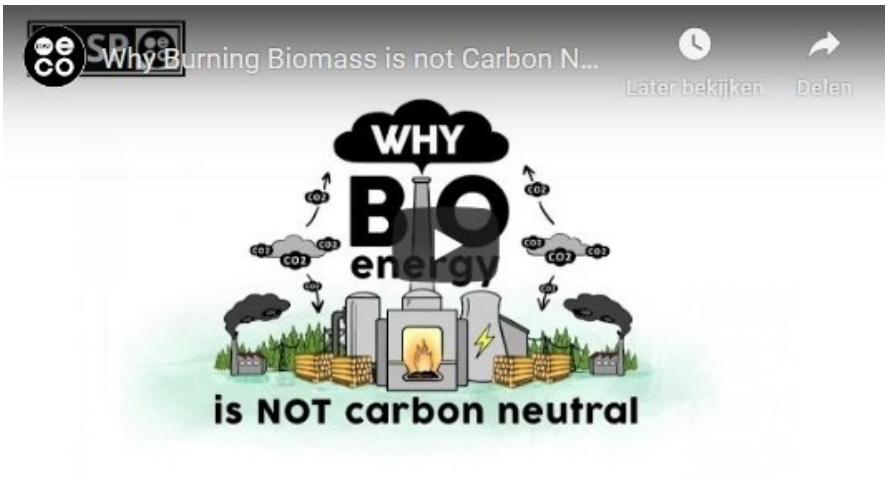
Research on Carbon Dioxide Emissions Caused by Burning Biomass



Trees remove carbon dioxide from the atmosphere while they grow and turn it into wood and oxygen. Small trees do not absorb much carbon dioxide but after 20 years they can absorb more than 20 kilos of carbon dioxide per year. When a tree reaches the age of 80 years it has removed more than a thousand kilos of carbon dioxide from the air and it produces enough oxygen to keep 2 people alive. When a tree dies, most of the carbon dioxide stays solid for a long time which provides a habitat for thousands of animal species and is slowly converted into breeding ground for new plants.

“Bioenergy” is energy made by burning biomass – mostly wood. This means energy is made by burning trees. Although it contains “bio”, which sounds positive, it is not a carbon neutral form of energy like wind or solar energy. A common misconception is that with bioenergy you have a closed circle of carbon that is absorbed from the air by a tree and then re-released when the tree is burned.

The reality is more complicated: Wood for bioenergy usually comes from forests. Healthy forests function as storage for carbon. That means they constantly soak up carbon dioxide from the atmosphere. Without this vital function our climate would be changing even faster than it already is.

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2019-10 \\ Multiple NGO's

What happens to the carbon if we harvest wood from those forests? Well, if the wood is used for example for houses or furniture the carbon stays locked in. That means it is not released into the atmosphere for a long time. But if we burn the wood for energy, this carbon is immediately released into the atmosphere. Even though it take a trees decades to absorb the same amount of carbon dioxide.

In the past two hundred years, all the trees on earth could not process the amount of carbon dioxide that we released into the air causing the temperature on earth to increase by 1 degree. Now we are going to cut down more trees and burn them which releases even more carbon dioxide and less carbon dioxide will be absorbed because the remaining trees will not suddenly starting absorbing more. This means that we will emit a lof of extra carbon dioxide in the air. This holds true even of we only harvest as much wood as regrows each year.

Extensive research concludes that burning biomass is responsible for far more CO2 emision compared to burning fossil fuels. Burning biomass wil result in increased and excelerated global warming & climate change. This page on our website contains multiple reports and the conclusions based on the findings.

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 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.

"The upfront CO2 emissions from burning wood in power plants are even higher than those from coal per unit of energy."

2019-09-16-dnvgl-emissies-naar-de-lucht-bij-inzet-van-biomassa-voor-electriciteit-en-warmte-producties-dutch.pdf

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2019-08 \\ BioEnergy

2019-08-14-tpfc-misguided-strategy-burning-wood-to-mitigate-climate-change-in-germany-english.pdf

2019-08 \\ TPFC

2019-08-12-virginia-commonwealth-university-structurally-complex-forests-better-at-carbon-sequestration-english.pdf

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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 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

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

2019-08 \\ IPCC

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

2019-08\\ EUBiomassLegalCase

2019-07-31-elsevier-understanding-the-timing-and-variation-of-greenhouse-gas-emissions-of-forest-bioenergy-systems-english.pdf

2019-07 \\ Elsevier Research

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

2019-07 \\ EPN

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2019-06 \\ GOV NL MINLNV

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

2019-06 \\ WUR

2019-06-18-european-commission-staff-working-document-assessment-for-the-national-forestry-accounting-plans-english.pdf

2018-12 \\ European Commission

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.

"...Burning forest biomass releases large amounts of climate-warming pollution into the atmosphere and destroys crucial carboncapturing ecosystems, setting us back decades in the fight against climate change right when we most need to be moving forward with urgency. But the European Union has erroneously decided to categorize biomass energy as a form of renewable energy and treats biomass as "carbon neutral." That effectively places it on par with solar or wind. On top of that, E.U. member states are providing huge financial subsidies to incentivize this practice. In some member states, biomass energy subsidies now make up a large share of all subsidies available to renewable energy sources..."

"...Additionally, it is worth noting that hidden subsidies in the form of energy tax exemptions or carbon tax exemptions are granted to E.U. bioenergy producers under the false assumption of biomass "carbon neutrality." In some instances the value of these exemptions exceeds that of the subsidies evaluated in this report. In Denmark and Sweden, for example, these hidden subsidies total hundreds of millions of euros per year..."

"...No country relies more heavily on the worst form of bioenergy than the United Kingdom. Unlike other E.U. member states, more than half of total solid biomass use in the United Kingdom in 2017 was for electricity generation in power plants, which relies primarily on burning the most carbon-intensive type

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

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

2019-06 \\ Soutern Environment

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

2019-06 \\ Frontiers Research

2019-06-07-minez-minister-wiebes-beantwoording-vragen-over-milieuschade-houtstook-is-vele-malen-hoger-milieuschade-door-aardgas-of-stookolie-dutch.pdf

2019-06 \\ GOV NL MINEZ

2019-06-04-gov-nl-wiebes-antwoorden-op-kamervragen-pvdd-over-de-bij-stook-van-biomassa-in-centrales-dutch.pdf

2019-06 \\ GOV NL MINEZ

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

2019-06 \\ GOV NL

2019-05-28-pbl-effecten-ontwerp-klimaatakkoord-dutch.pdf

2019-05 \\ Gov NL PBL

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of biomass (e.g., trees and other vegetation taken directly from forests) in the least efficient way..."

"...When biomass burned for combined heat and power (CHP) is considered alongside dedicated electricity-only generation, Denmark, Slovakia, the Netherlands, Belgium and Sweden are also heavy biomass users. CHP plants make more efficient use of biomass fuel by utilizing both the electricity and the heat from burning biomass. As a result, biomass use for CHP generation tends to be less carbon-intensive per unit of energy. However, a shift to burning biomass for CHP does not alleviate all—or even most—concerns regarding biomass subsidies. Biomass harvest from forests—regardless of the facility in which it is burned—will almost certainly result in a lasting carbon debt by reducing forest carbon stocks..."

"...Per unit of electricity, all biomass power plants emit more CO_2 from their stacks than coal plants do, whether they burn biomass in the form of whole trees or harvest residues. This means that bioenergy, which the European Union treats as "carbon neutral," actually increases atmospheric CO_2 levels. Proponents of bioenergy argue that forest regrowth negates this harmful impact on our climate. That is simply not true, even under the bestcase scenario in which logged trees are immediately replaced with saplings. This is for three reasons:

> *1. Older trees have been shown to sequester CO_2 at a higher rate, so a permanent carbon debt is created when an older and larger tree is replaced with a sapling. Not only will it take years (likely decades) for the new tree to reach the size of the felled one, but during that time the now felled tree would have grown even larger if it had been left in place.15 This is often referred to as the "forgone sequestration" caused by additional biomass harvest in the forest.16 It means that biomass harvest reduces a forest's store of carbon over the long run, compared with what it would be without the additional demand for wood.*
>
> *2.It is difficult to ensure that harvested trees will be replaced and kept intact.*
>
> *3.Forest harvesting also releases carbon from the soil. Together, this means that harvesting wood for energy has an immediate and negative impact on the climate, with consequences that can persist for decades or even centuries.18 Even when biomass energy is generated by burning genuine forestry residues—the leftovers from logging operations, like tree tops and limbs—the result is increased CO_2 in the atmosphere over several decades. This is not compatible with the speed at which*

2019-05-14-un-environment-the-emissions-gap-report-2017-executive-summary-english.pdf

2019-05 \\ United Nations

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

2019-04-00-ipcc-report-global-warming-chapter-2-mitigation-pathways-compatible-with-1-5-degreas-in-the-context-of-sustainable-development-english.pdf

2019-04 \\ IPCC

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

2019-03 \\ Scientific Thinktank GL

2019-03-20-pfpi-aps-technologies-are-more-polluting-than-fossil-fuels-per-unit-of-energy-produced-and-should-not-be-subsidized-english.pdf

2019-03 \\ Scientific Thinktank GL

2019-03-04-vox-europes-renewable-energy-policy-is-built-on-burning-american-trees-english.pdf

countries must cut climate emissions to meet their climate targets under the Paris Agreement or limit global warming to 1.5 degrees Celsius..."

"...In February 2017, the U.K.-based think tank Chatham House challenged the fundamental assumption underlying European renewable energy policy: that burning forest biomass to produce electricity is a "carbon neutral" alternative to fossil fuel use. Its seminal report concludes, "In most circumstances, comparing technologies of similar ages, the use of woody biomass for energy will release higher levels of emissions than coal and considerably higher levels than gas."20 A subsequent study by the European Academies Science Advisory Council, which represents the consensus views of the national science academies of all E.U. member states, echoed these conclusions. It warns that E.U. policies are currently biased toward the use of forest biomass, which can release significantly more CO2 per unit of electricity than fossil fuels over long time frames. The authors express concern that allowing biomass energy to be counted as "carbon neutral" or "zero emissions" gives a false impression of a country's progress toward reducing climate pollution. The study also states that compared with solar and wind energy, biomass energy does a poor job of reducing CO2 in the atmosphere and that subsidies for renewables should reflect this..."

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Forest Degradation & Forgone Removals Increase the Carbon Impact of Intact Forest Loss by up to 626 Percent

2019-11-05-sciencemag-degradation-and-forgone-removals-increase-the-carbon-impact-of-intact-forest-loss-by-626-percent-english.pdf

In this research article it is shown that to fully account for gross carbon emissions from all deforestation across the pantropics it is required to factor in adverse effects of clearing forests. Four are considered here; forgone carbon sequestration, selective logging, edge effects, and defaunation. When these factors were considered, the net carbon impact resulting from intact tropical forest loss between 2000 and 2013 increased by a factor of 6 (626%). For this reason the researchers argue that a comparable analysis for extratropical regions is urgently required, given that approximately a half to two-thirds of carbon removals on Earth's intact ecosystems occur outside the tropics.

"Only 20% of tropical forests can be considered intact, but these areas store 40% of the aboveground carbon found in all tropical forests. The net biomass increase of intact forests also removes large amounts of atmospheric carbon

2019-03 \\ VOX Research

2019-03-04-euractiv-eu-dragged-to-court-for-backing-forest-biomass-as-renewable-energy-english.pdf

2019-03 \\ Euractive

2019-02-20-gnmf-aanbevelingen-hoogwaardige-inzet-houtige-biomassa-dutch.pdf

2019-02 \\ GNMF

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

2019-02 \\ EASAC

2019-02-06-shareaction-investor-report-the-biomass-blind-spot-english.pdf

2019-02 \\ ShareAction

2018-12-17-european-environment-agency-report-renewable-energy-in-europe-english.pdf

2018-12 \\ EU Environment

Agency

2018-08-07-nature-land-use-emissions-play-a-critical-role-in-landbased-mitigation-for-paris-climate-targets-english.pdf

2018-08 \\ NatComs

2018-05-00-cib-ecf-forest-research-report-carbon-impacts-of-biomass-consumed-in-the-eu-english.pdf

2018-05 \\ CIB

—sequestering at least one petagram of carbon per year, or up to 0.9 Mg of carbon per hectare per year —and thus makes substantial contributions to the residual terrestrial carbon sink phenomenon."

"The most obvious and immediate source of emissions from intact forest loss occurs through outright forest clearance. The clearance of intact forests also leads to numerous sources of committed emissions. Newly accessible forests are targeted for first-cut selective logging […]. Increased accessibility also initiates cryptic sources of emissions that occur more gradually, including the edge effects associated with forest fragmentation […] and declines of carbon-dense tree species due to overhunting of seed-dispersing animals ("defaunation"). The loss of intact forests also forgoes the opportunity for persistent carbon removals, as degradation processes or conversion to non-forest land uses reduces carbon uptake from the atmosphere."

"Intact tropical forests account for nearly half of all the carbon sequestered in global intact forests, which absorbed around 28% of anthropogenic carbon emissions from all sources during the period 2007–2016."

"Had the 28 million ha of forest damaged by clearance, logging, or edge effects remained intact from year 2000 onward, they could have sequestered 972 (1604 to 331) Tg C by 2050. Hence, after accounting for committed emissions and forgone carbon removals, the estimated net carbon impact from intact tropical forest loss in the 2000s increased sixfold over the estimate based on forest clearance alone, from 338 (372 to 208) to 2116 (2854 to 1004) Tg C […] and implies that accounting for clearance alone will underestimate the carbon impact of intact forest loss by 84%."

"Even when constrained to only being within 1 km of roads, we estimate that selective logging will cause emissions equivalent to 35% of those resulting from direct forest clearance."

"Forest fragmentation reduces the net amount of carbon stored at forest edges. […] We expect that cumulative net emissions from edge effects will approximately double those from direct forest clearance events observed in intact forest in the 2000s. […] This result is driven by large edge-to-forest clearance ratios found in lost parcels of intact forest. On average, every 1 ha of intact forest clearance resulted in 7 ha of new forest edge. Declines of large-seeded animal-dispersed trees in intact forests (defaunation) could lead to the emission of 102 (111 to 92) Tg C by 2050."

"Should all tropical intact forests reach saturation by 2030, forgone removals would reduce by 66%."

2018-02-02-fern-covered-in-smoke-why-burning-biomass-threatens-european-health-report-english.pdf

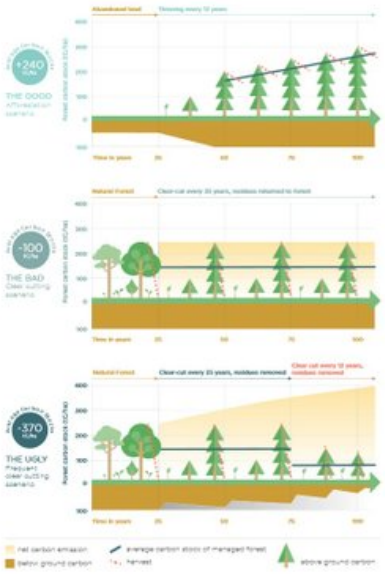
2018-02 \\ FERN

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

2014-03 \\ BVOR

ATTENTION!

We are analyzing reports and creating & posting new summaries every day. This is time consuming work but we will try to deliver multiple summaries per day. We are currently processing reports from 2019 and will work our way back into the hundreds of official research reports commissioned the last decade.



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NGOs Letter to Danish Parliament Regarding Forest Biomass

2019-10-09-ngos-letter-to-the-danish-parliament-and-climate-minister-regarding-forest-biomass-english.pdf

In this letter to the Danish parliament, international NGO's, representing millions of activists in the United States, Estonia, Lithuania, the U.K., and Germany, urge government 1) to impose a levy on biomass, 2) to phase out the subsidy for burning biomass from wood, and 3) to determine a date for phasing out biomass as soon as possible. All this in order to avoid extensive harm to the world's forests and the acceleration of climate change that will be caused by treating biomass as a green energy resource. Nearly 70% of Denmark's renewable energy supply (2017) is met by burning woody biomass, as a result of which 30% more carbon is being emitted than is required to report. On top of that, TV2 investigation series made it apparent that voluntary sustainability standards agreed upon by the biomass industry are falling short of genuinely protecting forests, climate, and communities.

"Even if forests are allowed to regrow, using wood deliberately harvested for burning will increase carbon in the atmosphere and warming for decades to centuries – as many studies have shown – even when wood5 replaces fossil fuels such as coal, oil, or natural gas."

"Carbon neutrality 14 assumptions around biomass are not made in reference to meaningful timeframes to address climate change: most critically, forests cut down to provide wood pellets for power immediately release large quantities of carbon dioxide, and decades of tree regrowth are required to reabsorb released CO2."

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Emissions when Burning Biomass for Power & Heat

2019-09-16-dnvgl-emissies-naar-de-lucht-bij-inzet-van-biomassa-voor-electriciteit-en-warmte-producties-dutch.pdf

This DVN GL report was commissioned by the Ministry of Infrastructure and Water Management to obtain a precise picture of the emissions released from the burning of coal in comparison to biomass and gas. In this study 6 different power stations were included. They conclude that electricity

production in a biomass power station causes a 20% higher specific emission for NOx, dust and CO2 due to the lower efficiency of this installation compared to a coal-fired power station. When biomass is being used in (partially) converted coal power stations emissions are comparable to when only coal is being used for electricity generation.

Important note; in this study it is assumed that the CO2 emitted from the use of biomass is short-cyclic CO2 and DNV GL (KEMA) has been envolved in the paid pro biomasslobby for nearly two decades & is a stakeholder in the biomass trade.

"Of the four cases where only electricity is produced, the specific emission in kg / MWe is lowest for all components in case 1, or 100% coal firing. Cases 2 and 3, in which 30% is co-fired and in which the coal-fired power plant has been converted for the use of 100% biomass, have only marginally higher emissions for all components due to the relatively small decrease in the efficiency of the installation when using biomass.
Case 4, the biomass power station of 40 MWe, has approximately 20% higher specific emissions for NOx, substances and CO2. This is mainly due to the lower electrical efficiency of this installation compared to the coal-fired power station from cases 1-3."

"Specific CO2 emissions from coal firing is 726 kg / MWe. [...] A modern biomass-fired powerplant has a specific CO2 emission of approximately 900 kg / Mwe."

"For NOx and CO2, the emission from the gas-fired boiler is approximately 50% and 40% lower than with the biomass-fired boiler."

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Call for Action to Restrict Climate Damaging Bioenergy

2019-09-11-easac-environmental-experts-call-for-international-action-to-restrict-climate-damaging-forest-bioenergy-schemes-english.pdf

This press release from EASAC followed soon after they'd published their paper "Serious mismatches continue between science and policy in forest bioenergy" and offers a short summary of their main findings.

"EASAC has repeatedly pointed out that the climate effects of current large-scale substitution of coal by forest biomass (especially when imported) may be increasing the risk of overshooting Paris agreement targets. The reason is

simple- when the forest is harvested and used for bioenergy, all the carbon in the biomass enters the atmosphere in one pulse. Moreover, since emissions of CO2 per unit of electricity generated are higher (for reasons see the paper), the net effect is that the initial effect of the switch from coal is for emissions to INCREASE."

"The carbon payback period] can be short where unused residues from sustainably-managed forests are involved, but as soon as additional trees start being cut to provide the raw material for pellet mills, the payback periods lengthen considerably, and extend to decades or even centuries depending on the specific case."

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Synthesis Best Available Science & Forest Carbon Policy

2019-09-09-dogwoodalliance-synthesis-of-best-available-science-and-implications-for-forest-carbon-policy-english.pdf

This report synthesizes and analyzes the best available climate science on the impacts of industrial forest practices in North Carolina. The first part of this report, the one we'll be focusing on, discusses how industrial forest practices disrupt nature's carbon cycle and provides an overview of three key climate impacts—loss of carbon storage, increased emissions from logging and wood products, and loss of carbon sequestration capacity. Emissions associated with logging and wood products in North Carolina averaged 44.59 MMT CO2-e per year between 2000 and 2018. It represents the third largest source of emissions statewide. If, on the other hand, "climate smart practices" were implemented across the board 3 additional gigatons of CO2 could be stored on forestlands in North Carolina alone.

"How industrial forest practices disrupt nature's carbon cycle and provides an overview of three key climate impacts—loss of carbon storage, increased emissions, and loss of carbon sequestration capacity."

"Clearcutting deforests the land, reduces net sequestration, and removes natural, climate resilient forests. Accumulation of carbon in the soil is eliminated or significantly reduced. As compared with nature's baseline, the industrial forest landscape stores less carbon, sequesters less carbon, emits more carbon into the atmosphere, and is more vulnerable to climate change."

"Natural forests sequester large amounts of carbon from the atmosphere and release small amounts from natural disturbances such as wildfires, storms,

insects, and disease and more significant amounts from the natural decay of dead and downed wood on the forest floor. But the net amount of carbon sequestered is always positive and is so for many centuries. Importantly, this allows the buildup of carbon stocks in forest soils."

"Trees are half carbon by weight. As long as they stay in the forest, they continue to accumulate and store this carbon in leaves, needles, branches, trunks, and roots. When they die, some of the carbon is converted into CO2 and emitted into the atmosphere, but most stays on site accumulating in the soil."

"Carbon is not stored very long in wood products, rather, it is converted to CO2 and released in accordance with wellestablished timeframes that depend on the type of product produced. Burning woody biomass releases stored carbon immediately. Paper, packaging, and other short-lived products release most of their carbon in a decade."

"Combining emissions associated with timber harvest removals (REM), storage in long-lived wood products (STOR), foregone sequestration (FS), and decay and combustion of logging residuals (DR) suggest that emissions associated with logging and wood products in North Carolina averaged 44.59 MMT CO2-e per year between 2000 and 2018. It represents the third largest source of emissions statewide."

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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 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.

"...The classification of forest biomass as 'renewable' is based on the reasoning that, since biomass carbon came from atmospheric CO2 and regrowth absorbs CO2 over time, it can be regarded as 'carbon neutral' with net emissions over the harvesting/regrowth cycle of zero. The 'carbon neutrality'

concept is, however, a gross misrepresentation of the atmosphere's CO2 balance since it ignores the slowness of the photosynthesis process which takes several decades for trees to reach maturity. This has been pointed out repeatedly. Nevertheless, its simplicity brought with it political and economic advantages and led to the inclusion of biomass in the European Commission's definition of renewable energy in its 2009 Renewable Energy Directive (RED), being treated as 'part of the package of measures required to reduce greenhouse gas (GHG) emissions…"

"…It is thus of considerable concern that scientific analyses indicate that, far from reducing GHG emissions, replacing coal by biomass for electricity generation is likely to initially increase emissions of CO2 per kWh of electricity as a result of the lower energy density of wood, emissions along the supply chain, and/or less efficient conversion of combustion heat to electricity. The resulting increase in atmospheric concentrations of CO2 increases radiative forcing and thus contributes to global warming…"

"…some EU member states have already recognized that biomass electricity has a much higher carbon footprint as a 'renewable' energy than solar and wind, and have set much more stringent standards for future renewable energy subsidies. This, however, only affects the conditions on future projects, not the facilities already established and operating. Nor do such trends in Europe appear to be reducing efforts by pellet manufacturers to expand their markets outside Europe…"

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Misguided Strategy Burning Wood Against Climate Change

2019-08-14-tpfc-misguided-strategy-burning-wood-to-mitigate-climate-change-in-germany-english.pdf

This report commissioned by multiple organizations like TPFC, WWF, ARA and DenkHausBremen clearly states the reasons why burning woody biomass to mitigate climate change is a misguided strategy.

"…Wood contains less energy than coal, oil or gas. Thus, more of it has to be burned to produce the same amount of energy. According to calculations by the Intergovernmental Panel on Climate Change, heating with wood releases almost twice as much carbon dioxide (CO2) as using gas…"

"…Advocates of burning wood don't see this as a problem. They assume that wood, being a regenerative raw material, emits only as much CO2 during burning as the trees have previously absorbed from the atmosphere during

growth. Wood growth (CO_2 sink) and wood burning (CO_2 source) offset one another, which is why they consider wood to be a carbon neutral energy source. But this does not account for the fact that most tree species take decades to grow back and that they would store additional carbon, if they would not have been cut for burning…"

"…To mitigate climate change we need to reduce carbon emission immediately within the next 20 years. If wood is harvested just to burn it, the carbon dioxide stored in the timber is released into the atmosphere instantaneously…"

"…Within the next two important climate-change decades, burning fresh wood will release additional carbon emissions and adversely affect the climate…"

"…Forests are desperately needed to mitigate climate change. As long as the technical devices that could one day filter CO_2 from the air remain unproven technologies, only forests can provide us with the much needed "negative emissions". If a tree is not cut down, the carbon contained in the wood remains stored. And as it grows, the tree absorbs additional carbon. For a long time, it was assumed that young forests have a particularly strong rate of growth and that a balance between CO_2 capture (growth) and release (decay) would be achieved after about 150 years. Today we know that even in very old forests, biomass continues to increase and more CO_2 is stored every year, albeit at a decreasing rate…"

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Structurally Complex Forests Better at Carbon Sequestration

2019-08-12-virginia-commonwealth-university-structurally-complex-forests-better-at-carbon-sequestration-english.pdf

This study report by the Virginia Commonwealth University demonstrates for the first time that a forest's structural complexity is a better predictor of carbon sequestration potential than tree species diversity. The discovery holds implications for the mitigation of climate change.

"…the arrangement of vegetation is highly varied — sequester more carbon, according to a new study led by researchers at Virginia Commonwealth University. The study demonstrates for the first time that a forest's structural complexity is a better predictor of carbon sequestration potential than tree species diversity. The discovery may hold implications for the mitigation of climate change…"

"…forests that are structurally variable and contain multiple layers of leaves outperform structurally simple forests with a single concentrated band of vegetation…"

"…Many of the ecological indicators of forest growth and carbon sequestration fail to explicitly account for complexity…"

"…It takes tree diversity to produce a variety of leaf and plant shapes and, additionally, a critical quantity of leaves to supply the building blocks required to assemble a structurally complex forest capable of sequestering lots of carbon…"

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Serious Mismatches Between Science & Bioenergy Policy

2019-08-09-easac-serious-mismatches-continue-between-science-and-policy-in-forest-bioenergy-english.pdf

This report considers how current policy might be reformed to reduce negative impacts on climate and argue for a more realistic science-based assessment of the potential of forest bioenergy in substituting for fossil fuels. Since the length of time atmospheric concentrations of CO_2 increase is highly dependent on the feedstocks, the authors argue for regulations to explicitly require these to be sources with short payback period. Furthermore, they re-emphasize the reasons why current policy is achieving the opposite of that intended, and why the urgency of its revision has increased following the conclusion of the Paris Agreement.

"The 'carbon neutrality' concept [concerning forest biomass] is, however, a gross misrepresentation of the atmosphere's CO_2 balance since it ignores the slowness of the photosynthesis process which takes several decades for trees to reach maturity."

"Replacing coal by biomass for electricity generation is likely to initially increase emissions of CO_2 per kWh of electricity as a result of the lower energy density of wood, emissions along the supply chain, and/or less efficient conversion of combustion heat to electricity. […] This initial negative impact is only reversed later if and when the biomass regrows. Research has shown that the time needed to reabsorb the extra carbon released can be very long, so that current policies risk achieving the reverse of that intended—initially exacerbating rather than mitigating climate change. This issue has been pointed out by many authors."

"Burning forest biomass transmits the carbon from the forest stock to the atmosphere within minutes, and there is a carbon 'payback period' between this initial release and a return to forest carbon stocks through regrowth. […] Where additional trees are harvested the payback periods depends on the species and conditions of regrowth which range from decades to centuries. In some scenarios, the carbon present in the original forest stock may never be recovered. This means that the concept of carbon neutrality is both uncertain and highly time and context dependent."

"Assessing the net effects of switching from coal to forest biomass, […] the reduction in the carbon stock of the forests harvested should be included. […] Increasing forest stock harvesting of stemwood (whether thinnings or clear-cut) increases atmospheric CO2 levels for decades to centuries depending on the counterfactual scenarios. […] Even scenarios with 65% residues and only 35% of additional harvests exceeded emissions from a coal reference scenario"

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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.

"...Sustainable forest management can maintain or enhance forest carbon stocks, and can maintain forest carbon sinks, including by transferring carbon to wood products, thus addressing the issue of sink saturation (high confidence)..."

"...Where wood carbon is transferred to harvested wood products, these can store carbon over the long-term and can substitute for emissions-intensive materials reducing emissions in other sectors (high confidence)..."

Where biomass is used for energy, e.g., as a mitigation strategy, the carbon is released back into the atmosphere more quickly (high confidence)..."

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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.

*“…burning wood for energy puts more carbon in the atmosphere than burning fossil fuels, including coal; and the vast increase in industrial logging which it necessitates destroys the very forest systems that have absorbed carbon from the
atmosphere…”*

“…Achieving net zero emissions by 2050 means balancing carbon emissions with carbon sinks, which will require massive effort in both directions. The only carbon sinks currently under human control to any degree3 are natural systems, including agricultural soils and, especially, forests. Accordingly, many scientists are discussing ‘natural climate solutions, especially restoring and expanding forests, as a means of increasing sequestration of atmospheric CO2…”

“…the Paris Agreement also emphasises the role of forests and other terrestrial sinks for carbon. Its Article 5 urges signatories to protect and expand forests and to “take action to implement and support […] activities relating to reducing emissions from deforestation and forest degradation…”

“…There are significant carbon losses ‘upstream’ of the finished pellet, particularly pellets from harvested trees rather than sawmill residues. The carbon footprint of wood pellets includes the roots left after harvesting, which decompose, and tops, limbs, and bark that may be chipped and burned at the manufacturing plant to dry the pellets. Total biogenic emissions are around 2.85 tonnes for every tonne of pellets. Additional to these emissions are the fossil fuel emissions from growing, harvesting, manufacturing, and transporting pellets…”

“…Biomass power plants generally emit more CO2 per unit energy than fossil-fired plants,12 partly because wood tends to have a high moisture content which must be evaporated before useful energy can be generated. Accordingly, power plants combusting solid biomass for fuel tend to operate at a lower efficiency than gas, oil, or coal-fired plants, so more fuel must be burned to generate a given amount of energy which, in turn, emits more CO2 per unit energy…”

"...Wood also has a lower energy content per unit carbon than natural gas, further increasing CO_2 emissions per unit energy relative to gas. Pre-drying wood fuel, and particularly manufacturing it into wood pellets, can increase combustion efficiency and thus reduce carbon emissions per unit energy when the fuel is burned, but that requires energy and emits carbon upstream..."

"...Despite having higher CO_2 emissions than coal per unit energy, burning wood for energy has often been wrongly treated as 'carbon neutral' under regulations and incentive programs. The rationale is generally that materials are 'waste' that would decompose and emit CO_2 anyway, or that plant sources of biomass will grow back and re-sequester an equivalent amount of CO_2 as was released by combustion. Burning even waste wood produces considerable net emissions..."

"...For instance, the net emissions impact of burning forestry residues (the tops and limbs left over from sawnwood harvesting) can be calculated as the cumulative additional CO_2 from burning rather than allowing material to decompose in the forest. But for temperate and cool climates in Europe, where decomposition rates are typically moderate to slow, burning wood emits much more CO_2 than decomposition. Modeling shows that even after ten years of power plant operation, 60% to 90%+ of the cumulative CO_2 from residue burning constitutes a net addition to the atmosphere..."

"...EC staff pointed out an obvious flaw in the bioenergy assessment conducted during development of the Directive: "...it is assumed that the CO_2 emitted will be compensated by the CO_2 captured during plant regrowth. However, compared to crops which regrow over short periods, forest biomass is part of a much longer carbon cycle. A forest stand typically takes between decades and a century to reach maturity. Recent studies have found that when greenhouse gas emissions and removals from combustion, decay and plant growth (socalled biogenic emissions from various biological pools) are also taken into account, the use of certain forest biomass feedstocks for energy purposes can lead to substantially reduced or even negative greenhouse gas savings compared to the use of fossil fuels in a given time period (e.g. 20 to 50 years or even up to centuries)..."

"...That conclusion contrasts with the Directive's claim that its sustainability and GHG criteria "ensure" that biomass delivers emissions reductions relative to fossil fuels.
Contrasting with the Directive's treatment of biogenic carbon as zero, the EC bioenergy assessment concludes that there is 'agreement in the scientific community that adequate account of biogenic CO_2 emissions is needed..."

"...A number of scientific studies have concluded that the net emissions impact of harvesting trees for energy is even greater than the net impact of burning residues that would otherwise decompose. With regard to burning forest wood to generate electricity, a number of studies have concluded that it can take from several decades to more than a century for forests to regrow sufficiently to draw net bioenergy emissions down to the point where they are equivalent to net emissions if fossil fuels were burned to generate the same amount of electricity..."

"...The European Academies Science Advisory Council (EASAC), which serves as an advisory body to the EU, explains that it is not only slow forest regrowth but also forgone sequestration that increases the net carbon impact: "The net climate effects of harvesting a forested area for bioenergy will thus be a combination of the emissions from burning and the loss of carbon absorption potential after harvest."..."

"...The Joint Research Centre (JRC), which serves in an advisory capacity to the EU, evaluated carbon accounting for woody biomass for the EU. JRC's report also warns that harvesting trees ('stemwood') for bioenergy can lead to a longlasting transfer of forest carbon to the atmosphere: "In the case of dedicated harvest of stemwood for bioenergy purposes and short term GHG reduction policy objectives (e.g. 2020) the assumption of "carbon neutrality" is not valid since harvest of wood for bioenergy causes a decrease of the forest carbon stock, which may not be recovered in short time, leading to a temporary increase in atmospheric CO2 and, hence, increased radiative forcing and global warming..."

"...Accordingly, as for the Article 31(1)(a) default values, the formula treats emissions from the fuel in use as zero, and only accounts for changes to biogenic carbon stocks where emissions result from land-use change. In the absence of land-use change, it counts emissions as zero. The Directive (see Annex VIII, part B) adopts the categorisation of the IPCC, such that land use change is when there is a move from one category to another (forest land, grassland, wetlands, settlements, or other land, to cropland or perennial cropland). Significantly, there is no land use change when a forest is felled and allowed to regrow, despite the fact that it may take decades to centuries for the forest to recover...."

"....Further, there is no land use change when a natural, biodiverse-rich forest is felled and replaced with a managed forest (such as a mono-crop pine plantation), which has a far lower capacity to sequester carbon. Despite this, the Directive treats the emissions caused by this felling as zero. Therefore, like the default values it is not capable of capturing the fact that equivalent CO2 to that emitted by combusting biomass is only sequestered over a period of

decades, assuming that trees do indeed regrow and are permitted to mature to their former size..."

"...In contrast, when there is a land use change (such as conversion of a forest to agricultural land), the el value attempts to capture the emissions by averaging them over a 20 year period. This difference in treatment of effectively the same action (namely, harvesting a forest) is entirely arbitrary and underlines the fallacy of treating biogenic emissions in the absence of land use change as zero...."

"...While the GHG criteria are intended to ensure a GHG saving from using biomass
rather than fossil fuels as an energy source, as explained below, they cannot do
that in relation to forest biomass because, in summary:
1) There are no GHG criteria for existing installations; they are only applicable to new installations post-2021. Existing installations can qualify for the Article 29(1) purposes even without meeting any GHG criteria at all; and
2) Even when the GHG criteria are applicable to new installations from 2021, the methods to calculate GHG emissions mandated by the Directive are inadequate..."

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Timing and Variation of GHG Emissions of Forest Bioenergy

2019-07-31-elsevier-understanding-the-timing-and-variation-of-greenhouse-gas-emissions-of-forest-bioenergy-systems-english.pdf

This research paper discusses the greenhouse gas (GHG) impact of three forest-based bioenergy systems from the USA, Canada and Spain supplying wood pellets for electricity in the UK were evaluated by conducting lifecycle assessments and forest carbon modelling of the three forest systems. Cumulative emissions were analysed by calculating the forest carbon stock change and net GHG emissions balance of the forest-based bioenergy electricity. The analysis considered both the replacement of the existing electricity mix with bioenergy electricity and forest management with and without bioenergy use.

"...Frameworks which consider all biogenic carbon within plants to be carbon neutral simplify implementation and are reasonably accurate for bioenergy systems where carbon sequestration and release are temporally close e.g.

annual crops, but fail to capture the more complex carbon dynamics of forests…"

"…discussions about and criticism of forest-based bioenergy systems and accounting frameworks show the importance of timing related to biogenic carbon emissions that are not necessarily compensated for by contemporaneous sequestration and the accumulation of carbon and emissions in forests, forest products or atmosphere…"

"…The temporal framing of forest carbon stocks and flux differs between forest type and forest management as work by others has shown. This creates additional variation and uncertainties when assessing carbon dynamics and the possible climate change mitigation potential of forest-based bioenergy…"

For each supply chain a suite of three assessment methods were applied:
1. Lifecycle assessment (LCA), to evaluate GHG emissions (including CO2 and non-CO2 emissions) of the supply chain processes and activities at each point of occurrence.
2. Forest carbon modelling, to assess the carbon balance of the forest stands, evaluating the amount and dynamics of the carbon sequestration and release in the forest system.
3. GHG balance assessment (incorporating LCA and carbon forest modelling in a cumulative emissions framing).

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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 outlines the evolution of this threat and maps its frightening expansion in scale and global extent now and over the next ten years.

"…The harm inflicted by biomass industry is outlined in the recently released position statement endorsed by over 130 non-government organisations globally.
The statement outlines that: Large- scale burning of forest biomass for energy
harms the climate
- it is not low carbon
- it is encouraged by flawe carbon accounting
harms forests
- it threatens biodiversity and climate resilience
- it undermines the climate mitigation potential of forests
harms people

- it undermines community rights and interests
- it harms human health and well-being
harms the clean energy transition
- it provides a life-line for burning coal for energy production
- it pulls investment away from other renewables…"

"…Burning trees for biomass power is misleadingly classified by its supporters as a 'clean' and 'carbon-neutral' source of energy, when in fact biomass power creates major air pollution problems at the site of combustion, and exacerbates climate change through very high per-megawatt-hour releases of CO2 and other greenhouse gases…"

"…Countries in Asia are making the same mistakes that European countries made in encouraging large scale biomass burning for energy production. Japan and South Korea are now heading down the same wrong road that faulty European Union policies enabled, namely subsidizing power generation from forest biomass and failing to count smokestack carbon emissions resulting from wood burning…"

"…these dramatic increases in bioenergy use are predominantly driven by incentives intended to help utilities reduce greenhouse gas emissions, mostly by substituting wood for coal. Yet burning wood to generate energy emits even more carbon, on a per-unit-of-energy basis, than burning coal,7 while increasing harvest rates in forests depletes their capacity to act as sinks and degrades the world's carbon stocks. Consequently, biomass power represents a 'doubly false' solution – not only does it fail as a low-carbon energy source, but also the carbon sequestration function of forests is lost if trees are cut down to fuel energy demand. On top of this are the high levels of embedded emissions in pellet manufacture and transport…"

"…the main demand driver in Europe is climate policy, specifically a flawed "Renewable Energy Directive" (RED) that classifies forest biomass as a renewable energy source alongside wind and solar. International policy and deeply flawed carbon accounting under the Kyoto Protocol create a false impression of carbon neutrality for energy from forest biomass, thus putting it in direct competition with energy sources, such as wind and solar, that truly are carbon neutral. From a utility's perspective, it is far easier to co-fire wood with coal, or to convert coal-fired power generators to burn forest biomass, than it is to embark on the path of converting its generating capacity to true, low-carbon renewable power…"

"…Burning biomass involves combustion of organic matter and emits CO2 to the atmosphere, just as burning fossil fuels does. Per unit of energy, burning biomass emits even more CO2 than burning fossil fuels. Two main arguments

are used to claim that power from forest biomass is carbon neutral, or zero emissions: Tree or forest regrowth will subsequently sequester an equivalent of carbon as initially emitted, thus netting out to zero emissions. If forest biomass comprises wastes or residues that would otherwise decompose, then emissions from burning are equivalent to those that would have happened anyway, and not additional. There are significant problems with these assumptions. Burning emits carbon instantaneously, whereas decomposition of residues is slow. Forest regrowth will take decades to centuries. Meanwhile that carbon is in the atmosphere causing further warming, and this occurs regardless of whether forest management is 'sustainable'..."

"...Burning emits carbon instantaneously, whereas decomposition of residues is slow. Forest regrowth will take decades to centuries. Meanwhile that carbon is in the atmosphere causing further warming, and this occurs regardless of whether forest management is 'sustainable'. Yet time is of the essence when addressing climate change. To meet the targets of the Paris agreement, in particular to make our best efforts to limit levels of warming to 1.5C, the carbon debt generated by burning forest biomass needs to be recovered rapidly. Instead, where full regrowth occurs, it would be many decades before net zero is reached, potentially after 2100..."

"...there is no guarantee of full regrowth and no one is checking up on it. Occurrences such as land use change and deforestation, or substitution of monoculture plantations for natural forests all deplete carbon in perpetuity and are not unusual..."

"...Serious loss of soil carbon also occurs as an effect of logging. Intensified logging regimes for biomass supply often mean reduced rotation times such that the forest never regrows to previous levels of carbon stock..."

"...any logging for biomass reduces the amount of CO2 that forests would have sequestered otherwise, and foregone CO2 sequestration has the same impact on the climate as increased CO2 emissions..."

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Dutch Government Answers To Disappearing Forests/CO2

2019-06-27-minlnv-beantwoording-schriftelijke-vragen-over-het-bericht-staatsbosbeheer-wil-duidelijker-bosbeleid-van-minister-dutch.pdf

This document holds the questions and answers to the Dutch government concerning disappearing forests and the consequences for the CO2 effects.

"…PvdD party questions for the Dutch government:
Is it true that every year more forest volume disappears than is added? If so, what consequences does that have for the net CO2 effects of our forest?.."
"…Dutch government answer:
In hectares there is indeed a net decrease in the forest area. Scientists from Wageningen Environmental Research have published figures on deforestation in the Netherlands in the Nature, Forest and Landscape journal from September 2017 ("The Dutch forest as a source of CO2"). They state that (after correction) during the 2013-2017 period the net deforestation (the balance of afforestation minus deforestation) covered an average of 1350 ha per year. The gross afforestation (ie excluding afforestation) was 3036 ha in this period. According to the article in the, the gross deforestation of these 3036 ha per year corresponds to an emission of 1.5 Mton CO2 per year. In greenhouse gas reports, deforestation is much more important than new forestry planting. In the case of deforestation, the disappearance of the entire stock is taken into account, while the build-up of the carbon stock in new forest is 40 times slower…"

"…PvdD party questions for the Dutch government:
Do you share the view that the EU position to co-fire wood in coal-fired power plants has been labeled as CO2 neutral is incorrect and must be combated? If this is not the case, why not? If this is the case, in what timeframe and manner do you wish to object to this position?.."
"…Dutch government answer:
That the use of biomass is seen as climate neutral is one principle that is laid down in guidelines for climate policy in a UN context... These agreements form the basis for the global, European and national climate policy. I know that there are other opinions, but I have to ultimately base myself on international agreements. Other insights must discussed in the UN context and may lead to adjusted agreements..."

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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;..."

"...[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..."

"...About half of wood and other biomass consist of carbon (C) and as long as this biomass is intact, the carbon remains stored and there is therefore less CO2 in the atmosphere. Through branch and leaf fall and tree death, the carbon stored in the plant ends up in and into the soil... In a managed ecosystem, like most forests, harvesting usually takes place, whereby part of the carbon stored in the forest is removed during harvest in the form of trunks, firewood and / or branch and top timber. The method of harvesting can also have effects on the amount of C stored in the soil..."

"....Because products made from wood last a certain time, a carbon stock is created here in the form of, for example, furniture, parquet, wooden houses and books. By reusing or recycling used wood products and using them as raw materials for other products, the time when the carbon from the wood is released into the atmosphere can be postponed..."

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Assessment for the National Forestry Accounting Plans

2019-06-18-european-commission-staff-working-document-assessment-for-the-national-forestry-accounting-plans-english.pdf

This report is commissioned by the European Commission and contains an assessment for the national forestry accounting plans.

"…Member States should ensure that sinks and reservoirs, including forests, are conserved or enhanced with a view to meeting the ambitious greenhouse gas emissions reduction targets of the Union by 2030 and strategies to reduce emissions to net zero by 2050, in line with the Paris Agreement…"

"…To help achieve these goals, the LULUCF Regulation sets out a robust accounting system. This Regulation sets a binding commitment for each Member State to ensure that accounted emissions from land use are at least compensated by an equivalent removal of CO_2 from the atmosphere through action in the sector. This is known as the 'no debit' rule…"

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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.

"…Multiple independent, peer-reviewed studies have determined that burning biomass from forests for electricity creates more carbon dioxide emissions than burning coal, and that increased carbon dioxide concentrations persist in the atmosphere for decades or more…"

"…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…"

"…Our forests are a giant storehouse of carbon; in fact, they contain more carbon than all our known exploitable deposits of oil, gas, and coal. Protecting forests is a critical weapon in the fight against climate change. Releasing even a small percentage of this stored carbon or reducing the amount of carbon that our forests suck out of the air makes avoiding climate devastation much, much harder…"

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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.

"…In claiming that woody biomass derived from harvesting forests is "carbon neutral," the wood pellet industry claims its demand will accelerate establishment of pine plantations in the region. These claims, however, fail to acknowledge the adverse effects of these forest conversions on the region's biodiversity. In addition to the large-scale changes in forest types, southern forests are also decreasing in area. A study by the U.S. Forest Service acknowledged a "net forest loss" in the southern U.S. Specifically, "the South is forecasted to lose between 4 million and 9 million hectares (7 and 13 percent, respectively) of forests from 1997 to 2060…"

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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.

"Carbon is lost from forests in several ways: damage from natural disturbances including insects and pathogens ("pests"), fire, drought and wind; forest conversion to development or other non-forest land; and forest harvest/management. Together, fires, drought, wind, and pests account for ~12% of the carbon lost in the U.S.; forest conversion accounts for ~3% of carbon loss; and forest harvesting accounts for 85% of the carbon lost from forests each year."

"Proforestation produces natural forests as maximal carbon sinks of diverse species and can reduce significantly and immediately the amount of forest carbon lost to nonessential management. Because existing trees are already growing, storing carbon, and sequestering more carbon more rapidly than newly planted and young trees [...] proforestation is a near-term approach to sequestering additional atmospheric carbon."

"Far from plateauing in terms of carbon sequestration (or added wood) at a relatively young age as was long believed, older forests (e.g., >200 years of age without intervention) contain a variety of habitats, typically continue to sequester additional carbon for many decades or even centuries, and sequester significantly more carbon than younger and managed stands"

"The age when sequestration rates decrease is not known. [...] Forestry models underestimate the carbon content of older, larger trees, and it is increasingly clear that trees can continue to remove atmospheric carbon at increasing rates for many decades beyond 100 years"

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Dutch Government Answers to Burning Wood Questions

2019-06-07-minez-minister-wiebes-beantwoording-vragen-over-milieuschade-houtstook-is-vele-malen-hoger-milieuschade-door-aardgas-of-stookolie-dutch.pdf

This document contains the answers from the Dutch government concerning questions about the damage to the environment caused by burning wood.

"... PvdD party question for the Dutch government:
Do you support the conclusion that the damage of [burning] wood pellets from Canada and North America are extra harmful? Can you indicate how many of these pellets are imported annually for (industrial) wood burning? If not, why not? ..."

"...Dutch government answer:
It is factually correct that the indirect emissions of wood pellets from North America are relatively higher due to the longer distance they are transported and the fact that this transport is still mainly carried out with fossil fuels. The total import of wood pellets from North America (Canada, the US and Mexico) to the Netherlands in 2018 was 15.8 million kg (€ 2.7 million)... It is not possible to indicate what these pellets have been used for, nor whether they will be exported again, because this is not being recorded..."

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Dutch Government Reply to Questions on Biomass Co-Firing

2019-06-04-gov-nl-wiebes-antwoorden-op-kamervragen-pvdd-over-de-bij-stook-van-biomassa-in-centrales-dutch.pdf

This document contains the answers from the Dutch government concerning questions about the co-firing of biomass in power plants.

"...PvdD party question for the Dutch government:
Do you agree that CO2 emissions from biomass co-firing in coal-fired power stations are 2.3 times as much as with gas-fired plants and that emissions are even 3 times as high when biomass is burned in smaller biomass plants? Can you indicate which share comes from the production, transport and processing of biomass? If not, why not?

"Dutch government answer:
It is a fact that CO2 is released during incineration - also from biomass. However, as indicated in response to question 2, the co-firing of biomass on the basis of international agreements is seen as CO2 neutral. I cannot give an

exact breakdown of the CO2 emissions associated with the production, transport and processing of biomass ... "

"...PvdD party question for the Dutch government:
Do you agree that the classification of burning biomass as CO2 neutral is only a paper reality, if only because the transport and processing of biomass causes CO2 emissions? If not, why not?

"Dutch government answer:
No, I don't endorse this view. In accordance with international agreements, firing biomass is considered CO2 neutral ... "

"...PvdD party question for the Dutch government:
Can you confirm that the use of biomass from 2016 to 2020 may be 17 times as much? If so, does this justify the conclusion that there might be 10 to 12 MT more CO2 in the air in 2020 than what is now sketched on paper? If not, why not?

"Dutch government answer:
According to the most recent data in the National Energy Survey (NEV) 2017, the total amount of energy production through the use of biomass will increase from 78.5 PJ in 2016 to 148.9 PJ in 2020. The conclusion that this may lead to 10 to 12 I share more CO2 in the air, I do not share, because CO2 emissions are compensated by the planting of new vegetation that removes an equally large amount of CO2 from the air..."

"PvdD party question for the Dutch government:
Do you endorse the threat and the great impact of reaching the so-called tipping points, such as those involved in the melting of land ice and the methane emissions from permafrost, possibly within a period of 15 to 30 years? If not, why not? Does the CO2 emission of an ever more extensive use of biomass and biofuels have an accelerating effect on the approach of such tipping points? If not, why not?

"Dutch government answer:
Regardless of the use of biomass, the government's policy is aimed at keeping the temperature rise, in accordance with the Paris Climate Agreement, well below 2 degrees Celsius compared to pre-industrial times. Our national and international efforts must prevent the so-called turning points from being reached..."

"PvdD party question for the Dutch government:
Do you agree with the opinion of many experts (including Tropenbos Int.) That it takes an average of 60 to 100 years for the CO2 emissions of wood burning

to be recorded in forests again (regardless of the additional CO2 emissions from transport, the release of CO2 from the roots that are left behind, air pollution, the loss of biodiversity, etc.)? If not, why not?

"Dutch government answer:
It is true that time is running out to take up the emissions that are released when burning biomass in new trees. The sustainability criteria stipulate that the growth and conservation of the forest from which (solid) biomass is obtained is greater than the loss of carbon. In this way, no net debt occurs, but a reduction in CO2 emissions is actually achieved..."

"...PvdD party question for the Dutch government:
Do you believe that the extensive use of biomass and biofuels still fits in efficiently with the urgent climate problem? If so, what do you rely on? If not, what measures follow from this?

"Dutch government answer:
The government is convinced that the use of biomass now and in the direction of 2030 and 2050 is necessary for making our economy more sustainable and achieving the climate challenge. Various PBL studies also show that the use of biomass fits in with a cost-efficient transition. The government's point of departure is that only sustainable biomass really contributes to making the economy more sustainable and that sustainable biomass at a global level will be scarce in the long term. That is why the highest possible use of biomass is required in the long term..."

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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..."

"…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 problematic for the climate 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…"

"…Input Prof. Dr. Martijn Katan, biochemicus, Vrije University
Wood contains a lot of CO2. As a result, producing a certain amount of heat from biomass leads to twice as much CO2 emissions as from gas, and to 15% more emissions than from coal. The cultivation, drying and transport of biomass also requires more energy than coal or gas. As a result, the total emissions for biomass are more than three times as high as for gas, and more than 50% higher than for coal…"

"…Biomass for power plants is often imported from the US in the form of wood pellets. These are largely made from tree trunks: 64% from logs of pine and 12% from hardwood. Wood waste and sawdust hardly play a role, there is too little of it to meet demand. The growing demand for biomass leads to logging of large areas of forest, including primeval forest (hardwood). Will forest owners completely replace trees with new trees? That depends on the competitive destinations for land, expectations about timber prices and subsidies, willingness to invest in long-term, etc. Economic science cannot predict what those forest owners will do. What we do know is that even with 100% replanting it takes 20-100 years for the cuttings to be so large that they have absorbed the CO2 emitted by our power stations. The extra CO2 from biomass therefore remains in the air until 2050 or 2100 and worsens the climate crisis…"

"…According to international treaties, the CO2 content of the air does not increase by burning biomass. That is why biomass is considered climate neutral. This could be true if we are talking about wood waste that would otherwise be incinerated alongside the road. The however, global industrial demand for wood pellets has been since 2010 quadrupled, from five to twenty billion kilos and continues to grow. This growth does not come from sawdust, branches or dead trees. There is too little of that and it does not work efficiently. The growth comes from the mechanical harvesting and processing

of complete forest plots. Before they have grown again, we are 20-100 years further. That is why the claimed "climate neutrality" is fiction…"

"Conclusion; Between now and 2050, replacing coal and gas with biomass will lead to a significant increase in the amount of greenhouse gas in the atmosphere…"

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Effects of the Drafted Climate Agreement

2019-05-28-pbl-effecten-ontwerp-klimaatakkoord-dutch.pdf

This report is commissioned by the Dutch Government (PBL) and describes the effects of the drafted climate agreement.

"…Emissions from international aviation and shipping are not included in Dutch emissions. Also emissions due to the use of biomass are counted as zero. Emissions outside the Netherlands that are associated with the production and transport of biomass are therefore not included…"

"…In industry, the deployment of extra imported sustainable biomass (as expected at the top of the bandwidth) lead to an increase in emissions abroad (typically less than 0.5 Mton). The obligation to use biofuels in the mobility sector can lead to emissions abroad related to the production and transport of biomass and biofuels when imported (in the order of 0.1 - 0.4 Mton)…"

"…If the SDE ++ is more focused on CO2 reduction instead of renewable energy, then the use of biomass in industry can also turn out lower than in this analysis is assumed…"

"…The role of biomass in a future CO2 emission-free system is of great importance, but at the same time there are many uncertainties in both the range and application. The sustainability of the biomass is under discussion, in particular because land requires cultivation and cultivation the conversion from a natural area to agricultural land is often accompanied by loss of carbon from vegetation and soil and because the growth of wood takes time…"

"…The concept of cascading is used and it is indicated that applications without CO2-free alternatives are preferred, but the translation thereof into concrete policy proposals has been omitted. Optimal use of biomass that can no longer be used as material or as raw material for specific components, does not only mean utilization of the energy but also the carbon…"

"…Future visions show that the scarce biomass should be used as a priority for applications where there are few low-carbon alternatives, such as in aviation and shipping, use as a raw material for the chemical industry and application in combination with capture and storage of CO2. Due to the increasing scarcity of biomass would be immediate use for heat supply in homes, for heating networks and for industrial heat without CCS / CCU should be limited. However, there are no proposals in the OKA included to limit such applications; those options therefore remain visible…"

"…The support for this must come from the SDE ++, but the analyzes show that direct biomass combustion is still preferred based on the costs above the more innovative, sometimes second-generation technologies…"

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The United Nations Emissions Gap Report

2019-05-14-un-environment-the-emissions-gap-report-2017-executive-summary-english.pdf

This report, which is the eighth Emissions Gap Report produced by UN Environment, focuses on the "gap" between the emissions reductions necessary to achieve these agreed targets at lowest cost and the likely emissions reductions from full implementation of the Nationally Determined Contributions (NDCs) forming the foundation of the Paris Agreement and discusses "bioenergy" in combination with "carbon dioxide capture and storage".

"The combined potentials of bioenergy and carbon dioxide capture and storage in 2050 are estimated at between 2 and 18 GtCO2 per year. To achieve this scale, the demands on land use are significant: a level of carbon dioxide removal consistent with average 2°C emissions pathways would require between 0.38 and 0.7 billion hectares of crops purpose-grown for bioenergy with carbon dioxide capture and storage. Under more conservative assumptions, the demands on land use would be even higher."

"The potential competition for land from widespread use of bioenergy with carbon capture and storage remains a major issue for large-scale bioenergy with carbon capture and storage deployment and policymaking"

"Three main barriers stand out with regard to large-scale implementation of bioenergy with carbon dioxide capture and storage. Firstly, carbon dioxide

capture and storage and bioenergy enjoy little public acceptance. Secondly, whether there are substantial, or even any carbon reductions when accounting for displaced activities is unclear. Thirdly, the lack of economic incentives and the regulatory barriers related to underground storage hamper large-scale implementation."

"Whether bioenergy with carbon dioxide capture and storage can thus be scaled up in the manner required to achieve ambitious climate change targets remains questionable, given the lag in actual carbon dioxide capture and storage deployment, compared to the requirements associated with emissions pathways that are compatible with the 2°C target."

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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.

"..The protection of existing ecosystems is crucial not only because of their potential to hold or accumulate carbon, but also because mature systems with a high degree of integrity and diversity tend to be more resistant to the impacts of climate change and other ecological shocks than simplified ones. Simplified ecosystems are vulnerable to cascading trophic collapse, that may be accompanied by major losses of carbon."

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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.”

“The climate impacts of forest biomass energy are in many cases as bad as those of coal (for the same amount of energy generated).”

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Mitigation Pathways Compatible with 1.5 Degreas

2019-04-00-ipcc-report-global-warming-chapter-2-mitigation-pathways-compatible-with-1-5-degreas-in-the-context-of-sustainable-development-english.pdf

This chapter in the IPCC report assesses mitigation pathways consistent with limiting warming to 1.5˚C above pre-industrial levels. One of the mitigation measures that is considered is Carbon Dioxide Removal (CDR) and most scenario’s to keep warming below 1,5 degrees need at least some type of CDR, but for most types more research is needed and are therefore not integrated into the mitigation models. That is, except for carbon capture and storage in combination with biomass energy (BECCS), since this is one of the few CDR measures that have been more thoroughly investigated. But, as additional CDR measures are being built into IAMs (Integrated Assessment Modeling), the prevalence of BECCS is expected to be further reduced.

“This reflects the fact that afforestation is a readily available CDR technology, while BECCS is more costly and much less mature a technology.”

“Concerns have been raised that building expectations about largescale CDR deployment in the future can lead to an actual reduction of near-term mitigation efforts. The pathway literature confirms that CDR availability influences the shape of mitigation pathways critically. Deeper near-term emissions reductions are required to reach the 1.5˚C–2˚C target range if CDR availability is constrained.”

“Evaluating the potential from BECCS is problematic due to large uncertainties in future land projections due to differences in modelling approaches in current

land-use models, and these differences are at least as great as the differences attributed to climate scenario variations. […] It is not fully understood how land-use and land-management choices for large-scale BECCS will affect various ecosystem services and sustainable development, and how they further translate into indirect impacts on climate, including GHG emissions other than CO2. "

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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.

"The burning of wood for energy supply causes 1.5 times as much CO2 emissions as the burning of coal and 3 times as much when compared to the burning of natural gas."

"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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APS Technologies More Polluting Than Fossil Fuels

2019-03-20-pfpi-aps-technologies-are-more-polluting-than-fossil-fuels-per-unit-of-energy-produced-and-should-not-be-subsidized-english.pdf

This document is a call from PFPI to legislators to support act H.853, an "Act to Assure the Attainment of Greenhouse Gas Emissions Goals in the Alternative Portfolio Standard (APS)", stating that "these technologies are more polluting than fossil fuels per unit of energy produced and should not be subsidized through Massachusetts' clean energy programs."
"Massachusetts established the Alternative Energy Portfolio Standard (APS) in 2009 to complement the state's Renewable Energy Portfolio Standard (RPS). While the RPS is designed to increase the use of renewable energy for electricity, the APS is intended to reduce greenhouse gas emissions from the heating sector. However, the inclusion of biomass and garbage incineration in the APS undermines this goal. "

"Combustion of biomass and solid waste releases large quantities of greenhouse gas emissions, fine particulates (soot) and other air pollutants"

"While included in the RPS as "renewable energy," both garbage incinerators and biomass power plants release more CO2 emissions at the stack per megawatt hour than coal-fired power plants. A recent PFPI study shows that even in the industry's "best case" scenario, where only wood residues are burned for energy (as opposed to whole trees), biomass energy is a net source of carbon for decades"

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Europe's RED Policy is Built on Burning American Trees

2019-03-04-vox-europes-renewable-energy-policy-is-built-on-burning-american-trees-english.pdf

This Vox-article discusses how it came to be that Europe's banking on biomass to meet their obligations under the Paris agreement is causing forests to be felled in the US (and elsewhere) and how large scale deployment of biomass for energy is in fact failing to meet any carbon reduction targets at all.

"Because trees take time to regrow, harvesting them for energy use increases the world's "carbon debt" for decades if not centuries, according to a research paper published in scientic journal Nature in September. Wood "typically emits 1.5x the CO2 of coal and 3x the CO2 of natural gas because of wood's carbon bonds, water content and lower burning temperature,"

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EU Dragged to Court for Backing Forest Biomass as RED

2019-03-04-euractiv-eu-dragged-to-court-for-backing-forest-biomass-as-renewable-energy-english.pdf

This article, which was published early march 2019 on www.earactiv.com, reports about a group of plaintiffs from Estonia, France, Ireland, Romania, Slovakia, Sweden, and the US, filing a lawsuit against the European Union to challenge the inclusion of forest biomass in the bloc's renewable energy directive. The group argues that EU institutions have failed to take account of scientific evidence showing that forest biomass harvesting and combustion for energy purposes exacerbates climate change by causing deforestation outside of Europe.

"Because trees take time to regrow, harvesting them for energy use increases the world's "carbon debt" for decades if not centuries, according to a research paper published in scientic journal Nature in September. Wood "typically emits 1.5x the CO2 of coal and 3x the CO2 of natural gas because of wood's carbon bonds, water content and lower burning temperature,"

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Durable Usage of Woody Biomass in the Netherlands

2019-02-20-gnmf-aanbevelingen-hoogwaardige-inzet-houtige-biomassa-dutch.pdf

This report has been prepared by the Gelderland Nature and Environment Federation and contains the recommendations for the municipal Climate and Energy Implementation Program and the Regional Energy Strategies (RES).

""When woody biomass is burned to generate bioenergy, more than twice as much CO2 is released as when burning natural gas. It'll take 50 to 100 years for newly planted trees to recapture these added emissions."

"Use woody biomass (prunings) from forest, landscape and urban areas as a soil improver, [...] so that CO2 is captured for a longer period of time"

"A high-quality application [of prunings] is to use it as a soil improver (including as a structure material used in composting). In addition to CO2 capture, this application leads to higher soil fertility. The use of fertilizer is thereby reduced,

and therefore also the use of gas (and CO2 emissions) that is needed in the production of fertilizer."

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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 [...]"

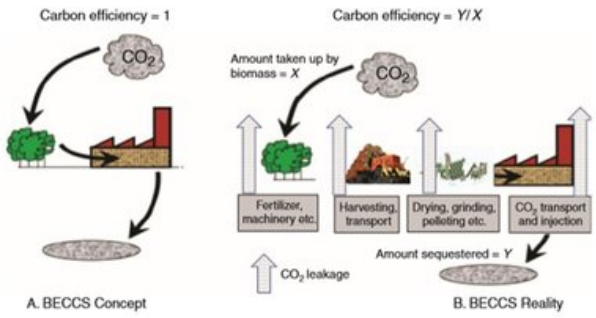

Figure 3. Simple BECCS concept and real life-cycle emission flows.

"GHG emissions throughout the biomass supply-chain 'leak' carbon, which reduces the carbon efficiency (Figure 3B). Some life cycle analyses [e.g. 31] of the entire process chain for a BECCS crop to final carbon storage in the ground have shown leakage of CO2 to be greater than the CO2 captured at the point of combustion, thus resulting in carbon efficiencies of less than 50% (see figure 3) [...]. However, the effects on land carbon stocks must also be included—both from the direct land use change involved in switching to the BECCS crop and from secondary impacts. These effects can be significant"

"The ability of BECCS to remove carbon could easily be offset by losses due to land-use change"

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Investor Report the Biomass Blind Spot

2019-02-06-shareaction-investor-report-the-biomass-blind-spot-english.pdf

Carbon emissions from burning wood have been ignored by utility companies and policy makers for two reasons. Firstly, because it is incorrectly seen as a "renewable" resource. The carbon emissions from combustion are assumed to be recaptured as trees regrow. However, at the point of combustion, wood emits more CO2 than coal. It takes decades for this carbon to be reabsorbed by forest growth. Given that we urgently need to reduce greenhouse gas (GHG) emissions over the short-term to reach a net zero energy system by 2050, biomass is not compatible with achieving this. The second reason is related to international carbon accounting rules. UNFCCC's reporting guidelines require GHG emissions related to bioenergy to be counted in the land-use sector, where the tree is felled rather than at the point of combustion. […] This paper challenges the assumption that carbon is recaptured by forest regrowth, at the rates required to offset emissions from combustion. Converting natural forests into a managed or plantation forest reduces their stored carbon. In addition, the methods used to grow and harvest biomass feedstocks also have an enormous impact on how quickly forest carbon can recover."

"According to IPCC data, wood emits 17% more CO2 than bituminous coal, the most common type of coal used in electricity generation in the US, and twice the emission of natural gas. The net carbon emissions then decrease over time as the carbon stock of the forest regrows, however this takes decades and not all carbon can be permanently recaptured if the forest is repeatedly harvested."

"[The] 'Biomass Emissions and Counterfactual' model [developed by Stephenson and Mackay] of GHG emissions from biomass that fully accounts for the changes in the carbon stock of forests, emissions related to cultivation, processing, transportation and emissions from biomass combustion for electricity generation. By accounting for all carbon emissions, Stephenson and MacKay demonstrate that, at the worst extreme, the GHG intensity of biomass sourced from natural timberland can be as much as 4 times that of coal over

a 40 year period."

"Luysseart et al. (2008) demonstrate that ancient forests can continue to absorb carbon at a rate of about 2 to 5 tC/ ha each year."

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Renewable Energy in Europe

2018-12-17-european-environment-agency-report-renewable-energy-in-europe-english.pdf

This report is commissioned by the European Environment Agency and discusses the calculation flaw in which the burning of woody biomass has been assigned an emission factor of zero because of the absence of information and the messures to be brought in place to correct this issue from 2021 onwards.

"...The term 'gross avoided GHG emissions' illustrates the theoretical character of the GHG effects estimated in this way, as these contributions do not necessarily represent 'net GHG savings per se' or are based on life-cycle assessment or full carbon accounting.
Taking life-cycle emissions into account could lead to substantially different results..."

"...The [current] approach takes into account neither life cycle emissions nor carbon accounting..."

"...In the absence of specific information on current bioenergy systems, CO2 emissions from the combustion of biomass (including biofuels/bioliquids) were not included in national GHG emission totals in this report, and a zero emission factor had to be applied to all energy uses of biomass. This should not be interpreted, however, as an endorsement of default biomass sustainability or carbon neutrality..."

"...To impede further conversions of coal-fired plants into biomass plants, the criteria require that only high-efficiency cogeneration (with a yield of ≥ 80 %) counts towards national progress in RES generation, and that heat and power plants achieve at least an 80 % reduction in GHG emissions compared with fossil fuels from 2021 onwards, and 85 % from 2026 onwards (EU, 2018a)..."

"...In 2016, the largest amounts of gross avoided GHG emissions were attributable to onshore wind energy (137 MtCO2), solar PV energy (73 MtCO2)

and heat from solid biomass (37 MtCO2). Onshore wind and solar PV energy are also the most significant contributors to avoided fossil fuel consumption and avoided primary energy consumption. In contrast, heat from solid biomass increased primary energy consumption by 3.5 Mtoe in 2016. The use of solid biomass for electricity and heating leads to a reduction in GHG emissions and fossil fuel consumption, but it drives up primary energy consumption..."

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Forest-based Mitigation versus BECCS CO2 Removal

2018-08-07-nature-land-use-emissions-play-a-critical-role-in-landbased-mitigation-for-paris-climate-targets-english.pdf

This report shows that the effectiveness of BECCS strongly depends on several assumptions related to the choice of biomass, the fate of initial above ground biomass, and the fossil-fuel emissions offset in the energy system.

"...Carbon removed from the atmosphere through BECCS could easily be offset by losses due to land-use change. If BECCS involves replacing high-carbon content ecosystems with crops, then forest-based mitigation could be more efficient for atmospheric CO2 removal than BECCS..."

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Carbon Impacts of Biomass Consumed in the EU

2018-05-00-cib-ecf-forest-research-report-carbon-impacts-of-biomass-consumed-in-the-eu-english.pdf

This report was commissioned from Forest Research by the European Climate Foundation (ECF) to provide an elaborated analysis to clarify the findings of a project undertaken for the European Commission (DG ENER), known as Carbon Impacts of Biomass Consumed in the EU. The report leads to the following conclusion:

"...Unless appropriate policy measures are taken to support sustainable bioenergy supply, particularly in the case of forest bioenergy supply, a significant increase in bioenergy use in the EU is likely to lead to a net increase, rather than decrease, in GHG emissions being contributed from bioenergy sources..."

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Covered in Smoke

2018-02-02-fern-covered-in-smoke-why-burning-biomass-threatens-european-health-report-english.pdf

This report discusses the burning of solid biomass, mainly wood, for heating and power generation in the European Union.

"... The European Commission Joint Research Centre (JRC)14 finds that for slow growing trees, the use of stem-wood for bioenergy can generate an increase in carbon dioxide (CO_2) emissions compared to fossil fuels over several decades, if all the carbon pools and their development with time are considered. Comparison of the Greenhouse Gas (GHG) balance for the use of forest materials versus coal and natural gas has concluded that the time to reach parity ranged from approximately 10 years with increased use of forest residues, to 100s of years with an increased rate of thinning, to more than 500 years when felling was increased to supply bioenergy for certain types of forest. The comparison with gas naturally leads to longer time-scales given that it generates less GHG emissions than coal..."

"...The EASAC report also addresses the complexity of the forest-climate relationship beyond direct impacts of forest management through the biophysical effects of albedo, forest structure, evapo-transpiration, and the release of volatile organic compounds and microbes from plant surfaces capable of forming aerosols and subsequently clouds. EASAC refers to Ellison et al.16 who suggested that forests should be managed to increase their contribution to climate cooling through hydrological mechanisms and not just from a carbon-centric (i.e. use of biomass as a fuel) perspective. EASAC also found that "evidence suggests that ignoring biophysical interactions – as is currently the case in the Kyoto Protocol and the Paris Agreement – could result in mitigation projects that provide little climate benefit or, in the worst case, are counterproductive..."

"...Further to this, the argument of carbon neutrality overlooks emissions from:

- *Forest management*
  - *Planting*
  - *Production and application of fertiliser*
  - *Harvesting*
  - *Other general management activities*

- Processing material so that it is fit for combustion
- Transport

With respect to transport, it is generally assumed that wood and other forest materials such as bark will be used within a short distance of the growing site and that long range transport is uneconomic. However, this is not necessarily the case. As shown later in this report, large users of biomass can find it economically attractive to source material on global markets, leading to significant levels of emission not only from transport on land, but also from shipping..."

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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.

"...The term carbon debt refers to a temporary "imbalance" between CO2 emissions biomass and CO2 capture of forests: when biomass is harvested from forests and burned release CO2 emissions immediately, while "compensating" them takes time due to the re-growth of biomass in the forest. Only when this carbon debt is "repaid", the biomass contributes net to CO2 reduction. Depending on the type of biomass and the method of harvesting, it can "pay back" from the carbon debt can last from a few years to many decades. Critical parties such as the environmental movement argue that with such long periods bioenergy actually does not c... change. The necessary scientific uncertainties s... For the time being, therefore, it is too early to sp... consequences..."

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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

Biomass Research Lobby Facts

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Biomass Research Solutions

Biomass Research Subsidies

Biomass Research Sustainability

Biomass Research Whole Trees

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