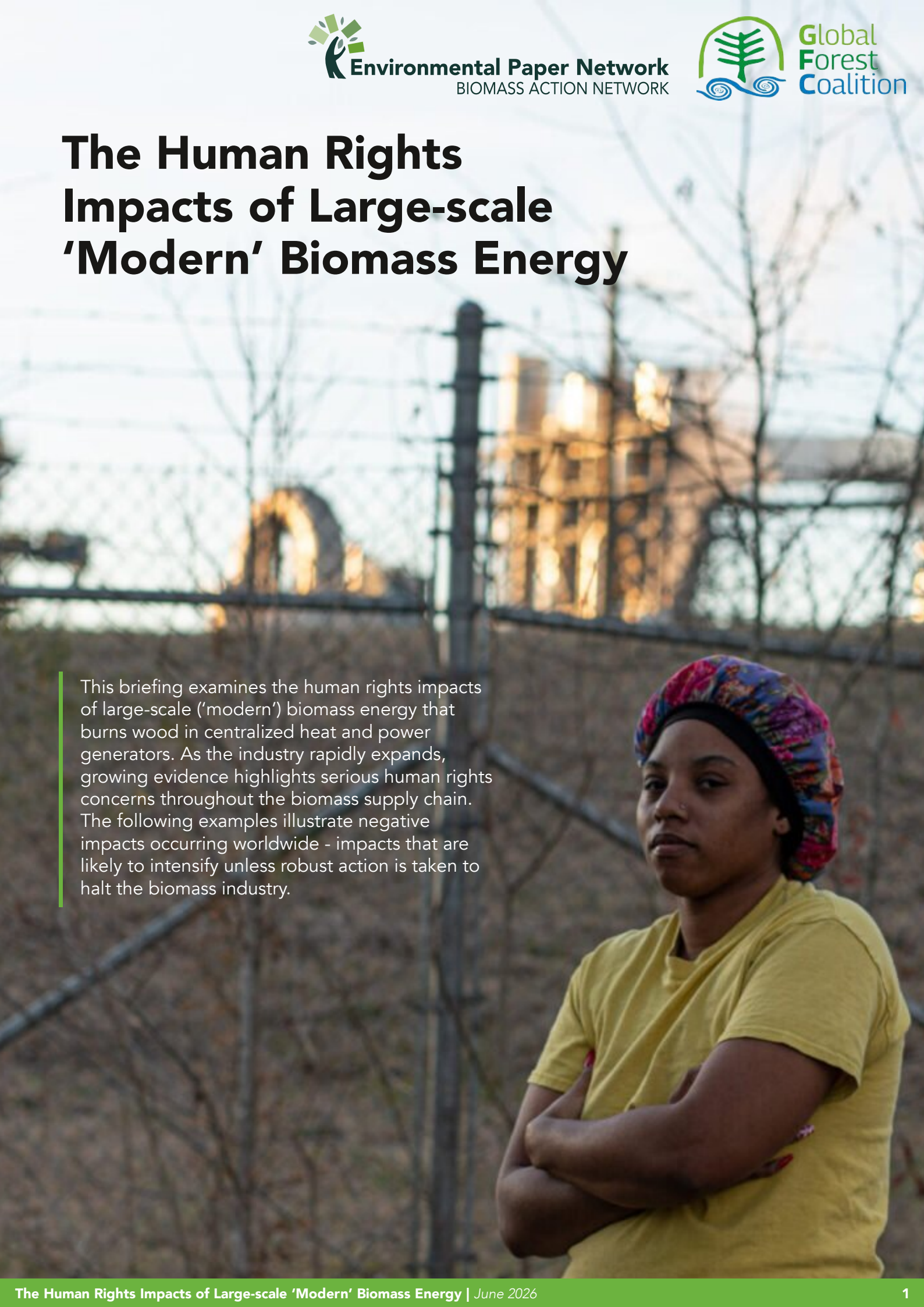
Environmental Paper Network
BIOMASS ACTION NETWORK

Global Forest Coalition

The Human Rights Impacts of Large-scale 'Modern' Biomass Energy



This briefing examines the human rights impacts of large-scale ('modern') biomass energy that burns wood in centralized heat and power generators. As the industry rapidly expands, growing evidence highlights serious human rights concerns throughout the biomass supply chain. The following examples illustrate negative impacts occurring worldwide - impacts that are likely to intensify unless robust action is taken to halt the biomass industry.

What the United Nations human rights council says about biomass energy

"Due to considerable climate, environmental and human rights concerns, new bioenergy development should be considered with the ***highest level of precaution*** *and* ***extensive consideration of alternatives****, in the context of a human rights-based and ecosystem approach."*

Summary of the Report of the Special Rapporteur on the promotion and protection of human rights in the context of climate change.

Humans rights impacts are occuring globally.

Treating woody biomass as a renewable fuel in the drive to defossilize economies has triggered subsidies and incentives that accelerate demand. This has created a large global trade in wood pellets and woodchips as commodities. As a result, the biomass supply chain extends from forests or tree plantations where woody biomass is sourced, to processing facilities that convert the biomass into woodchips or pellets for burning, and finally to the energy generation facility that burns the biomass. Due to this, impacts on people are occurring on a global scale and often in locations far from the actual energy-generating power plant.

Biomass energy undermines community rights and interests.

Rising demand for biomass exacerbates conflicts over land and forest resources, fueling land grabbing and undermining the rights, interests, livelihoods, and cultural heritage of Indigenous, tribal and local communities. Established businesses that rely on forest resources are also affected. The wide-ranging impacts threaten food security for populations, both directly and indirectly, now and in the long term.

Biomass energy harms human health and well-being.

Forests are vital in protecting communities from the worst effects of climate change. People living on the front lines of forest destruction are especially vulnerable - not only to climate impacts, but also to pollution and land use changes driven by extractive industries. Biomass manufacturing and combustion facilities are frequently located in economically disadvantaged areas, where they further diminish quality of life by releasing pollutants that increase rates of respiratory and other diseases.

The **Biomass Action Network** is a coalition of more than 220 NGOs across 70 countries. Our position statement, The Biomass Delusion, outlines the significant harm large-scale forest biomass burning causes to the climate, forests, people, and the clean energy transition.

Impacts from biomass feedstock

Woody biomass is sourced from both natural forests and monoculture tree plantations - each linked to human rights abuses such as land and water grabbing, dispossession, gender-based impacts, increased zoonotic diseases, conversion of community and agricultural land, and loss of access to clean water, medicinal resources, and food, undermining food security and food sovereignty.

Natural forests

The demand for large volumes of wood for biomass energy intensifies pressure on the world's remaining natural forests and the people who depend on them. This also worsens the impacts of other exploitative industries, such as pulp and paper and, to some extent, palm oil, as these sectors increasingly source wood fiber for biomass energy.

Monoculture tree plantations

Increasingly, natural forests are being replaced by tree plantations for biomass production. Natural forests have many functions and roles that cannot be replicated by plantations, and so their loss deeply affects the communities that depend on them. In some cases, land traditionally used for agriculture and livestock by communities is also being targeted for plantation establishment. These create biodiversity "deserts" and can have huge impacts on water availability, which has profound consequences for communities.

Impacts from biomass processing and combustion

Processing wood into pellets - and burning these pellets or woodchips in biomass facilities - releases excessive amounts of dangerous pollutants. These include fine particulates ($PM_{2.5}$), volatile organic compounds (VOCs), nitrogen oxides (NO_x), carbon monoxide (CO), carbon dioxide (CO_2), methanol, acrolein, and formaldehyde. Numerous studies have shown that exposure to these chemicals can cause serious and long-term health problems, including respiratory and cardiovascular diseases, cancer, and developmental disorders.

Biomass-based technologies

Any technology that relies on biomass energy - such as wood-based e-fuels, Bioenergy with Carbon Capture and Storage (BECCS), industrial-scale biochar and charcoal for "green steel" - shares the same supply chain and therefore amplifies the human rights impacts described in this briefing.

Bioenergy with Carbon Capture and Storage (BECCS)

Climate models often rely on large-scale deployment of BECCS to limit warming to 1.5°C, however BECCS poses significant threats to human rights, stemming from the sheer scale of the land it requires. Exactly how much land depends on the type of biomass and the scale of the expected negative emissions, but some scenarios require an area comparable to the size of India. This would create significant competition with agriculture, driving up food prices and compromising people's rights to affordable food. BECCS also presents trade-offs between land and water usage that would dramatically increase global water demand, worsening water scarcity and undermining people's right to clean drinking water.

Examples of human rights impacts

> **The following examples document the impacts of biomass feedstock production, processing and combustion around the world.** *Please note that claims of "Sustainable Forest Management" do not obviate these impacts because the concept is not fit for purpose.*

United States of America

Biomass manufacturing and combustion facilities are often sited in disadvantaged areas, where pollution worsens health and quality of life. An example of this can be found in the Southeastern United States, which is the largest manufacturer and exporter of wood pellets globally. Here, systemic racial injustices have resulted in the disproportionate placement of biomass manufacturing industries in majority-Black communities. Pellet manufacture emits excessive amounts of harmful pollutants and exposure to these chemicals has been shown to lead to respiratory illnesses, heart disease, premature deaths, low birth rates, Type 2 diabetes, strokes, Alzheimer's, Parkinson's, and lung, kidney, and bladder cancer. Southeastern U.S. residents have reported an increase in many of these health problems.

Pellet producers have repeatedly violated the U.S. Clean Air Act, emitting dangerous chemicals well beyond permitted limits. A litany of examples show how ineffective regulation and woefully insufficient fines for polluting - that do not function as a deterrent - are failing communities. An investigation found that wood pellet mills owned by UK energy giant Drax have violated environmental regulations 18,000 times in the US since 2014. The violations include exceeding permitted limits of toxic air pollutants, bypassing crucial emission-control technologies and releasing contaminants into waterways. This is a systematic disregard for pollution controls and for the human right to clean air and water. This is a pattern repeated around the world in areas where biomass is processed and burned.

Gloster, Mississippi, resident Jasmine Jenkins stands in front of the Drax plant Amite Bioenergy, which began operations next to her community in 2014. ***Andy Sarjahani/Unearthed***

Local communities in Indonesia take part in a day of action against biomass energy by holding signs which read "Land clearing disrupts the ecosystem and damages local people's land" and "Let's restore forests and community living spaces". ***Trend Asia***

Indonesia

In Indonesia, "Energy Plantation Forests" (HTE - Hutan Tanaman Energi) are driving deforestation and replacing natural forests with monoculture plantations to supply biomass for energy use. This practice is jeopardising the rights and livelihoods of local and Indigenous communities, as exclusivity rights are often granted to companies without proper identification of third-party land users or consideration of those already living on or using the land. Companies frequently proceed without employing remote sensing or adequate geographical and satellite mapping, contributing to the destruction of local farmland and traditional access routes. These projects are often approved by national authorities without consulting regional or local governments or seeking the free, prior, and informed consent (FPIC) of affected communities, thus bypassing essential local oversight.

This pattern is evident across Sumatra, Java, Kalimantan, Sulawesi, and Maluku, where biomass energy projects have deprived communities of access to forests and lands essential for food, medicine, cultural practices, and livelihoods - severing their ties to ancestral territories. In Jambi, the Suku Anak Dalam Indigenous community lost their gardens, forests, and fields to a bioenergy project: while PT Hijau Artha Nusa deforested 4,000 hectares, it replanted only 64.5 and failed to provide compensation or honor agreements. In Maluku, the O Hanga Manyawa Indigenous people were excluded from any communication about a bioenergy project on their ancestral land, even after permits were issued. On Buru Island, state-owned enterprise (BUMN) plantations ignored FPIC protocols, resulting in further loss of forests and farmland.

A 2024 report revealed that residents in the development zone of Indonesia's largest HTE programme received no benefits from biomass energy and in fact remained without electricity until mid-2023. Instead, all 'energy crop' output was exported to Japan for use in power stations. It also found that the conversion of land to monoculture plantations poses a grave threat to food security - not only for communities directly reliant on agroforestry, but also for urban populations dependent on rural food supplies. These risks, therefore, cannot be dismissed as merely local concerns.

Nepal

A 2022 report highlights major concerns about the impacts of industrial-scale bioenergy production on women and other forest-dependent peoples in Nepal. These include reduced access to and increased scarcity of forest resources, loss of grazing lands for community livestock, increased air pollution and associated health risks, unfair compensation for biomass, unsustainable biomass harvesting, and the erosion of community forestry decision-making and authority. Together, these issues have fueled rising conflict between local communities and bioenergy companies.

The National Forum for Advocacy Nepal (NAFAN), lead authors of the report, explains that "Marginalised, Indigenous, and tribal communities still depend on forest products for their daily survival —for food, shelter, employment, and trade. Over-exploitation of forest resources to fuel industrial-scale biomass production will inevitably disrupt forest biodiversity, degrade soil quality, and ultimately threaten the bioculture, medicinal plants, and wild foods that Indigenous communities have long relied upon."

Women from the local community told NAFAN that the growing scarcity of grass, fodder, and other forest products is likely to intensify conflict within their communities: *"As women are primarily responsible for collecting firewood, fodder, and leaf litter, this will disproportionately affect them, forcing them to travel farther to gather these essential materials."* The Nepal Indigenous Forum (IPs SWBC Nepal) is currently working to ensure that the principles of Free, Prior, and Informed Consent are upheld in the context of biomass harvesting.

A woman member of a Community Forest User Group in Nepal collects green manure. ***Chandra Shekhar Karki/CIFOR***

A resident rides past a biomass power plant in southern Thailand. ***Muhamahasan Chearong***

Thailand

In Thailand, tensions between local communities and biomass operators are escalating due to growing concerns over air pollution and its impact on public health. Nongluk Pla-nguen, a 44-year-old farmer, traveled four hours from her village of Ton Muang in Phrae province to the Chiang Mai Administrative Court to file a lawsuit against authorities, accusing them of permitting a wood pellet factory to operate despite residents' concerns that it is harming their health.

The factory, owned by Green Terminal Co. Ltd., began operating near her village in 2023, producing rubberwood pellets for biomass power plants. Since its opening, the community's health concerns have intensified, with many residents reporting respiratory problems and skin conditions. Approximately 400 people live in the affected area and so far, 17 residents - ranging in age from 6 to 73 - have been diagnosed at Phare's Somdet Phra Yupparat Den Chai Hospital with conditions such as allergies and bronchitis. Doctors have suggested that these illnesses could be linked to exposure to smoke and chemicals from industrial activity.

Amid the debate, Green Terminal released data showing that chemicals in the plant's emissions remain within legal limits and the company claims it uses techniques to trap up to 90% of dust and soot. However, existing regulatory gaps in Thailand mean that, amongst other things, there is currently no enforced monitoring for PM2.5 from biomass plants. As a result, these assurances have failed to ease residents' distrust, prompting Nongluk and her fellow villagers to pursue a lawsuit, which the court accepted.

"We see smoke released from the factory, and many residents later experience health problems. I just want clean air back in my village" said Nongluk Pla-nguen, a local resident.

This information has been reproduced with permission of The Mekong Eye.

Sweden

Sweden's prevailing forestry model, which systematically converts irreplaceable native forests into tree plantations - primarily for producing biomass - is violating Indigenous Sámi peoples' rights. Over just 60 years, 71% of Sweden's lichen-rich forests have vanished due to clear-cutting and plantation expansion. These forests are vital for the survival of reindeer, which are central to Sámi culture and livelihood. Sámi communities are raising the alarm, warning that "the reindeer are starving," and have issued an open letter to the government.

Further harm to Sámi reindeer herders results from the large-scale replacement of natural forests with non-native contorta pine (*Pinus contorta*, or lodgepole pine) plantations, established by biomass energy and pulp and paper companies. Research shows that reindeer struggle to find food and move freely in contorta pine plantations. However, despite Sámi communities' zero-tolerance policy toward planting contorta pine, the forestry industry continues to disregard their rights to free, prior, and informed consent (FPIC).

Logging site in Sweden. ***Marcus Westerberg***

Burned trees in Chile following a wildfire. ***Techo/Flickr***

Chile

Wood burned at Arauco's numerous biomass power stations in Chile, such as its power station at the Valdivia pulp mill, is sourced from extensive industrial monoculture tree plantations. These ecological "deserts" have inflicted profoundly negative impacts on the Mapuche Indigenous Peoples. Land-grabbing, fraudulent land acquisitions for commercial plantations and the criminalisation of traditional practices have displaced thousands of peasant farmers and Mapuche families. The expansion of forest industries has eroded both cultural and economic diversity, disrupting land use and reducing biodiversity. This includes a decline in medicinal plants vital to local communities, affecting Indigenous women in particular. Additional consequences include diminished water availability, depleted soil fertility, and increased frequency and intensity of wildfires.

Brazil

Brazil produces approximately 7 million tonnes of charcoal each year, primarily using wood from monoculture eucalyptus plantations. This industry has driven extensive land-grabbing, community conflicts, deforestation, loss of livelihoods, water shortages, and increased use of pesticides and agrotoxins linked to the expansion of plantations.

Nearly all of Brazil's charcoal is consumed by the iron and steel industry for so-called "green steel" production, with 70% of these mills located in Minas Gerais—the state with the country's largest area of tree plantations. Charcoal is produced in large kilns, subjecting workers to hazardous health risks and poor working conditions. In 2022, Minas Gerais recorded Brazil's highest rate of forced labour, with charcoal production among the sectors most vulnerable to slavery-like practices. In Maranhão, Aço Verde do Brasil (AVB) claims to be the world's first carbon-neutral steel producer, yet its operations have harmed numerous communities, including those in Formiga (Anapurus).

Ghana

In Ghana, Norwegian company APSD acquired 42,000 hectares in the Bono East Region for a eucalyptus plantation linked to the construction of a new biomass power station. Whilst the power station has not been built, the plantations have directly undermined community rights. Residents must now travel long distances around the plantation, where they once had right of way—placing women at greater risk as they collect firewood for cooking. The plantation is guarded by private security, who regularly enter local villages to ensure no one is hunting animals for food. Community members have reported physical abuse, invasions of privacy, and harassment by company personnel. The process of obtaining free, prior, and informed consent has been reduced to a charade.

Mozambique

The Portucel Group, owned by Portuguese pulp producer and biomass power station operator The Navigator Company, controls approximately 360,000 hectares in Mozambique, where it has already established thousands of hectares of commercial eucalyptus plantations. The plantations were established as part of a broader project that initially included building a new pulp mill and biomass power station. In the process, Portucel has destroyed local farmers' homes and farmland, justifying these actions by claiming official land grants from Mozambique's Council of Ministers.

Uganda

The Ugandan government's decision to lease over 347 hectares of the South Busoga Forest Reserve in Bukaleba to the Norwegian company Green Resources is another example of how foreign investment in biomass energy accelerates primary forest destruction in Africa. The commercial tree plantations that the company has establishedSome of the harvested wood from the commercial tree plantations that the company has established is used for industrial charcoal production. As these plantations expand, vulnerable local communities have lost their land and forests. They report the disappearance of sacred and medicinal trees, diminished energy sovereignty, reduced agricultural land, and a ban on practicing their traditional *taungya* agroforestry system.

Community building surrounded by eucalyptus plantatons in Mozambique. ***Justiça Ambiental***