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Research on the Sustainability of Burning Biomass



By including bioenergy in renewable energy targets, the EU is promoting direct and indirect subsidies for it, claiming that it is a sustainable alternative to fossil fuels.

Extensive research shows that large-scale bioenergy is far from sustainable, as it relies on a major expansion of industrial agriculture, of monoculture tree plantations, and of industrial logging. These industrial activities deplete and pollute soils and water, destroy forests, grasslands and wetlands, and destroy the livelihoods of workers, farmers, Indigenous Peoples and other communities.

The sustainability criteria for forest biomass are minimal, and woefully inadequate. There is no requirement for the regulatory or management systems actually to promote (let alone achieve) sustainability. The sustainability criteria thus tolerate highly damaging actions, such as clearcutting a mature biodiverse natural forest for biomass fuel to be replaced with a monoculture pine plantation.

There is no justification for the failure to adopt more robust sustainability criteria for forest biomass: the effect of harvesting a forest can be as destructive as converting the forest to another land use. More

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fundamentally, there are simply no additional sustainability criteria which a Member State could impose.

Serious Mismatch Between Science & Policy

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This report based on recent work by Europe's Academies of Science was commissioned by 16 international institutions and finds that current policies are failing to recognize that removing forest carbon stocks for bioenergy leads to an initial increase in emissions and states the periods during which atmospheric CO₂ levels are raised before forest regrowth can reabsorb the excess emissions are incompatible with the urgency of reducing emissions to comply with the objectives enshrined in the Paris Agreement.

"...Sustainability criteria in the RED regulations include conditions that biomass should achieve a specified percentage of GHG emission savings relative to fossil fuel. This can be easily misinterpreted to mean that switching from coal to wood is immediately climate beneficial... It is seldom pointed out that this merely limits the emissions along the supply to less than the emissions from burning coal, and ignores the carbon emissions when the wood is burned..."

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EU Biomass Legal Case Main Arguments

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This legal document contains the main arguments in the EU Biomass Legal Case where the applicants seek annulment of the inclusion of "forest biomass" – essentially trees, including, stems, stumps, branches and bark – as a renewable fuel within the Renewable Energy Directive (recast) 2018.

"...the sustainability criteria is "to avoid unintended sustainability impacts". The criteria fall far below this goal; they do not impose any requirements to ensure that forest biomass was grown or harvested in a sustainable manner. Instead, they rely on the source country to deal with sustainability considerations..."

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"...Essentially, a source of forest biomass will meet the sustainability criteria if the country of origin has forestry laws or regulations. If there are no forestry laws or regulations in place, an even lower standard applies: the existence of a "management system" will satisfy the sustainability criteria..."

"...The sustainability criteria for forest biomass are minimal, and woefully inadequate. There is no requirement for the regulatory or management systems actually to promote (let alone achieve) sustainability. The sustainability criteria thus tolerate highly damaging actions, such as clearcutting a mature biodiverse natural forest for biomass fuel to be replaced with a monoculture pine plantation. There is no justification for the failure to adopt more robust sustainability criteria for forest biomass: the effect of harvesting a forest can be as destructive as converting the forest to another land use..."

"...More fundamentally, there are simply no additional sustainability criteria which a Member State could impose that would meet the objective of Recital 101. The only criteria that would come close to minimizing the biodiversity harms of forest harvesting, and help to minimize GHG emissions, would be to rule out the use of forest biomass altogether, or to confine qualifying biomass to only those materials that would in any case be burned for disposal, whether or not the energy was captured. This they cannot do: the Member States' discretion to adopt stricter criteria cannot extend to adopting criteria that undermine the purposes of the parent instrument – which include the promotion and development of biomass..."

"...Member States do not have the discretion under Article 29(14) to alter this definition of biomass through the imposition of additional sustainability criteria. Consequently, for biomass fuels (and biofuels and bioliquids) produced from forest biomass, the sustainability criteria cannot ensure GHG savings relative to fossil fuels and cannot ensure that the biodiversity of forests are protected..."

"...It follows from the fact that Article 29(7)(a)(i)-(iii) are alternatives that biomass can comply with the LULUCF criteria merely by coming from a country that is a party to the Paris Agreement. This is an exceptionally weak requirement which includes all biomass sourced from any of the 184 countries who have (to date) ratified the Paris Agreement, without even any requirement that the party in question is complying with its Paris Agreement obligations..."

Read the summary:

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Sustainable Biomass for the Production of Hydrogen

[2019-06-23-wageningen-university-research-duurzame-biomassa-voor-de-productie-van-waterstof-dutch.pdf](#)

This report discusses the burning of woody biomass to generate electricity to be used for the production of hydrogen.

"..The arguments of the proponents and opponents [of burning woody biomass] have to do with the:

- CO₂ and energy balance in the chain and the moment at which you measure the carbon stock;*
- biomass additional growth in relation to consumption and the effects of harvest on the landscape and the ecosystem;*
- guaranteeing sustainability through an administrative system of certification;*
- market forces and market failures, due to the exploitation of subsidies (level playing field) and the absence of a CO₂-related market mechanism;.."*

"..Forest is the most important source of woody biomass in the Netherlands. In the Netherlands there is approximately 373,480 ha of forest. That is approximately 11% of the land area. Currently, that area is diminishing due to deforestation for the development of heathland and drifting sands, as well as due to delay / omission of forest compensation after urban or infrastructural developments ... For sustainability, it is important that the harvest is lower than the additional growth, so that the forest sustainably sustained remains. When harvesting in forests, it is therefore important to know what is growing, so that the forest remains sustainable. The national average can be used as a guide number, but this can differ per growing location. A current determination of the additional growth can provide insight into the responsible harvest level ..."

"..It is important that the current sustainability requirements are now valid, but in all probability during the transition process in the coming years / decades will be tightened or adjusted to the then prevailing circumstances. In the longer term, for example, it is conceivable that the use of biomass will be seen primarily as sustainable if it is used for higher-quality applications than for bioenergy..."

"...[proposed] requirements for the various parties in the chain:

The use of biomass must lead to a substantial reduction in greenhouse gas emissions, calculated over the entire chain. The calculated reduction in greenhouse gas emissions must be at least 70% relative to the reference value for fossil fuels.

- production of raw biomass must not lead to destruction of carbon reservoirs.*

- biomass production may not lead to long-term carbon debt.
- biomass production must not lead to indirect land use change (ILUC) with a negative impact on carbon capture.
- relevant international, national and regional / local laws and regulations are followed.
- biodiversity must be preserved and, where possible, strengthened.
- the production capacity of each forest type must be maintained.
- forest management contributes to local economy and employment.
- sustainable forest management is realized on the basis of a management system..."

"..Healthy soil is of great importance for a sustainable harvest of wood and biomass. Important aspects of a healthy soil are nutrient management and physical soil quality ... With an increase in the harvest level and the harvesting of branch and top timber, the discharge of these nutrients is substantially increased. This can lead to a decrease and even a shortage of available nutrients, especially in forests on poorer soils ... These nutrients are important for the functioning of the forest as an ecosystem (preservation of biodiversity) ... "

"..Heavy harvesting machines are nowadays often used for harvesting. These machines can disrupt the soil and therefore the soil fauna and flora..."

".. if nature areas are converted for the production of biomass, this will have serious negative effects on biodiversity in the short term (direct effects) ... With these kind of conversions, it can take centuries for the effects of land use change on biodiversity to be restored..."

"..For energy applications, the harvest of branch and top timber is in the spotlight. However, this can have a number of disadvantages. Nutrients are removed with the branch and top timber, which can lead to shortages. On nutrient-poor soils, the harvest of take-and-top timber can lead to a negative nutrient balance. It can also have a negative effect on insects and other species bound to deadwood Dead wood is important for many plants, mushrooms and insects ... Maintaining standing dead trees is also good for biodiversity ... "

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This report commissioned by the Dutch Government discusses the absence of sustainability & durability requirements for the logging and burning of woody biomass.

"...In the future, in addition to quality requirements, requirements may also be imposed on the sustainability of the so-called solid biomass..."

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Soil Compaction and Deformation in Forest Exploitation

[2019-07-25-wageningen-university-probos-soil-compaction-and-deformation-in-forest-exploitation-english.pdf](#)

This report was commissioned by the Dutch Government and was intended for the green sector (forest, nature and urbangreen managers) and the policymakers to create awareness in the forest sector on the effects of forest exploitation on the soil and how to protect and preserve forest soils during forest exploitation.

"...Every year an average of 1 million m³ of industrial round wood is harvested in the Dutch forest. In most harvest operations the use of machines is common practice. There is a growing awareness among forest managers that the use of machines in forest operations can have negative consequences on the forest soil, causing soil compaction and deformation. This may lead, among other things, to degradation of soil structure, reduction of the soil's water storage capacity, lack of oxygen in the soil, death of fine roots and reduced rooting, all impacting biodiversity and forest productivity..."

"...Soil compaction and deformation occur during forest exploitation with heavy machinery due to complex interactions of soil pressure, shearing forces and vibrations into the soil. These effects do not only take place right underneath the machine but can also influence the soil up to 0.75 meter sideways of the wheels. Soil compaction does not only occur at the actual moment of machine traffic. Also, one to two years after machine traffic further soil compaction can occur..."

"...there is a general lack of knowledge in the forest sector on the (exact) impact of forest exploitation machines on the soil. Also, practical knowledge on how to prevent or counteract negative effects of forest exploitation on the forest soil is missing..."

"...Although in this chapter, chemical, ecological and productivity effects are discussed separately, it is important to note that these effects are all

intertwined. Complex interactions between these aspects together form the forest ecosystem and shape the overall effect of machine traffic on the forest productivity, biodiversity and general vitality..."

"...Soil disturbance can have a negative impact on soil biodiversity, leading to decreased stand fertility, productivity and vitality on the long term..."

"...compaction also leads to destruction of pore continuity, increasing soil bulk density and decreasing soil porosity and air conductivity. Gas exchange between the soil and the atmosphere is hampered, which leads to an altered CO₂ and O₂ exchange between soil and atmosphere. This altered gas exchange can be problematic. Oxygen (O₂), which is essential for soil life and chemical processes, cannot get into the soil and carbon dioxide (CO₂) cannot get out. Low O₂ levels decrease the presence of soil life and limit growth of plants and trees..."

"...Lack of oxygen also causes problems for mycorrhizae, which have a symbiotic association with tree roots to obtain the energy needed for decomposition of organic material, from which in turn nutrients become available for tree roots to take up. Therefore, soil compaction can hinder nutrient uptake by trees through mycorrhizae and therefore effect forest productivity and vitality. In addition, the activity of microorganisms decreases with increasingly anaerobic conditions, which leads to a loss of soil biodiversity and may indirectly influence forest (tree) vitality..."

"...Besides the effects on nutrient uptake via mycorrhizae, soil compaction has negative effects on the absorption of minerals by the plant's root system. The low oxygen levels in compacted soils for example cause denitrification to occur, losing nitrogen as it evaporates during the process. In a leaching experiment simulating long term impacts of forest operations, found that concentrations of nutrients in solution like Ca²⁺, K⁺, Mg²⁺ and Al³⁺ were lower in disturbed forest floors and compacted forest soils, hence decreasing the amount of nutrients available for plant uptake. Moreover, trees have difficulties taking up enough nutrients for growth under lower oxygen levels because oxygen is required to provide for the energy needed for transport and absorption processes within the plant..."

"...Overall, soil compaction negatively affects forest growth. Many of the effects discussed in the previous paragraphs, like decreased gas exchange capacity or rooting ability, have an influence on forest regeneration and growth. For instance, water shortages cause the plant to close its stomata, hence hampering photosynthesis. Reduced photosynthesis means a plant can produce less sugars needed for plant growth. Consequentially, plant growth, even forest productivity, can be reduced..."

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Threat Map Are Forests the New Coal

[2019-07-08-epn-report-threat-map-are-forests-the-new-coal-english.pdf](#)

This report was commissioned by the EPN as a wake-up call to those governments that are subsidising coal to biomass conversions; will persuade investors that financing biomass power is not sustainable; and will persuade energy analysts, retailers and consumers to distinguish forest biomass, as a high-carbon renewable energy technology, from lower-emitting technologies like wind and solar.

"...Where logging is an accepted use at a lower intensity, the advent of high intensity harvests for biomass may lead to serious depletion of nutrients in the ecosystem and impede regeneration..."

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Global Markets for Biomass Energy are Devastating Forests

[2019-06-17-nrdc-dogwoodalliance-southern-environmental-law-center-global-markets-for-biomass-energy-are-devastating-us-forests-english.pdf](#)

This report commissioned by NRDC, Dogwood Alliance, Southern Environmental Law Center exposes the damaging logging practices used to source the biomass industry, including the clearcutting of iconic wetland forests.

"...we must cut global emissions by half over the next decade to be on track to keep planetary warming within safe levels. Yet, climate and energy policies in countries like the United Kingdom, Denmark, the Netherlands, and now South Korea and Japan persist in treating biomass as a "carbon neutral" source of renewable energy and offering utilities lucrative incentives to increase reliance on biomass electricity. Policymakers have for years looked to "sustainable" sourcing standards to ensure their biomass imports are "green." Yet, the damaging practices documented in these investigations are all happening under the umbrella of such "sustainable" standards. "Sustainable forestry" cannot guarantee a reduction in carbon dioxide emissions within timeframes relevant to fighting climate change..."

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