Biochar poses new threat to forests in France: MIRAIA's proposed Garlin biochar project

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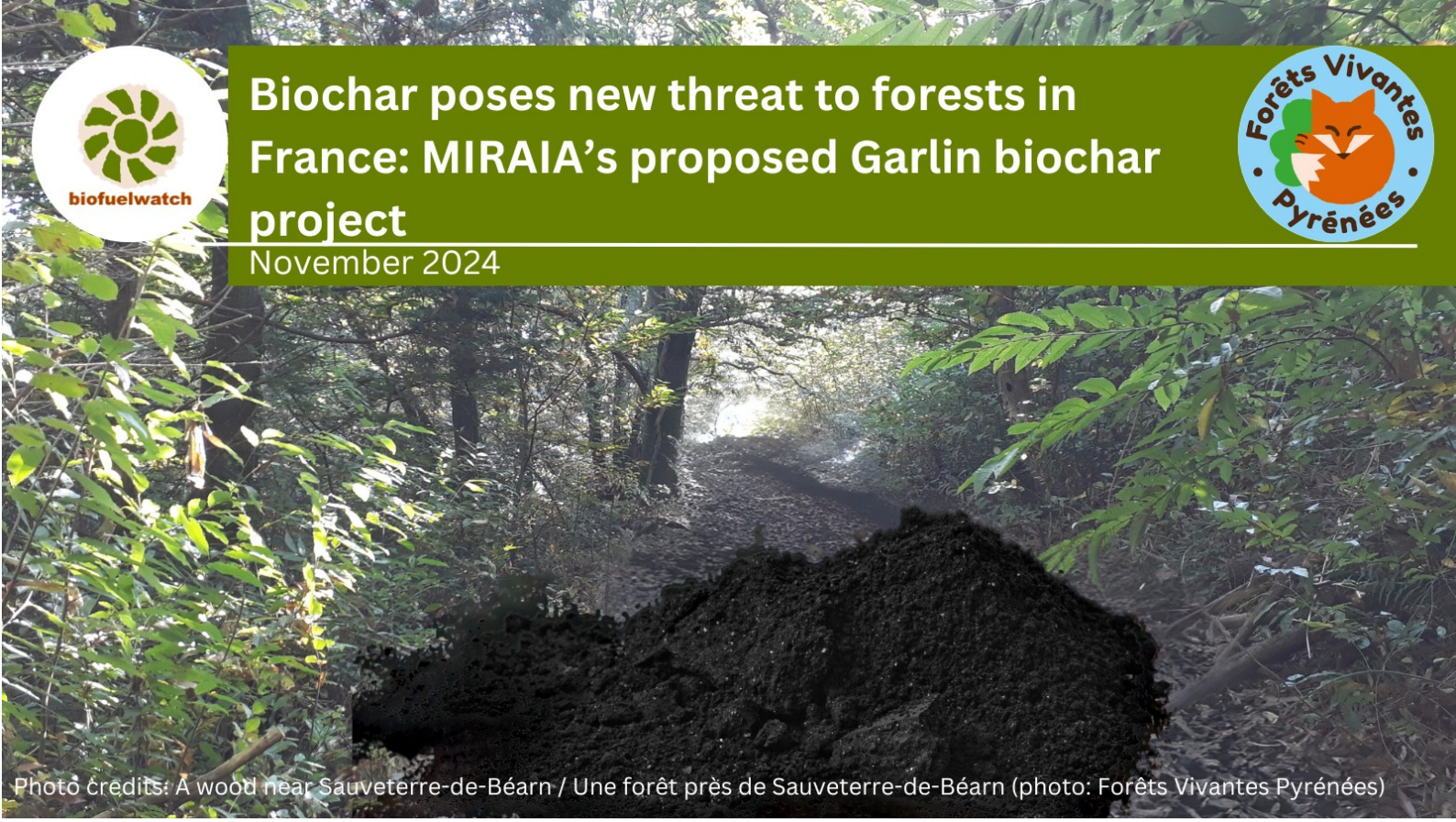

Photo credits: A wood near Sauveterre-de-Béarn / Une forêt près de Sauveterre-de-Béarn (photo: Forêts Vivantes Pyrénées)

Executive Summary

The start-up company MIRAIA wants to build six or seven pyrolysis plants to produce biochar as well as bio-oil (which can be used in some heating appliances) and electricity. It is proposing to build its first commercial-scale plant in the town of Garlin, in the Pyrénées-Atlantiques Department in southern France by 2026. For that, MIRAIA plans to use 135,000 tonnes of wood every year, of which, according to information they shared at a consultation meeting, 70% would be roundwood, supplied by France's largest forestry cooperative and company, Alliance Forêt Bois. According to investigations by the French NGO Canopée, Alliance Forêt Bois's forestry model consists of clearcutting biodiverse forests and then planting conifer monocultures.

As discussed in this briefing, there are many open questions about the impact which adding biochar has on soil carbon in different circumstances. However, even if one assumes that a large share of the carbon it contains will remain stable in soil over long periods, this does not make biochar produced from trees from clearcut biodiverse forests climate friendly. Forest ecosystems, after all, play a vital role in regulating the climate by storing and sequestering carbon and helping regulate the water cycle as well as the local climate.Finally, the briefing highlights the fact that biochar, depending on feedstock and production methods, can contain different toxins, but that there are no regulations to prevent such toxins from being introduced into soils and, potentially, food crops.

Who are MIRAIA and what are they proposing?

MIRAIA is a start-up company, founded in 2023, which wants to develop its first biochar project in Garlin in the Pyrénées-Atlantiques Department in southern France by 2026. They plan to undertake small-scale tests elsewhere in the South-west of France from December 2024, before installing a large vertical pyrolysis plant in Garlin. They state that they will produce 20,000 tonnes of biochar, 50,000 – 55,000 tonnes of bio-oil and 9 GWh[A],[1] of electricity a year, using 135,000 tonnes [B] of wood.

In the long term, MIRAIA hopes to build a total of 6-7 such plants.[2] Their overall use of wood could thus be as high as 945,000 tonnes a year.

[B] All figures for wood requirements cited in this briefing are for freshly cut wood.

What are ‘pyrolysis’ and ‘bio-oil’?

The term *pyrolysis* means heating any organic material, such as wood, in the absence of oxygen. Charcoal has been produced in this way for thousands of years. Modern pyrolysis reactors, such as that proposed by MIRAIA, capture not just the char but also a liquid, called *bio-oil* and gas, called *syngas*, both of which can be burned for heat and/or electricity.

Bio-oil from pyrolysis cannot be used in transport fuels, and its use for heat and electricity is limited by the fact that it is highly corrosive.[3] According to a 2024 report by the International Energy Agency – Bioenergy,[4] around 120,000 tonnes of commercially usable bio-oil (‘biocrude’) is produced worldwide every year.

Nearly all of it is used in heating applications and attempts to upgrade it to be used as transport fuel (including marine fuel, which MIRAIA has referred to[5]), have not so far been successful.

What is biochar?

The term *biochar* was first used in the 2000s to describe biomass-derived black carbon (i.e. charcoal or char) when it was applied to soils.[6] It was coined by its advocates, who have been claiming that turning large quantities of biomass into char and then adding it to agricultural soils would create a long-term stable new carbon sink, as well as making crops grow better.

In recent years, the term biochar has been used for other applications of char(coal), too. MIRAIA has mentioned using it to make asphalt and concrete, as well as using it in metal smelting and also in agriculture and gardening.[7]

Is it true that biochar helps the climate by storing carbon long-term?

Carbon derived from pyrolysis (‘black carbon’) can remain stable in soils for millennia. However, there is ongoing scientific debate on:

- how much black carbon remains stable in soils under what circumstances.
- what the effects of adding biochar are on the carbon already in soils and thus on overall soil carbon levels.
- the overall global warming impacts of adding biochar to soils.

Some of the recent findings are summarised in a fully referenced Biofuelwatch briefing published in May 2024.[8] Here are two noteworthy quotes from different scientific studies:

- “*The stability of added biochar in soil remains a contentious topic...Biochar’s stability in soil depends on the production process (including types of feedstock and pyrolysis conditions), climatic conditions, soil structure, and other environmental factors*.”[9]
- “*We performed a meta-analysis of 91 published papers with 552 paired comparisons. Our results showed that biochar application significantly increased soil CO_2 fluxes by 22.14%, but decreased N_2O [nitrous oxide] fluxes by 30.92% and did not affect CH_4 [methane] fluxes. Consequently, biochar application may significantly contribute to an increased global warming potential (GWP) of total soil GHG [greenhouse gas] fluxes.”* [10]– Adding nitrogen fertilisers as well as biochar counters this effect, according to the authors; however, nitrogen fertiliser use leads to nitrous oxide emissions, which is a very potent greenhouse gas.

The IPCC has written about the potential biochar offers in terms of soil carbon sequestration; however, this does not mean that it has endorsed biochar unconditionally. In its most recent Assessment Report, it highlights the risks of “*particulate and GHG emissions from production; biodiversity and carbon stock loss from unsustainable biomass harvest*”.[11]

Even though the French government is allowed to account for ‘negative emissions’ via soil carbon sequestration from biochar, those could be much outweighed by carbon losses from forests. This

would happen if wood sourcing resulted in greater forest logging and thus forest degradation. As shown below, there is a distinct possibility of this happening should MIRAIA get to realise its plans.

Forest ecosystems play a vital role in regulating the climate by storing and sequestering carbon, and by helping to regulate rainfall, thus mitigating against droughts and flooding.

Where will the wood come from?

At a public meeting held in Garlin in June 2024, a MIRAIA spokesperson stated that 70% of the biomass will consist of roundwood supplied by Alliance Forêt Bois, and 30% would consist of residues from the wood products industry. Wood is to be sourced from within a 100-150 km radius.

photo credits: A wood near Sauveterre-de-Béarn (photo: Forêts Vivantes Pyrénées)

Elsewhere, MIRAIA has referred to 'forest residues.[12] Most people think of brush or slash left behind after logging when they hear the word 'forest residue'. Unfortunately, it is both lawful and common across and beyond the EU for companies to describe whole trees as 'forest residues', as long as the wood is surplus to the requirements of sawmills.[13]

In the same region, another company, E-CHO, wants to source 500,000 tonnes of wood a year. They partnered with Alliance Forêt Bois for their feasibility study.[14] As argued in a Biofuelwatch briefing, there are significant doubts over the technical feasibility of the E-CHO project (located in Lacq).[15]

According to satellite data presented by Global Forest Watch, the Pyrénées-Atlantiques Department lost just 0.71% of its tree cover between 2000 and 2020.[C], and 93% of its tree cover consists of natural forests.[16] By comparison, Landes Department, the original centre of Alliance Forêt Bois's forestry activities, lost 19% of its tree cover during that period, and 52% of tree cover consists of tree plantations as opposed to natural forest.[17]

Given that MIRAIA will be relying on external service providers for this wood harvesting, it will be difficult to know exactly where and how all of the wood is sourced.

Who are Alliance Forêt Bois and what are their practices?

Alliance Forêt Bois is the largest forestry cooperative and company in France. It was founded in 2011 and was initially confined to the Landes de Gascogne (Gascony Moors) forest region. Since then, it has been joined by 18 more cooperatives and is now active across France.[18]

As shown in an investigative report by the environmental association Canopée, the company's economic and forestry model is based on clearcutting forests and planting monoculture tree plantations.[19] 94% of the trees it plants are conifers, mostly Maritime pine, whereas deciduous trees dominate France's native tree cover. In the report, Canopée presents a 'case study' of the company's practices from Lésigny, in the Department Vienne. There, the company clearcut 20 hectares of forest, including oak, birch and chestnut trees. Afterwards it planted Maritime pine (*Pinus pinaster)*. The clearcut exposed bare soil on a wetland to direct sunlight. Trees were even cut next to a pond with different dragonfly species, tadpoles and frogs. Subsequently, the water level in the ponds fell and some areas dried up.

photo credits: A wood near Sauveterre-de-Béarn (photo: Forêts Vivantes Pyrénées)

[C] Net changes

Alliance Forêt Bois claims that their forestry practices support adaptation to climate change.[20] In reality, though, Maritime pine plantations have proven to be very prone to wildfires. In the summer of 2022, thousands of hectares of Maritime pine went up in flames in the Departments Gironde, Landes and Lot-et-Garonne.[21]

In response to evidence shared by Canopée, several companies have cut ties or refrained from partnering with Alliance Forêt Bois, amongst them Orange and RemovAll Carbon.[22]

Nonetheless, even biochar made from trees from such clearcuts would likely qualify as “sustainable biochar” under the only voluntary certification scheme, the European Biochar Certificate![23] This is because most of the “forest management” is certified by the Programme for the Endorsement of Forest Certification (PEFC), [24] a scheme rejected by the great majority of environmental NGOs that focus on forests.

Biochar can cause toxins to accumulate in soils

Depending on the type of feedstock and the pyrolysis temperature, biochar can contain a range of toxins, including polycyclic aromatic hydrocarbons (PAHS), heavy metals, dioxins and furans, and environmentally persistent free radicals (EPFRs).[25] Trees can absorb pollutants from the air and from soils. High levels of heavy metals have been found in ashes from wood pellets.[26] During pyrolysis, ash does not accumulate separately from biochar, which would thus incorporate those pollutants.

As yet, there is no effective control of toxins in biochar and no toxicity tests are required in France or across the EU.

Biofuelwatch provides information, advocacy and campaigning in relation to the climate, environmental, human rights and public health impacts of large-scale industrial bioenergy.

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[3] task34.ieabioenergy.com/bio-oil/

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[5] lesechos.fr/pme-regions/innovateurs/miraia-relance-le-charbon-vegetal-dans-lagriculture-et-lindustrie-2105750

[6] Bio-char sequestration in terrestrial ecosystems – a review, Johannes Lehmann et.al., Mitigation and Adaptation Strategies for Global Change, 2006

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