

NEWS FEATURE | 20 August 2024

How 'green' electricity from wood harms the planet — and people

Many nations have embraced burning wood pellets to produce electricity – under the assumption that it is carbon neutral. But research shows this approach can boost greenhouse-gas emissions and threaten the health of local communities.

By [Melba Newsome](#)



A truck takes wood to an Enviva wood-pellet plant in Garysburg, North Carolina. Credit: Mehmet Demirci/Redux/eyevine

The town of Hamlet, North Carolina, seemed to hit the jackpot in September 2014. After the community had endured decades of economic despair and high poverty rates, the world's largest producer of wood-based energy, Enviva Biomass, announced plans to open a major facility nearby that would turn wood into dense pellets that can be used as fuel. The project promised 80 well-paying jobs for residents in Hamlet and the surrounding area. It seemed like a win for both local people and the planet.

The company's plant, which opened in 2019, is part of a global expansion in the use of wood – or solid biomass – to generate electricity. Pellet companies advertise their products as a renewable-energy source that lowers carbon emissions, and the European Union agrees, which has spurred many countries, including the United Kingdom, Belgium and Denmark, to embrace this form of energy. As with similar projects

worldwide, Enviva Biomass, which is based in Bethesda, Maryland, said that its operations in Hamlet would displace fossil fuels, grow more trees and help to fight climate change.

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But opposition is building on many fronts. An expanding body of research shows that burning solid biomass to generate electricity often emits huge amounts of carbon – even more than burning coal does. In February 2021, more than 500 scientists and economists signed a letter to US president Joe Biden and other world leaders urging them to not support using wood to generate energy, arguing that it harms biodiversity and increases carbon emissions. Although pellet companies advertise that their operations

consume low-quality wood, this claim has come under increased scrutiny, with mounting evidence of significant deforestation around wood-pellet plants.

Residents living near wood-pellet facilities are increasingly complaining about the harmful impacts from air pollution, traffic and noise coming from the wood-pellet operations. And in many cases, these facilities are located near marginalized communities lacking political power.

In Hamlet, 45% of the population identifies as Black, and in the tiny community closest to the mill, about 90% of people are Black, says Debra David, a local resident and activist. She calls the Enviva operation a clear case of [environmental racism](#) – layering environmental burdens on an already vulnerable population. David rattles off the names of poultry farms, a chemical company, a natural-gas plant and gravel mines in or near the town. “We are very much overloaded here,” she says.

Enviva did not respond to multiple requests to comment about concerns raised in this article relating to the Hamlet plant and its other operations.

The green gold rush

The big push towards biomass began with the European Commission's 2009 Renewable Energy Directive, the legal framework for [developing renewable energy in all sectors of the EU economy](#). It became known as the 20-20-20 climate and energy package, and mandated three goals to reach by 2020: reduce EU greenhouse-gas emissions by 20% from 1990 levels; increase the renewable portion of EU energy consumption to 20%; and improve EU energy efficiency by 20%. The directive was initially hailed by environmentalists for taking concrete steps towards [limiting global warming to 1.5 °C above pre-industrial levels](#) – the international goal set by the 2015 Paris climate agreement.

As part of the 20-20-20 package, the EU set standards to reduce carbon emissions by using more biofuels. Since then, EU countries have handed out substantial subsidies to the wood-pellet industry, which have amounted to billions of Euros in the past few years. An assessment from Trinomics, a consultancy firm based in Rotterdam, the Netherlands, found that ten EU countries that were analysed in the study spent more than €6.3 billion (US\$6.9 billion) in subsidies for solid biomass energy to produce electricity in 2021 (see go.nature.com/3m4mbm2).

The support for wood biomass relies on the idea that carbon emitted by burning biomass will be absorbed by the regrowth of vegetation that replaces the trees used by the industry. But in the past decade, a growing number of scientists have challenged this assumption.



Enviva's wood-pellet manufacturing facility in Garysburg, North Carolina. Credit: Erin Schaff/The New York Times/Redux/eyevine

John Sterman, the director of the System Dynamics Group at the Massachusetts Institute of Technology Sloan School of Management in Cambridge, is one of the researchers who signed the 2021 letter. In 2018, Sterman and his colleagues did a life-cycle analysis of the effects of replacing coal with wood to generate electricity ([J. D. Sterman et al. *Environ. Res. Lett.* **13**, 015007; 2018](#)). They found that this substitution could exacerbate climate change until at least 2100, mainly because it takes decades for trees to regrow on harvested land and to remove enough carbon dioxide from the atmosphere.

Sterman and his colleagues calculated that it would take between 44 and 104 years for new trees to absorb as much CO₂ as the amount generated by wood bioenergy that displaces coal. Despite claims that it helps the fight against global warming, he says, “our conclusion is no, it actually makes climate change worse”.

In 2019, the European Academies' Science Advisory Council (EASAC) reviewed the EU's policies and concluded that they are failing to recognize that removing forest carbon stocks for bioenergy leads to an initial increase in emissions (see go.nature.com/3wkqupk). "Using biomass emits even more CO₂ to the atmosphere per energy generated than even fossil fuels," says Michael Norton, a co-director of the environment programme at the EASAC secretariat in Vienna.

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Eventually, biomass energy will produce less carbon than fossil fuels do. But the time it takes to make up for the extra initial emissions, says Norton, "is so long as to worsen climate change for decades to centuries – hardly an effective climate strategy given that we are already overshooting Paris agreement targets".

Researchers have pointed out other problems with the way wood pellets are accounted for in carbon-emission assessments. In particular, the EU accounts for greenhouse-gas emissions associated with biomass at the point of production, not the point of combustion. That allows EU countries relying on biomass to avoid including emissions from this source in their tallies and creates an incentive to use biomass energy, say Sterman and other researchers.

In 2023, the EU announced that it was considering changing its climate policies concerning energy produced from wood biofuels. Forest advocates and biomass opponents were thrilled – but the EU eventually decided that biomass from wood will remain classified as renewable energy.

When trees fall in the forest

Beyond climate concerns, some researchers also warn that the wood-pellet industry harms forests and promotes deforestation. On its website, Enviva says that it produces pellets from low-value wood, such as trees that are unsuitable for other industries, tops

and limbs that cannot be processed into lumber, deformed trees and by-products from other industries, such as sawdust. The company says it “does not source from old growth forests, protected forests, or forests that are harvested for land use conservation”.

But many environmental groups and media outlets have photographed stacks of mature hardwood trees waiting to be delivered to Enviva processing plants – and the clear-cut woods left behind. The Dogwood Alliance, a non-profit conservation organization in Asheville, North Carolina, estimates that Enviva facilities in North Carolina consume about 50,000 acres of forest each year, raising questions about Enviva’s practices.

Christopher Williams, an environmental scientist at Clark University in Worcester, Massachusetts, analysed satellite data of forest cover near several Enviva pellet mills. In a report conducted for the Southern Environmental Law Center, a non-profit organization based in Charlottesville, Virginia, Williams found that rates of forest loss from 2001 to 2016 near three Enviva mills were more than double that of a region with similar forests that was not located near a mill (see [go.nature.com/4fsb79w](https://www.nature.com/4fsb79w)).

“We found that the area of forest-lands cleared each year increased markedly after the initiation of pellet-mill operations,” said Williams.

Along with increasing scrutiny and criticism of the biomass industry in the past few years, some companies have run into economic headwinds. Citing debts exceeding US\$2.6 billion, Enviva filed for bankruptcy in March.

In 2020, the Drax pellet plant in Gloster, Mississippi, paid a US\$2.5-million penalty for air-pollution violations. Credit: Eric J. Shelton/Mississippi Today

According to the industry publication *Biomass Magazine*, there are now more than 100 wood-pellet plants in the United States, scattered across the country. But the world’s

largest wood-pellet producers, such as Drax, based in Selby, UK, and Enviva, have staked their futures in the southeast and south of the United States.

Enviva now operates ten US wood-pellet facilities – one each in Florida, Georgia, South Carolina, and Virginia; two in Mississippi and four in North Carolina. Besides the issues of the industry’s environmental impact, there are also concerns about the effects of these operations on the health of people living nearby.

Many residents in the four counties of North Carolina where Enviva plants are located, say the wood-pellet operations have placed a heavy burden on the health of vulnerable communities.

Wood-pellet facilities in the south are about 50% more likely to be located in “communities already besieged by polluting industries and environmental injustices”, says Heather Hillaker, an attorney at the Southern Environmental Law Center in Chapel Hill, North Carolina. “So, you have all the cumulative impacts as well as the disproportionate impacts on these communities.”

Despite concerns raised about the wood-pellet industry, the North Carolina Department of Environmental Quality (DEQ) permitted the construction of Enviva’s Hamlet facility, and its subsequent requests for expansion.

Breathing problems

David describes the near-constant smell of rotten eggs that comes from living downwind of the plant, but she mostly worries about the long-term health consequences of the poor air quality. She says she started having breathing problems not long after the facility began its round-the-clock operations. At one point, her oxygen levels dipped so low that she needed supplemental oxygen daily. Now, she uses an albuterol rescue inhaler and a once-daily inhaled asthma treatment. And she says she’s not alone.

and Urania, Louisiana, for a total of \$3.2 million in September 2022, although the company denied that it committed any violations.

Drax told *Nature* that it has “engaged an independent, third-party to conduct an air toxics impact analysis. Those results support that there are no adverse effects to human health from the facility and determined that no modelled pollutant from the facility exceeded the acceptable ambient concentration”. It adds that the company seeks “100% compliance with our permits and has installed additional technology to manage emissions”.

In response to concerns about carbon emissions from biomass energy, Drax says that multiple governments, as well as scientists, classify biomass as carbon neutral.

A path forward

In the heart of south Georgia lies the rural town of Adel, with a population of 5,500. The residents of the city’s west side, most of whom are Black, have lived alongside polluting industries for decades. But three years ago, the community found itself embroiled in two climate-justice battles.

The first one started in 2021, when Georgia’s Environmental Protection Division issued a permit to the Renewable Biomass Group, a wood-pellet production company, for a facility that would produce 450,000 tonnes of wood pellets per year. The company had not even broken ground for its facility when, in October 2021, another biomass company, Spectrum Energy, applied to construct and operate a wood-pellet manufacturing facility that would produce 600,000 tonnes each year, which would make it one of the largest in the world.

Concerned Citizens of Cook County (4C), a social and environmental justice organization in Adel, and 14 other public-interest organizations opposed the permit for the Spectrum plant. “We were already overburdened with multiple industries and legacy pollution,” says Treva Gear, a community activist and the founder of 4C.

Opponents of the plants said that the proposed Spectrum wood-pellet facility would further harm the neighbourhood of Black and Hispanic residents and threaten the health and welfare of local people.

In 2022, the state approved the permit for Spectrum to commence two phases of construction and operation. In December 2022, Spectrum reached out to Adel community organizers and their lawyers, at the Southern Environmental Law Center, to seek a compromise.

Although initially reluctant to bargain, Gear says that they realized that negotiation might be their best hope, because they doubted the state regulatory agency would take their side in the dispute. The two sides reached an agreement in which Spectrum pledged to mitigate potential noise and visual concerns. The agreement also includes the potential for adding more air-pollution control measures.

In an e-mail response to a request for comment about the plant's impacts, Spectrum president Michael Ainsworth said that Spectrum's participation in the settlement was voluntary, despite having already received a favourable ruling from the Georgia's Environmental Protection Division. "Spectrum also agreed to be transparent with the community and to share more information than required by the regulations and also to share information more often than required," wrote Ainsworth.

Community activists such as Gear are taking solace in winning these concessions because they can see that the deck is stacked against them with the increasing global demand for wood pellets.

"We reached a settlement agreement that put us in a position to have probably the cleanest wood-pellet plant in the world," she says.

It's a victory for the local community, but as the biomass industry continues to expand globally, these kinds of battle will become more common as debates over the impacts of

wood pellets heat up.

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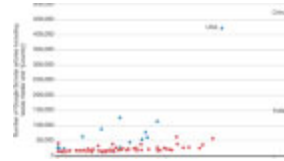
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