# Research on the Impact of Burning Biomass on Biodiversity


Trees hold significant stocks of micronutrients in limbs and leaves. Removing forestry residues can deplete soil nutrient status, leading to loss of site productivity and the ability to regrow the forest. Biomass harvesting is promoted to give value to wood which is "low value" because it is not valuable as sawnwood (for example because species, flaws, holes, etc).

However, these are the trees most valuable for biodiversity. Removing such trees significantly reduces habitat for cavity-dwelling animals such as owls and squirrels. Removing dead and decaying wood also removes materials from base of the food chain that support complex fungi and invertebrate communities.

## 37 NGO's Send Letter to the Dutch Government on Biomass

2019-11-25-ngos-letter-to-dutch-government-biomass-is-not-a-lifeline-for-coal-english.pdf

In this letter 37 NGO's urge the Dutch House of Representatives to ensure that no further subsidies will be granted for burning biomass either in coal power stations or in dedicated biomass plants and to redirect the biomass

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2019-11 \\ 37 NGO's

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2019-10 \\ BioFuelWatch

2019-08-22-bioenergy-serious-mismatches-continue-between-science-and-policy-in-forest-bioenergy-english.pdf

2019-08 \\ BioEnergy

subsidies already granted towards non-emissive renewable energy. Despite the fact that 800 scientists, many different studies (and counting) and EASAC having concluded that cutting down trees to burn in power stations is not compatible with the need to try and stabilise the climate, the EU hasn't budged. Most of the NGO's that cosigned the letter are from Estonia and the (southwestern) U.S. which are two areas whose forests have been heavily effected by the subsidies granted for the burning of woody biomass in the EU.

*"In Lithuania, clearcutting operations inside regional and national parks, including Natura 2000 sites are happening with government authorisation and without environmental impact assessments, harming wildlife and plant biodiversity."*

*"Enviva, the world's largest pellet producer, sources predominantly hardwood, which in its sourcing region means wood from the clearcutting of biodiverse forest ecosystems that form part of the world's newest Global Biodiversity Hotspot."*

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## Paid Pro-Biomass LobbyFacts Research - The Scientists

2019-11-22-edsp-eco-pro-biomass-lobbyfacts-research-part-3-scientists-martin-junginger-english.pdf

This report describes the paid pro-biomass lobbying activities of scientists in the Netherlands and is part of an extensive study on the paid pro-biomass lobbyfacts in the Netherlands. Researchers, professors and the directors of universities, (former) members of the House of Representatives, ministers and officials from the government are paid directly or indirectly through biomass projects that are allocated by the companies who benefit from burning woody biomass through subsidies paid by the government and the European Union. This specific article focuses on the Copernicus Institute of Utrecht University. Other institutes are discussed in following chapters.

*"...On September 12, 2018, Professor Klaas van Egmond raised the alarm and said that the large companies had too much power and that they misused it with a disastrous effect on the major issue of our time, the climate problem. The promises of the large companies would be systematically violated and those involved who would like to tackle the problems (such as at the time with the palm oil plantations) were called back by the shareholders who wanted to*

2019-08-08-ipcc-summary-report-for-policymakers-on-climate-change-and-land-english.pdf

2019-08 \\ IPCC

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2019-08 \\ EUBiomassLegalCase

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2019-07 \\ WUR

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2019-07-08-epn-report-threat-map-are-forests-the-new-coal-english.pdf

2019-07 \\ EPN

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2019-06-23-wageningen-university-research-duurzame-biomassa-voor-de-productie-van-waterstof-dutch.pdf

2019-06 \\ WUR

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

2019-06 \\ Multiple NGO's

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2019-06-14-southernenvironment-burning-trees-for-power-the-truth-about-woody-biomass-energy-and-wildlife-english.pdf

*keep making profits. Professor van Egmond accused the companies of deliberately trying to delay the much needed changes."*

*"Quote from 2018 by Professor van Egmond: The whole of The Hague is talking about the Paris climate targets, but this way we will never achieve them – the aim is about CO2 emissions being halved in eleven years. Of course, muddling along can be the choice in a parliamentary democracy. This is a choice they can make, but then at least be honest about it and stop moaning about the future and the lives of our grandchildren. (...) Civilizations do not perish because they do not see the problem coming, but because the older invested generation refrains the younger from adapting on time."*

*"On November 19, 2019, the members of the National Federation Against Biomass Centers (www-the-fab.org) were invited to the talk show "Warehouse de Zwijger - Biomass: from promise to culprit". On the podium, Professor van Egmond stood opposed to a colleague from the University of Utrecht who argued for the burning of woody biomass. The thrust of his story was clear: Burning biomass is not a good idea for the climate, biodiversity and fertility of the soil and it is naive to think that politics will make laws to force companies to use biomass in a sustainable way. You especially don't have to expect anything from the companies themselves. The use of woody biomass not only stops the energy transition, it makes the problem worse and it is disastrous for our future."*

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## EU Clean Energy Policies Lead Forest Destruction

2019-11-12-nrdc-burnout-eu-clean-energy-policies-lead-forest-destruction-english.pdf

This report is based on research from the consulting firm Trinomics. It provides the most comprehensive and up-to-date assessment of government subsidies and other forms of financial support offered to biomass energy producers in the European Union. We focus on the 15 E.U. member states most heavily reliant on bioenergy and cover the period from 2015 to 2018. The Technical Appendix contains Trinomics' full report, including a detailed description of methods, analyses, and results.

*"...Despite the biomass industry's claims that it sources wood "sustainably," on-the-ground investigations by media and independent watchdogs over the past decade have exposed the ecologically damaging logging practices—including the clearcutting of iconic wetland forests—used in the United States to source*

2019-06 \\ Soutern Environment

2019-06-11-frontiers-research-proforestation-mitigates-climate-change-and-serves-the-greatest-good-english.pdf

2019-06 \\ Frontiers Research

2019-06-03-tweede-kamer-hoorzitting-bomen-kappen-voor-klimaat-en-natuur-roofbouw-of-noodzakelijk-kwaad-dutch.pdf

2019-06 \\ GOV NL

2019-04-00-natural-climate-solutions-averting-climate-breakdown-by-restoring-ecosystems-english.pdf

2019-04 \\ Natural Climate Solutions

2019-04-00-environmentalpaper-the-reputational-and-financial-risks-of-investing-in-forest-biomass-energy-english.pdf

2019-04 \\ EnvironmentalPaper

2019-03-25-wetenschappelijkbureaugroenlinks-maak-een-einde-aan-de-co2-neutraliteit-van-houtstook-dutch.pdf

2019-03 \\ Scientific Thinktank GL

2019-02-10-easac-forest-bioenergy-carbon-capture-and-storage-and-carbon-dioxide-removal-english.pdf

2019-02 \\ EASAC

2018-08-28-flinders-university-eu-renewable-energy-directive-

*wood for pellets exported by Enviva, the world's largest wood pellet manufacturer. Significant and troubling evidence shows that biomass headed for the E.U. energy market comes from the logging of mature hardwood forests in places like the U.S. Southeast. The investigations also spotlight the vast quantities of whole trees and other large-diameter wood—biomass feedstocks most damaging to the climate—that are entering the industry's supply chain. Enviva's pellets are shipped to E.U. power companies, such as Drax Power in the United Kingdom and Ørsted in Denmark. These unsustainable sourcing practices not only destroy carbon stocks but also damage biodiversity in the North American Coastal Plain, a region designated as a global biodiversity hot spot..."*

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## Estonia Logging and Pellet Production

2019-10-02-biofuelwatch-estonia-logging-and-pellet-production-english.pdf

This report from Biofuelwatch (august 2019) investigates logging sites and practices in Estonia, in particular the ones associated with Graanul Invest, the 2nd biggest pellet producer, after Enviva, in the world. As the demand for wood pellets is on a sharp increase due to the existing subsidies for burning wood for energy, signs of over-exploitation of Estonia's forests are becoming more numerous and alarming as logging activities are pushed into protected areas.

*"The Nature Conservation Commission of the Estonian Academy of Sciences warned: "Today's forest management as a whole is unsustainable in its present trend, does not guarantee biodiversity conservation, takes little account of ecosystem services and therefore needs to change.""*

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## Serious Mismatch  Between Science & Policy

2019-08-22-bioenergy-serious-mismatches-continue-between-science-and-policy-in-forest-bioenergy-english.pdf

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

revisions-put-biodiversity-at-risk-english.pdf

2018-08 \\ Flinders University

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2014-12-00-bvor-houtchips-als-brandstof-dutch.pdf

2014-12 \\ BVOR/RVO

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2013-08-07-rvo-bio-energie-input-houtige-biomassa-dutch.pdf

2013-08 \\ RVO

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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.

*"...Concern has also been expressed over the effects of increased forest biomass harvesting on ecosystem biodiversity and losing services such as the ecologic regulation of water and nutrient cycles or soil maintenance..."*

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## Climate Change and Land

2019-08-08-ipcc-summary-report-for-policymakers-on-climate-change-and-land-english.pdf

This report was commissioned by the IPCC and is intended for policymakers and discusses sustainable forest management and carbon sinks and storage methods.

*"... Expansion of areas under agriculture and forestry, including commercial production, and enhanced agriculture and forestry productivity have supported consumption and food availability for a growing population. With large regional variation, these changes have contributed to increasing net GHG emissions, loss of natural ecosystems (e.g. forests, savannahs, natural grasslands and wetlands) and declining biodiversity..."*

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## EU Biomass Legal Case Main Arguments

2019-08-00-eu-biomass-legal-case-main-arguments-english.pdf

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 EC Bioenergy Impact Assessment report points out that "an excessive removal of harvest residues, or the removal of stumps, can harm soil productivity, biodiversity, and water flows." However, the impact assessment*

*does not acknowledge that simply harvesting trees represents the total removal of an ecosystem, and that recovery can take decades to several centuries..."*

*"...Trees hold significant stocks of micronutrients in limbs and leaves. Removing forestry residues can deplete soil nutrient status, leading to loss of site productivity and the ability to regrow the forest. Biomass harvesting is promoted to give value to wood which is "low value" because it is not valuable as sawnwood (for example because species, flaws, holes, etc)..."*

*"...However, these are the trees most valuable for biodiversity. Removing such trees significantly reduces habitat for cavity-dwelling animals such as owls and squirrels. Removing dead and decaying wood also removes materials from base of the food chain that support complex fungi and invertebrate communities..."*

*Read the summary:*
2019-08-00-eu-biomass-legal-case-environmental-objectives-english.pdf

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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 $CO_2$ and $O_2$ exchange between soil and atmosphere. This altered gas exchange can be problematic. Oxygen ($O_2$), which is essential for soil life and chemical processes, cannot get into the soil and carbon dioxide ($CO_2$) cannot get out. Low $O_2$ 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 $Ca^{2+}$ , $K^{+}$ , $Mg^{2+}$ and $Al^{3+}$ 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.

*"…In addition to the climate impacts, biomass burning exacerbates the biodiversity crisis because of the intensity of harvests designated for energy use…"*

*"…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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## Sustainable Biomass for Production of Hydrogen

2019-06-23-wageningen-university-research-duurzame-biomassa-voor-de-productie-van-waterstof-dutch.pdf

This report was commissioned by the Dutch Government and was intended for the green sector (forest, nature and urbangreen managers) and the policymakers as they need a scientific evidence- based underpinning of the use of biomass (branch and top timber) as a sustainable raw material for bio-energy production.

*"...Sustainability concerns the following aspects that have to do with the ecosystem:*
*• effects on biodiversity;*
*• effects on soil quality (soil chemical: nutrient management and physical: compaction);*
*• effects on carbon cycle (in soil and vegetation);*
*• other effects on environmental quality (eg air quality);*
*• indirect land use effects (may play a role in the creation of new forests);*
*• other effects (eg logistics / transport movements).*

*"...The arguments of the proponents and opponents [of burning woody biomass] have to do with the:*
*- $CO_2$ 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 $CO_2$-related market mechanism;.."*

*"...[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 insects 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 poor 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..."*

*"...In addition to the amount of harvest [from woody biomass], the method of harvesting is also important for biodiversity. Harvesting of wood can have a disruptive effect on animals, for example during the breeding season, and plants and soil can be damaged. The scale and frequency of the harvest also influence biodiversity. Harvest over larger areas (more than 1 hectare) must be handled with care ... In forests with many plants that are characteristic of old forest, one must be cautious with large logs. For wind sensitive species (including Douglas and Norway spruce), wind throw must be taken into account. Beech may cause sunburn on the bark in direct sunlight, which can lead to death ..."*

*"...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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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.

*"…Global demand for wood pellets is devastating forest ecosystems in the Southeast United States… Despite the claims of the industry, the independent reporting shows a disturbing pattern: wood pellets burned by Drax and others come from wood that is harvested from native hardwood forests in an area designated as a global biodiversity hotspot. They also spotlight the vast quantities of whole trees and other large-diameter wood— biomass feedstocks known to be high-carbon…"*

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## Burning Trees for Power the Truth about Woody Biomass

2019-06-14-southernenvironment-burning-trees-for-power-the-truth-about-woody-biomass-energy-and-wildlife-english.pdf

This report commissioned by Southern Environment states the many and extreme dangers for biodiversity caused by the logging and burning of woody biomass.

*"…Wildlife and biodiversity in southeastern U.S. forests are threatened by increased clearcutting of private lands to supply wood pellet exports to Europe…Privately owned forests are managed and harvested without much restriction or oversight to protect against large-scale clearcutting and loss of biodiversity. For example, most of the biodiversity in the southeastern U.S. is found on private land; yet private landowners are not required to survey for threatened or endangered species and few states in the region have additional legal protections for these imperiled species. This lack of regulation is significant since over 80 percent of forests in the southeastern U.S. are privately owned. This system has allowed the rapid expansion of unregulated wood pellet production in the southeastern U.S. and its export to Europe…"*

*"…Bottomland hardwood and other wetland forests in the southeastern U.S. are among North America's most valuable ecosystems; they remove nutrients and other pollutants from water to maintain the quality of streams, rivers, and estuaries, and sequester and store large amounts of U.S. carbon emissions. These forests are also among the U.S.'s most important habitats for wildlife. Despite these valuable ecosystem services, the U.S. Environmental Protection*

*Agency estimates that 60 percent of the original almost 12 million hectares of bottomland forests in the southeastern U.S. have been destroyed…"*

*"…some of these highly biodiverse forests are now being clear-cut to supply wood for pellet mills in the southeastern U.S. Similarly, the Southeast's natural longleaf pine forests are extremely diverse and species-rich ecosystems that provide habitat for many endemic species…"*

*"…Biomass sourcing also relies heavily on softwood pulpwood and therefore incentivizes the conversion of natural forests to plantation pine forests. The increasing demand for woody biomass threatens the region's remaining naturally biodiverse longleaf pine forests. The U.S. Forest Service estimates that the South's naturally regenerating pine forests will decline by 25 to 58 percent from 2010 to 2060. Meanwhile, by 2060 artificial plantation pine is expected to comprise 24 to 34 percent of the region's forest area…"*

*"…As a result of the destruction of the region's natural bottomland hardwood and longleaf pine forests, numerous species dependent on these forests are now classified as rare, declining, and of conservation concern…"*

*"…The largest losses of natural forests in the Southeast are forecasted in Florida, South Carolina, and North Carolina (58, 35, and 30 percent loss, respectively). In particular, the region's bottomland hardwood forests, already "reduced to a mere fraction of their original extent," are "now being logged to supply the wood pellet export industry…"*

*"…Since 2013, reports and independent investigations have discovered that Enviva, the largest exporter of wood pellets from the southern U.S., sources wood for several of its North Carolina and Virginia wood pellet mills from clear cuts of wetland forests in the global biodiversity hotspot area. Large-scale clearcutting of mature bottomland hardwood forests negatively affects many vulnerable interior-nesting bird species and water quality. In addition to direct logging removals, increased residual removals (i.e., downed wood) in these forests can negatively impact forest regeneration and lead to habitat degradation…"*

*"…By 2060, the U.S. Forest Service projected that planted pine will comprise 24 to 34 percent of the South's forest area. The conversion of natural forests to plantations, specifically monoculture pine plantations, has significant negative impacts on biodiversity. These conversions are "widely recognized as a major risk factor associated with increased bioenergy demand," with a study funded by the National Wildlife Federation predicting that high levels of woody biomass harvest will threaten several indicator species in the region through large-scale changes to the type and extent of forest and farm habitats. After*

*conversion, "the remaining forests [are] composed of more intensively managed forest and less of the bottomland hardwood and longleaf pine habitats that support biodiversity." The U.S. Forest Service recognizes that pine plantations are "generally poor wildlife habitat," especially "when compared with natural pine and hardwood forests…"*

*"…The South's natural longleaf pine forests, in particular, are highly valued for their biodiversity due to high levels of diversity, endemism, and species-richness. Unfortunately, these prized forests are facing "near elimination," which the U.S. Forest Service acknowledged as "perhaps the greatest ecosystem alteration resulting from intensive forest management and land use conversion in the South…"*

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## Proforestation Mitigates Climate Change

2019-06-11-frontiers-research-proforestation-mitigates-climate-change-and-serves-the-greatest-good-english.pdf

In this paper it is argued, based on multiple studies on carbon sequestration in forests, that proforestation is the best way available to mitigate climate change and prevent loss of biodiversity. Proforestation (growing existing forests intact to their ecological potential) – is a more effective, immediate, and low-cost approach than afforestation and reforestation, and could be mobilized across suitable forests of all types. Forests are already responsible for the largest share of the carbon removal and since technologies for direct CDR from the atmosphere and bioenergy with carbon capture and storage (BECCS) are far from being technologically ready or economically viable (Anderson and Peters, 2016), forests in general, and proforestation in particular, are considered ever more important for mitigating climate change. On top of that they provide unparalleled ecosystem services such as biodiversity enhancement, water and air quality, flood and erosion control, public health benefits, low impact recreation, and scenic beauty.

*"Large trees and intact, older forests are not only effective and cost-effective natural reservoirs of carbon storage, they also provide essential habitat that is often missing from younger, managed forests."*

*"Proforestation will increase the diversity of many groups of organisms."*

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## Dutch Government Hearing Logging Trees for the Climate

2019-06-03-tweede-kamer-hoorzitting-bomen-kappen-voor-klimaat-en-natuur-roofbouw-of-noodzakelijk-kwaad-dutch.pdf

This report commissioned by main parties like the Dutch State Forest Management and it's former Director, Professors at the University and others concerned with the massive amount of trees being logged for biomass production.

*"…Input Staatsbosbeheer (Dutch state forest management):*
*An important part of Dutch biodiversity is linked to forest; forests are rich ecosystems. Moreover, trees are a source for CO2 storage, and therefore an important key to tackling climate change. And trees yield wood; a sustainable and circular raw material for, for example, construction, furniture and cardboard…"*

*"…The Netherlands must become more wooded and forests must be given the time to develop… Staatsbosbeheer wants more forest in the Netherlands because of the climate, but certainly also for biodiversity and an attractive living and working environment. More than ever before, climate objectives demand this. That is why we want to plant 5,000 hectares of new forest in our own areas where possible in the coming years. We are currently identifying the most promising areas. But this is not nearly enough for solving the climate issue…"*

*"…In addition, we will work with provinces and other stakeholders on the future plans for PAS and take a good look at the N2000. Because if we are just as important can achieve biodiversity goals for open landscapes without or with less logging that is our strong preference. Some of the biodiversity goals can also go beyond the current ones nature areas. And if it cannot be otherwise, and trees must still be felled we advocate generous compensation…."*

*"…The Ministry of LNV recently announced that it would be working with a new national one forest strategy, which resolves inconsistencies in policy goals (biodiversity and climate) more work is being done on more new forest in the Netherlands and attention is being paid to it sustainable wood use…"*

*"…Input Natuurmonumenten forest management:*
*Trees store carbon, and forest clearing is at odds with this task. At this point we can be clear: Natuurmonumenten fully supports the climate task. Combating climate change is a new task in which everyone is responsible nature*

*conservation, which is fully in line with our commitment to the Agriculture & Land Use sector table of the Climate Agreement, so Natuurmonumenten wants to and will explicitly review its forest policy and adjust it if necessary, focusing on 'climate adaptive forest management'..."*

*"... The Netherlands needs much more forest. Nature managers have a responsibility in this - by ensuring that the forest area they manage does not decrease, but increases. But politicians and society as a whole also have a responsibility ..."*

*"...Input former Director Dutch State Forest Management*
*Firstly, SBB (Dutch state forest management) has fallen back on the logging method for harvesting wood in combination with tillage, as if trees are an arable crop. Euphemistically, this is also referred to as rejuvenation. The clearing as a method for forest exploitation is an outdated phenomenon: deliberately abolished long ago because of the major disadvantages for the forest ecosystem. It is a national policy that kills around two thousand football pitches per year. Bare cutting leads to a sharp decrease in soil fertility, in biodiversity and in perception value. Moreover, it is climatic because it leads to a substantial increase in CO2 emissions and to the conversion of climate-robust mixed forests into monocultures of mainly pine trees that are vulnerable to climate change..."*

*"...Secondly, the organization has since not only harvested logs, but also branch and top timber. This biomass harvest is a new phenomenon. It is inspired by the market that has been created for biomass since the use of biomass for the production of energy has been subsidized. Biomass harvesting is ecologically irresponsible..."*

*"...For clarity, I am not opposed to the Natura 2000 objectives. This "transformation hood", which is important for biodiversity, is in principle not in question here. However, various groups have signaled improper use of the Natura 2000 scheme, for example that more is being cut than is necessary..."*

*"...SBB has an exemplary role as the country's largest government-affiliated forest manager. I see a worrying oil spill effect from their method of clearing to municipalities, road authorities, private individuals and some other site managers..."*

*"...Input Dutch forest management and nature conservation*
*Disadvantages of clear-cut exploitation:*
*1. build-up of long-term financial debt;*
*2. loss of the next-generation forest already established spontaneously;*
*3. reduction of climate robustness;*

*4. loss of biodiversity;*
*5. reduction in the amount of bound CO2;*
*6. loss of soil fertility;*
*7. loss of forest aesthetics…"*

*"…Advice:*
*- stop subsidy for exploitation that destroys the forest ecosystem and leads to losses;*
*- stop unnecessary mobilization of CO2 and mineral loss due to soil tillage;*
*- stop subsidies for biomass that should remain in the forest ecosystem…"*

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## Averting Climate Breakdown by Restoring EcoSystems

2019-04-00-natural-climate-solutions-averting-climate-breakdown-by-restoring-ecosystems-english.pdf

This report commissioned by Natural Climate Solutions calls for a great increase in the attention and spending devoted to Natural Climate Solutions, as part of a massively enhanced global effort to prevent both climate breakdown and ecological collapse.

*"…In most climate abatement models, there is a strong emphasis on Bio-Energy with Carbon Capture and Storage (BECCS). This means growing biomass in plantations, burning it in power stations to produce electricity, capturing carbon dioxide from the exhaust gases and burying it in geological formations."*

*"Unfortunately, any deployment of BECCS on a scale sufficient to cause significant climate abatement is likely also to cause either humanitarian or ecological disaster. […] Even on a pathway that involved a far greater mitigation of industrial emissions (RCP2.6), BECCS still requires massive land use. The result would be either to risk mass starvation or to replace, on a global scale, vibrant and diverse ecosystems with industrial monocultures."*

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## The Reputational & Financial Risks of Investing in Forest Biomass Energy

2019-04-00-environmentalpaper-the-reputational-and-financial-risks-of-investing-in-forest-biomass-energy-english.pdf

This briefing document, a collaborative effort by Environmental Paper Network, Biofuelwatch and Global Forest Coalition, sums up the reputational and financial risks involved with investing in forest biomass energy. "Reputational risks stem from the growing awareness and body of evidence showing that forest biomass is far from being a low carbon or even carbon neutral energy source. […] Reputational risks can translate into financial risks given the high level of dependence of this form of energy on public subsidies. Failure to fully disclose environmental, social and governance (ESG) risks in portfolios exposes financial institutions to regulatory risk."

*"[…] Biomass energy is linked to accelerating forest and biodiversity destruction, as well as to air pollution affecting public health."*

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## Burning Woody Biomass is Not CO2-Neutral

2019-03-25-wetenschappelijkbureaugroenlinks-maak-een-einde-aan-de-co2-neutraliteit-van-houtstook-dutch.pdf

In this document the scientific think tank of GroenLinks (GreenLeft party) argues against the status of burning woody biomass for our energy supply as carbon neutral, and in effect, against subsidizing the burning of woody biomass. They suggest CO2 emissions caused by the burning of biomass should be added to the total sum of emissions of the country where the biomass is actually burned. And the CO2-balance should be checked by taking up the preliminary CO2 uptake in the LULUCF balance of the country where the biomass stems from.

*"Proper management of forests is safeguarded when perverse incentives to burn biomass are taken out of the equaion. The loss of biodiversity can be halted if we lower the number of trees we cut down."*

*"Through international agreements on Land Use, Land Use Change and Forestry (LULUCF) every country is committed to keep track of the amount of CO2 that's being stored and lost in their soil and forests. […] But these measures don't safeguard against losses of stored CO2 in forests, since there is no penalty in place for the exporting countries, whereas importing countries, like the Netherlands, subsidize the burning of trees. This policy functions as an*

*incentive to cut down more trees than is sustainable considering the CO2 balance and biodiversity [...]."*

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## EU RED-2 Revisions Put Biodiversity at Risk

2018-08-28-flinders-university-eu-renewable-energy-directive-revisions-put-biodiversity-at-risk-english.pdf

This report commissioned by Flinders University discusses the RED II legislation and states it will undermine the sustainability requirements and the risks for biodiversity.

*"...RED II is an immense step in the wrong direction for biodiversity and we strongly recommend that it be revised immediately. It undermines the already weak sustainability requirements for forestry and opens the door for indirect effects within the EU bioenergy market selling compliant wood to larger plants and non-compliant biomass to smaller plants..."*

*"The revisions outlined in RED II would apply only to areas considered agriculture and no longer encompass forestry. Instead, new management rules that lack adequate safeguards have been added, so biomass harvested in forests could now legally be sold as a 'sustainable' product in Europe,"*

*"...Other additions include inefficient measures for biodiversity protections in terms of forestry management The new land-use criteria focusing on carbon safeguards won't be effective for many reasons..."*

*"...Under the proposed revisions published on June 2018 the 'RED II' legislation around 75% of wood energy being sold in EU would not have to comply with sustainability requirements..."*

*"...There is an exemption on importation guidelines and a complete lack of regulation surrounds the process of conversion to agricultural land..."*

*"...Red II also undermines the protection of highly biodiverse grasslands, with only non-natural lands identified by a 'compotent authority' protected..."*

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## Heat from Burning Wood

2014-03-03-bvor-warmte-uit-hout-dutch.pdf

This report was commissioned by multiple woodlogging companies to determine the most effective method for producing woodchips for burning biomass.

*"...With the increasing demand for biomass for energy production, the social debate about the sustainability of that biomass is also increasing. Where the discussion takes place initially focused on biofuels for road traffic, made from edible crops like maize and palm oil, now also solid biomass for electricity production is emphatically present in the interest. Social groups and others fear that increasing use of biomass leads to more deforestation, loss of biodiversity and competition between the use of biomass for energy and for other purposes. As indicated in 2.3.1, the subject is also stated "Carbon debt" is in the spotlight. Although the discussion occurred to an important extent focuses on voluminous biomass flows from abroad (for example wood pellets from Canada), Dutch biomass flows are also considered critically. That is also the case for wood from nature, forest, landscape and landscaping..."*

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## EASAC Forest Bioenergy BECCS and CO2 Removal

2019-02-10-easac-forest-bioenergy-carbon-capture-and-storage-and-carbon-dioxide-removal-english.pdf

As global emissions of carbon dioxide (CO2) continue to exceed levels compatible with achieving Paris Agreement targets, attention has been focusing on the role of bioenergy as a 'renewable' energy source and its potential for removing CO2 from the atmosphere when associated with carbon capture and storage (CCS). This new commentary of EASAC updates its findings from 2017/2018, based on peer-reviewed papers and environmental reviews that have been published since then. The overall conclusion is that the use of biomass, even when combined with with carbon capture and storage (BECCS) remains associated with substantial risks and uncertainties, both over its environmental impact and ability to achieve net removal of CO2 from the atmosphere. The large negative emissions capability given to BECCS in climate scenarios limiting warming to 1.5˚C or 2˚C is not supported by recent analyses [...]"

*"The impacts of BECCS on terrestrial biodiversity have also been further examined and BECCS found to have generally negative effects."*

*"BECCS deployment at the huge scales envisaged in many scenarios may*

*greatly overestimate our collective ability to manage carbon cycle flows, thereby risking doing more harm than good."*

*"BECCS risks and uncertainties remain substantial in other aspects such as water, fertiliser, food security and biodiversity."*

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## Dutch Government (RVO) Bio Energy Input Woody Biomass

2013-08-07-rvo-bio-energie-input-houtige-biomassa-dutch.pdf

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

*"...Requirements for sustainability:*
*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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## All Research Papers on Deforestation & Woody Biomass

https://biomassmurder.org/research/index.html

We have collected and read all the research reports and official documents from the past decades and have started to make summaries for each subject and published the summaries on the following pages:

Biomass Research Abbreviations

Biomass Research Availability

Biomass Research Biodiversity

Biomass Research Carbon Dioxide

Biomass Research Certification

Biomass Research Ecotoxicity

Biomass Research Health Risks

Biomass Research Legal

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Biomass Research Whole Trees

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