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# From Forest to Furnace:

## The Impact of Wood Biomass Energy

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## Contents

Summary	3
The Impact of Wood Biomass Energy around the World	5
Europe	6
Germany	8
Portugal	10
UK	11
North America	11
Southeastern US	12
British Columbia	13
East Asia	14
Japan	14
South Korea	14
China	15
Southeast Asia	15
Indonesia	16
Malaysia	17
Vietnam	17
Africa	19
South America	20
The author	23

# Summary

The burning of wood in power and heat installations as well as the industrial use of charcoal are expanding rapidly worldwide. This development is driven by a combination of renewable energy targets and subsidies, coal phaseout policies that support wood biomass as an alternative, the exemption of biomass from carbon taxes and pricing and, in parts of the global South, carbon-offsetting schemes.

As shown in this report, the industrial-scale burning of wood for energy has severe impacts on forests and other ecosystems that have been converted to more monoculture tree plantations, and on communities whose livelihoods depend on forests – as they may face more land-grabbing for plantations – or that live next to polluting biomass facilities. For the climate, cutting down trees and burning them for energy is no less harmful than burning coal.

The precise drivers and impacts of large-scale wood bioenergy vary between regions. This report looks at wood biomass energy developments in Europe (especially in Germany, Portugal, and the United Kingdom (UK)), North America (southeastern United States (US) and British Columbia (BC)), East Asia (Japan, South Korea, China), Africa, and South America.

In Europe, wood biomass investments are supported by renewable energy targets and subsidies, and promoted by forestry and energy companies. Their impacts vary between countries, leading to the intensification of logging, forest degradation, and the loss of forest carbon sinks in countries such as Germany; to greater incentives for monoculture tree plantations such as eucalyptus in Portugal; and to large-scale pellet imports from forests in North America and elsewhere, especially in the United Kingdom.

In North America, the southeastern US is the world's largest pellet-exporting region, while BC is the centre of pellet production and exports in Canada. In both regions, wood for pellets is routinely sourced from the clearcutting of highly biodiverse forests, including old-growth forests in BC. In the southeastern US, pellet plants are disproportionately sited in deprived non-white communities. Violations of air quality standards are commonplace in North American pellet plants.

In East Asia, Japan and South Korea have become the largest wood pellet importers after European countries, due to renewable energy subsidies, especially for co-firing wood with coal and converting coal plants to biomass. Pellets are imported from Southeast Asia and North America. Campaigners in both countries have persuaded governments to limit the further expansion of wood biomass and especially imports. However, China is now implementing biomass co-firing targets, which could increase the global demand for wood pellets.

In Southeast Asian countries – especially Vietnam, Indonesia, and Malaysia – rainforests are coming under additional pressure from new domestic demand for co-firing wood in coal plants (especially in Indonesia), and for pellet production for export mostly to East Asia. Vietnam has become the world's second-largest pellet exporter after the southeastern US. Vietnamese pellets are mostly from acacia plantations, which are associated with rainforest destruction and soil erosion.

Africa is the continent most heavily reliant on so-called traditional biomass, that is, the use of fuelwood mostly for cooking. Indoor air pollution from cooking with solid fuels has serious health impacts, and fuelwood collection puts a significant burden on women and girls. Instead of securing universal access to electricity and clean energy, climate finance schemes and carbon markets are supporting so-called improved – but still polluting – biomass stoves, and a switch to wood from tree plantations. Monoculture tree plantations and the land- and water-grabbing and biodiversity destruction they are associated with, are the biggest concerns in the context of biomass energy.

In South America, Brazil is the world's largest producer of charcoal, much of which is used for iron and steel production. Most of that charcoal is made from monoculture tree plantations that are linked to forest destruction as well as land- and water-grabbing. In Brazil and Chile, pulp and paper companies are also now increasingly diversifying into biomass power generation, again relying on industrial tree plantations.



# The Impact of Wood Biomass Energy around the World

Wood biomass energy use is [expanding rapidly around the world](#). This expansion is driven by renewable energy targets and incentives, coal phaseout policies, exemptions from carbon taxes and, in some regions, inclusion in carbon-offsetting. This is despite the fact that the immediate levels of CO<sub>2</sub> emissions from burning wood are no less than those from burning coal. Wood-burning continues to be incentivised as low- or zero carbon and renewable, even though [800 scientists have warned in an open letter](#):

*Even if forests are allowed to regrow, using wood deliberately harvested for burning will increase carbon in the atmosphere and warming for decades to centuries – as many studies have shown – even when wood replaces coal, oil or natural gas. The reasons are fundamental and occur regardless of whether forest management is <sustainable.>*

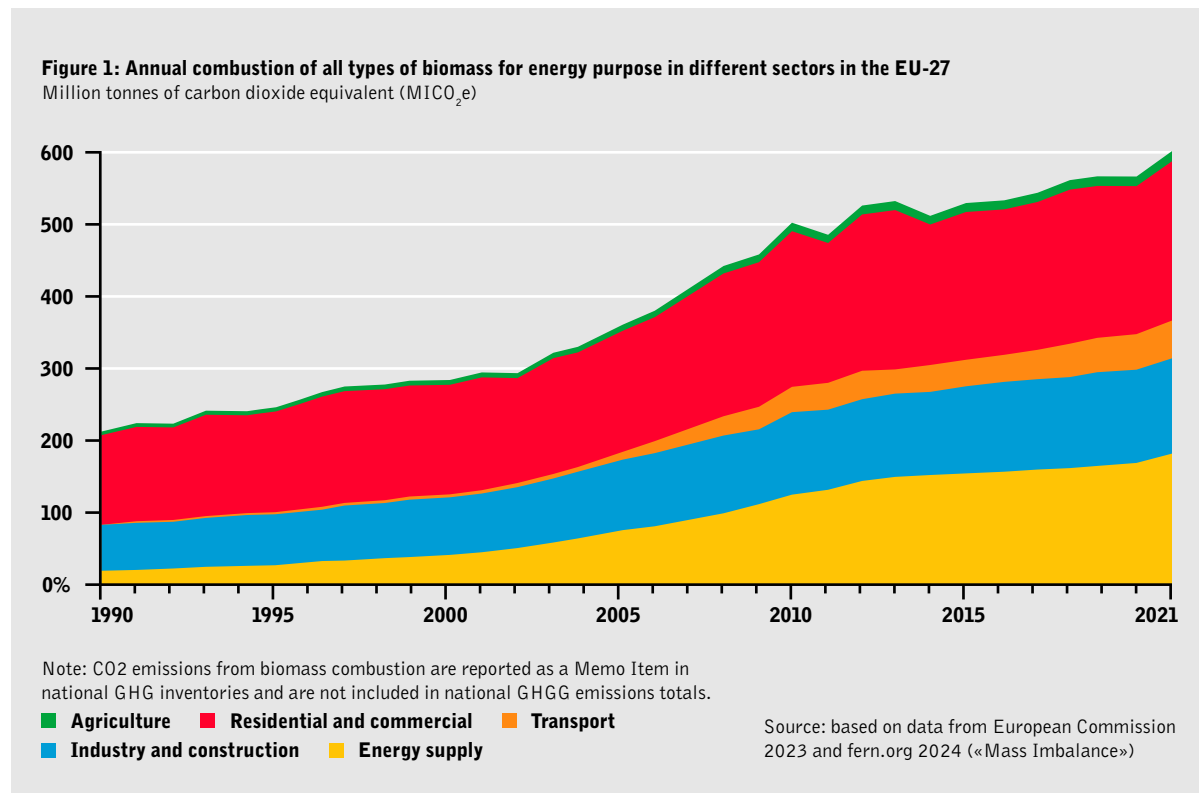
A [peer-reviewed study published in 2018](#) showed that even the burning of genuine logging residues is not compatible with the goals of the Paris Climate Agreement, due to the long carbon debt that arises from the upfront CO<sub>2</sub> emissions from burning wood. The use of sawmill residues and waste wood for energy is often regarded as less problematic, even though the levels of CO<sub>2</sub> emissions from smokestacks are still as high as those from burning wood from whole trees. However, those residues and waste wood are in limited supply, and burning them for energy competes with using them to make higher-value wood products. Apart from a small proportion of waste wood, all wood can be used for wood products.

The reason why wood bioenergy is nonetheless treated as a climate-friendly renewable energy source goes back to United Nations (UN) [carbon accounting rules](#), which were agreed several decades ago. Under those rules, countries are asked to record CO<sub>2</sub> emissions from biomass burning separately, but not to include them in their national greenhouse gas inventory reports. This was originally agreed to avoid the «double counting» of emissions: When forests are logged, the loss of forest carbon sinks and carbon sequestration are meant to be accounted for in the land and forestry sector where they occur, and not in the energy sector where the wood is burned and the carbon it contains is emitted into the atmosphere. In practice, however, carbon accounting in the land and forest sector is far from robust. Even if it was, energy companies are able to claim «zero emissions» from burning wood and other biomass, and countries where imported biomass is burned can do the same.

Large-scale wood biomass energy has severe impacts on forests and communities around the world. This report highlights important developments in some key regions in the world.

# Europe

The EU and UK combined play a leading role in the expansion of wood biomass worldwide. This expansion has been driven first and foremost by EU renewable energy directives, the *first of which was agreed in 2001*. The most recent EU directive is the EU Renewable Energy Directive 2023 (RED III), which sets a target of 42.5% renewable energy by 2030.



As before, EU member states are allowed to subsidise burning biomass – which is subject to *minimal efficiency and sustainability criteria* – as renewable energy and to count it towards renewable energy targets. Certification by any accredited voluntary certification scheme can be used for compliance with sustainability criteria. This is despite strong *evidence that the criteria and certification schemes are failing* at all levels and that, for example, *even wood pellets derived from whole logs from the clearcutting of old-growth forests, such as those produced by Drax, are being certified* as «sustainable».<sup>[1]</sup>

EU member states are not required to subsidise wood biomass energy, and they are allowed to introduce stricter criteria, too, for example ones that exclude feedstocks, such as forest wood. However, the support among member states for even burning forest wood remains strong. In 2020, there were 11 EU countries, together with the UK, that subsidised

**1** Note that all of Drax's pellet plants are certified by the Sustainable Biomass Program: <https://sbp-cert.org/certifications/certificate-holders>



Clearcut in old growth forest linked to Drax





biomass electricity to the tune of more than €7.2 billion. In addition to the direct subsidies, CO<sub>2</sub> emissions from biomass energy are counted as zero under the EU Emissions Trading Scheme, and they are exempt from all carbon taxes and payments across the EU and UK – an indirect subsidy.

According to the most recent figures from [2021](#), bioenergy accounts for 51% of all renewable energy in the EU, and wood accounts for just over one-third of total renewable energy. [More than half of the wood burned comes directly from forests and tree plantations](#); 19% of forest wood burned was imported from outside the EU that year. Within the EU, the Baltic region is the main exporter of pellets to other member states. Woodchips are commonly traded between neighbouring countries.

The increased demand for wood bioenergy is contributing to the collapse of Europe's forest carbon sinks. According to [governments' greenhouse gas accounts](#), the entire land sector of six EU member states (Czechia, Denmark, Estonia, Ireland, Latvia, and the Netherlands) was a net source of CO<sub>2</sub> emissions in 2021. In another 11 countries, the land sector sequestered less CO<sub>2</sub> than it did in 1990. Those negative trends are due to forests continually losing their capacity to sequester CO<sub>2</sub>. The actual situation may be even worse: [Germany's forest inventory report in 2024](#) revealed that the country's forests have been a net source of CO<sub>2</sub> emissions since 2017. The authors of a [study published in 2023](#) modelled changes in canopy height from 2001 to 2021. They found significant decreases in canopy between 2012 and 2021, which they ascribed to «a concurrent increase in timber harvesting and natural disturbances». A [previous study](#) also showed a clear correlation between forest biomass loss and the intensification of logging.

Governments' decisions to continue supporting biomass energy instead of shifting subsidies to genuinely low-carbon and clean renewables is driven by two factors: first, the combined lobbying by forest industries and energy companies, and second, a reluctance to invest in the energy storage and grid upgrades needed to move away from the large-scale burning of carbon-rich fuels, whether fossil fuels or biomass. How this plays out in different European countries is illustrated with three examples below.

## Germany

Germany [burns more wood than any other European country and has the most biomass subsidies in the EU](#), although (outside the EU) the UK offers even more biomass subsidies. It is also Europe's [largest wood pellet producer](#). The vast majority of pellets are burned in domestic wood stoves, which have been heavily subsidised. Furthermore, Germany has at least [130 wood-burning power and/or heat plants](#) with a capacity of at least 1 megawatt (MW). Overall, [half of all wood](#) in Germany (including waste wood) is burned for energy. Germany's [Environment Agency has warned](#) that, if current trends are not reversed, the country is likely to become a significant net importer of wood biomass by 2030.



Bischofferode-Holungen power station owned by Stadtwerke Leipzig





The growing wood biomass demand has a severe impact on Germany's forests. The escalating climate crisis has led to severe droughts, heatwaves, and storms, which have caused significant tree mortality and allowed bark beetles to multiply. After four years of drought that started in 2018, *more than 600,000 hectares (ha) of forest had died off*, and 80% of all trees have been damaged. Spruce monocultures have been the worst affected, whereas protected forests in national parks are showing resilience and natural regeneration. The demand for relatively low-cost wood for biomass energy leads forest owners to clearcut dead and damaged trees, even though new trees struggle to grow without shelter from the sun and heat. Since 2018, *logging rates have been far higher* than they were during the preceding decade. This trend puts the future of Germany's forests at serious risk.

## Portugal

Most of Portugal's tree cover consists of eucalyptus plantations and pine monocultures, both of which increasingly supply biomass energy.

Portugal has around 900,000 ha of eucalyptus plantations. They are linked to the depletion of soils and freshwater, and provide no wildlife habitats. Eucalyptus is highly flammable, and the *plantations have made wildfires far more severe*. In 2017, there were 117 people who died from such fires. In 2024, *four people died and 100,000 ha burned*. Eucalyptus plantations supply the country's pulp and paper industry. That industry has been heavily investing in biomass electricity, generating *almost 80% of the country's biomass electricity*, a large proportion of which is sold to the grid rather than meeting the energy requirements of pulp mills.

Pine plantations are also more flammable than the remnants of Portugal's native forests, albeit less so than eucalyptus. Sawmills and industries for high-value wood products rely on pine. In recent years, wood pellet plants have been sourcing increasing quantities of pine: In 2022, 20% of all harvested pine went into the production of 1.4 million tonnes of pellets, around two-thirds of them for export. Due to excessive logging, Portugal *lost more than 25% of its pine woods between 2008* and 2015, and evidence of a further significant decline is expected once the government publishes its 2015-25 figures. Sawmills and panelboard producers are struggling to compete with wood pellet producers for the wood they need. An *investigation by the Portuguese NGO ZERO and Biofuelwatch* in late 2023 revealed that one large pellet plant had even sourced wood from a mountainous nature reserve designated as an EU Natura 2000 site.



## UK

The UK pays *more subsidies for biomass energy than any EU country*, including Germany, and it is the world's largest wood pellet importer. The majority of biomass is burned for electricity, with just three power stations burning all imported pellets: MGT Teesside (300 MW), Lynemouth Power (420 MW), and the largest wood-burning plant, Drax Power Station, with an active capacity of just under 2 gigawatts. By the end of 2023, the UK government had given Drax Power Station alone a *total of £6.5 billion* (€7.81 billion) for biomass burning. Subsidies for Drax and Lynemouth Power are due to end in early 2027. However, the UK government will decide in 2025 whether to extend them, despite overwhelming evidence of the serious harm caused by their wood pellet imports and, in the case of Drax, pellet production. The great majority of imported pellets come from the southeastern US, followed by BC, with some also coming from the Baltic states, Portugal, and Brazil.



## North America

Although wood biomass use is promoted across the US and Canada, the wood pellet industry – especially in the southeastern US and in BC – stand out as having particularly severe impacts on forests and, especially in the southeastern US, on communities. The great majority of those pellets are exported to Europe and East Asia. Both regions allow large-scale clearcuts of highly biodiverse forests, including old-growth forests in BC, with few or

no constraints. In the southeastern US, *86% of forests are privately owned*, mostly by families, and there are no laws to regulate logging on private lands. *In Canada*, 94% of forests are publicly owned and managed by governments. Forestry regulations vary between provinces. In BC, logging, including forest clearcutting, is *permitted* in the large majority of primary and old-growth forests, *even in so-called Old Growth Management Areas*.

This, presumably, is why those regions are so heavily targeted by the wood pellet industry.

## Southeastern US

The southeastern US is the world's *largest wood pellet exporter*. It has *28 wood pellet mills*, with active proposals for six more. The world's largest pellet producer, Enviva, operates all 10 of its plants there. The second-largest pellet capacity belongs to the UK company Drax Group. Over many years, *investigations by NGOs as well as reporters* have shown that Enviva routinely sources wood from the clearcutting of coastal hardwood forests. In 2022, a whistleblower told a reporter from Mongabay: *«We take giant, whole trees. We don't care where they come from. The notion of sustainably managed forests is nonsense. We can't get wood into the mills fast enough.»* Enviva exports pellets to the UK and Japan. In the past, Enviva also sold pellets to the Netherlands, Denmark, and the French Overseas Territories (Guadeloupe, Martinique, possibly Réunion) and may still be doing so.<sup>[2]</sup>

The region's coastal hardwood forests lie at the heart of a *global biodiversity hotspot*, one with more than 1,700 endemic vascular plants as well as 70% habitat loss. Only *around 20% of the original wetland forests – called bottomland hardwoods – remains*. They are some of the most important habitats for birds, reptiles, and tree biodiversity in North America. In the past, the pulp and paper industry was the main driver of the destruction of those forests, but in recent years, that role has been increasingly taken up by the pellet industry. According to the forest conservation NGO Dogwood Alliance, the pellet industry has *destroyed more than 400,000 ha of forests, including around 4,900 ha of bottomland hardwoods in North Carolina* alone.

According to a *study published in 2018*, wood pellet plants in the region are 50% more likely to be located in environmental justice communities. Those are communities with a poverty rate above the state average and where at least 25% of the population is non-white. All pellet plants in North and South Carolina were sited in such communities. A *community survey* published in October 2024 found that 91% of households living within half a mile of

**2** There is no requirement in the EU for energy companies to publish any information as to where they are sourcing wood from.

pellet mills suffer from problems created by dust, traffic, and noise at least weekly, 55% reported that concerns over pellet mill impacts disrupted their outdoor activities, and 58% reported health concerns such as sinus and throat irritation.



Drax is now building a large pellet plant in Washington state and has partnered with Golden State Natural Resources, which is seeking to build two large plants in California. Those plants face opposition from environmental NGOs and, especially in Stockton, California, from [a coalition of local organisations concerned about environmental justice impacts](#).

## British Columbia

Canada produces around 3.5 million tonnes of pellets a year, the vast majority of which are exported to Europe, Japan, and South Korea. [BC produces more pellets than any other province](#). The UK-based Drax Group has a near monopoly on pellet production in BC, operating eight out of nine pellet plants.

Across BC, the vast majority of harvested wood is from primary forests. Even the sawmill residues that are used to make pellets ultimately come from clearcutting such forests. In early 2024, Conservation North, the Bulkley Valley Stewardship Coalition, and Biofuel-watch published an [investigation into Drax's wood sourcing in the region](#) throughout 2023. The investigation showed that Drax had been sourcing logs from mature trees cut down in old-growth forests, including some of the rarest, irreplaceable old-growth forests, which an



expert committee had classed as Priority Deferral Areas. A parallel [BBC investigation](#) came to the same conclusions.

In BC, the definition of an old-growth forest is a primary forest with trees that have reached an advanced age and in which plants, animals, and other life forms have developed complex, interconnected relationships. Old-growth forest covers just 3% of the Province after a century of logging.

## East Asia

**Japan** is the second-largest importer of wood pellets worldwide, after the UK. In [2023](#), 45% of those pellets came from Vietnam, 28% from BC, and most of the rest from the US, followed by Indonesia. In addition, Japan imported around [4.8 million tonnes of palm kernel shells](#) from Indonesia and Malaysia – residues of palm oil production linked directly or indirectly to deforestation.

Large-scale investments in biomass electricity started with feed-in-tariffs being introduced in 2012 following the Fukushima disaster. In 2018, the government finally [excluded new biomass co-firing projects from subsidies](#). However, by then half of all coal power plants were already co-firing biomass, and another nine biomass projects had been [approved feed-in-tariffs at coal plants](#). Dedicated biomass plants continue to be built.

As well as incentivising large-scale wood pellet burning in Japan, the government has been drawing up energy transition roadmaps for Southeast Asian countries via the Asia Energy Transition Initiative. The state-owned Japan Bank for International Cooperation (JBIC) has been providing large loans for biomass projects in the region; Nippon Export and Investment Insurance and private Japanese finance institutions play a key role in accelerating finance for «energy transition», including biomass projects. Japan thus helped devise Indonesia's policy of co-firing wood with coal, JBIC has helped finance biomass projects led by Japanese energy companies in Japan, and the Japanese government has signed a Memorandum of Understanding for the development of biomass power generation with Thailand. The latter is believed to involve the country's [first project to co-fire wood pellets with coal](#). Japan thus plays a pivotal role in promoting biomass expansion – above all the burning of wood in coal power plants – not just domestically but across Southeast Asia.

**South Korea** is Asia's second-largest wood pellet importer, with [3.7 million tonnes imported in 2023](#). In recent years, more than half of all [pellet imports](#) have come from Vietnam, followed by Russia, Indonesia, Malaysia, and Canada. Since June 2022, South Korea has been the only official [destination of Russian wood pellets](#). Around 84% of pellets burned are imported, the rest are produced domestically, mostly from the clearcutting of South Korean forests. Biomass (over 75% of it wood pellets) is almost exclusively burned for electricity: in 28 dedicated biomass plants (some of them converted coal plants), and in 41 coal power

stations co-firing wood pellets. Biomass power capacity is expected to grow by more than 50% by 2026, with several plants under construction, even though the government's current Basic Plan for Long-Term Electricity Supply and Demand says that biomass capacity should be frozen at 2023 levels.

South Korea's biomass expansion took off in 2014, when biomass became subsidised more generously than wind or solar power, with extra weighting of Renewable Energy Credits (the main subsidy scheme), as well as additional subsidies for converting coal plants to biomass. As a result, the growth of wind and solar power was stymied. From 2018, the amount of biomass subsidies was reduced, but only for new developments that had not yet been approved. Today, solar power has become the main source of renewable electricity, but biomass still generates *more than 3.5 times as much power as wind*.

South Korea's biomass policy has so far been driven mostly by energy companies – led by the state-owned power corporation, KEPCO – that are intent on preserving their coal power assets. In addition, the Korea Forest Service has recently been advocating for a major expansion of domestic wood biomass production, which means more forest clearcuts.

This, however, seems to finally be changing: In December 2024, after years of campaigning led by the NGO Solutions for Our Climate, the *government announced* significant reductions in renewable energy subsidies that are paid out for burning imported wood pellets. However, the South Korean NGO *Solutions for Our Climate warns*: «While this change largely heralds a step in the right direction to mitigate the controversial forest biomass, slow phase-out timelines and loopholes continue to threaten global forests».

Little is known about biomass investments in **China**. As of now, China is not a major wood pellet importer. However, the International Energy Agency (IEA) writes in *its 2024 World Energy Outlook*: «The largest source of growth [of biomass energy] is the power sector in China, where consumption grows from 3 EJ [exajoule] today to 7 EJ in 2050 in the APS [Announced Pledges Scenario].» The IEA assessment seems credible, given a recent *Chinese government announcement* that all coal plants will have to co-fire 5% biomass or «green» ammonia, or install carbon capture in future. Of those three options, burning wood is the simplest and most economical.

## Southeast Asia

Industrial-scale biomass is becoming a new driver of deforestation in three Southeast Asian countries: Indonesia, Vietnam, and Malaysia.

In Indonesia, forests and the people depending on them, many of them Indigenous Peoples, are threatened on the one hand by the growing demand for wood pellets in Japan and South

Korea, and on the other hand by the Indonesian government's promotion of co-firing wood pellets with coal.

In 2020, the **Indonesian** government and the state-owned power company, PT PLN, published a plan to co-fire wood in 52 coal power stations. The plan was supported by a Just Energy Transition Partnership, set up by Japan and the US to mobilise \$20 billion in public and private finance to fund this plan and to replace 5-10% of coal with biomass. By 2021, co-firing pilot projects had already been implemented at 32 coal plants. By 2025-2030, *PLN foresees up to 14 million tonnes of biomass a year*, mostly woodchips and wood pellets, being co-fired with coal, as well as 600 MW of dedicated biomass power plants being built. In addition, *Indonesia exported around 121,000 tonnes of wood pellets to South Korea and Japan* combined, a figure that is expected to rise steeply in the coming years. At least two wood pellet plants are being built – one on Sulawesi, the other in East Kalimantan, Borneo – that will each be *larger than any pellet plant in Europe*.

In order to meet the demand, plantation and coal companies have started investing in new fast-growing «energy wood-base» tree plantations, in many cases at the expense of rainforests. The *largest pellet plant* that is currently being developed in Indonesia, with an ultimate capacity of 900,000 tonnes a year, is located in Gorontalo Province, Sulawesi. The investing company, Biomasa Jaya Abadi (BJA), has entered into wood supply agreements with two plantation companies that had acquired concessions to plant oil palms but, having failed to do so, had those permits revoked. Both have now been granted new permits for tree plantations. According to NGO investigations, they cleared a total of 1,141 ha of rainforest from 2021 to 2023, selling first the wood from forest clearance and eventually also wood from the plantations to BJA. More deforestation is expected – in a district with *a particularly high number of bird species that are found nowhere else*. All pellets are for export to Japan and South Korea.

In Malinau District, East Kalimantan, a subsidiary of a coal company is planning to build another pellet mill for exports to South Korea, and it has obtained concessions for 19,045 ha of land, including around 15,000 ha of rainforest. *Villagers have reported* unfair deal-making, that pressure has been put on them to sign away their land, and in two instances land seizures without villagers' permission.

Biomass developments in Indonesia are thus driven by new corporate alliances between coal and plantation companies, reminiscent of alliances between oil and plantation companies that have driven much of the expansion of biofuels. Coal companies benefit by evading the pressure to close plants in order to reduce Indonesia's high CO<sub>2</sub> emissions, since they do not have to account for emissions from burning wood. They also get to diversify into a new line of business, while plantation companies have found a new market to allow them to expand. Those developments have received strong support from Japan, in particular.



**Malaysia** exported around [860,000 tonnes in 2023](#), a figure expected to be even higher in 2024. Pellet production is currently [expanding most rapidly in Sarawak](#), Borneo. In the same province, [plans](#) for a very large – up to 500 MW – biomass power station have just been announced by the Sarawak-based company Acacia Power and the Italian multinational Marie Group. Most Malaysian pellets are going to Japan and South Korea, with smaller quantities being shipped to the [Netherlands and France](#). So far, there have been no independent investigations into the impacts of this pellet production.

In May 2024, [six NGOs active in Sarawak](#) urged the European Commission to classify the province as a high-risk area for deforestation under the new EU Deforestation-Free Products Regulation. They pointed out that the provincial government had not

*enforced measures to tackle deforestation and protect human rights, and it has not made relevant data available. Its legal framework has failed to uphold Indigenous [People's] rights to own and control their land, participate in decision-making, and access important information that impacts their rights and livelihoods.*

One of the groups, Rimba Watch, showed that 2.3 million ha of naturally regenerating rainforest are at risk of deforestation, mostly for timber plantations. The timber corporation Samling Group features prominently in this evidence provided by NGOs and in many other reports on deforestation and the violation of Indigenous People's rights in Sarawak. Samling has now entered the pellet business with a [plant in Bintulu](#), which sells to Japan, South Korea, and likely the Netherlands.<sup>[3]</sup>

Clearly, large-scale biomass investments in Malaysia are driven by the timber and plantation industry taking advantage of a new international demand for wood.

**Vietnam** is currently the second-largest exporter of wood pellets worldwide, with the large [majority of pellets going to South Korea and Japan](#). A 2023 [investigation by the Earth Journalism Network](#) shows that 70% of pellets produced in Vietnam are from acacia plantations, with some plants using or having used wood from the country's tropical forests. There is no effective control over what wood goes into pellets, and Vietnam [imports large quantities of wood from countries considered at high risk of illegal logging or trading in illegal logs](#), such as Cameroon, Laos, and Cambodia.

As of 2019, Vietnam had around [4.2 million ha of tree plantations](#). More than two-thirds of Vietnam's tropical forests are in poor condition – only 5% of tree cover consists of biodiverse, closed-canopy cover. According to the [Earth Journalism Network](#), acacia plantations are frequently associated with rainforest destruction, depleting the soils of nutrients

**3** A wood pellet shipment from Sarawak went to the Netherlands in 2024, and the Bintulu plant is the only one with the relevant (although highly questionable) sustainability certification.





**OUR FORESTS ARE  
NOT FOR POWERING  
JAPAN AND KOREA**  
**#BigBadBiomass**



(leading to declining yields and incomes), and, when planted on mountains – with landslides – some of them deadly. The authors of the report state that the »acacia frenzy in Central Vietnam has been driven by rising prices following ever-higher demand for its wood« – now fuelled by the global demand for wood pellets.

In addition to exporting ever larger amounts of wood pellets, Vietnam is looking to co-fire large amounts of wood with coal. In 2023, the government set out a roadmap for energy, including plans to convert all old coal plants to biomass or ammonia (unlikely to be economically viable) or close them, and to co-fire wood or ammonia in coal plants older than 20 years. *Japanese companies* are playing an important role in developing biomass plants and co-firing schemes in the country. And *in January 2025*, Vietnam's Ministry of Industry and Trade announced imminent plans to include biomass electricity into a subsidy scheme that has so far only supported wind and solar power.

## Africa

Across Africa, biomass accounts for *52% of all energy use*. The vast majority of this consists of fuelwood and charcoal that is burned for cooking, which is classified as «traditional biomass». The *World Health Organization estimates* that, in 2020, 3.2 million people – more than 237,000 of them children under five – died worldwide from household air pollution due to cooking with solid fuels, mostly biomass. Time-consuming fuelwood collection has a serious *impact on women's quality of life* and ability to take up paid employment. Yet, instead of investing in rural electrification based on clean renewable energy, a significant share of relevant climate and development finance goes into promoting supposedly cleaner and more efficient «improved» biomass cookstoves as well as tree plantations to produce charcoal for such stoves. This is despite the fact *that studies show* that the promised benefits from «improved» biomass cookstoves have consistently failed to materialise. Such stoves, which are generally sold to communities, as well as commercially produced charcoal or wood pellets are classified as «modern bioenergy». In practice, the difference is one of ownership and commercial versus community control rather than of climate and health impacts.

The official distinction between «traditional» and «modern» biomass matters greatly: UN Sustainable Development Goal 7 requires universal access to «affordable, reliable and modern energy services» by 2030. This goal *can be met in part by burning «sustainable biomass» in «improved cookstoves»*. Climate finance and *carbon offset schemes treat fuelwood, usually collected by women and girls, as inherently unsustainable, non-renewable, and CO2-emissive*. This is based on the assumption that communities are simply cutting down trees without «managing» the forest or planting trees. On the other hand, when charcoal and wood from timber plantations are burned (whether in «improved» cookstoves or larger biomass facilities), this is treated as zero carbon, sustainable, and renewable based on the assumption that trees continue to be replanted.



An example of tree plantations being promoted for «modern» biomass is the Green Charcoal Project in Uganda, which was funded by the Global Environment Facility and implemented by the United Nations Development Programme and the Ugandan government. Eucalyptus has accounted for 90% of planted trees. According to a [report published by the Global Forest Coalition](#), the planting of eucalyptus has impacted negatively on biodiversity, freshwater, and soils. Agricultural productivity fell because farmers were incentivised to plant trees on their farmland, and eucalyptus depleted water resources. Similar projects continue to be funded elsewhere, for example by the [Green Climate Fund](#) in the Republic of Congo, where fuelwood acacia plantations are being established.

For [environmental campaigners in Africa](#), monoculture tree plantations are the primary concern as regards «modern» biomass. A particularly harmful plantation scheme supposedly designed for biomass energy involves a [42,000 ha land grab for eucalyptus plantations](#) in Ghana by the Norwegian company APSD, with funding from APSD, the African Development Bank's initiative, the Africa Renewable Energy Fund, and UK and Belgian development finance institutions. APSD claimed that those plantations would supply energy to a large new biomass power plant they were building, yet no such plant has been developed. [Investigations by the Ghanaian NGO Civic Response](#) found that farmers have lost their livelihoods, suffered due to the pollution of their drinking water, and have been subjected to serious human rights abuses at the hands of APSD, resulting in at least one death.

There are no signs that any African country is likely to export wood pellets to the global North in the foreseeable future. The lack of abundant, cheap energy, which is required for energy-intensive pellet production, is likely to be a factor. Africa's largest wood-biomass power station is the Ngodwana Biomass Plant in South Africa. It is operated by the timber corporation Sappi next to a pulp mill, with all the electricity produced being sold to the grid. The plant is relatively small by the standards of European and East Asian biomass plants. However, as [shown by the South African NGO GeaSphere](#), it still increases the demand for eucalyptus and pine logs from the region's vast tree plantations. Those plantations have a disastrous impact on freshwater, soils, and on biodiverse wildlife habitats. This mirrors similar biomass investments by pulp mill operators elsewhere, including in Chile and Portugal.

## South America

Across the region, large-scale wood biomass burning primarily involves the use of charcoal in the iron and steel industry – and, increasingly, burning wood in biomass plants that are linked to pulp mills, but exporting some of the electricity to the grid. Wood pellet production remains relatively small-scale, with [only one larger plant](#) making pellets from acacia plantations for export to Europe.

## Charcoal

Brazil is the world's largest charcoal producer, having produced [7.1 million tonnes in 2022](#), nearly all of it from eucalyptus plantations. [As of 2017](#), 90% of the charcoal produced was used by the country's iron and steel industry (the largest in the world). Eighty per cent of the charcoal was sourced from industrial tree plantations, most of them eucalyptus. Seventy per cent of Brazil's iron and steel mills are located in the southeastern state of Minas Gerais, which also has the largest plantation area of any state in the country. Historically, more charcoal has been used in pig iron<sup>[4]</sup> and steel production in Brazil because of a lack of coking coal deposits and easy access to wood. In recent years, charcoal use has been [boosted by government and international climate finance](#), which is aimed at reducing the use of coal – and ostensibly carbon emissions – from steel production.



In 2020, the [Global Forest Coalition published a case study](#) about one such climate finance project in Minas Gerais, based in part on interviews with the affected communities. Eucalyptus plantations are among the top three drivers of the destruction of the Cerrado biome, the world's most biodiverse savannah. At the time of the report, the Cerrado had already lost 52% of its vegetation cover, resulting in rivers and streams running low and springs drying up. The destruction of the Cerrado is linked to [disrupted rainfall over the Amazon Basin and other regions](#). Most charcoal in the state is made in small kilns, where workers are exposed to serious health risks, and where working conditions tend to be extremely poor. In 2022, [Minas Gerais](#) was the state with the highest prevalence of forced labour, with charcoal production being one of the high-risk sectors for slavery-like conditions. Interviews with communities revealed widespread land-grabbing; eucalyptus drying up

**4** Pig iron is made by smelting iron ore with coking coal or charcoal to enrich it with carbon. It is commonly used in steel production.

water sources and causing vital fruit trees to die; the application of pesticides and other agrotoxins; and a lack of work, leading to young people leaving traditional communities.

### *Pulp mills and biomass*

Pulp mills traditionally burn production residues – mostly black liquor (sludge left behind from the production process) and bark – to generate energy for those plants. However, in recent years, growing numbers of pulp mill operators worldwide have started investing in larger biomass plants that also burn woodchips and sell surplus electricity to the grid. The international Biomass Action Network has [mapped](#) 18 such biomass plants (planned and operational) in Brazil, 9 in Chile, 1 in Paraguay, and 3 in Uruguay. A [joint case study](#) by Colectivo VientoSur, the Global Forest Coalition, and the Environmental Paper Network looks at the Valdivia biomass power plant in southern Chile, part of a pulp mill complex operated by Arauco. The plant was designed to be so large as to export most of the electricity to the grid. It received carbon credits under the UN Clean Development Mechanism. According to the NGO investigation, there are indications that some of the biomass burned is wood from whole trees. The pulp mill complex relies on large eucalyptus and pine plantations. It has had serious negative impacts on the Mapuche Indigenous People, including land-grabbing, loss of livelihoods and food sovereignty, and rural depopulation. The impacts on biodiversity have been severe, and the monoculture tree plantations are highly susceptible to disastrous wildfires.



# The author

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