



FUTURE ON FIRE

HOW THE EU BURNS TREES IN THE NAME OF RENEWABLE ENERGY

Future on Fire:
How the EU Burns Trees in the Name of Renewable Energy

Luke Chamberlain
Céline Grommerch
Mary S. Booth

With help from Forest Defenders around the EU

April 5, 2022

**FOREST
DEFENDERS
ALLIANCE**

TABLES OF CONTENTS

Executive summary.....	2
Background.....	4
What kinds of forest wood are burned for energy?.....	5
How we did the report.....	8
What we found.....	9
Facilities notable for use of large stemwood.....	9
Facilities notable for claims about feedstock.....	9
Notable claims about GHG impacts.....	10
Conclusions.....	10
Use of stemwood for pellets imported into the EU.....	12
Countries:	
Austria.....	13
Belgium.....	17
Bulgaria.....	19
Croatia.....	21
Denmark.....	22
Estonia.....	23
Finland.....	25
France.....	27
Germany.....	32
Greece.....	35
Hungary.....	36
Italy.....	38
Latvia.....	41
Lithuania.....	43
The Netherlands.....	45
Portugal.....	47
Romania.....	49
Slovakia.....	50
Spain.....	51
Sweden.....	52

Executive summary

Burning trees for renewable energy is increasingly controversial due to its climate and ecosystem impacts. We investigated the use of tree trunks (“stemwood”) by several wood-burning power plants and wood pellet manufacturing plants in the EU using satellite imagery and photos on the ground. Despite claims by some facilities that they use sawdust and other mill waste for fuel and feedstock, the evidence suggests they are also using trees logged directly from forests, which scientists warn increases greenhouse gas emissions and damages forests.

European Commission science concludes that harvesting and burning both stemwood and coarse woody debris (chunks of wood left over after logging) increases net greenhouse gas emissions compared to fossil fuels for decades to centuries, because burning wood emits more CO₂ per unit energy than burning fossil fuels, and offsetting these emissions through forest regrowth occurs slowly. Scientists warn that industrial logging also poses high risks for biodiversity, ecosystem function and the ability of forests to regenerate, making use of stemwood and coarse woody debris a “lose-lose” scenario for both forests and the climate.

EU policy now includes new climate and nature goals that depend on forest protection and restoration. Some policymakers, including Vice President of the European Commission Frans Timmermans, have expressed dismay at the idea of trees being burned for energy. However, despite such statements, there appears to be an unrealistic perception that logging residues can meet the EU’s exploding demand for wood fuel. The goal of the report is to provide a snapshot of a small slice of the EU’s enormous biomass industry, to illustrate its current dependence on burning trees for fuel, and the necessity of excluding forest wood from the EU’s climate policies in order to reverse forest degradation and decline in the forest carbon sink.

Of the 43 facilities the report examined across several EU member states, 21 are power or CHP facilities, 16 are pellet plants, 5 produce both power and pellets, and one is a wood chip producer. Most appear to be using significant amounts of stemwood, including what appear to be very old trees from natural forests. Several plants built in recent years are already using large logs.

We compared evidence of stemwood use with statements on company websites concerning wood use, finding that about a quarter of the companies make misleading claims, usually that they use sawdust and other mill residues, with no mention of stemwood. Mill residues are often perceived as a more benign type of fuel than logs, although this material could in many cases be used for longer-lived wood products, rather than being burned for energy.

Despite unequivocal statements by the Intergovernmental Panel on Climate Change and leading scientists that forest biomass should not be assumed to be “carbon neutral” or beneficial to the climate, we found that more than half the companies make misleading claims of this nature, in direct contradiction of accepted science. The claims often rise to a level that seemingly should trigger scrutiny under the EU’s consumer protection laws.

The investigation is timely because EU policymakers are considering proposed reforms to biomass provisions in the EU’s Renewable Energy Directive, and also because the biomass industry and policymaker allies see an opportunity in the Ukraine crisis to promote increased wood-burning as a way to replace Russian fossil fuel imports. However, the EU is already overwhelmingly dependent on burning wood and other types of biomass to meet renewable energy targets, with biomass energy inputs about five times greater than the next most important technology, wind power. The EU’s dependence on bioenergy costs EU citizens about €17 billion per year, which is paid as subsidies to the biomass industry.

At more than 405 million tonnes of CO₂ emissions per year, all counted under EU renewable energy policies as “zero”, bioenergy emits about as much carbon pollution each year as the entire reported emissions of Poland or Italy. Wood sourced directly from forests is the largest source of fuel, and about half the wood harvested in the EU is burned for energy. The EU also increasingly imports wood pellets and chips from the US, Canada, Russia, and the global South, where massive wood pellet facilities stand accused of logging natural forests.

Policymakers are under tremendous pressure to find alternatives to Russian fossil fuel imports. However, no good will come of doubling down on damaging policies. There are hundreds more facilities in the EU like the ones examined in this investigation, all imposing daily demand for trees and other wood. Current levels of logging are already degrading the EU’s forest carbon sink and destroying natural ecosystems, yet replacing just 10% of the fossil fuels the EU imports from Russia would require burning about 60% more wood. Given the current use of stemwood, it is highly unlikely that mill residues or forestry residues can meet emerging demand, and in any case these materials also entail climate and environmental costs. Increased biomass demand will require logging more trees – something the EU’s natural systems, and climate future, cannot afford.

Background

The invasion of Ukraine has precipitated an important discussion about the EU's dependence on fossil fuels, particularly fossil fuels from Russia. Putting aside the obvious humanitarian crisis of the war, accelerating the EU's transition to renewable energy could be another response to this tragic development.

However, this outcome won't help anything – not people, climate, or ecosystems – if it includes burning more biomass for renewable energy, because this will only undermine the EU's attempts to reduce air pollution and greenhouse gas emissions, and to restore forests and other ecosystems.

The EU is already overwhelmingly dependent on burning biomass to meet renewable energy goals (Figure 1). Wood sourced directly from forests (“forest biomass”) is already about 51% of the wood burned in the EU, making forests the largest source of biomass overall.¹ EU citizens are paying for their bioenergy habit – around €17 billion per year in publicly funded subsidies,² plus avoided carbon trading fees worth billions more.

Allocating land to growing energy crops for biofuels when Europe's food supply will obviously be impacted by the Ukraine crisis seems more foolhardy than ever. But increasing biomass use poses a special threat to forests, because much of the infrastructure to burn more wood already exists, and the biomass industry and its policymaker allies are agitating to burn even more wood. In any case, use of wood for home heating is likely to increase as energy prices go up.

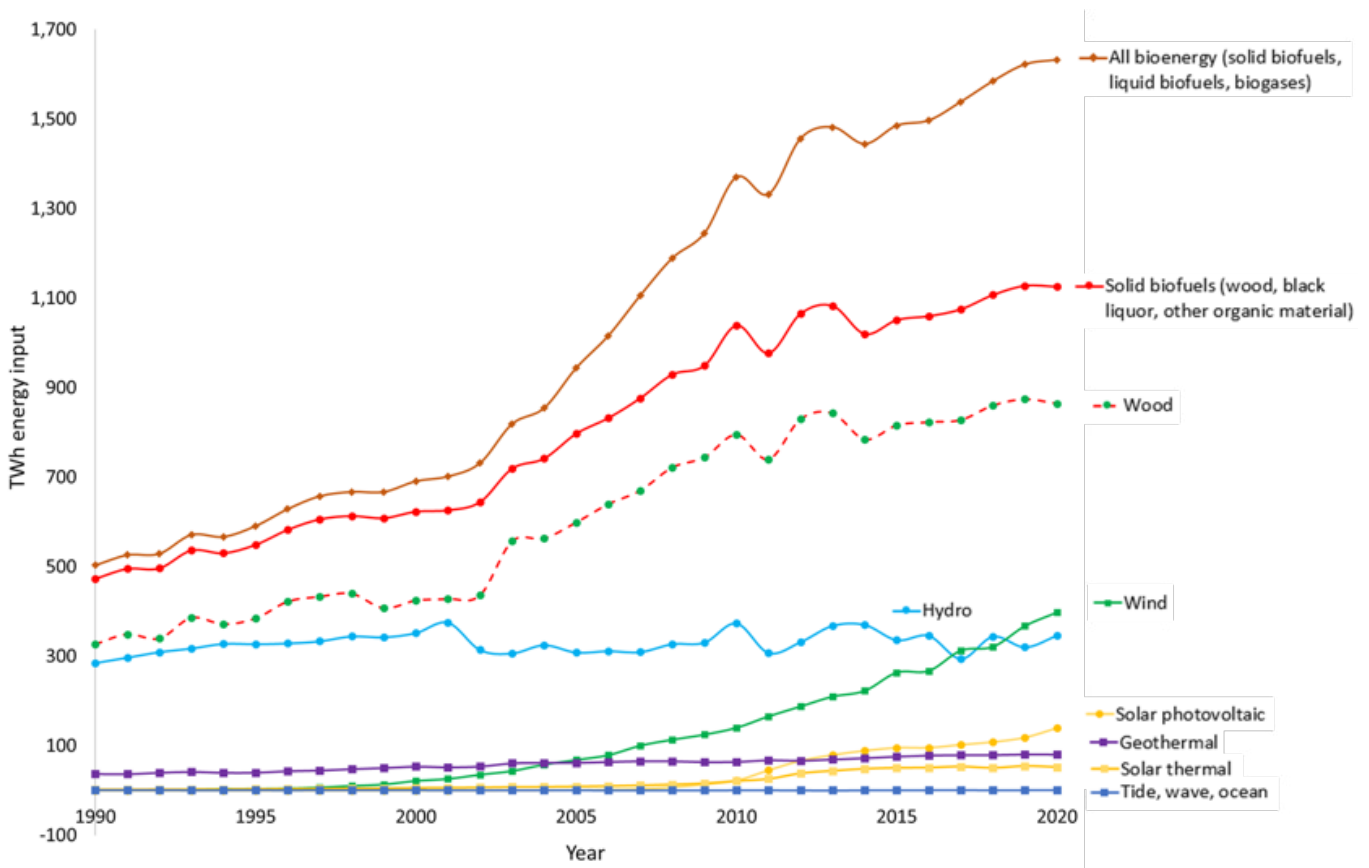


Figure 1. Growth since 1990 in renewable energy by technology and fuel.³ The EU counts energy input toward renewable energy targets, thus actual useful energy yield from bioenergy is much lower.

Biomass as renewable energy isn't just expensive – it also has extraordinarily high greenhouse gas emissions. As of 2019, CO₂ emissions from “solid biofuels” (wood, black liquor, and other organic material) were around 405 million tonnes per year, though chronic underreporting of actual wood use by official statistics⁴ means the actual total is somewhat higher. This is in the same range as total reported emissions from Poland or Italy.⁵ Emissions from burning wood, only, were around 311 million tonnes per year (similar to total emissions from Spain); again, the actual total is somewhat higher.

Despite these massive emissions, burning trees and other biomass is assumed to have “zero” greenhouse gas emissions by the EU's renewable energy policy – an assumption that even its own proponents cannot coherently explain.⁶

The physical reality is that burning wood emits more CO₂ per unit energy than burning fossil fuels, and logging and burning forest biomass emits CO₂ faster than trees can regrow to absorb it. The result, as recognised by the European Commission's own scientists, is that logging and burning forests for fuel increases net greenhouse gas emissions compared to fossil fuels for decades to centuries, while degrading forest ecosystem function. Adding to the damage, residential wood burning (all of which is counted toward the EU's renewable energy targets) is the largest source of fine particulate matter in the EU, a pollutant that currently kills more than 1,000 people per day.⁷

What kinds of forest wood are burned for energy?

Forest biomass refers to all kinds of wood from trees: tree trunks (often called “stemwood” or “logs”), tops and branches, stumps, and even roots. Residential heating constitutes more than half of the demand for forest biomass in the form of logs and increasingly as wood pellets. Many power plants burn green or partially dried wood chips sourced from stemwood and forestry residues (mostly tree tops and limbs, but in practice often including stemwood, stumps and roots). An increasing portion of wood burned in power plants is in the form of wood pellets. In general, the wood pellet industry prefers clean, dry, debarked stemwood as feedstock, rather than forestry residues, which have a higher bark-to-wood ratio and can be quite dirty. The pellet industry's dependence on stemwood is illustrated by the annual report for the UK's Drax plant, which states that less than 3% of the more than 7 million tonnes of wood pellets burned in 2020 was from “branches and tops,” while about 52% came from stemwood and 43% came from sawmill residues. Drax imports wood pellets from the US, Canada, Latvia, Portugal, Brazil, Belarus, Russia, Estonia, Lithuania, and other European countries, sourcing less than 1% of its fuel domestically.

There have been some attempts to address these problems in policy. The 2018 Renewable Energy Directive (REDII) for the first time included “sustainability” criteria for forest biomass, although these retained the zero carbon status of biomass without addressing the fundamental problem that burning wood emits carbon faster than trees can regrow.⁸ In 2021 the European Commission proposed mostly minor changes to the REDII criteria that again, do not address the fundamental issue of greenhouse gas emissions⁹ and fall far short of what was called for by the 2020 Biodiversity Strategy, which states that in order to mitigate environmental risks:

“The use of whole trees and food and feed crops for energy production – whether produced in the EU or imported – should be minimised”.¹⁰

But it is not just burning “whole trees” or tree trunks that is problematic. In fact the Joint Research Centre (JRC) has identified the majority of forest biomass now burned in the EU – both coarse woody debris and stemwood – as harmful to ecosystems and the climate.

Regarding climate impacts, burning any wood generally emits as much or more CO₂ per unit energy at the smokestack as burning fossil fuels, thus for this fuel to actually have “zero” impact on atmospheric CO₂ requires those emissions to be offset quickly. However, forests regrow slowly, meaning that net emissions from most forest biomass – i.e., CO₂ emissions from logging and burning the wood, minus CO₂ uptake from regrowing the trees – do not decrease fast enough to help the EU achieve its 2030 and 2050 emission reduction targets.¹¹ As the Intergovernmental Panel on Climate Change notes in an explainer on carbon accounting, “*IPCC Guidelines do not automatically consider or assume biomass used for energy as ‘carbon neutral,’ even in cases where the biomass is thought to be produced sustainably.*”¹² Notably, the European Commission’s 2016 impact assessment on forest biomass concluded that not only is an increase in CO₂ emissions compared to fossil fuels “almost inevitable,” but that the period of increased emissions could last hundreds of years or “even to infinity.”¹³

The longest-lasting climate impacts arise from logging and burning trees from natural forests that could instead continue growing and taking up CO₂ from the atmosphere. But even burning forestry residues, including “coarse woody debris” – which includes the chunkier wood waste left over after logging – can increase net CO₂ emissions over fossil fuels for decades to centuries.¹⁴ This is in part because biomass logging degrades the forest’s ability to take up atmospheric CO₂ and store it as carbon in trees in soils. Given that more than half the wood harvested in the EU is burned for energy, biomass logging is strongly implicated in the ongoing decline of the EU’s forest carbon sink. Indeed, satellite imaging shows a recent increase in clearcutting and a decline in forest density in the EU, trends connected to intensive harvesting for biomass fuel.¹⁵ These trends must be reversed for the EU to achieve its climate target of “carbon neutrality” by 2050.¹⁶

Biomass logging impacts go far beyond the climate, however. Following a comprehensive survey of the scientific literature, a 2021 report by the JRC concluded that harvesting and burning coarse woody debris is a “lose-lose” scenario not only because it increases emissions compared to fossil fuels, but also because of the damage it does to forest ecosystems.¹⁷ Overall, logging for biomass is more damaging than traditional logging because lucrative renewable energy subsidies make even previously “low value” trees worth harvesting, thus rendering both clearcutting and intensive residue collection more economic.¹⁸ Clearcuts obviously obliterate forests, but removing forestry residues even on partially logged sites eliminates habitat for animals; reduces diversity of plants, animals, and fungi; reduces soil fertility and carbon;¹⁹ and degrades the ability of forests to regrow.²⁰

Given these impacts, and increasing recognition and outrage by civil society about the forest destruction being perpetrated in the name of saving the climate,²¹ it is not surprising that the biomass and pellet industries are increasingly cagey about what types of wood they actually use, and increasingly make misleading statements about the climate and environmental “benefits” of bioenergy. There is hardly a biomass-related company or trade group that doesn’t make extraordinary claims on their website. Some examples include:

Bioenergy Europe (EU based bioenergy non-profit industry association) “*Bioenergy is carbon neutral: Europe needs this renewable energy source to fight climate change and reduce emissions.*”²²

The Austrian Pellets Association, ProPellets “*Eco-friendly: Since wood absorbs the same quantity of CO₂ from the atmosphere whilst growing as is emitted during combustion, wood fuels do not contribute to the concentration of carbon dioxide in the atmosphere. In Austria wood pellets are produced from sawdust and wood shavings.*”²³ (The managing director of ProPellets, Christian Rakos, is also President of the World Bioenergy Association).

European Pellet Council “Wood pellets burn in a CO₂ beneficial manner, meaning they only emit nearly the same amount of CO₂ that had been taken out of the atmosphere while the trees were growing. Wood pellets thus counteract the greenhouse effect and make a valuable contribution to preserving the environment”²⁴

Website for European Pellet Conference “As a CO₂-neutral fuel, sustainable bioenergy is a key pillar for decarbonisation. In 2022, the European Pellet Conference – the largest annual pellet event worldwide – shows how firing up pellet markets can boost the energy transition and how to position pellets as an important climate solution!”²⁵

Such statements are so consistently misleading, it would be surprising if they do not violate European consumer protection laws.²⁶ Meanwhile, the blizzard of biomass industry propaganda has given policy-makers plenty of cover for conflicting and confused statements that sometimes suggest they believe that forestry residues can meet the EU’s exploding demand for biomass. There is likely no more high-profile example of this than that of Frans Timmermans, Vice President of the European Commission, who when recently challenged on the continued inclusion of forest wood as zero-carbon fuel in the EU’s renewable energy policies, stated ²⁷ (in translation):

“We’re not going to stop (using biomass). We will make sure that entire forests are not cut down and then thrown into small pieces here in the combustion. We have to. You do have a point there. For countries that have a hard time pretending that they were all supplying small pieces of wood when they first cut down entire forests. We have to do something about that.”

As promising as that statement was, the next one suggested he has little idea of the magnitude of the EU’s dependence on burning wood:

“If you use what falls from the trees in forest that you to have to remove anyway, then that’s no problem, then that’s profit.”

Timmerman’s Head of Cabinet, Diederik Samsom, has made similar statements that combine a passionate opposition to burning trees, combined with a lack of appreciation for the number of trees already being burned:

“It is a deadly sin to throw a complete tree in the furnace... You are talking about complete trees in a power plant and we are going to stop doing that. Of course, we are going to stop doing that. We needed to stop already.” But also:

“You can collect dead wood, you can collect those elements of the forests that are no longer alive, fallen down, etc. That constitutes a serious amount of biomass. There is also debris used in wood used in construction... As long as your definition is sustainable, then I think we can work with biomass. But I do admit it’s quite complicated to get this right.”²⁸

Critically, despite these protestations, nothing in the 2018 RED or the European Commission’s July 2021 proposed changes to the biomass criteria would stop or even meaningfully slow exploitation of forests for fuel.²⁹ This is by design. The various sustainability criteria and other minor restrictions on facilities burning forest biomass are mostly ineffectual, but beyond that, they do not apply to residential heating (the major use of forest wood) and they do not apply at existing power plants.³⁰ Thus, the vast majority of biomass use can continue untroubled by regulation even if the biomass criteria are strengthened. Meanwhile, EU citizens are expected to take seriously proposals such as one to plant 3 billion trees³¹ – even as the EU continues to pay out tens of billions in subsidies for logging and burning trees.

As there are no credible policy proposals that prioritise restoring and protecting forests over burning them for energy, the biomass industry push to burn more wood as a way to curtail use of Russian fossil fuels is a real decision moment for European policymakers. As devastatingly tragic as the situation in Ukraine is, it will not help Ukrainians if policymakers fall under the sway of biomass industry arguments. The proposal is not even practical. Although more than half of harvested wood is already burned for energy, forest biomass covers just 3% of the EU's energy needs. Replacing just 10% of even the fossil fuels imported from Russia³² would require increasing wood burning by about 60%. Given the accelerating degradation of forests and loss in the forest carbon sink under current levels of logging, any meaningful increase will fatally undermine the EU's ability to reduce emissions and restore nature.

Given that the European Commission has largely ignored the recommendations of its own scientists regarding the inadvisability of logging and burning trees to address climate change, we wonder what it will take for policymakers to recognise that while the biomass industry is already doing immense damage, it is just getting started. Nonetheless, given obvious concern by certain policymakers about forest impacts, we produced this report in an attempt to shine a light on actual EU biomass and pellet industry practices, including the types of wood they are now using—trees—versus what they claim to be using, and how they misleadingly claim climate benefits from logging and burning forest wood. There is still time for EU policymakers to reverse their disastrous policy of counting forest biomass toward renewable energy targets, and to recover and reallocate some of the approximately €17 billion in biomass subsidies per year that prop up this destructive, polluting industry.

How we did the report

The EU has hundreds of pellet manufacturing plants and energy plants utilising forest biomass for heat, power, or both (combined heat and power facilities, “CHP”). We surveyed multiple plants at locations identified on a map created by the Environmental Paper Network,³³ ultimately selecting a group of facilities where we were able to pinpoint the facility location and we were able to obtain some kind of detailed image of the feedstock storage area (we used images from Google Maps/Earth satellite view, the Google Street-view function, images and videos from company websites, and on-site photographs). We ultimately featured images from 42 facilities where we saw evidence of use of stemwood, and one new facility where questions remain about fuel use. Where possible, we examined websites from the companies that own these plants, and included statements in the report from websites that refer to the types of wood used at the facility and the climate and other environmental impacts of woody biomass.

This report does not attempt to provide an objective sampling of biomass and pellet plants, or to provide any analysis of what proportion of EU plants use stemwood versus other types of wood. It is intended to simply highlight some examples of what using wood for energy in the EU looks like, and the claims that some companies make. We chose to exclude facilities from the report for various reasons. Some sites showed piles of chips or sawdust for which the source could be either mill residues or forest wood that was chipped elsewhere. Some clearly showed stemwood but the images showed large areas of their feedstock site as being empty, or the resolution of the image was too low. Some were co-located with a sawmill where logs and processed wood piles (chips or sawdust) could be seen, but it was impossible to determine whether the stemwood was being used by the biomass or pellet facility. Some were located at a facility where the feedstock is delivered by ship, and while ships generally deliver pellets or chips that may be derived from stemwood, it was not possible to determine the actual source. Importantly, we acknowledge that we can not know if the imagery depicts exactly what is burned for energy or used to make pellets at each facility – we can only assess what wood was piled at the site at the time the image was acquired.

What we found

The report focuses on plants that appear to use stemwood for biomass fuel or pellet feedstock. It features 21 power plants that are electricity-only or combined heat and power, 16 pellet mills, 5 facilities that produce both power and pellets and one wood chip producer. Nine of these facilities are co-located close to a sawmill but the evidence suggests that they also use stemwood as feedstock. One of the facilities (Alholmens Kraft, Finland) is co-located with a pulp mill, but the website and photographs suggest that it also sources directly from forests.

We found evidence of the growth of the biomass industry, identifying “before/after” images for several plants constructed in recent years in Bulgaria (page 19), Croatia (page 21), France (pages 28 and 29), and Latvia (page 41). Whether or not they are also using mill residues or chipped forestry residues, these new plants clearly have stemwood piled on site. In some cases what we couldn’t see was just as interesting. In Italy, we found a enormous new biomass facility (page 40) that only recently began operations. Although images of stemwood could not be seen in the satellite imagery, the plant does not seem to be located anywhere near a sawmill of relative size to provide such large volumes of mill residues. We wonder from where it receives such large quantities of wood.

Facilities notable for use of large stemwood

There are several facilities featured in the report that are especially notable for their use of large stemwood. Examples are:

- *Wien Energie*, Wald-Biomassekraftwerk biomass power station, Vienna, Austria (page 14). This large combined heat and power plant, located on the outskirts of Vienna, utilises a holding yard where it chips stemwood into wood chips to be burned for electricity and heat. Rows and rows of large tree trunks of unknown origin can be seen stacked at the site.
- *Biosyl Pellet Plant*, Cosne sur Loire, France (page 27). In 2021, environmentalists from French NGO Canopée found large tree trunks, some up to 4 metres long and 90 cm wide, stacked in the yard. The plant operator said they didn’t know that hundred year old oak trees were located on site.
- *TeHo Biomass Plant*, Bardejov, Slovakia (page 50). In January, 2022, Slovakian environmentalists followed logging trucks from the forest to the TeHo biomass plant in eastern Slovakia. They were in the forest where the trees were being cut and confirmed with the logging contractors that the trucks were delivering the wood to the TeHo plant. The website of the company says the plant sources from “wood waste” but these photographs tell a different story.

Facilities notable for claims about feedstock

We viewed company websites and other materials for statements about the types of wood the industry used. We found 11 companies (about 25% of the total) that made statements concerning the type of wood used that did not align with what can be seen in the images. Examples are:

- *Scandbio Pellet plant*, Ulricehamn, Sweden (page 53). “Pellets are a form of wood fuel that we obtain from the plant kingdom by compressing waste products from the forestry and saw mill industries, such as shavings and different types of sawdust.”
- *Vapo Oy/Neova Pellet plant*, Ilomantsi, Finland (page 25). “Pellets are a Finnish, renewable and reliable fuel. We make pellets from wood processing by-products, sawdust and cutter chipping. Wood pellets are environmentally friendly and can replace the use of fossil fuels such as oil, natural gas and coal.” (Translated from company website).
- *ENEFIT Green Latvia* (page 42). “The production facility consumes natural energy resources – forest chips, sawdust and bark, as a result providing environmentally friendly energy for self-consumption and export in the form of pellets.”

Notable claims about GHG impacts

We also analysed company websites for statements about the climate impact of burning biomass. Even without doing an in-depth review of company materials, we found 25—more than half—made misleading statements on climate and environmental impacts of burning forest biomass that do not align with accepted science. Examples are:

- *Fernheizkraftwerk Linz-Mitte*, Linz, Austria (page 13). “The environmental benefit of using biomass as a fuel lies in its importance as a carbon neutral fuel. This means that the atmosphere is not additionally polluted with the greenhouse gas carbon dioxide. This makes a valuable contribution to reducing global warming.” (Translated from company website).
- *Schneider Pellets/ Axel Trade 2009 Ltd*, Samokov, Bulgaria (page 20). “Carbon emissions from combustion do not change the content of carbon dioxide (CO₂) in the atmosphere. They are environmentally friendly fuel, neutral in terms of CO₂, as they are extracted from renewable sources.”
- *Pinewells pellet plant*, Sarzedo, Portugal (page 48). “The company produces a type of bio fuel, which due to its characteristics, has no environmental impact, promoting reduction of CO₂ emissions. Furthermore, it promotes forest management by using products mostly coming from forest clean up and waste from the wood industry.” (Translated from company website).

While it was already clear that sustainability criteria of the REDII would not apply to most of the existing biomass industry, it is worth providing examples of how little regulation some facilities experience. Pellet manufacturers like Nevroko Alfa Pellets in Greece (page 35) and Laxå Pellets in Sweden (page 55) make bagged pellets for the commercial and residential markets. None of the sustainability criteria in the REDII apply to residential biomass users or small pellet burners – so these plants, with their massive piles of logs, would be untouched by even light regulations.

Conclusions

The images in this report provide clear evidence that far from mostly utilising mill residues or small branches left over from logging, the EU biomass and pellet industry, including at the newest plants, is plainly committed to using stemwood—just like infamous pellet producers in less regulated regions like the US, Canada, and Russia.

The European Commission’s own scientists, and other scientists around the world, have repeatedly warned that burning forest wood—“forestry residues” as well as stemwood—harms ecosystems and the climate. Yet despite crystal-clear science on this topic, based on common sense observations that burning wood emits carbon faster than forests can regrow, and that industrial logging destroys forest ecosystems, EU bioenergy policy has blundered on, allocating literally billions each year to an industry that is clearly undermining the EU’s climate and nature goals.

We already knew that the biomass and wood pellet industries utilise stemwood before we did the report, but we were still surprised at how shocking this looked up close—and also by the way that companies and biomass trade associations blatantly misrepresent climate benefits of burning forest wood, apparently on the assumption of complete impunity. But why shouldn’t they? They’ve had policymakers twisted around their finger for years, because the EU has allowed itself to become so dependent on burning wood to meet its renewable energy targets, it’s difficult to get policymakers to consider meaningful reform.

With the push to divorce from Russian fossil fuels, the situation for the EU’s forests, and forests in other regions that export pellets to the EU, could become even worse. But it will be another irony in a situa-

tion that can hardly get any crueler if the EU's eagerness to accelerate uptake of renewable energy results in destroying even more forests for false "zero carbon" energy.

Now that the EU has pledged to be climate neutral by 2050, policymakers are paying more attention to the urgency of protecting and restoring forests, but apparently not enough, because they continue to insist that the EU can meet its exploding demand for biomass with mill residues and light removal of forestry residues that won't harm ecosystems. This report shows how unrealistic that is.

For the sake of forests and the climate, it's time for the EU to remove forest biomass from the Renewable Energy Directive. We need to restore and protect forests – not burn them for fuel.

Use of stemwood for pellets imported into the EU

While this report focuses on biomass and pellet facilities in the EU, the EU's appetite for biomass has also driven explosive growth of wood pellet manufacturing in North America, Eastern Europe, and even the global South. Typically, this industry prefers regions with poor or weak forestry regulations. While some of the pellets exported to the EU are made from sawmill waste, as the industry has grown it has become increasingly common for these mega-export plants to use stemwood as feedstock. Some of these companies are especially notable for making misleading claims about climate and environmental benefits of wood pellets.



Enviva Pellet Plant, Northampton County, North Carolina, USA.
© Google, Commonwealth of Virginia, Maxar, USDA Farm Service Agency.
GPS: 36.502467, -77.613799

Enviva owns and operates multiple large pellet plants in the United States. The company uses both mill residues and trees directly logged from forests as pellet feedstock, including trees from hardwood wetland forests, some of the most biodiverse and carbon-rich ecosystems in the United States.³⁴ The company routinely makes misleading statements that portray its pellets as climate friendly.³⁵



Pinnacle (Drax) Pellet Plant, Burns Lake, British Columbia, Canada.
© FDA. GPS: 54.154087, -125.451447

Pinnacle Pellets owns several plants in BC; the company is now a subsidiary of Drax Group. While the Canadian pellet industry previously mostly utilised mill residues, it is now increasingly turning to use of stemwood for pellet feedstock, some of that sourced from Canada's old growth forests.³⁶ Drax's claims about carbon neutrality of burning forest wood for energy resulted in NGOs filing a complaint against the company at the OECD.³⁷

It is unknown if the Vyborgskaya Cellulose plant, which used to be Europe's largest, is still in operation; it was mentioned in pellet industry media communications in early 2022. The tragic war in Ukraine has recently put the spotlight on Russian exports. A recent analysis by Earthsight linked³⁹ links Russian oligarchs to wood exports to the EU, including pellets.



Vyborgskaya Cellulose pellet plant, Leningrad Oblast, Russia.
GPS: 60.5472053, 28.6727205. Still image from "Bioenergy: The Ugly Truth"³⁸

1. Fernheizkraftwerk Linz-Mitte

Facility type	Combined heat and power (hereafter “CHP”)
Address	Nebingerstraße 1, 4020 Linz, Austria
GPS	48.3004237, 14.326302
Website	www.linzag.at/portal/de/ueber_die_linzag/konzern/gesellschaften/linz_strom_gas_waerme_gmbh/energieerzeugung/biomassekraftwerk
Quote	<p>Der Umweltnutzen bei der Verwendung von Biomasse als Brennstoff liegt in seiner Bedeutung als CO₂-neutraler Brennstoff. Das heißt, dass die Atmosphäre nicht zusätzlich mit dem Treibhausgas Kohlendioxid belastet wird. Somit wird ein wertvoller Beitrag zur Verringerung der globalen Erwärmung geleistet. Source: company website.⁴⁰</p> <p>Translation: The environmental benefit of using biomass as a fuel lies in its importance as a carbon neutral fuel. This means that the atmosphere is not additionally polluted with the greenhouse gas carbon dioxide. This makes a valuable contribution to reducing global warming.</p>
Comment	Images show large piles of logs, including old hollowed trees and other material on site. Austria spends more money per capita on the burning of wood than any other EU country. Source: Trionomics. ⁴¹ Click here to see further video footage.



Biomass plant and log piles. Image © 2022 Google, GeoContent, Geoimage Austria, Maxar Technologies



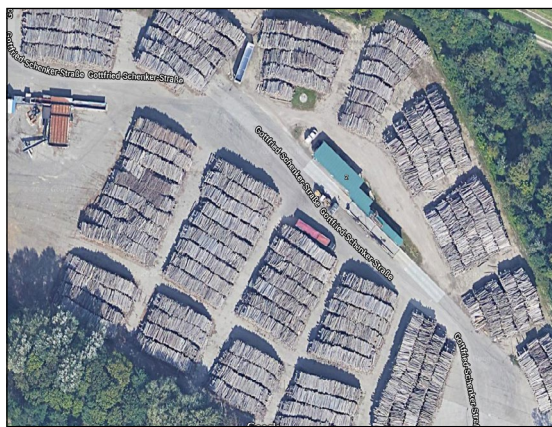
26 September 2021 log piles. Photo: FDA.



26 September 2021 log piles, older trees. Photos: FDA.

2.Wien Energie Simmering Biomassekraftwerk

Facility type	CHP
Address	Gottfried-Schenker-Straße 1, 1110 Wien, Austria
GPS	48.157925, 16.503011
Website	www.wienenergie.at/ueber-uns/unternehmen/energie-klimaschutz/energieerzeugung/biomasse/
Quote	<p>Holz ist ein natürlicher und nachwachsender Rohstoff, der zeitlich unbegrenzt verfügbar ist und noch dazu CO₂-neutral ist. So entsteht saubere Energie aus Österreichs Wäldern. Wir betreiben mit dem Wald-Biomassekraftwerk in Simmering die größte Anlage in Österreich. Source: company website.⁴²</p> <p>Translation: Wood is a natural and renewable raw material that is available indefinitely and is also CO₂-neutral. This is how clean energy is generated from Austria's forests. With the forest biomass power plant in Simmering, we operate the largest plant in Austria.</p>
Comment	Images show logs piled up at the holding yard for the plant. Click here to see video of large logs being chipped at the site.



Biomass plant and stock pile of logs. Image © 2022 Google, European Space Imaging, Maxar Technologies



11 December 2021 log pile at the biomass plan storage facility. Photo: FDA.

3.Peter Seppeler GmbH/Heizinos

Facility type	Pellet plant
Address	Gewerbegebiet 3, Sachsenburg, Austria
GPS	46.814311, 13.351793
Website	www.heizinos.at/lose-pellets
Quote	<p>In Sachsenburg produzieren wir Holzpellets aus Säge- und Hobelspänen der Fa. Hasslacher. Source: company website. ⁴³</p> <p>Translation: In Sachsenburg we produce wood pellets from sawdust and wood shavings from Hasslacher.’</p>
Comment	Images show logs here on site of pellet mill, which is located close to the sawmill. The proximity of the large pile of logs to the pellet plant raises questions about whether logs are also used as well as sawdust from sawn timber operations.



Pellet plant (at right) has piles of stemwood on the site of its operations. Image © 2022 Google, Maxar Technologies



Image: August 2019 © 2021 Google - 46.814250, 13.353973

4.RZ Pellet Amstetten

Facility type	Pellet plant
Address	Mitterweg 10, 3300 Amstetten, Austria
GPS	48.123162, 14.898186
Website	www.rz-pellets.at/standorte--kontakt/standort-amstetten
Quote	<p>Wir beziehen unsere Säge- und Hobelspäne ausschließlich von Sägewerken aus Österreich. So stellen wir sicher, dass unser Rohstoff aus nachhaltiger Waldwirtschaft kommt. Holzpellets leisten einen wichtigen Beitrag zum Klimaschutz! Source company Source: Company website. Source: company website. ⁴⁴</p> <p>Translation: We obtain our sawdust and wood shavings exclusively from sawmills in Austria. This is how we ensure that our raw material comes from sustainable forestry. Wood pellets make an important contribution to climate protection!</p>
Comment	Images show logs here on site of pellet mill, which is located close to the sawmill. The proximity of the large pile of logs to the pellet plant raises questions about whether logs are also used as well as sawdust from sawn timber operations.



Biomass plant and logs. Image © 2022 Google, GeoContent, Geoimage Austria, Maxar Technologies



26 September 2021 logs piled on site. Photo: FDA.

5.Max Green Central Rodenhuize

Facility type	Power plant
Address	Energiestraat 2, 9042 Gent, Belgium
GPS	51.131430, 3.780761
Website	www.corporate.engie.be/en/energy/biomass
Quote	The combustion of biomass is considered to be CO ₂ neutral. The quantity of CO ₂ released into the atmosphere during combustion is equal to that which biomass took from the air while it grew. Source: company website. ⁴⁵
Comment	Although only large pile of chips/pellets seen here, wood is sourced from plants in British Columbia where some pellet plants are using trees as feedstock. Engie has also been named by Earthsight as a recipient of pellets from Russia. ⁴⁶ In 2020, the Flanders government ordered a review into the sourcing of pellets for the mill, citing issues with legality of sourcing in Russia. ⁴⁷



Biomass plant and stock pile of wood chips. Image © 2022 Google, Maxar Technologies

6.Ecopower

Facility type	Pellet plant
Address	De Snep, 3945 Ham, Belgium
GPS	51.080810, 5.157666
Webmail	www.ecopower.be/
Quote	<p>Zijn pellets CO₂-neutraal? Wat is het? Are pellets Het gebruik van fossiele brandstoffen of biomassa om energie op te wekken geeft altijd rookgassen. Die rookgassen bevatten een belangrijk deel CO₂. CO₂-neutraliteit betekent dat de brandstof tijdens haar ontwikkeling even veel CO₂ opneemt als er uitgestoten wordt bij de verbranding. Op die manier draagt de verbranding niet bij tot een toename van het CO₂-gehalte in de atmosfeer. Source: company website. ⁴⁸</p> <p>Translation: Are pellets CO₂-neutral? What is it? The use of fossil fuels or biomass to generate energy always produces flue gases. These flue gases contain a significant proportion of CO₂. CO₂ neutrality means that during its development, the fuel absorbs as much CO₂ as it emits during combustion. In this way, combustion does not contribute to an increase in the CO₂ content in the atmosphere. The capacity of the pelletplant is 40.000 ton/ year. Source: company website. ⁴⁹</p>
Comment	Company video shows pellets sourced from stemwood.



Image © 2022 Aerodota International Surveys, CNES/Airbus, Landsat/Copernicus, Maxar Technologie



Source: [company video](#)



Still image taken from [company video](#) showing logs being stockpiled on site.

7.Pellet4U

Facility type	Pellet plant
Address	ul. Sofiysko Shose 40, 2000 Samokov, Bulgaria
GPS	42.351265, 23.551607
Website	www.pellet4u.com/web/en/
Quote	With a production capacity of over 40,000 tons / year, the SAMKOV INVEST is one of the best companies and can ensure continuous production throughout the year, thanks to a completely automated plant, that starts with the logs, until the finished product. Source: company website. ⁵⁰
Comment	Satellite image shows the plant did not exist in 2014. The image from 2021 shows pile of logs on company's premises. The need for more logging to facilitate increasing the "renewable" output from biomass in Bulgaria is revealed in the country's National Climate and Energy plan. ⁵¹ The energy equivalent from burning wood waste generated by the wood industry is 2,841 GWh. The "realistic" scenario for increased biomass use is 9,197 GWh and the "optimistic" approach is 12,286 GWh. Even the "realistic" scenario is three times what is available from industry waste.



Image showing biomass plant did not exist in 2014. Image © 2021 Google Earth



Image © 2021 Google Earth

8. Schneider pellets/ Axel Trade 2009 ltd.

Facility type	Pellet plant
Address	ul. Sofiysko Shose 40, 2000 Samokov, Bulgaria
GPS	42.325803, 23.551917
Website	www.schneiderpellets.com/en/
Quote	Carbon emissions from combustion do not change the content of carbon dioxide (CO ₂) in the atmosphere. They are environmentally friendly fuel, neutral in terms of CO ₂ , as they are extracted from renewable sources. Production of 20,000 tons per year. Source: company website. ⁵²
Comment	Images show logs piled on site.



Image from 9 March 2022. Photo: Mladi Za Zemiata

9.DD Tep Brinje

Facility type	CHP
Address	Brinje, Croatia
GPS	44.998520, 15.1085027
Website	www.ddtep.hr/brinje-biomass-cogeneration-plant-croatia-goes-into-commercial-operation/?lang=en
Quote	The nameplate capacity of the power plant is 5,0 MW, and the owner will use the thermal energy (10 MW) in their facilities for pellet production and wood drying. About 60,000 tons of biomass from forest wood per year are needed to operate the BE-TO Brinje power plant. Source: company website. ⁵³
Feedstock	According to the construction company this facility only began operation in 2021. From the company's youtube video logs can be seen on site. Click here to see more drone imagery at the site.



Image showing biomass plant did not exist in 2019 Image © 2021 Google Earth



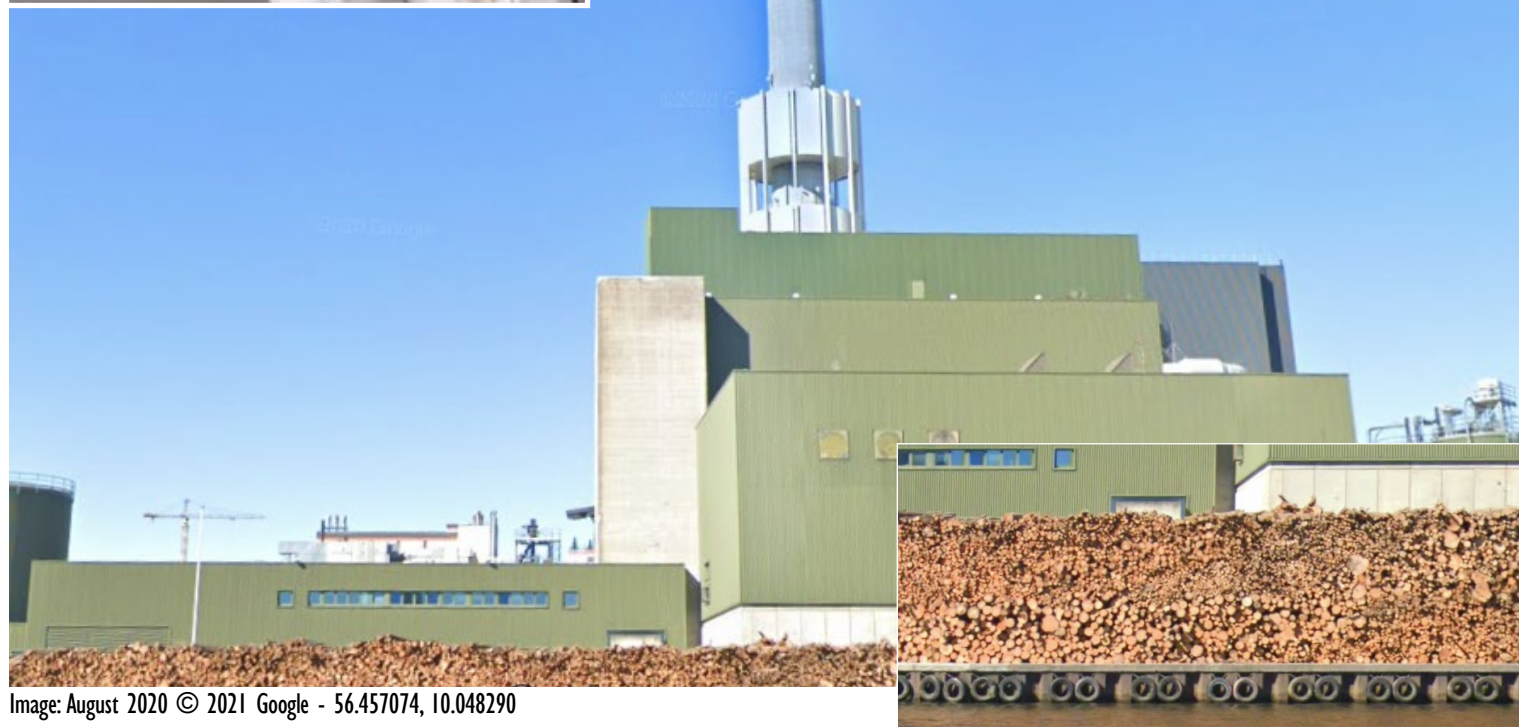
Image © 2021 Google Earth



Still image taken from company video showing logs being stockpiled on site. Source: [Youtube](#)

10.Randers Kraftvarmeværk

Facility type	CHP
Address	Kulholmsvej 12, 8930 Randers, Denmark
GPS	56.457911, 10.047222
Website	www.verdo.com/int/
Quote	<p>Randers Kraftvarmeværk har i rapporteringsperioden modtaget 172.193 tons biomasse to-talt, fordelt på 12.205 tons træ- og ligninpiller og 159.988 tons træflis og energitræ til flisning. 170.846 tons af biomassen kommer fra skovarealer (...) På baggrund af information og dokumentation fremlagt af Randers Kraftvarmeværk, og leverandører af biomasse, har Preferred by Nature verificeret, at der er modtaget biomasse med dansk, estisk, lettisk, russisk, spansk, tysk og nordamerikansk oprindelse i rapporteringsperioden». Source: company's report. ⁵⁴</p> <p>Translation: During the reporting period, Randers CHP received 172,193 tonnes of biomass in total, divided into 12,205 tonnes of wood and lignin pellets and 159,988 tonnes of wood chips and energy wood for chipping. 170,846 tonnes of the biomass comes from forest areas (...) Based on information and documentation provided by Randers CHP and suppliers of biomass, Preferred by Nature has verified that biomass of Danish, Estonian, Latvian, Russian, Spanish, German and North American origin was received during the reporting period.</p>
Comment	Images show large piles of logs on site.



11.Graanul Invest Osula Pellet

Facility type	CHP
Address	66642, Varese, Võru County, Estonia
GPS	57.873597, 26.793970
Website	www.graanulinvest.com/
Quote	Sustainably produced wood-based biomass is an environmentally friendly energy source, provided that the raw material comes from the natural waste stream, does not compete in price or value with other industries and is produced with the least possible environmental impact. The energy produced from biomass meeting these criteria has a life-cycle emission reduction potential of up to 98% compared to coal and is indispensable for achieving climate goals. Source: Company website. ⁵⁵
Comment	Images show large piles of logs stacked on site. Graanul is the largest pellet producer in the EU.



Image © 2022 CNES/Airbus, Maxar Technologies



Image from 25 July 2019 showing log stacks. Photo: Biofuelwatch - 57.874969, 26.794914



13 March 2022. Photo: Thomas Waitz

12. Warmeston OÜ Sauga

Facility type	Pellet plant
Address	Kilksama, 85003 Pärnu County, Estonia
GPS	58.441356, 24.527363
Website	www.warmeston.ee/en/products/
Quote	With the regulators growing ambition to move away from fossil fuels, carbon-neutral biomass remains an essential solution to mitigate the increasing volumes of intermittent renewable energy like wind and solar [...] Fossil fuels to biomass conversion enable up to 85% reduction of life cycle carbon emission. Source: company sustainability report. ⁵⁶
Comment	Images show large piles of logs stacked on site.



Image © 2022 CNES/Airbus, Maxar Technologies

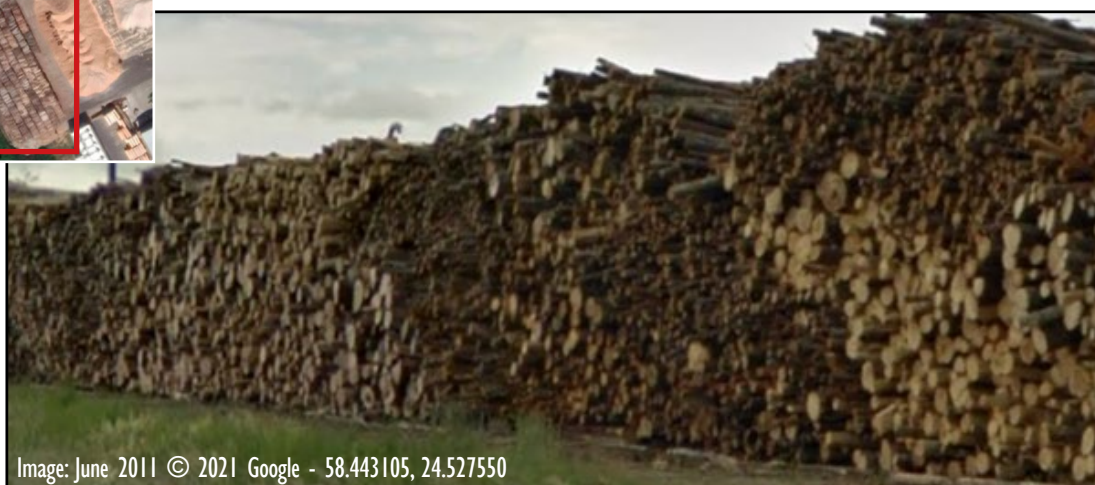


Image: June 2011 © 2021 Google - 58.443105, 24.527550



Image taken from company sustainability report 2020

13. Vapo Oy/Neova

Facility type	Pellet plant
Address	Savotantie 7, 82900 Ilomantsi, Finland
GPS	62.666784, 30.944138
Website	www.vapo.fi/puukauppa/
Quote	<p>Pelletti on suomalaista, uusiutuvaa ja toimitusvarmaa polttoainetta. Valmistamme pelletit puunjalostuksen sivutuotteista, sahanpurusta ja kutterinlastusta. Puupelletti on ympäristöystävällistä ja sillä voidaan korvata fossiilisten polttoaineiden, kuten öljyn, maakaasun ja kivihiilen käyttöä. Source: company website.⁵⁷</p> <p>Translation: Pellets are a Finnish, renewable and reliable fuel. We make pellets from wood processing by-products, sawdust and cutter chipping. Wood pellets are environmentally friendly and can replace the use of fossil fuels such as oil, natural gas and coal.</p>
Comment	Stacks of logs and piles of sawdust of unknown origin on site. This plant also appears to be burning peat. ⁵⁸ Of all EU countries, Finland financially incentivises more burning of wood relative to any other renewable energy source. ⁵⁹



Image © 2022 CNES/Airbus, Maxar Technologies

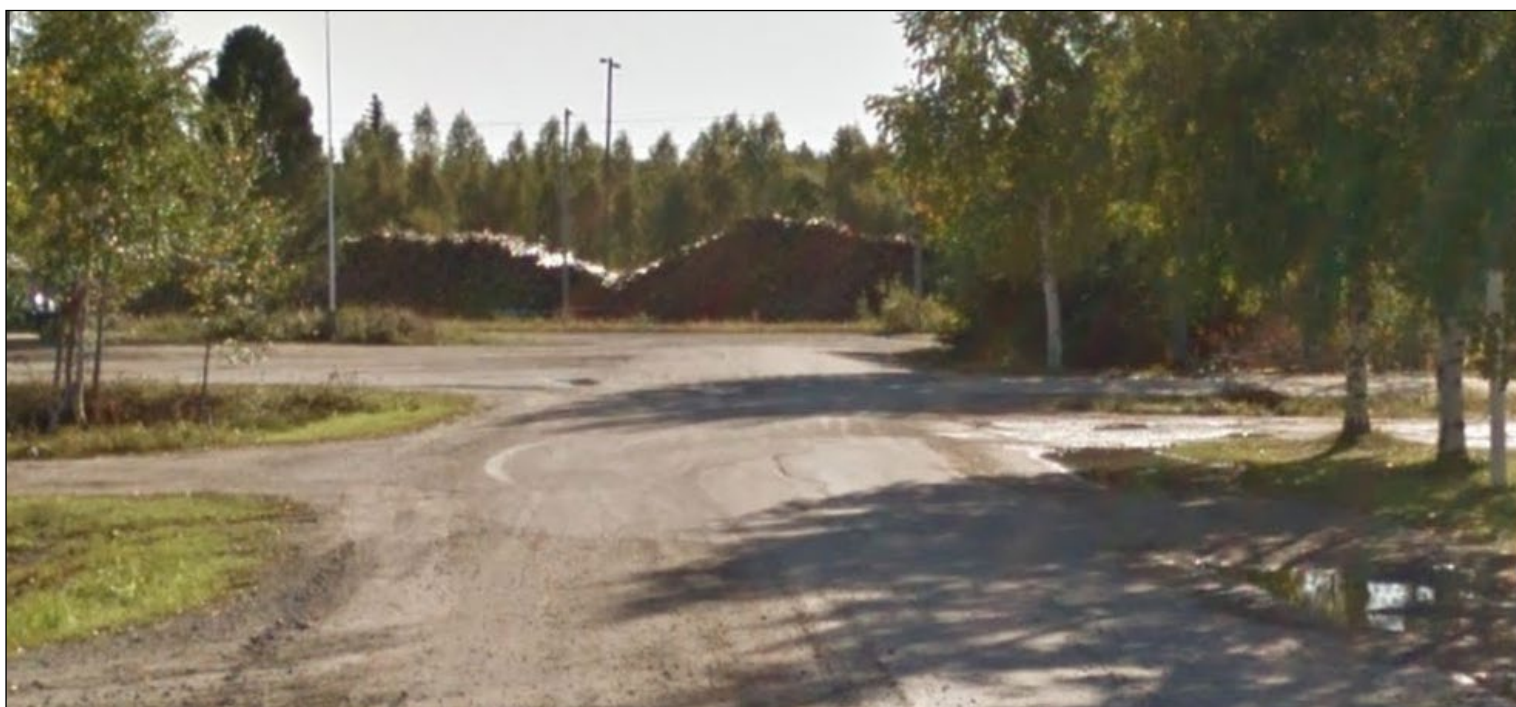


Image: September 2011 © 2021 Google - 62.667755, 30.939928

14. Alholmens Kraft

Facility type	Power plant
Address	Larsmovägen 149, 68600 Jakobstad, Finland
GPS	63.703654, 22.708840
Website	www.alholmenskraft.com/en/company
Quote	Most of the rest of the wood-based fuel consists of logging residues from the region's forests.... Stumps are crushed either at the power plant or at an earlier stage in the supply chain. Wood that is not good for mass production is also included in the fuel mix. Source: company website. ⁶⁰ The power plant burns 800 cubic metres of fuel per hour at full effect. ⁶¹ Wood fuels account for 50-70% of the combustion. ⁶²
Comment	Images show piles of chipped wood/saw dust as well as logs. The plant burns wood, peat and coal. ⁶³



Image © 2022 CNES/Airbus, Lantmäteriet/Metria, Maxar Technologies



Source: company website

15.Biosyl

Facility type	Pellet plant
Address	Chemin des champs Bailly 58200 Cosne sur Loire, France
GPS	47.378982, 2.920910
Website	www.biosyl.fr/notre-matiere-premiere.html
Quote	Les granulés de bois, ou pellets, sont des combustibles organiques générant de faibles émissions de CO ₂ . Source: Company website. ⁶⁴ Translation: Wood pellets, or pellets, are organic fuels that generate low CO ₂ emissions.
Comment	Images show large logs piled on site. Click here to see French NGO Canopée's visit to the site in 2021. Since 2010, increased logging in France is primarily driven by energy use. ⁶⁵



Image © 2022 Maxar Technologies



Piles of logs photographed on site during visit by [Canopée](#). Photo: Canopée, 2021



Still image from company video (no longer available online) showing trees being used as pellet feedstock. Source: removed company video.

16.FICA-HPCI

Facility type	Pellet plant and CHP
Address	La Couture, 51110 Bazancourt, France
GPS	49.349125, 4.155355
Website	www.fica-hpci.fr/qui-sommes-nous
Quote	<p>Elle permet la réduction de près de 230 000 tonnes d'émissions de CO₂ par an pendant les prochaines décennies, soit l'équivalent en émissions de 145 000 voitures. Elle contribue directement à l'atteinte des objectifs de développement durable fixés par l'ONU et notamment la lutte contre le changement climatique et ses impacts. Source: company website. ⁶⁶</p> <p>Translation: It enables the reduction of almost 230,000 tonnes of CO₂ emissions per year for the next few decades, ie the equivalent in emissions of 145,000 cars. It contributes directly to achieving the sustainable development goals set by the UN and in particular the fight against climate change and its impacts.</p> <p>HPCI Green Pellet® is sourced from agricultural and forestry residues for a negative carbon footprint. ⁶⁷</p> <p>They plan the construction of a similar plant in Fessenheim. ⁶⁸</p>
Comment	Satellite image shows the plant did not exist in 2016. The image from 2021 shows large rows of stemwood on site.



Image © 2021 Google Earth



Image © 2021 Google



29 October 2021 large piles of logs being handled on site. Photo: FDA



29 October 2021 large piles of logs on site. Photo: FDA

17.Kogeban Biomass Plant

Facility type	CHP
Address	Chem. d'Amiens, 80190 Nesle, France
GPS	49.765323, 2.900677
Website	www.pbenergie.com/
Quote	Feedstock is “mainly wood logs (95%). Source: Youtube. ⁶⁹
Comment	Google Earth image from 2014 shows the plant did not exist then. Piles of stemwood seen in images on site.



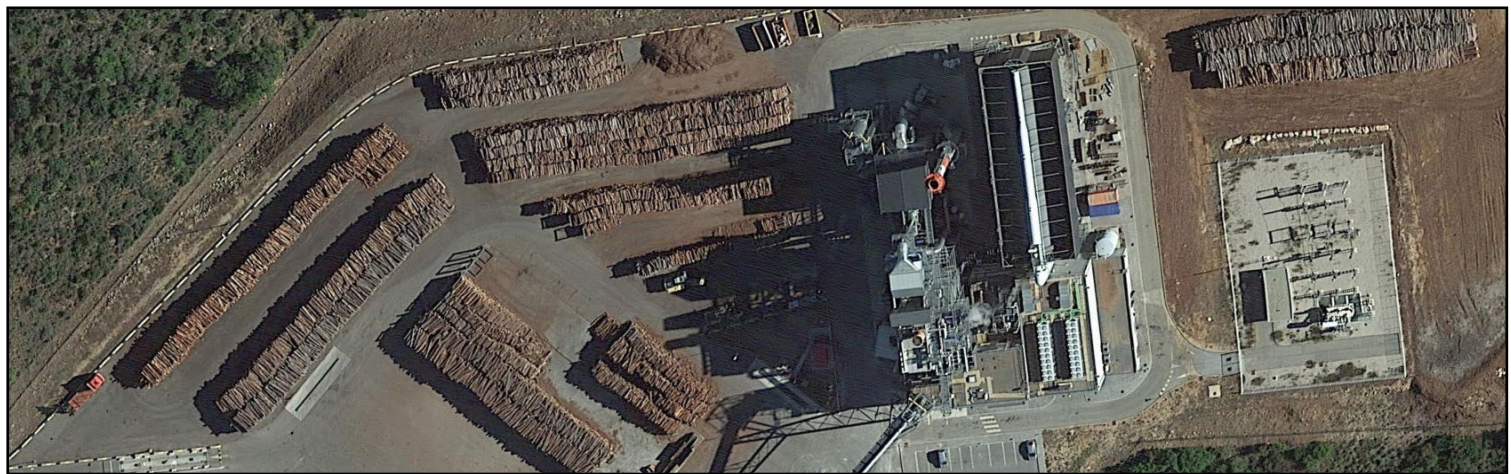
18. Gardanne power station

Facility type	CHP
Address	5 Rte des Sauvaires, Mereuil, France
GPS	43.467088, 5.496495
Website	www.eppowereurope.cz/en/tiskove-zpravy/eph-signs-agreements-to-buy-generation-business-and-other-activities-in-france-from-uniper/
Quote	<p>Pour fonctionner, la centrale requiert en effet quelque 850 000 tonnes de bois par an, et un peu de charbon pour des raisons techniques. Translation: To operate, the plant requires some 850,000 tonnes of wood per year, and a little coal for technical reasons. Source: French Media.⁷⁰</p> <p>In Gardanne, France, we expect to bring online a biomass power plant (150MW) in 2021. Once operational, the Gardanne biomass plant will be a further tribute to our strategy of providing security of supply from renewable sources. Source: Energetický a průmyslový holding.⁷¹</p>
Comment	Images show large piles of stemwood on site.



19. Sylviana

Facility type	Power plant
Address	ZAC de Nicopolis, Rue Vermentino, 83170 Brignoles, France
GPS	43.392169, 6.159535
Website	www.sylviana.fr
Quote	The biomass used consists exclusively of clean wood. Waste wood and forest biomass are used. Waste wood comes from waste sorting and recovery centres. After separation, sorting, preparation, we recover all the clean unpolluted wood which would have no other outlet than that of being buried in landfill or burned in a household waste incinerator. This is wood from pallets, crates, crates, natural furniture, etc. Forest biomass comes from forest maintenance cuts in the PACA region, related sawmill products and the wood fraction of green waste (waste disposal). Why do we say green energy production plant? Because the production of electricity from biomass is CO ₂ neutral, and non-polluting. In addition, biomass is a local and renewable resource. CO ₂ neutral + Renewable = Green energy» 100,000 tons of forest wood collected within a radius of 100 km around Sylviana. (English version only - lack of space to include original quote). Source: company website. ⁷²
Comment	Images show large stacks of logs on site.



2021 image showing biomass plant and massive stock pile of logs. Image © 2021 Maxar Technologies.



Image: August 2021 © 2021 Google - 43.393028, 6.158855



Source: Youtube

20. Biomassekraftwerk Bischofferode

Facility type	Power plant
Address	Schachtstraße 1-3, 37345 Holungen, Germany
GPS	51.490050, 10.411168
Website	www.l.de/stadtwerke/
Quote	<p>Unsere Biomasse-Kraftwerke gehören zu den modernsten in Deutschland. Sie werden ausschließlich mit naturbelassenem Holz betrieben, das bei der Waldpflege bzw. Durchforstung oder der Landschaftspflege anfällt..... Damit setzen wir auf eine zuverlässige, regionale und umweltschonende, weil CO₂-neutrale, Erzeugung. Source: company website. ⁷³</p> <p>Translation: Our biomass power plants are among the most modern in Germany. They are operated exclusively with natural wood that is obtained from forest maintenance or thinning or landscape maintenance.... We are thus relying on reliable, regional and environmentally friendly, CO₂-neutral, generation.</p>
Comment	Images of logs seen here on site. Click here to see further video footage.



22 March 2022 Large logs with hollows seen here on site. Photo: Jana Ballenthien/ROBIN WOOD

21.Cycleenergy

Facility type	CHP and pellet plant
Address	Am Gäuseberg 1, 57339 Erndtebrück, Germany
GPS	50.994581, 8.319079
Website	www.cycleenergy.com/standorte/erndtebrueck/
Quote	The biomass cogeneration plant was commissioned in 2009 and produces around 40,000 MWh of baseload-capable green electricity per year. A total of around 45,000 tonnes of landscape maintenance wood from the region are recycled per year in the combined heat and power plant. Cogeneration technology also allows optimal use of heat for drying the raw material for pellet production. The CO ₂ savings are around 48,000 tons per year. Source: company website. ⁷⁴
Comment	Images show large rows of stemwood on site. Click here for more video footage.



27 March 2022 logs piled on site. Photo: FDA.

22.1Heiz Energie GmbH and 1Heiz Pellets AG Eberswalde

Facility type	CHP and pellet plant
Address	Angermünder Str. 68, 16225 Eberswalde, Germany
GPS	52.851260, 13.778446
Website	www.1heiz-pellets.de/holzpellets.php
Quote	<p>Holzpellets sind stäbchenförmig und werden überwiegend aus Sägenebenprodukten hergestellt..... Als Sägenebenprodukte werden alle Holzreste bezeichnet, die beim Einschnitt und der Verarbeitung von Sägerundholz in Sägereien anfallen. Es handelt sich dabei hauptsächlich um Hobelspäne und Sägemehl. Source: company website. ⁷⁵</p> <p>Translation: Wood pellets are rod-shaped and are mainly made from sawmill by-products..... Sawmill by-products are all wood residues that occur during the cutting and processing of sawlogs in sawmills. These are mainly wood shavings and sawdust.</p> <p>Das wohl bekannteste, wenn auch umstrittenste, Beispiel für Biomassenutzung im Stadtgebiet ist das Holzkraftwerk Eberswalde, welches seit Dezember 2014 von der 1Heiz Energie GmbH betrieben wird. Die 2006 errichtete Anlage mit einer Leistung von 20 MWe erzeugt aus etwa 100.000 t Frischholz pro Jahr rund 160.000 MWh. Source: municipality website. ⁷⁶</p> <p>Translation: Probably the best-known, albeit most controversial, example of biomass use in the urban area is the Eberswalde wood-fired power plant, which has been operated by 1Heiz Energie GmbH since December 2014. The plant, which was built in 2006 and has a capacity of 20 MWe, generates around 160,000 MWh per year from about 100,000 t of fresh wood, which could cover almost the entire electricity demand of the city of Eberswalde.</p>
Comment	Images of logs seen here on site. The website and comment is for the pellet plant and these logs are taken at the CHP plant adjacent to the pellet plant.



23.Nevroko Alfa Pelletspi

Facility type	Pellet plant
Address	7th Klm K. Nevrokopi - Exochi - Drama Greece
GPS	41.396902, 23.838645
Website	www.alfapellet.gr/en/
Quote	Pellet is a standardized cylindrical biofuel 40 mm long and 6 mm in diameter with quality specifications. for the preparation of which no chemical additives or other substances are used, thus making it a completely environmentally friendly product. Source: company website. ⁷⁷ Over 60 000 tonnes per year. Source: Youtube. ⁷⁸
Comment	Images, company video and comments on website show that logs are used for pellet production.



Image © 2021 Google Earth



Still images taken from company video showing logs being stockpiled on site. Source: [Youtube](#)

24. Pannon Hőerőmű

Facility type	Power plant
Address	Pécs, Edison u. 1, 7630 Hungary
GPS	46.061981, 18.263848
Website	biomassza.veolia.hu/en/pecs-power-plant/
Quote	In addition to the generation of electricity, the largest biomass power plant in Central Europe provides 100% green district heat to the city of Pécs. The annual fuel demand of Pécs Power Plant is approximately 500,000 tons, which is provided entirely from renewable energy sources: in addition to woody biomass and agricultural by-products, we also utilize SRF (Solid Recovered Fuel) in a smaller proportion in accordance with the relevant permit issued by the regulatory authority. SRF is a blend of paper and plastic, the material of which is no longer recyclable, and has undergone a rigorous testing and product qualification process. Source: company website. ⁷⁹
Comment	Images of large piles logs can be seen on site. Website also shows they burn plastic, but claims to provide 100% green district heat.



25. Bakonyi Erőmű Zrt

Facility type	CHP
Address	Ajka, Gyártelepi út 1, 8400 Hungary
GPS	47.096551, 17.559612
Website	www.bakonyi.hu/#hirek
Quote	Veolia's Ajka power plant generates electricity, district heat and industrial steam. The annual fuel demand of Ajka power plant is approximately 600,000 tons, which is largely provided from renewable energy sources: woody biomass, agricultural and sawmill by-products. ⁸⁰
Comment	Images of very large rows of logs can be seen as feedstock.



Image © 2022 CNES/Airbus, Maxar Technologies



Image: July 2021 © 2021 Google - 47.096551, 17.559612

26.Sicet - Societa' Italiana Centrali Elettrotermiche S.R.L.

Facility type	Power plant
Address	Via Alemagna, 27, 32010 Ospitale di Cadore BL, Italia
GPS	46.326033, 12.322195
Website	https://www.steenova.eu/en/home/reference-plants/opticom/energy-plant-sicet-ltd-ospitale-die-cadore-i/
Quote	N/A
Comment	Images show logs, stumps and tree roots on site.



Image © 2022 European Space Imaging, Maxar Technologies



Image: August 2019 © 2021 Google - 46.326286, 12.324022



Image: August 2019 © 2021 Google - 46.324660, 12.321721

27. C.E.B spa

Facility type	CHP
Address	Zona Industriale Villanova, 1, 32013 Castellavazzo, Longarone BL, Italy
GPS	46.270590, 12.308617
Website	www.bellunodolomiti.voximprese.it/aziende/ceb-spa-compagnia-energetica-bellunese
Quote	<p>La C.E.B. SpA è una centrale termoelettrica che produce energia elettrica sfruttando gli scarti di legno come combustibile nel processo di combustione in caldaia. Autorizzata dal Ministero dell'Industria nel 1997, è stata realizzata nel corso dell'anno seguente ed è entrata in servizio nella primavera del 1999. La produzione elettrica oraria lorda è di circa 5950 kWh a fronte di un consumo orario di biomassa di legno cippato compreso fra 7.000 e 8.000 kg. La produzione netta annuale di energia elettrica si aggira sui 33 milioni di kWh ceduti alla rete in media tensione. Il consumo annuale di biomassa è dell'ordine di 65.000 tonnellate. Source: Confindustria Belluno Dolomiti.⁸¹</p> <p>Translation: The C.E.B. SpA is a thermoelectric power station that produces electricity by exploiting wood waste as fuel in the combustion process in the boiler. Authorized by the Ministry of Industry in 1997, it was built in the following year and entered service in the spring of 1999. The gross hourly electricity production is approximately 5950 kWh compared to an hourly consumption of wood chip biomass including between 7,000 and 8,000 kg. The net annual production of electricity is around 33 million kWh sold to the medium voltage grid. The annual consumption of biomass is of the order of 65,000 tons.</p>
Comment	Evidence of logs, including stumps and roots as feedstock.



Image © 2022 Maxar Technologies



Image: January 2022 © 2021 Google - 46.271545, 12.308871



Image: January 2022 © 2021 Google - 46.271089, 12.309026

28. PowerCrop

Facility type	Power plant
Address	Vicolo Carrarone, 5, 48026 Russi RA, Italie
GPS	44.385537, 12.020729
Website	www.powercrop.it
Quote	<p>Oltre all’aspetto energetico, l’uso di biomassa agro forestale per la produzione di energia elettrica, consente una significativa riduzione delle emissioni di gas serra e dell’inquinamento atmosferico rispetto alla produzione di energia elettrica da fonte fossile, garantendo la salvaguardia del territorio e creando occupazione, come il reimpiego delle maestranze che operavano negli ex-zuccherifici.</p> <p>Source: company website. ⁸²</p> <p>Translation: In addition to the energy aspect, the use of agro-forestry biomass for the production of electricity allows a significant reduction in greenhouse gas emissions and air pollution compared to the production of electricity from fossil fuels, ensuring the protection of the territory and creating jobs, such as the re-employment of workers who worked in former sugar factories.</p>
Comment	Although images of stemwood could not be seen in the satellite imagery, the mill does not seem to be located anywhere near sawmills of relative size to provide such large volumes of mill residues. The question must be asked whether it does receive only residues from local operations, or whether wood is sourced from forests elsewhere.



Image: 2021 © Google Earth



Image: 2021 © Google Earth



Image: August 2019 © 2021 Google - 56.698276, 22.590618 - 44.384030, 12.023138

29.Graanul Invest

Facility type	CHP and pellet plant
Address	Plānupes iela 34, Inčukalns, Inčukalna pagasts, LV-2141, Latvia
GPS	57.088929, 24.669878
Website	www.graanulinvest.com/
Quote	We only use industry leftovers We use wood bark and chipped forest residues as fuel for the CHPs. We obtain most of the wood bark from the debarking lines of pellet plants, but we also buy the material left over in the timber industry. Forest chips – i.e., a mix of branches, treetops and bark – have been chipped by the time they get to our CHPs as a by-product of the forest industry. Source: company website. ⁸³
Comment	Images show mix of logs (at top of picture) and sawdust/chipped wood of unknown origin on site. Although this plant is located close to a sawmill, the logs piles at top are assumed to be used for pellet production since they are located here on site



Images © 2022 CNES/Airbus, Maxar Technologies

30. Enefit Green

Facility type	CHP and pellet plant
Address	Brocēnu lauku teritorija, Latvia
GPS	56.701173, 22.589332
Website	https://enefitgreen.ee/en/avaleht
Quote	The production facility consumes natural energy resources – forest chips, sawdust and bark, as a result providing environmentally friendly energy for self-consumption and export in the form of pellets. The research shows that about 10 million m3 of woodchip equivalent remain/rot in the Latvian forest every year. The Brocēni plant will be in sync with nature and forest utilising low-value timber, cleaning and tidying forests and the environment. It will exist in synergy and harmony with natural processes. Source: company website. ⁸⁴
Comment	According to their website, this plant was only built in 2016. So called ‘low-value timber’, including deadwood - what the industry calls residues from thinning, ‘cleaning’ and ‘tidying’ - is a critical component of forest biodiversity and does not need to be ‘cleaned up’.



Image © 2021 Google Earth



Image © 2021 Google Earth



Image: August 2019 © 2021 Google - 56.698276, 22.590618

31.Granulita

Facility type	Pellet plant
Address	Draugystės g. 41, Pakiršiny 82293, Lithuania
GPS	55.658271, 23.783227
Website	www.granulita.lt/zaliava.html
Quote	The softwood we use for the production of wood pellets comes from Lithuanian conifer trees. Our products are made of sawdust, wood shavings, firewood and woodchips supplied by lumber processing companies and forest owners. Firewood is quality calorific wood that does not meet the requirements for use in the construction or furniture-making industry. Source: company website. ⁸⁵
Comment	Images, including on company's own website, show stemwood on site.



Image © 2022 CNES/Airbus, Maxar Technologies



Image: June 2012 © 2021 Google - 55.657811, 23.7848869



Source for both photos: [company website](http://www.granulita.lt/zaliava.html)

32.Graanul Invest Alytus

Facility type	Pellet plant
Address	C2QC+CH Alytus, Lithuania
GPS	54.440273, 24.020260
Website	www.graanulinvest.com/
Quote	Wood pellets are an environmentally friendly biofuel sourced from the production residues of the forest and wood industries. Pellets are made from production residues of the wood industry (sawdust, wood chips) and low-quality roundwood that is not suitable for producing sawn timber or other wood products. Source: company website. ⁸⁶
Comment	Images show mix of logs (at bottom of picture) and sawdust/chipped wood of unknown origin on site. Although this plant is located close to a sawmill, the logs piles at top are assumed to be used for pellet production since they are located here on site.



Image © 2022 CNES/Airbus, Maxar Technologies



Source: company website



Image: July 2012 © 2021 Google - 54.439091, 24.023507

The Netherlands

33. RWE Kraftwerk Amer

Facility type	Power plant
Address	Amerweg 1, 4931 NC Geertruidenberg, The Netherlands
GPS	51.710517, 4.843368
Website	https://benelux.rwe.com
Quote	Over the past few years, a start has been made on gradually replacing coal with sustainable biomass, enabling RWE to make its own significant contribution towards the achievement of climate targets in the Netherlands. Over the next few years, the CO2 emissions from its power plants will be reduced even further. Source: company website. ⁸⁷
Comment	RWE sources from Graanul Invest, Estonia via their ship the Imavere. Graanul Invest is the EU's largest pellet producer. Graanul uses logs to make pellets, as can be seen in images at its Imavere pellet mill in Estonia.



Image © 2022 Aerodota International Surveys, Maxar Technologies

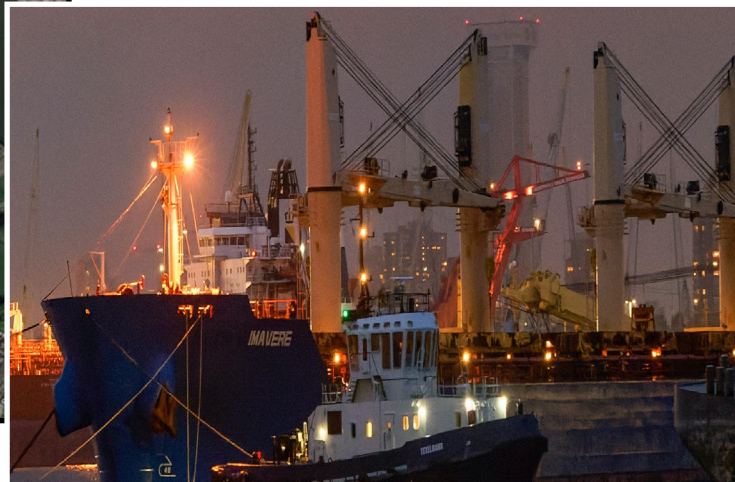


Image from 2021 showing IMAVERE bulkcarrier from Graanul Invest. Photo: Kool Bert.



Image from 28 April 2018 showing harvested logs at Imavere Graanul Invest pellet plant in Jarva County, Estonia. Photo: Biofuelwatch.

34. Van den Broek

Facility type	Wood trader
Address	Marsdijk 35, 4033 CC Lienden
GPS	51.948937, 5.568538
Website	www.vandenbroekbv.nl/producten/houtchips-productie
Quote	<p>Van den Broek B.V. produceert houtchips met onze nieuwe productielijn. De stammen worden ontschorst, gechipt en gezeefd. Houtchips worden gebruikt voor verschillende doeleinden waaronder de papierindustrie, spaanplaatindustrie, pellets en houtgestookte installaties. Source: company website.⁸⁸</p> <p>Translation: Van den Broek B.V. produces wood chips with our new production line. The logs are debarked, chipped and sieved. Wood chips are used for various purposes including the paper industry, chipboard industry, pellets and wood-fired installations.</p>
Comment	Although not a pellet plant itself, this facility clearly shows evidence that logs are used as feedstock to the energy industry.



Image: August 2019 © 2021
Google - 51.949353, 5.566383

Image © 2022 Aerodota International
Surveys, GeoContent, Maxar Technologies



Still images taken from company video showing large logs as
chipping feedstock. Source: [Company website](#)



35. Central De Biomassa Do Fundão

Facility type	Power plant
Address	Rua das Peónias - Zona Industrial do Fundão 6230-280-FUNDÃO
GPS	40.167868, -7.486877
Website	N/A
Quote	N/A
Comment	Clear evidence of very large piles of stemwood used as feedstock to this power plant. This plant is also the subject of legal challenges over its operations - see here . More info on NGO website. ⁸⁹



Image © 2022 CNES/Airbus, IGP/DGRF, Maxar Technologies



Image from 2020. Photo: Zero.



Image from 2020 showing piles of logs on site as bioenergy feedstock. Photo: Zero.

36.Pinewells

Facility type	Pellet plant
Address	Zona Industrial da Relvinha, Sarzedo 3300 - 416 Sarzedo AGN - Portugal
GPS	40.262683, -8.074135
Website	www.pinewells.com/pt/home
Quote	The company produces a type of bio fuel, which due to its characteristics, has no environmental impact, promoting reduction of CO2 emissions. Furthermore, it promotes forest management by using products mostly coming from forest clean up and waste from the wood industry. Source: company website. ⁹⁰ Pinewells uses harvesting residues, low-grade tree stems, and sawdust for pellet production. A part of pine wood originates from maintenance operations (thinnings). Source: company's report. ⁹¹ Pinewells used around 243,000 tonnes of wood in 2020, with 80% of this coming directly from the forest. Source NGO's report. ⁹² They are the largest Portuguese supplier to Drax in the UK.
Comment	Images show large rows of tree trunks evident on the site.



Images from 17 March 2021 showing logs at Pinewells station. Photo: Biofuelwatch.

Biomass plant and huge rows of logs. Image © 2022 CNES/Airbus, IGP/DGRE, Maxar Technologies



Image: August 2020 © 2021 Google - 40.261337, -8.072587

37.Bioenergy Suceava SA

Facility type	CHP
Address	Strada Energeticianului 1 Suceava 720166 Romania
GPS	47.650839, 26.296029
Website	www.suceava.website/servicii/energie-termica/bioenergy-suceava/
Quote	N/A
Comment	Although the resolution of the image is low, large piles of logs are evident on site from the satellite view at this power plant. In 2021, Romanian media reported that the Romanian government is looking to convert its coal power stations into burning wood. In 2022, this plant received an additional subsidy of 10,000,000 lei (approximately 2 million euros) to cover operation costs for 2021/22 winter. Source: Suceava News. ⁹³ In 2021, Romanian media reported that the Romanian government is looking to convert its coal power stations into burning wood. In 2022, this plant received an additional subsidy of 10,000,000 lei (approximately 2 million euros) to cover operation costs for 2021/22 winter.” Source: Suceava News ⁹⁴ and Balkan Green Energy News. ⁹⁵



Image © 2022 CNES/Airbus, IGP/DGRF, Maxar Technologies



38.TeHo Bardejov

Facility type	CHP
Address	Štefánikova 4081085 01 Bardejov, Slovakia
GPS	49.296182, 21.257974
Website	www.tehobardejov.sk
Quote	<p>Spaľovanie drevnej štiepky, ktorá sa vyrába z drevného odpadu nakúpeného v okruhu 60 km od elektrárne na biomasu, prináša šancu na úžitok z lesného bohatstva priamo v regióne. Source: company website.⁹⁶</p> <p>Translation: The incineration of wood chips, which is produced from wood waste purchased within a radius of 60 km from the biomass power plant, brings a chance to benefit from the forest wealth directly in the region.</p> <p>In the case of sensible forest management, if the biological limits of forest restoration are respected, if we do not treat forest and nature prey, forest and wood is an inexhaustible and sustainable source of energy, with minimal impact on the environment when burning wood chips. Source: company website.⁹⁷</p>
Comment	Images of large stem wood visible on site. On February 3rd, 2022, NGO representatives were present in the forest where the logs (seen here on truck) were cut. The logging contractors confirmed verbally that they were delivering these trees to the TeHo biomass facility.



Image © 2022 CNES/Airbus, Eurosense/Geodis Slovakia, Maxar Technologie



Image: April 2012 © 2021 Google - 49.2992901,21.248356



15 February 2022. Truck with very large old trees on site. Photo: Wolf Forest Protection Movement

39.Ertasa ENERGÍAS RENOVABLES

Facility type	Pellet plant
Address	Ctra, CM-220, km 28, 5, 02100 Tarazona de la Mancha, Albacete, Spain
GPS	39.211645, -1.946127
Website	www.ertasa.net/
Quote	<p>Erta se nutre de los productos generados en el mantenimiento, ordenación y limpieza de nuestros bosques, por ello se considera ecológico a este combustible obtenido. Así mismo esta fuente de energía renovable se denomina de carácter neutro dado que: El CO₂ emitido en su combustión es igual al CO₂ que absorben durante su crecimiento las plantas. Source: company website.⁹⁸</p> <p>Translation: Erta is nourished by the products generated in the maintenance, management and cleaning of our forests, for this reason this fuel obtained is considered ecological. Likewise, this renewable energy source is called neutral because: The CO₂ emitted in its combustion is equal to the CO₂ that plants absorb during their growth.</p>
Comment	Large piles of logs on site.



Pellet plant and log rows Image © 2022 CNES/Airbus, IGP/DGRF, Maxar Technologies, Map data



40.Scandbio Norberg

Facility type	Pellet plant
Address	Spännarhyttans industrial, Norberg, Sweden
GPS	60.078757, 15.956535
Website	www.scandbio.com/en/private-customer/
Quote	Wood fuel is a renewable energy source that produces heat and creates wellbeing. Pellets are a form of wood fuel that we obtain from the plant kingdom by compressing waste products from the forestry and saw mill industries, such as shavings and different types of sawdust. Source: company website. ⁹⁹
Comment	Images show stacks of stemwood and piles of chips/sawdust on site.



Image © 2022 CNES/Airbus, Lantmäteriet/
Metria, Maxar Technologies



Source: company website

41.Scandbio Ulricehamn

Facility type	Pellet plant
Address	Industrivägen 4 523 90 Ulricehamn Sweden
GPS	57.828290, 13.422160
Website	www.scandbio.com/en/about-us/production/
Quote	Wood fuel is a renewable energy source that produces heat and creates wellbeing. Pellets are a form of wood fuel that we obtain from the plant kingdom by compressing waste products from the forestry and saw mill industries, such as shavings and different types of sawdust. Source: company website. ¹⁰⁰
Comment	Images show several sources of wood for biomass including large piles of logs at top left of site.



Image © 2022 CNES/Airbus, Lantmäteriet/Metria, Maxar Technologies



Source: [company website](http://www.scandbio.com/en/about-us/production/)



Images: September 2019 © 2021 Google - 57.8294772,13.4216859

42.Stockholm Exergi AB

Facility type	CHP
Address	Returvägen 14, 195 60 Arlandastad, Sweden
GPS	59.608731, 17.858814
Website	www.stockholmexergi.se/fjarrvarme/sa-funkar-fjarrvarme/
Quote	Above all, different types of biofuels, residual products from the forest industry and Stockholmers' combustible household waste. Source company webiste. ¹⁰¹
Comment	Piles of logs, as well as woodchips of unknown source, evident on site. The different colours of woodchips could suggest that some of this is chipped directly from forest.



Images © 2022 CNES/Airbus, Lantmaretiet/Metria, Maxar Technologies

43.Laxå Pellets

Facility type	Pellet plant
Address	Logistikvägen, 695 72 Röfors, Sweden
GPS	58.931504, 14.624879
Website	www.laxapellets.se/varmepellets/
Quote	N/A
Comment	Images show very large piles of logs at right top of site.



Images © 2022 CNES/Airbus, Lantmaretiet/Metria, Maxar Technologies



Endnotes

1. Figure 8 of Camia, A., et al. (2021). The use of woody biomass for energy production in the EU Publications Office of the European Union, Luxembourg, Joint Research Centre. At <https://forestdefenders.eu/wp-content/uploads/2021/01/JRC-biomass-report-markup.pdf>
2. <https://op.europa.eu/en/publication-detail/-/publication/be5268ba-3609-11ec-bd8e-01aa75ed71a1/language-en>
3. Eurostat data on complete energy balances (nrg_bal_c), “total energy supply of renewables and biofuels.” Fuelwood data is from supply, transformation and consumption of renewables and wastes (nrg_cb_rw), “indigenous production.”
4. https://knowledge4policy.ec.europa.eu/sites/default/files/WRB_EU_v2021.pdf
5. <https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer>
6. See page 24 at Booth, M. S. and B. Mitchell (2020). Paper Tiger: Why the RED II biomass sustainability criteria fail forests and the climate. Pelham, MA, Partnership for Policy Integrity. At <https://forestdefenders.eu/wp-content/uploads/2021/05/RED-II-biomass-Paper-Tiger-July-6-2020.pdf>
7. <https://forestdefenders.eu/wp-content/uploads/2021/05/FDA-air-pollution-factsheet.pdf>
8. <https://forestdefenders.eu/wp-content/uploads/2021/05/RED-II-biomass-Paper-Tiger-July-6-2020.pdf>
9. <https://www.pfpi.net/wp-content/uploads/2021/11/PFPI-EU-Land-Sink-Target-report-Nov-23-2021.pdf>
10. See page 10 at https://eur-lex.europa.eu/resource.html?uri=cellar:a3c806a6-9ab3-11ea-9d2d-01aa75ed71a1.0001.02/DOC_1&format=PDF
11. Norton, M., et al. (2019). Serious mismatches continue between science and policy in forest bioenergy. GCB Bioenergy 0(0). At <https://onlinelibrary.wiley.com/doi/abs/10.1111/gcbb.12643>
12. Question Q2-10 at <https://www.ipcc-nggip.iges.or.jp/faq/faq.html>
13. European Commission. 2016. Impact Assessment: Sustainability of Bioenergy. Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast). Brussels. https://eur-lex.europa.eu/resource.html?uri=cellar:1bdc63bd-b7e9-11e6-9e3c-01aa75ed71a1.0001.02/DOC_1&format=PDF
14. cit
15. Ceccherini, G., et al. (2020). Abrupt increase in harvested forest area over Europe after 2015. Nature 583(7814): 72-77. At https://www.researchgate.net/publication/342615330_Abrupt_increase_in_harvested_forest_area_over_Europe_after_2015;
- Ceccherini, G., et al. (2021). Reply to Wernick, I. K. et al.; Palahí, M. et al. Nature 592(7856): E18-E23. At <https://doi.org/10.1038/s41586-021-03294-9>
16. Booth, M.S. (2021). Why the EU’s plan for climate neutrality by 2050 will likely fail. At <https://www.pfpi.net/wp-content/uploads/2021/11/PFPI-EU-Land-Sink-Target-report-Nov-23-2021.pdf>
17. Camia, A., et al. (2021). The use of woody biomass for energy production in the EU Publications Office of the European Union, Luxembourg, Joint Research Centre. Chart at page 9 of annotated version shows burning coarse woody debris as “lose-lose” for ecosystems and the climate. At <https://forestdefenders.eu/wp-content/uploads/2021/01/JRC-biomass-report-markup.pdf>
18. For instance, if all the subsidies received by a typical biomass power plant were allocated to wood fuel, a €50 per MWh subsidy would translate to a payment of about €40 for each tonne of forest wood.
19. Achat, D. L., et al. (2015). Quantifying consequences of removing harvesting residues on forest soils and tree growth – A meta-analysis. Forest Ecology and Management 348(Supplement C): 124-141. At <http://www.sciencedirect.com/science/article/pii/S0378112715001814>. Achat, D. L., et al. (2015). Forest soil carbon is threatened by intensive biomass harvesting. Scientific Reports 5: 15991. At <https://doi.org/10.1038/srep15991>. Hamburg, S. P., et al. (2019). Losses of mineral soil carbon largely offset biomass accumulation 15 years after whole-tree harvest in a northern hardwood forest. Biogeochemistry 144(1): 1-14. At <https://doi.org/10.1007/s10533-019-00568-3>.
20. Camia et al 2021, at <https://forestdefenders.eu/wp-content/uploads/2021/01/JRC-biomass-report-markup.pdf>
21. https://act.wemove.eu/campaigns/biomass-europe?utm_campaign=slider&utm_medium=website&utm_source=wemove
22. https://bioenergyeurope.org/index.php?option=com_content&view=article&id=286
23. <https://www.propellets.at/en/wood-pellets-fuel>

24. <https://epc.bioenergyeurope.org/about-pellets/>
25. <https://www.wsed.at/european-pellet-conference>
26. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02005L0029-20220528&from=EN>
27. Video: Fenna Swart queries VP Timmermans, March 11 2022, at <https://www.youtube.com/watch?v=FY8jQv90uRo>
28. <https://www.youtube.com/watch?v=13xB8jnMREg>
29. For information on the “biomass sustainability” criteria of the Renewable Energy Directive, see Booth, M. S. and B. Mitchell (2020). Paper Tiger: Why the RED II biomass sustainability criteria fail forests and the climate. Pelham, MA, Partnership for Policy Integrity. At <https://forestdefenders.eu/wp-content/uploads/2021/05/RED-II-biomass-Paper-Tiger-July-6-2020.pdf>. For assessment of the EC’s July 2021 RED reform proposal, see Booth, M.S. (2021). Why the EU’s plan for climate neutrality by 2050 will likely fail. At <https://www.pfpi.net/wp-content/uploads/2021/11/PFPI-EU-Land-Sink-Target-report-Nov-23-2021.pdf>
30. See Table 1, page 36 at <https://www.pfpi.net/wp-content/uploads/2021/11/PFPI-EU-Land-Sink-Target-report-Nov-23-2021.pdf>
31. https://ec.europa.eu/environment/3-billion-trees_en
32. <https://ec.europa.eu/eurostat/cache/infographs/energy/bloc-2c.html>
33. The Environmental Paper Network has an online resource (<https://environmentalpaper.org/tools-and-resources/mapping-bioenergy/>) that maps biomass and pellet facilities around the world. We selected facilities in the EU from this map
34. <https://s3.amazonaws.com/media.dogwoodalliance.org/wp-content/uploads/2019/07/Biomass-Investigation-Booklet-2019.pdf>
35. <https://www.pfpi.net/wp-content/uploads/2016/03/Report-to-SEC-on-Enviva-March-14-2016.pdf>
36. <https://thenarwhal.ca/bc-pacific-bioenergy-old-growth-logging-wood-pellets/>
37. https://www.pfpi.net/wp-content/uploads/2022/03/2021-10-21_OECD-complaint_Drax-Group-plc_FINAL-as-filed.pdf
38. https://www.youtube.com/watch?v=A_7N2940w2Y
39. <https://www.earthsight.org.uk/news/analysis/russias-timber-oligarchs>
40. <https://www.linzag.at/media/dokumente/linzag/energieerzeugung/umwelterklaerung-gj19.pdf>
41. <http://trinomics.eu/wp-content/uploads/2019/11/Trinomics-EU-biomass-subsidies-final-report-28nov2019.pdf>
42. <https://www.wienenergie.at/ueber-uns/unternehmen/energie-klimaschutz/energieerzeugung/biomasse/>
43. <https://www.heizinos.at/wissen-pelletproduktion>
44. <https://www.rz-pellets.at/aktuelles>
45. <https://corporate.engie.be/en/energy/biomass>
46. <https://www.earthsight.org.uk/news/analysis/russias-timber-oligarchs>
47. <https://www.brusselstimes.com/news/belgium-all-news/181046/too-hypocritical-for-words-burning-wood-for-power-isnt-sustainable-says-flemish-minister-of-energy>
48. <https://www.ecopower.be/groene-warmte/pelletdossier>
49. <https://www.ecopower.be/over-ecopower/productie-installaties/pelletsfabriek>
50. <https://www.pellet4u.com/web/en/chi-siamo/>
51. https://energy.ec.europa.eu/system/files/2020-06/bg_final_necp_main_en_0.pdf
52. <https://www.schneiderpellets.com/en/products/>
53. <http://www.ddtep.hr/brinje-biomass-cogeneration-plant-croatia-goes-into-commercial-operation/?lang=en>
54. https://issuu.com/verdo-as/docs/verdo_produktion_brancheaftaleevaluerend_2020_-_me/6
55. <https://graanulinvest.com/biomass/#product-info>
56. https://warmeston.ee/wp-content/uploads/2021/06/WEB_Warmeston_sustainability-report-2020.pdf
57. <https://www.vapo.fi/puupolttoaineet/>
58. <https://www.vapo.fi/energiaturve/>
59. <http://trinomics.eu/wp-content/uploads/2019/11/Trinomics-EU-biomass-subsidies-final-report-28nov2019.pdf>

60. <https://www.alholmenskraft.com/en/production/fuel>
61. https://www.alholmenskraft.com/en/company/bio-fuelled_power_plan
62. <https://www.alholmenskraft.com/en/production/fuel>
63. <https://www.alholmenskraft.com/en/production/fuel>
64. <https://www.biosyl.fr/les-granules-de-bois.html>
65. <https://www.ccomptes.fr/system/files/2020-05/20200525-rapport-58-2-structuration-filiere-foret-bois.pdf>
66. <https://www.fica-hpci.fr/qui-sommes-nous%20>
67. <https://www.ebiomass.eu/environmental-responsibility/>
68. https://www.ebiomass.eu/wp-content/uploads/2020/06/CP-PROJET-FESSENHEIM_EDB_HPCI_06-2020_v3.pdf
69. <https://www.youtube.com/watch?v=NP61N0-FeBU>
70. <https://reporterre.net/La-centrale-biomasse-de-Gardanne-bannit-le-bois-du-Bresil-sans-rassurer-les-ecolos>
71. https://www.eholding.cz/wp-content/uploads/eph_annual-report_2020.pdf
72. <https://www.sylviana.fr/entretenir-sa-foret/>
73. <https://www.l.de/stadtwerke/erzeugung/biomasse/>
74. <https://www.cycleenergy.com/standorte/erndtebrueck/>
75. <https://1heiz-pellets.de/holzpellets.php>
76. <https://www.eberswalde.de/start/stadtentwicklung/energie-und-klimaschutz-1/gut-zu-wissen-1/erneuerbare-energien/biomasse>
77. <https://alfapellet.gr/en/pellet-mpriketa/pellets.html>
78. <https://www.youtube.com/watch?v=E-MeImx3ao-o&t=32s>
79. <https://biomassza.veolia.hu/en/pecs-power-plant/>
80. <https://biomassza.veolia.hu/en/ajka-power-plant/>
81. <https://bellunodolomiti.voximprese.it/aziende/ceb-spa-compagnia-energetica-bellunese>
82. <http://www.powercrop.it/sviluppo-sostenibile>
83. <https://graanulinvest.com/heat-power/#product-info>
84. <https://alpha.enefitgreen.com/en/pelletitootmine>
85. <http://www.granulita.lt/zaliava.html>
86. <https://graanulinvest.com/biomass/>
87. <https://benelux.rwe.com/en/rwe-generation-nl>
88. <https://www.vandenbroekbv.nl/producten/houtchips-productie>
89. <https://zero.org/zero-apela-a-suspensao-da-atividade-da-central-de-biomassa-do-fundao/>
90. <https://pinewells.com/pt/home>
91. https://pinewells.com/assets/Pinewells_Supply_Base_Report_EN_2020.pdf
92. https://zero.org/wp-content/uploads/2021/10/Big_Biomass_in_Portugal.pdf
93. <https://www.svnews.ro/bioenergy-suceava-primeste-in-avans-10-milioane-de-lei-pentru-aprovizionarea-cu-biomasa-a-centralei-termice-a-orasului/269308/>
94. <https://www.svnews.ro/bioenergy-suceava-primeste-in-avans-10-milioane-de-lei-pentru-aprovizionarea-cu-biomasa-a-centralei-termice-a-orasului/269308/>
95. <https://balkangreenenergynews.com/romania-to-decarbonize-its-coal-power-plants-with-wood-pellets/>
96. <https://tehobardejov.sk/zdroj-zelenej-energie/>
97. <https://tehobardejov.sk/zdroj-zelenej-energie/>
98. <http://www.ertasa.net/pellet-de-madera>
99. <https://www.scandbio.com/en/private-customer/our-advantages/>
100. <https://www.scandbio.com/en/private-customer/our-advantages/>
101. <https://www.stockholmexergi.se/fjarrvarme/sa-funkar-fjarrvarme/>