true. In the ideal wood pellet scenario, leftover woody stems and branches from a recently harvested tree stand are burned for fuel, their emissions captured by BECCS. The landscape, which would have been converted into a shopping mall, instead is reseeded with more carbon-capturing trees.

In the perfect carbon offset forest, spinning chainsaws whining toward a timber harvest are suddenly stilled when a government or company offers to pay the landowner to preserve the forest instead, forever or for a term of years.¹³⁶ All of the carbon that the forest goes on to sequester then counts toward the carbon savings of the company, buying that company time to catch their production processes up to their ambitious decarbonization goals.¹³⁷ In that sense, carbon offsets allow companies to begin reducing their carbon footprint before they have the technological

<https://www.smithsonianmag.com/innovation/next-generation-biofuels-could-come-from-these-five-crops-180965099/>.

¹³⁴ Elizabeth Ouzts, *With Looming Loss of European Subsidy, Wood Pellet Industry Faces Turning Point*, ENERGY NEWS NETWORK (Oct. 29, 2019), <https://energynews.us/2019/10/29/with-looming-loss-of-european-subsidy-wood-pellet-industry-faces-turning-point/>.

¹³⁵ See, e.g., The Journal, *The Growing Market of Not Cutting Down Trees*, WALL ST. J. PODCASTS (Aug. 23, 2021), <https://www.wsj.com/podcasts/the-journal/the-growing-market-of-not-cutting-down-trees/5e0b4e3d-f26e-42cf-94e8-acaab805a65a> (noting market expansion over last decade).

¹³⁶ The Natural Capital Exchange has started working with smaller landowners in the South to establish one-year leases, while satellite imagery is reducing the upfront costs of establishing an offset. See *The Data-Driven Forest Carbon Exchange*, NAT. CAP. EXCH., <https://ncx.com/ncx/> (last visited Jan. 2, 2022).

¹³⁷ G. Cornelis van Kooten & Craig M.T. Johnston, *The Economics of Forest Carbon Offsets*, 8 ANN. REV. RES. ECON. 227, 229 (2016).

capacity to do so. For countries party to the Kyoto Protocol, nation states, too, can purchase such credits.¹³⁸

Yet, like the wood pellet market, the carbon offset market has stirred significant controversy for the ways it falls short of its ideal model. To be considered credible, carbon offsets must be demonstrably additional, permanent, and not subject to “double counting.”¹³⁹ Most concerning for critics of forest offset markets is the problem of additionality—that is, that land which would have been maintained as forest anyway has, through the offset market, given industries license to pollute more, or at least less accountably.¹⁴⁰ Instead, the only offsets which should count are those which reduce atmospheric CO₂ beyond the baseline level of reduction absent incentives.¹⁴¹

Furthermore, in part due to the changing climate, the permanence of carbon benefits of forest carbon offsets is vulnerable to environmental hazards. Fire, pests, and drought can all render the carbon capture promised by landowners valueless in terms of atmospheric CO₂, even long after the credits have been cashed in.¹⁴²

Finally, forest offset markets, like other forest conservation measures, present the possibility of leakage—a phenomenon wherein incentives to promote carbon-capturing forest preservation in one locality lead to changes in land use elsewhere that ultimately release more CO₂.¹⁴³

Forests at risk of harvest for wood pellet production are uniquely well suited to solve these problems. Land targeted for wood pellet production exists exclusively within the seventy-five mile radius of manufacturing facilities,¹⁴⁴ and SELC’s recent image analysis revealed disproportionately high rates of clear-cutting within pellet mill sourcing

¹³⁸ *Mechanisms Under the Kyoto Protocol*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, <https://unfccc.int/process/the-kyoto-protocol/mechanisms> (last visited Jan. 17, 2023).

¹³⁹ JONATHAN L. RAMSEUR, CONG. RSCH. SERV., RL34241, VOLUNTARY CARBON OFFSETS: OVERVIEW AND ASSESSMENT 3–4 (2009).

¹⁴⁰ See, e.g., Umair Irfan, *Can You Really Negate Your Carbon Emissions? Carbon Offsets, Explained*, VOX (Feb. 27, 2020), <https://www.vox.com/2020/2/27/20994118/carbon-offset-climate-change-net-zero-neutral-emissions>.

¹⁴¹ van Kooten & Johnston, *supra* note 137, at 229.

¹⁴² See, e.g., Winston Choi-Schagrin, *Wildfires Are Ravaging Forests Set Aside to Soak up Greenhouse Gases*, N.Y. TIMES (Aug. 23, 2021), <https://www.nytimes.com/2021/08/23/us/wildfires-carbon-offsets.html>; Craig Welch, *Polluters Are Using Forests as ‘Carbon Offsets.’ Climate Change Has Other Plans.*, NAT’L GEOGRAPHIC (May 4, 2022), <https://www.nationalgeographic.com/environment/article/forests-as-carbon-offsets-climate-change-has-other-plans>.

¹⁴³ van Kooten & Johnston, *supra* note 137, at 230.

¹⁴⁴ ENVIVA, WOOD PELLET MANUFACTURING IN THE SOUTHEAST UNITED STATES (n.d.), https://www.envivabiomass.com/wp-content/uploads/ITR-21177-WoodPelletsBrochureResize_v1a1.pdf.

areas.¹⁴⁵ Indeed, this limited sourcing radius has its negative effects—like concentrating the pollution associated with wood pellet manufacture in the same area from which air-filtering trees are being removed.¹⁴⁶ Yet the radius also offers a tidy border for determining the credibility of carbon offsets in the Southeast because trees within that seventy-five-mile radius stand at heightened risk for harvest. Perhaps the chainsaws are not spinning yet, but based on data from SELC and the likelihood of increased demand, the chainsaws may not be far off.¹⁴⁷ Thus, existing stands of timber within pellet mill sourcing radiuses provide truly additional carbon offset potential.

Concerns about permanence are also less grave in the context of southeastern forests. Unlike forests in the American West and Southwest, tree stands in the Southeast face generally lower odds of releasing their carbon early due to uncontained wildfire.¹⁴⁸ Thus, trees conserved through offset markets in the humid southeastern climate, known as the “Nation’s wood basket,” offer uniquely permanent carbon sequestration when compared to other U.S. forests.¹⁴⁹

Finally, the danger of leakage, although not absent, seems empirically lower within the Southeast. Indeed, expanding the offset market in at-risk areas of the Southeast could be justified by the same logic relied on for wood pellet manufacturing—that making timber more expensive, in this case by increasing scarcity, incentivizes more forest planting in the Southeast. Only, unlike with wood pellets, landowners in the offset market could benefit financially from keeping their properties forested without having to cut the trees down first. By incentivizing the preservation of forests without the EU lowering or eliminating subsidies for wood pellets, expanding the offset market in the Southeast might inadvertently drive up the price of timber further, which historically has increased forest cover.¹⁵⁰ Even if wood pellets have disrupted that trend

¹⁴⁵ SELC, *supra* note 43, at 4.

¹⁴⁶ Lucia Ibarra, *Wood Pellet Facilities Sourcing Radius Affects Neighboring States*, DOGWOOD ALL. (Sept. 11, 2020), <https://www.dogwoodalliance.org/2020/09/wood-pellet-sourcing-radius-affects-neighbor-states/>.

¹⁴⁷ SELC, *supra* note 43, at 5, 7.

¹⁴⁸ See generally Charles W. Lafon, *Fire in the American South: Vegetation Impacts, History, and Climatic Relations*, 4 GEOGRAPHY COMPASS 919 (2010) (explaining that humidity and rainfall retard the development of wildfires).

¹⁴⁹ Zoë Hoyle, *Where’s the Wood?: Bioenergy and Southern Wood Supplies*, 17 COMPASS MAG. 1, 1 (2010).

¹⁵⁰ More research would be required to explore whether an upper limit cabins the historic rule that higher timber prices mean more tree cover in the South. See Abt, Galik & Baker, *supra* note 39, at 155.

within their sourcing regions,¹⁵¹ offsets could effectively lower the opportunity cost to landowners of forgoing harvest.

Of course, the Southeast is not the only place in the world with forests, and critics might reasonably worry that by stymying the pellet production market there, offsets might merely push the industry into other regions or the world—potentially regions with fewer environmental regulations than the United States.¹⁵² A few factors make this unlikely in the near term. First, wood pellet producers lack flexibility to quickly pick up stakes and move, given not only their investment in manufacturing facilities, but also their reliance on local networks for sourcing materials.¹⁵³ Second, European consumer demand for pellets is somewhat elastic, meaning that policymakers and consumers could respond to supply constraints by switching to alternative energy sources rather than merely seeking out new woody biomass supplies.¹⁵⁴ Finally, while the Southeast's relatively minor share of the total wood pellet market might otherwise indicate a high risk of leakage if supply were cut off, the timing here is critical.¹⁵⁵ By tightening the screws on U.S. pellet producers in concert with the EU's slow turn away from wood pellet subsidization, expanding offset markets in the Southeast could send a stronger market signal than it would if acting alone. That price signal, combined with sustained efforts by activists and scientists, may serve as one more driver of policy change.

For offsets to provide a damper on wood pellet demand, however, many landowners within the sourcing radius of mills would need to buy—or, more appropriately, sell—into them. Two types of forest offset markets exist in the Southeast: compliance and voluntary. Both markets could be improved and adapted in the context of forests in wood pellet sourcing regions to make forest carbon offsets more accessible and desirable to landowners.

¹⁵¹ See discussion *supra* Part II.

¹⁵² As an example of that threat, one industry group has consistently identified South America as an area where wood pellet production has “yet to reach its full potential,” with modest growth in Chile and Brazil. See *Start Wood Pellet Production Business in South America*, ABC MACH., <http://www.gmec.com/faqs/wood-pellet-production-business-in-South-America.html> (last visited Dec. 31, 2022); *Biomass Pellet Production Potential in South America*, ABC MACH., <http://www.bioenergy-machine.com/biomass-pellet-production-potential-in-south-america.html> (last visited Dec. 31, 2022).

¹⁵³ For more on how producer flexibility is a key condition for high leakage risk, see W. AARON JENKINS, LYDIA P. OLANDER & BRIAN C. MURRAY, ADDRESSING LEAKAGE IN A GREENHOUSE GAS MITIGATION OFFSETS PROGRAM FOR FORESTRY AND AGRICULTURE 5 (2009), <https://nicholasinstitute.duke.edu/sites/default/files/publications/offsetseries4-paper.pdf>.

¹⁵⁴ See *id.*

¹⁵⁵ See *id.*

Compliance markets tend to be more desirable for landowners, as prices for forest offsets have been unsurprisingly higher than voluntary market prices.¹⁵⁶ Initiatives like California’s greenhouse gas emissions trading program and the Regional Greenhouse Gas Initiative (“RGGI”) give landowners access to the compliance carbon market, wherein companies are required to cap their emissions but may purchase offsets to come into compliance. However, barriers to entry can sometimes be prohibitive. For instance, under RGGI, forest owners in the vicinity of pellet mills might seek to take advantage of the Avoided Conversion Project, designed to prevent forested land from being converted into non-forested use.¹⁵⁷ However, RGGI requires evidence of threat of conversion to non-forested use, which may not include many rural forests that might be subjected to harvest for wood pellets.¹⁵⁸ Furthermore, RGGI requires a twenty-five-year commitment and a formal conservation easement in order to enter the market.¹⁵⁹ While these measures provide added security, they reduce coverage and make compliance more costly. By lowering requirements for forest offsets in the context of at-risk forests within the sourcing radius of pellet mills, RGGI and other compliance markets might secure more buy-in from local landowners in the critical window during which the wood pellet industry in Europe continues to roar.

For landowners failing to meet compliance standards, the voluntary carbon market offers payments for preservation. Many options exist in the United States, like the Climate Action Reserve, Verified Carbon Standard, American Carbon Registry, and the Gold Standard. While historically lower value, buy-in to voluntary carbon markets has skyrocketed in recent years. Trade volume increased by 80% in 2020 alone, with forestry and land use offsets dominating the market.¹⁶⁰ Prices have increased steadily with growth, jumping by 60% between 2020 and 2021 and bringing the total value of the market to more than \$2 billion in

¹⁵⁶ In 2021, the average price for a forest offset credit in the voluntary carbon market ranged from \$4 to \$6, whereas in compliance markets, like RGGI, it ranged from \$12 to \$14. Wilder Person, *An Inside Look at Pricing in the Forest Carbon Market*, GREENBIZ (Mar. 2, 2021), <https://www.greenbiz.com/article/inside-look-pricing-forest-carbon-market>.

¹⁵⁷ REGIONAL GREENHOUSE GAS INITIATIVE, REGIONAL GREENHOUSE GAS INITIATIVE OFFSET PROTOCOL: U.S. FOREST PROJECTS 9, 32 tbl.5.3 (2013), https://www.rggi.org/sites/default/files/Uploads/Design-Archive/2012-Review/2013-later-materials/Forest_Protocol_FINAL.pdf.

¹⁵⁸ *Id.* at 9.

¹⁵⁹ *Id.* at 14.

¹⁶⁰ STEPHEN DONOFRIO ET AL., *MARKETS IN MOTION: STATE OF THE VOLUNTARY CARBON MARKETS 2021*, at 1, 8 (2021), <https://www.ecosystemmarketplace.com/articles/press-release-voluntary-carbon-markets-rocket-in-2021-on-track-to-break-1b-for-first-time/>.

2022.¹⁶¹ For activists concerned with the growing presence of wood pellet trade, increasing knowledge and access among rural landowners to the voluntary carbon offset market could tamp enthusiasm for wood pellet projects.

As with compliance markets, upfront costs of enrollment in traditional voluntary markets can be substantial, and historically, acreage requirements and ten- to one-hundred-year contracts have kept small landowners out.¹⁶² While those requirements make sense to ensure high quality credits generally, in the context of forests in the range of wood pellet mills, the near-term future may justifiably matter more than certainty in the long-term. Conservationists might target their efforts at connecting landowners with newer players in the carbon market, such as the Natural Capital Exchange and the Family Forest Carbon Program, which are leveraging new technology like remote sensors and satellite imagery to lower barriers to entry for small landowners.¹⁶³

V. CONCLUSION

Undoubtedly, tipping the scales against the wood pellet industry would have its critics, both locally and internationally. But for policymakers in the rural communities where the pellets are manufactured and the forests sourced, such measures may be justifiable for more than conservation purposes. European policies subsidizing the burning of wood pellets for energy as a “renewable” source not only pose a risk to American southeastern forests, but also to southeastern economies. European subsidies have suppressed the fiscal and carbon costs associated with burning woody biomass through two highly controversial practices: classifying woody biomass as carbon neutral and accounting for emissions only at the point of harvest. Shifts in either policy could fundamentally alter the industry landscape by sharply decreasing

¹⁶¹ Jennifer L., *Real Voluntary Carbon Market Value Is \$2 billion*, CARBONCREDITS.COM (Aug. 5, 2022), <https://carboncredits.com/real-voluntary-carbon-market-value-is-2-billion/>.

¹⁶² Logan Yonavjak & John Talberth, *What Woodland Owners Should Know About Forest Carbon Offsets in the U.S. South*, WORLD RES. INST. (2011), <https://www.ecosystemmarketplace.com/articles/what-woodland-owners-should-know-about-forest-carbon-offsets-in-the-u-s-south/>; LOGAN YONAVJAK, PAULA SWEDEEN & JOHN TALBERTH, *FORESTS FOR CARBON: EXPLORING FOREST CARBON OFFSETS IN THE U.S. SOUTH* (2011), https://files.wri.org/d8/s3fs-public/pdf/forests_for_carbon.pdf.

¹⁶³ Marisa Repka, *New Forest Carbon Offset Strategies Turn to Small Landowners for Big Impact*, CONSERVATION FIN. NETWORK (July 24, 2020), <https://www.conservationfinancenetwork.org/2020/07/24/new-forest-carbon-offset-strategies-turn-to-small-landowners-for-big-impact>.

demand.¹⁶⁴ American policymakers might consider measures appropriate to insulate local economies from the threat of bust looming over the currently booming biomass market.

The expansion of the wood pellet production began with European policy, and without substantial changes in that policy, the market appears unlikely to change course. But United States policymakers need not be idle. While the patchwork of regulatory regimes spanning southern treetops makes traditional command and control difficult, using market mechanisms such as subsidy removal and connection to offset markets, the Southeast could slowly tighten the tap on wood pellet supplies to Europe. And with demand rising, the United States might have to if it wants to keep its trees.

¹⁶⁴ See, e.g., Keith L. Kline et al., *Effects of Production of Woody Pellets in the Southeastern United States on the Sustainable Development Goals*, 13 SUSTAINABILITY 821, 832 (2021) (“Threats to the supply chain include reliance on policies and subsidies that could be eliminated at any time, which would result in major disruptions in demand.”).