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MIKE LIVERMORE: Welcome to the Free Range podcast. I'm your host Mike Livermore. This episode is sponsored by the Program on Law, Communities, and the Environment at the University of Virginia School of Law. So today's episode is a bit different. With me today, are two law students at UVA, Matt Disandro and Elizabeth Putfark. And they've been doing some research on the issue of wood pellets. With the energy crisis in Europe, the need to transition away from fossil fuels alternatives, like biofuels, have gotten a lot of attention. And wood pellets are a prime example of a biofuel.

Indeed, most of the climate models in which we are able to actually keep temperature change below 1 and 1/2 or 2 degrees Celsius. They have an important place for what are called BECCS. And what BECCS are, that stands for Bioenergy with Carbon Capture and Storage. So the idea here is that you grow biofuel, in the process that sucks carbon out of the atmosphere. Then you burn the biofuel for energy. Then you capture and then you store the carbon, so that the whole operation is carbon negative.

And again, BECCS are really important components of the plan, such as it is, to keep temperature change at manageable levels. So Matt and Elizabeth both wrote great papers for my environmental law class last semester. And incidentally, they both focused on wood pellets. So we thought it might be fun to do a deeper dive on that issue for an episode of Free Range OK, so other than finding a paper topic, Matt, what got you interested in wood pellets in the first place?

MATT DISANDRO: Yeah, so hi, I'm Matt. And what got me interested in wood pellets is what I was reading about European countries. And on one hand right now, because of the war in Ukraine, they have a lot of pressure to adopt alternative energy sources. And at the same time, they also want to reduce greenhouse gas emissions. And wood pellets seem to fit the bill, so they've become a very hot topic right now. And that's what's got me interested.

MIKE LIVERMORE: Yeah, cool, and what about Elizabeth?

ELIZABETH PUTFARK: Yeah, I came to law school really to study environmental law. And so naturally, kind of, have been watching to see what issues pop up. But also, my dad is in the logging industry, and so I kind of grew up understanding this tension between my dad who loves trees and loves forests and my best memories are camping as a kid, but also he supported our family by being involved in an industry that cuts them down.

And, of course, the more that I've gotten involved in conservation, the more that tension has tended to implode between us a little bit. We've gone around over sustainable yield and clear cutting and pine plantations and things like that, where he brings his 40 years of experience in the industry to my couple of hours of scholarship reading and the courage of my convictions. And he's usually pretty patient.

But it was interesting because earlier this year, when I started hearing about wood pellets, I brought it to my dad of course, because you have to poke the bear. And he was weirdly quiet. He was kind of like, I don't know those guys. That's something else. And I thought, that's strange. So something must be going on here.

MIKE LIVERMORE: Yeah, that's interesting. So Matt, what were your what were your priorities going into this issue? Like broadly, what were your initial impressions? What did you expect to find?

MATT DISANDRO: So my initial understanding was generally positive view of wood pellets. I know that wood pellets are a technology that's been around for a while, but also hold a lot of promise for the future. Because wood pellets are known to be carbon neutral. So my understanding was that wood pellets were a great way to transition away from coal and toward a future that was more environmentally friendly.

MIKE LIVERMORE: And yeah, how about you, Elizabeth?

ELIZABETH PUTFARK: Yeah, I'd heard it more from the other side. So I'd heard reports of this increasing the pressure on Southern forests, on clear-cutting, on sort of losing a lot of trees in the Southeast. So that was my understanding of what a big part of the controversy was. Less about the energy, and more about what's happening to trees on the ground.

MIKE LIVERMORE: Well, good. You started with different priors. So that's always a productive place. But what's the answer? Who's right? Is this the dream of the future that's going to save us from climate change, or be part of the solution at least? Or is it a disaster that's going to destroy our forests?

MATT DISANDRO Well, guess what? It's complicated.

ELIZABETH PUTFARK: Yeah, a lot of it depends on who you ask.

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MATT DISANDRO: So to start. What is a wood pellet? We asked Daniel Reinemann from Bioenergy Europe, which is a nonprofit based in Brussels, and it advocates for biomass energy,

DANIEL REINEMANN: Biomass is any plant-based material that can be used for energy. And this can be wood, whether it's wood chips, or waste wood, or wood pellets. But it could also be something like agricultural biomass, such as sunflower husks, or olive stones, or any other kind of residues.

MATT DISANDRO: But wood pellets are a specific type of biomass. Wood from trees is broken apart, heated to reduce moisture, converted into a fine powder. Then compressed to form a solid, dense, and short pellet.

ELIZABETH PUTFARK: It looks like dog food, and that's because wood pellet-making technology comes directly from animal feed pellet lines, which have just been adapted to woody materials.

DANIEL REINEMANN: Well, the wood pellets are quite interesting because they actually represent the closest thing that the biomass market has to a commodity. They're going to be more or less uniform in shape, density, properties, energy content. And it's going to be quite different from wood chips, for example, which have a much lower density. You have a bigger differentiation in the size and the ash content.

MATT DISANDRO: The controversy over wood pellets isn't so much about making them than it is about burning them. So what effect does burning wood pellets have and how does this compare to burning, say, fossil fuels? We asked Dr. Alan Knight, who is the Group Director of Sustainability at Drax Group, one of the biggest companies in the woody biomass industry.

ALAN KNIGHT: The fundamental difference between coal and fossil fuels and biomass, is the fact that coal and fossil fuel are fossils, i.e., both coal and other forms of fossil fuels are the result of millions of years, tens of millions of years of biological matter which has settled on the ground, in the sake of coal, and the sea for the sake of oil. And then being buried through geological processes. And then over millions of years be, in turn, fossilized, basically, and turned into coal.

And so the lump of coal may represent hundreds of years of organic growth, which is being compressed and locked out of the atmosphere for, obviously, millions and millions of years. The biomass we used was in the sky a few years ago when that tree started growing.

ELIZABETH PUTFARK: So trees spend their whole lives soaking up carbon out of the atmosphere. And when a tree is burned, that carbon is released. But unlike coal, that's not the end of the story.

ALAN KNIGHT: One of the fundamental principles of good forest management is that you allow the forest to grow back to make more timber. Or you even, in many cases, you actually replant a tree where necessary, and that tree starts growing. So we plug into a natural carbon cycle of the trees growing and taking the CO2 out of the sky. So there's always a net balance of CO2 in the sky.

Fossil fuel basically takes carbon, which has been stored underground for millions of years and took millions of years of carbon to accumulate, puts them into the sky overnight with no means to take that CO2 out of the sky. So fossil carbon is linear, biomass is circular.

MATT DISANDRO: The process of trees soaking up CO2 in the atmosphere is called carbon sequestration. If trees are able to sequester CO2 at a faster rate than CO2 is released into the atmosphere, that's called the carbon dividend. The size of the carbon dividend can be further increased through bioenergy with carbon capture or BECCS.

ALAN KNIGHT: So this is where you stick with your biomass plant or your bioenergy plant, but you add CCS, Carbon Capture and Storage, that then allows that plant to become a carbon removal machine. And if you look at what came out of COP 27 in Egypt.

But it's been there since COP 26. IPCC have been talking about this, is that we need gigatons of carbon removals if we're going to have any chance of reaching two degrees, let alone 1.5 degrees by 2050. There's a very clear scientific consensus that part of the world's mitigation plan for climate change is to remove carbon from the sky.

What BECCS does, which is bioenergy, so biomass creating energy, but then the CCS stores that CO2 underground. It does that at perhaps the most cost-effective way of doing carbon removals.

ELIZABETH PUTFARK: Drax has plans to add BECCS to one of its power stations as early as 2024. But the vast majority of bioenergy plants don't have BECCS yet. The technology is super expensive. And it's difficult to scale. Without BECCS, the size of the carbon dividend really turns on what type of wood is being used. Large-diameter trees, old-growth forests, hardwoods. These trees store a lot of carbon. And once that carbon is released, it takes a really long time to store again.

MATT DISANDRO: But according to Dr. Knight, that kind of wood isn't even on the table.

ALAN KNIGHT: The biomass we focus on at Drax is the woody residues and the materials from the timber industry. So if you imagine if you go into a forest, which is harvested for timber or pulp. There will be a lot of thinnings, there'll be a lot of disease logs, and small logs which are too small or too twisted and bent, which can be used in a big professional large-scale sawmill.

And, of course, those sawmills themselves produce a lot of sawdust. And so we can use those twisted logs, we can use the undergrowth and the thinnings and the branches and the tree tops. And we can also use the sawdust.

MATT DISANDRO: Or, as Daniel puts it, you don't use a T-bone steak to make hamburgers or dog food.

DANIEL REINEMANN: Yeah, so any type of wood can be used, in theory. But when we're talking about how this is actually working in practice, I mean, it's just the low-quality wood and the residues From other wood processing sectors or from forestry itself. And this is because whether you're using a high-quality wood or low-quality wood, it's not going to have any impact on the bioenergy. It's still going to be able to capture the same energy content.

ELIZABETH PUTFARK: So, according to Daniel, the industry has every incentive to stick to low-quality residues, because it just makes business sense.

DANIEL REINEMANN: Bioenergy producers are always going to be focusing on the lowest-cost material and considering the prices that exist for high-quality sawlog material, which is going to be at least three or four times higher than what we're going to get for forest residues, it doesn't make sense for any of this material to be going into bioenergy. Now, this isn't something that's really regulated by laws. This is something that's more just kind of done on the market level.

MATT DISANDRO: Proponents of current harvesting practices argue that this is an efficient use of otherwise unusable wood. Providing additional revenue to forest owners and incentivizing good management of forests.

ALAN KNIGHT: Let's say I've got a small holding of land where i got trees on them. I will, at some stage, want to harvest those trees for timber. And I will harvest them for timber and not for pellets, because I get more money for the timber than I would ever get for a pellet. But doing the growing of that little forest estate, I will have to do thinnings to protect the health of my trees. I might have to remove some diseased wood.

And by us being present in that sector, we can provide a revenue stream to them for material which isn't of timber quality, both during the development of that forest, i.e., the thinning cycles. And ultimately, when they choose to harvest that forest for timber, we will take the tops and the bottoms of the tree, and the thinnings and the other bits they don't want. So they get more money from that operation.

ELIZABETH PUTFARK: And aside from environmental effects, the biomass industry is also a significant source of employment and tax revenue, particularly in the rural areas where mills get sited and trees get sourced.

ALAN KNIGHT: Because the regions where the forests are, it's not unusual for us to only be almost the only employer, or one of the few employers in these regions. So we do bring jobs, we do bring income into those regions.

MATT DISANDRO: What really makes wood pellets work are policies and subsidies that support them. Most importantly, biomasses are considered renewable energy by the European Union. This is all codified in what's called the Renewable Energy Directive, commonly referred to as the RED.

ELIZABETH PUTFARK: RED is a set of sustainability criteria meant to get the EU on track to meet its decarbonization goals. Getting categorized as a renewable energy source in the RED means heavy industry subsidization. And that's how woody biomass is currently categorized. Between the Eu's energy targets, RED subsidies, and increasing demand across the UK and Europe, it's not surprising that the use of energy from biomass, particularly wood pellets, has skyrocketed.

DANIEL REINEMANN: In the case of Europe, bioenergy is the biggest source of renewable energy in the EU today. Based off of the numbers in 2019, bioenergy made up 57.4% of renewable energy, so quite a significant share. And we do expect, obviously, the share to decrease as other technologies become more and more mature.

But bioenergy is going to continue playing an important role, particularly in the heating sector where there are a lot more limited options as to what can be done to go through and decarbonize. And in the heating sector in particular, bioenergy makes up 85% of the renewable energy. So that's quite significant.

MATT DISANDRO: Amendments to the RED have been proposed to change this landscape. But industry argues that these changes aren't necessary.

DANIEL REINEMANN: I would say, one of the things that we are following the most closely is the provision that the European Parliament has added on primary woody biomass, which would place some additional restrictions on what kind of material is able to be used for bioenergy, and how that's able to be supported.

Now, the concerns that we have with regards to this are that when you're talking about primary woody biomass, it's just referring to where this material is originating from. So it's just concerned about whether it's a byproduct from the sawmill industry, or pulp and paper, or if it's coming directly from the forest. Now, it doesn't mean that it's going to be any kind of indication of the quality of the material, or that it's going to be any indication of what the end use of this material would be otherwise.

And so the big concern that we have, as industry, is that this material is going to be prevented from being used for bioenergy, even though it's not going to have any other kind of material use, because it's going to be too small, to crooked, it's going to be infected by mold or fungi, and that is going to be rejected by other industries. But that it still will be, by this legislation, restricted from being able to be used for energetic purposes.

ELIZABETH PUTFARK: And, like we learned in Professor Livermore's class, imposing regulations doesn't come without costs.

DANIEL REINEMANN: The language on primary woody biomass, which I was talking about earlier, I think, is probably one of the most important aspects. Because this isn't something that's tracked by companies or governments or even academia right now. So kind of adding this definition and restriction could potentially severely constrict the supply of biomass for the sector. And that could potentially reduce a lot of the trade volumes happening between the US and the EU.

MATT DISANDRO: But the biomass industry doesn't just affect Europe, it also includes wood pellet manufacturers in the Southeast United States. The Southeast is very rich in timber and is called the US wood basket.

ELIZABETH PUTFARK: Even though timber has long been a major industry in the Southeast, wood pallet production has dramatically increased in the region over the last decade. In the last five years alone, wood pellet exports from the Southeast have gone up by 60%.

MATT DISANDRO: We spoke with Professor Bob Abt, a man who has dedicated his life to studying forests in the Southeast.

BOB ABT: The South is unique, right? It's 80% privately owned. So if I was any other place, Canada, the Pacific Northwest, I'd be spending a lot of time figuring out what forest policy consequences were. But in the US South, it's really a market-driven, largely unregulated story. So it's a lot of policy and market questions end up depending on the market-driven dynamics in the South, which drives both the amount of timberland, how intensely it's managed.

ELIZABETH PUTFARK: Professor Abt is a forest economist at North Carolina State University. And as an economist, Professor Abt tends to take a middle-of-the-line approach.

BOB ABT: That's sort of way, you look at it every question as not a right versus wrong, but who wins and who loses and what are the distributional consequences of that.

MATT DISANDRO: So, what are the distributional consequences of wood pellets?

BOB ABT: My initial sort of point of view from the modeling and that conversation was, yes, they will in fact compete for wood with other users. And from a market perspective, what that does is drive up prices. And in the South, unlike, I'd say, most any other place in the world, in the South when you drive up prices from more demand, the private landowners respond.

So there's plenty of research that shows that forest area in the South expands with higher prices. And that's because when prices go up, those people who are managing forests for income either manage more or plant more. And so that was one of my first insights from it, was that in fact, there will be competition in wood from the pellet industry.

ELIZABETH PUTFARK: OK, so basically, the more people there are trying to cut trees down, the more trees there are going to be. This is pretty much exactly what my dad has always said.

MATT DISANDRO: So your dad's right, then.

ELIZABETH PUTFARK: Yeah, thanks a lot, Professor Abt.

BOB ABT: The work I've done and others have done suggests that the marginal impact of the demand for pellets on Pine pulpwood has had a rent effect. In other words, we can show that areas where pellet mills have moved in, now have higher prices than areas where pellet mills did not move in.

Those price increases and increasing returns to landowners would suggest, based on history, that there could be an increase in carbon stock. The landowners who own land for income respond, both in terms of increasing the growth of their trees, maybe by fertilization, and by expanding, on marginal land, the forest base.

MATT DISANDRO: Part of the increase in the Southeast carbon stock is driven by alternative land uses, becoming less profitable. While timber harvesting becomes more profitable.

BOB ABT: In the US South, part of our ecosystem here, and where most of our forests came from in abandoned Ag land. But if we don't mow our yards, we'll end up with a forest. You can see trees growing up through old houses all the time. So that's an ecological advantage of the situation in the South, is a very resilient and turns into forests if you just stop bothering it. So that's one reason that the South is increasing, as there's less land needed for Ag.

ELIZABETH PUTFARK: But remember, like we talked about earlier, all trees aren't created equal, not in terms of carbon sequestration, anyway.

MATT DISANDRO: Right. Whether you increase the forest carbon stock can largely depend on the type of wood that is in demand.

BOB ABT: It's easy for me to explain it. If you take the part of the forest out that slow growing, which is lowland hardwoods are much slower growing than pine plantations, for example. Then actually there's a benefit. In other words, if you move harvest off of those slow-growing lands, the inventory and carbon impacts are actually better, because you're putting more of the demand against the resource that responds to it, which would be pine plantations in the South, mostly. If it's for pine-- it's a different story for hardwoods. But if you increase demand for pine. You can actually get a positive forest and carbon response.

Now, of course, there's trade-offs in that, too. Which is, if you were cutting down upland hardwoods to put in Pine plantations, you may gain a sequestration advantage but you may lose a carbon stock or a habitat or diversity advantage. So that's why I end up being able to work each side of the issue, because there's-- the economics comes out with trade-offs, not a yes/no answer.

[MUSIC PLAYING]

MIKE LIVERMORE: OK. Well, that sounds pretty great. We get a transition off of coal to a fuel source that has a shorter life cycle than a fossil fuel. Way shorter life cycle than fossil fuel transitioning from. I don't know, tens of thousands, or millions of years or something, to a few hundred years. We increased forest cover because people are growing trees in order to make a profit. And we can trust the market to keep the really high-quality trees that people are worried about out of the mill. So this sounds like a win-win-win. What could be the problem?

MATT DISANDRO: Well, that's just one side of the story.

MIKE LIVERMORE: Well, I guess that's almost always the case on environmental issues. There's more than one perspective.

ELIZABETH PUTFARK: Yeah, conservationists have been raising alarms about wood pellets pretty much since production started booming in the early 2010s. One of the people we spoke with is Louise Guillot, a journalist at Politico who's been covering the controversy.

LOUISE GUILLOT: The topic of bioenergy in the EU has been quite tense over the last years mainly because you have on the one hand the industry that promotes the potential of bioenergy as a substitute for fossil fuels, which is becoming increasingly important in the energy transition that the EU is doing.

While on the other hand, you have environmental campaigners and also scientists warning that burning wood for energy also emits CO2. And sometimes more so too, than the fossil fuel equivalent, as far as to quite debated issue.

MATT DISANDRO: Turns out, sure, trees soak up carbon, but it takes time. Like a long time.

MARY BOOTH: Burning would in fact emits more CO2 per unit energy produced than fossil fuels. And, obviously, it's not carbon neutral energy because, basically, for the very simple fact that trees don't grow back as fast as you can burn them. So there's always going to be more CO2 in the atmosphere if you're burning wood for energy than if you weren't.

ELIZABETH PUTFARK: That's Dr. Mary Booth, director of the Partnership for Policy Integrity's Science and Advocacy work. She started her career at Utah State University, where she earned her PhD in the Rangelands Ecology Program.

MARY BOOTH: They have a great ecology program. But I also went to school with guys who were big belt buckles.

MATT DISANDRO: Dr. Booth was part of a lawsuit challenging the EU'S classification of woody biomass as a renewable energy source. The EU is supposed to update these classifications to reflect new science. And by the time the case was heard in 2019, scientists like Dr. Booth argued that the science had changed on woody biomass.

ELIZABETH PUTFARK: The case lost on standing. Meaning that the court never heard the plaintiff's arguments against classifying woody biomass as renewable. But it helped put wood pellets on the map as a controversial fuel source in the climate community. Their basic point, which a lot of critics continue to raise, was that burning woody biomass causes an immediate spike in carbon.

MARY BOOTH: Wood is a low-- has a lot of carbon and not very much energy in it compared to fossil fuels. And it's also a wet fuel, so it's a very inefficient fuel. So per unit energy generated, per megawatt hour of electricity generated, burning wood emits like 50% more CO2 than coal. And a couple 100% more CO2 than natural gas. And that's just a physical fact.

MATT DISANDRO: Even when new trees get planted, that dividend can take decades or longer to realize. Even if they're regrown at a faster rate than they are burned.

ELIZABETH PUTFARK: And the scale is huge. According to one study, to offset emissions by Drax alone, we would need to plant and regrow 60 million trees.

MARY BOOTH: Another way to think about this is. I always tell people like the bathtub model. So if you envision the level of CO2 in the air as the water level in a bathtub, and there's the water level depends on how fast the water's running in, and how fast the water is running out the tap. So the tap and the drain. And if you're burning trees, burning more carbon, burning more terrestrial carbon, and pumping that into the air, that's like turning up the tap. And the level of water in the bathtub is going to go up, right?

And if you don't do something to simultaneously drain water faster out, which would be trees, taking carbon out of the atmosphere, then the water level is going to rise, and CO2 is going to accumulate in the atmosphere. And that's essentially what's happening. In reality, cutting and burning a tree over here will not make a tree anywhere else grow faster.

MATT DISANDRO: And the climate community is pretty darn worried about near-term spikes in CO2. IPCC warns that carbon emissions need to be curbed by at least 43% by 2030 to avoid catastrophic climate change.

MARY BOOTH: The best time to have started reducing emissions was 50 years ago. The next best time is now, right?

ELIZABETH PUTFARK: Matt and I both came across several studies that emphasize this point, that the key problem with the near-term spike is the timing. If we were talking about this 20 years ago, maybe it would be different. But now we're in what climate scholars call this critical period, when the near-term really matters. And that's why BECCS aren't really a satisfactory solution either.

MARY BOOTH: We need to take carbon that's in the atmosphere now out of the atmosphere. And basically, right now, the only way to do that that's really viable is with trees. We don't have technological solutions that exist. And certainly not at scale.

MATT DISANDRO: OK. But then, why does the RED continue to classify wood pellets as a zero-carbon energy source?

ELIZABETH PUTFARK: Well, it has less to do with science, and more to do with bookkeeping.

MARY BOOTH: The biomass burning and other kinds of harvesting you of forests is counted as affecting the land sector's carbon uptake, basically. It's reported as more or less, depending on how much harvesting is happening. And because that's already that emission, that flux of carbon from the land sector has already been counted in the land sector, it's treated as zero-emissions for the purposes of counting in the energy sector to avoid double counting.

That convention of bookkeeping and counting the carbon in one part of the books was translated into kind of a assumption that bioenergy actually has zero-emissions in the energy sector.

MATT DISANDRO: Oh, so it's not that nothing is getting counted. It's just that the counting has already stopped when the wood actually burns.

ELIZABETH PUTFARK: Exactly.

MATT DISANDRO: Well, that seems odd.

ELIZABETH PUTFARK: Yeah. Even Professor Abt is not convinced.

BOB ABT: The CO2 that we emit into the atmosphere is being put back in the atmosphere, but was at one time withdrawn. And now that's not a carbon neutral story, right, because there's diesel logging equipment, there's diesel trucks hauling it, there's factories being built. So from a simple stack perspective, what's going out of the stack is carbon that was once in the atmosphere.

And so that's when you get into a question of, how good is this? Well, it depends on how fast the trees grow. It depends on what would happen to the trees if you didn't harvest them for fuel. For example, if the tree was going to stay there. This is easier to tell as a public land story. But if the tree was going to stay there for hundreds of years. If we harvested it at 20 and burned it right then, you've foregone a lot of sequestration.

MATT DISANDRO: But wait, we're talking about whole trees now. Shouldn't we be talking about refuse, tree tops, and branches, and diseased trees, all that stuff that gets left behind from logging? That's just going to get burned or decompose and release its CO2 anyway, right?

ELIZABETH PUTFARK: Well, that would be different. But there's a lot of evidence that shows that, in practice, it's just not what's being used. I spoke with Heather Hillaker Hillaker the Southern Environmental Law Center. She's done research on wood pellet sourcing in the Southeast.

HEATHER HILLAKER: The Southern Environmental Law Center has been involved in the woody biomass issue for, I would say, at least 10 years or so. And it started with some of the initial claims of the industry being carbon-neutral, and in particular, when Enviva, which is the world's largest manufacturer of wood pellets, they started building some of their first facilities in North Carolina, which is really the heart of SELC's region.

And when these wood pellet mills first got constructed, of course, they claim of Enviva. In the industry was that they were going to use wastes and residues, and that this was a green and clean and carbon-neutral source of energy. But we quickly started getting reports from partners about clear-cutting of some of the most biodiverse and ecologically sensitive hardwood forests in our region around these pellet mills.

MATT DISANDRO: Connecting those clear cuts to wood pellet mills is tricky, though. In large part, because tracing each pellet back to its roots is a pretty tough chore.

HEATHER HILLAKER: The overwhelming majority of forests in the Southeast United States are privately owned. And the wood pellet industry and Enviva, in particular, they purchase their wood from thousands of individual landowners. And so to get down to a parcel by parcel, forest by forest tract analysis is near impossible. We don't have information about every single forest property that has been harvested for Enviva or other wood pellet mills.

And so to be able to get down to that level of analysis is nearly impossible, because we don't have-- we're not privy to some of the information that Enviva has, obviously, about who they are contracting with to purchase these materials. So what we are left with are kind of these anecdotal pieces of evidence.

MATT DISANDRO: So the SELC had to get creative.

ELIZABETH PUTFARK: In 2021, they commissioned a report from researchers at Clark University. The goal was to use satellite imagery from the past 10 years to figure out exactly what wood was coming from where. They focused on the sourcing areas around three pellet mills, two in North Carolina and one in Virginia.

HEATHER HILLAKER: What we found was that hardwood forest harvesting actually increased in the area around these three mills after Enviva's mills started operating.

ELIZABETH PUTFARK: SELC's geospatial team followed up that study by doing additional research using the US Forest Service timber products output data set, or TPO data.

HEATHER HILLAKER: The results of that study confirmed what we saw from the satellite images, which was the amount of materials being harvested for this category. Bioenergy and fuel would, increase dramatically after Enviva's pellet mill started operating, which makes sense. Because that's what the category of wood is for.

But one of the key findings of looking at that research was actually the type of wood being used for Enviva's pellet mills, or being used for this bioenergy and fuel wood category. And what they found was that the overwhelming majority, 84%, of the hardwood material being used for bioenergy and fuel wood came from larger diameter whole trees that could otherwise be used for sawtimber, not the waste and residues that Enviva and the industry claims as being used.

MATT DISANDRO: Wow, 84%?

ELIZABETH PUTFARK: Yeah. And this problem doesn't seem to be restricted to Southern forests. It goes to European forests, as well. Here's Louise, again, with Politico.

LOUISE GUILLOT: The EU is also the largest producer of wood pellets in the world, followed by the United States and Canada. Sourcing biomass in the EU is intimately regulated through the Renewable Energy Directive, which states that biomass has to be harvested following sustainable forest management practices.

That means, in practice, that foresters should maintain the forest biodiversity, productivity, and regeneration capacity, so that, in simple terms, that you need to replant the trees that you harvest, so that your forest is regenerated over the long term And that can-- and then you can keep using the biomass that it produces, basically.

But, of course, we also have seen reports in the last years of illegal wood cuts happening, notably in natural protected areas, like in Romania, for instance, or in Poland in the past. In Romania, media reports have shown that illegally cut trees or allegedly used to produce wood pellets.

MATT DISANDRO: As we mentioned earlier, the New RED amendments are trying to fix some of this by putting restrictions on sourcing. But if you ask Bob, the sourcing of whole trees may be a feature, not a bug.

BOB ABT: It doesn't take much math to point out that you can't really build much of an energy sector off of picking up the scraps.

ELIZABETH PUTFARK: These reports also cast some doubt on whether the historic stability in forest cover with only the market regulating it is really an adequate answer to forest sustainability questions now, in the face of increased demand for pellets.

HEATHER HILLAKER: We also found that from 2011 to 2016, which is the time period after Enviva's Mills started operating, that hardwood forest harvesting actually exceeded growth. Resulting in a net loss of hardwood forest cover in the area. And this was a key finding, because one of the main claims of the industry is that growth exceeds harvest.

But what they're looking at is a very big picture, very zoomed-out focus of harvesting in the South, or harvesting in the United States writ large. And what this did was really narrowed in the focus and said, OK, let's look at the actual sourcing area for specific pellet mills and what is the impact there.

MATT DISANDRO: It turns out, the local impacts of the wood pellet industry have raised concerns about way more than just carbon sinks. In large part, because of where they tend to get cited.

HEATHER HILLAKER: Community impacts and what is happening from the wood pellet industry to the communities that are living right next to these pellet mills. And unfortunately, what we see in the southeastern United States as that wood pellet mills are 50% more likely to be included-- constructed in what is considered an environmental justice community.

ELIZABETH PUTFARK: An environmental justice community generally refers to any low-income community or community of color. These communities have historically hosted a disproportionate share of high-polluting industries and waste sites in the US, and still do today. And wood pellet manufacturers, well, they tend to be that kind of neighbor.

HEATHER HILLAKER: We see a lot of very harmful impacts that are coming from the wood pellet manufacturing. So wood pellet mills are industrial sources of pollution, they emit large levels of several different harmful pollutants, such as volatile organic compounds, which create smog and ground-level ozone, hazardous air pollutants, some of which are carcinogenic or likely carcinogenic, and fine particulate matter, PM 2.5, that has some very severe respiratory impacts to communities.

And not only that, you have the impacts from just the dust, the noise, and the traffic from these wood pellet mills on the nearby communities. I've spoken with several communities that live next to wood pellet mills, and their top two complaints are often dust. The fine dust particles from the wood processing that float onto their houses and their cars and make it hard for them to breathe. And the noise. In one case, they said unbearable noise on all hours of the day and night that prevent them from being able to get a good night's rest.

MATT DISANDRO: The SELC joined with the Environmental Integrity Project to represent Clean Air North Carolina in a lawsuit against Enviva's Hamlet, North Carolina facility.

HEATHER HILLAKER: In that particular permit appeal in North Carolina for the Enviva Hamlet facility, that actually resulted in a settlement agreement between Clean Air North Carolina, Enviva, and the State Department of Environmental Quality, whereby and Viva agreed to install additional pollution control technologies that would reduce its emissions of some of these harmful pollutants by at least 95%.

ELIZABETH PUTFARK: As a result of that suit, all Enviva's new plants have to install the same technology. That's a pretty big win.

MATT DISANDRO: But there's still seems to be a tension between these negative impacts and the fact that the wood pellet industry brings jobs and tax revenue to rural communities, right?

ELIZABETH PUTFARK: True, but then again, all the sourcing happens within a 75-mile radius of the mills, which means these communities are losing their trees at a high rate, too.

MATT DISANDRO: But it seems like those local landowners would benefit then, and they'd have a pretty strong incentive to keep their land and trees instead of converting it to some other use.

ELIZABETH PUTFARK: That's the argument industry always points to. Heather is not convinced.

HEATHER HILLAKER: I often think of this, actually, as like the Walmart argument, that without the pellet demand, these forests would be converted to a Walmart or some other store or parking lot, or apartment buildings. And I don't think that has borne out, at least, in the evidence that I have seen. In particular, in the area in Eastern North Carolina, where a lot of Enviva's wood pellet harvesting has historically been, that's not the reality. These forests aren't being threatened with those types of conversions.

ELIZABETH PUTFARK: And if wood pellets aren't increasing forest cover, or at the very least maintaining it. That spells really bad news for climate change.

HEATHER HILLAKER: I always want to say we have 10 years to drastically reduce our emissions. And then I remember that the report that said 10 years was like four or five years ago. So we are in a very short time period right now to drastically reduce our emissions while also increasing significantly our natural carbon sinks, including our forests. And the entire wood pellet supply chain is bad for the climate.

So you've got the forest harvesting, which is having these carbon emissions from forest harvesting in and of itself. You've got the foregone sequestration, which means the emissions, the carbon emissions that would have been sequestered in those forests have they been left standing and left to continue sequestering emissions.

Then you've got the actual wood pellet manufacturing process and transport, both to the pellet mill and to the ultimate utility that's going to burn them. You've got those processing and transport emissions, in terms of carbon emissions and GHG emissions. And then you actually have the wood pellet combustion itself. And burning wood pellets for energy actually increases carbon pollution in the short term over coal. And so when you're looking at this through the lens of climate change and carbon reductions, it just doesn't make sense.

[MUSIC PLAYING]

MIKE LIVERMORE: Yeah, at this point, it sounds like wood pellets are, like many other issues, complicated, multifaceted, lots of different things going on here. On the one hand, it's just a fact that we need to get off of fossil fuels. And wood pellets provide us with a readily available, arguably carbon neutral, or even, potentially in the future, carbon negative source of energy. It's relatively cheap. And it's plentiful, it's available.

And especially in places like Europe that are facing an extreme immediate energy crisis, it's not a big surprise that they're reaching for sources of energy like wood pellets. But on the other hand, there's local environmental consequences. There's a real worry about ancient forests and old growth forests that are going to be subject to this use.

Mechanisms to make sure that only scrap wood or low-quality forests, whatever that means are being used, they're going to have holes in them. And, of course, there's just questions about whether how, ultimately, how carbon neutral or how environmentally sound this practice really is.

So, I guess, actually, you two are in as good a position as anybody to come down with a verdict on this. So what do you think? When you do the cost-benefit analysis, and consider whether all the pros and cons of this practice, is this actually a good thing? Or is it something that we should be really moving away from altogether?

MATT DISANDRO: So I'm not quite sure where I land on the issue. But I do still think that wood pellets have a lot of promise. Despite wood pellet's deficiencies, their benefits relative to coal and their ability to bring jobs into region suggests that maybe wood pellets are a necessary evil, or a sort of bridge to better technology in the future.

MIKE LIVERMORE: And so, Elizabeth, what do you think?

ELIZABETH PUTFARK: Well, I'm still less convinced. I think it sounds great in theory, but in practice, it seems like we've got kind of three big factors working against it. The biggest of which is just the timing. I mean, it's hyperbolic to ever say that there's like a worse time. Probably, this is the worst time to spike emissions. But it seems like a really bad time to spike emissions. Which is what it seems to suggest-- or what evidence seems to suggest does happen when you swap wood for coal.

Kind of like you mentioned, sourcing, evidence just shows that it's not just refuse right now. And there's not a lot of protection out there to make it refuse in the future. So it seems like the kind of sourcing that we see now is likely to continue. And maybe those two things, we could get around, just with the idea that we got to get off of coal, and we need a new energy source.

But it's drawing from the same bucket of subsidies that wind and solar and geothermal, maybe nuclear. It's the same pot of renewable energy spending. And that's just going to get more expensive if you add BECCS. So I'm not sure if any of those factors are ultimately dispositive for me. But combined, I think it seems like bad news.

MIKE LIVERMORE: So now that you guys have done this really quite extensive amount of research on this issue. I just think a little bit maybe we can zoom out a little more broadly about environmental issues, in general, or addressing climate change. I mean, are there any lessons here for other technologies? Or just for policy design, how we think about addressing environmental issues?

I always try to-- is there a broader lesson? Or is this just a story of one technology? And the lesson is, you have to look at the details every single time. I mean, that's also worthwhile. But I'm just curious about your thoughts on-- yeah, what you learned more generally about how we approach environmental issues. Or-- and specifically, maybe the issue of transitioning away from fossil fuels to cleaner sources of energy.

ELIZABETH PUTFARK: Well, I know for me, it made me a little bit more skeptical of carrots versus sticks. Just in the way that this is an industry that has boomed largely based on government subsidization. And that's great if it turns out to be a really renewable, good source of fuel. But that kind of juicing that market.

It seems like that's part of what's led to finding old growth being cut down in Romania, and losing more hardwoods here in Virginia. So it has made me just, I guess, think twice a little bit more about it being a great idea whenever we use the old phrase, pick winners and losers. So yeah, that's been an interesting takeaway.

MIKE LIVERMORE: Yeah, how about you, Matt?

MATT DISANDRO: Yeah, I think that this project underscored the fact that, especially with environmental issues, there are not going to be clear answers. And Professor Abt really spoke to the fact that there really is no right or wrong answers, there are just winners and losers and trade-offs.

And even if we do decide that wood pellets are worth it and better than coal. Whether that actually increases the carbon stock still depends on a lot of factors, such as whether you're pulling from-- pulling hardwood out or pulling pine from plantation.

So I think it's important when we approach these issues to be mindful of that and to be willing to balance all those factors, instead of just jumping to one side of the issue.

MIKE LIVERMORE: Great. Well, thanks so much for joining me today and for all the work that you put into this episode. I think it's a really special version of the podcast. And I appreciate all the work that went into it.

ELIZABETH PUTFARK: Yeah, thanks so much, Professor Livermore.

MATT DISANDRO: Thank you.

[MUSIC PLAYING]