

Summary of Biomass Research

Reports and evidence

Burning wood for electricity (Biomass) is high-carbon, emitting as much or more CO₂ per megawatt-hour as coal. A wealth of scientific evidence shows that this emissions increase can persist for decades or even more than a century, even assuming trees are immediately replanted. EU carbon trading and UK Greenhouse Gas Standards nonetheless **incorrectly treat bioenergy as zero-emissions**.

1. **Opinion of the European Environment Agency Scientific Committee on Greenhouse Gas Accounting in Relation to Bioenergy**¹. 2011. Biomass is classed as zero-carbon because the carbon is assumed to be taken up by regrowth. This Opinion described this assumption as a 'serious carbon accounting error'—a conclusion that is supported by a large and growing body of science, some of which is cited below. The EU Commission guidance 2010² also assumed biomass would be sourced from wastes and residues rather than whole trees and other large-diameter wood, which currently supply a significant proportion of wood pellets (see below). The UK Bioenergy Strategy 2012³ specifically warned against using 'entire trees' because of high carbon impacts.
2. **Lifecycle Impacts of Biomass Electricity in 2020**, more usually known as the **Biomass Emissions and Counterfactual** (BEaC) report⁴. 2014. This report, authored by DECC's chief scientist, warns that there are "*bioenergy scenarios that could lead to high GHG intensities (e.g. greater than electricity from coal, when analysed over 40 or 100 years) but would be found to have GHG intensities less than 200 kg CO₂e/MWh by the Renewable Energy Directive LCA methodology,*" and therefore would be eligible for government subsidy as low-carbon renewable generation. Scenario 13 (*'increased harvesting of naturally regenerated hardwood forest'*) is shown to have emissions of 3346kg CO₂ equivalent per MWh, compared with 1037kg CO₂e p MWh for coal. Follow-up research by BEIS shows that High Carbon scenarios are currently in operation to supply UK biomass (see item 9 below). Research taking the BEaC report as a starting point has confirmed that these High Carbon Scenarios make up significant proportions of wood pellets burned for electricity in the UK.
3. **The potential effects of land-based mitigation on the climate system and the wider environment: A synthesis of current knowledge in support of policy**⁵. 2017. A review of new scientific knowledge on land-based mitigation options and the effect of these options on land-use and land-cover change. It provides three key messages: (1) Land-based mitigation competes for land with food production, other ecosystem services & biodiversity; (2) Biophysical effects are significant and can have important co-benefits; and (3) Time lags and multiple goals strongly limit the effectiveness of land-based mitigation, but there is potential for improvement and co-benefits can be achieved.
4. **Think Wood Pellets Are Green? Think Again**⁶. 2015. The Natural Resources Defense Council (NRDC) commissioned biophysical modelling to analyze the carbon pollution from burning wood pellets from Southeastern forests to produce electricity and compared those emissions with those from burning coal and natural gas. The analysis showed that, 'even when whole trees make up as little as 12% of wood pellets, ... burning pellets still produces emissions comparable to natural gas... for approximately 50 years.' See 6 and 9 below, which show that whole trees make up a much greater percentage than that.

5. **Carbon Emission Estimates for Drax power plants in the UK sourcing from Enviva pellet mills in US Southeastern hardwoods using the BEaC model**⁷. 2015. The Southern Environmental Law Center commissioned modelling which showed that if the current emissions threshold of 285kg CO₂e/MWh is not to be exceeded, an upper limit of 8% of biomass from additional hardwood harvests can be contained in the feedstock mix, assuming that the remainder of the feedstock mix is derived from low-emission saw mill residues only. It should be remembered that the emissions threshold drops to 200kg CO₂e/MWh in 2020 and again to 150kg in 2025.
6. **Environmental implications of increased reliance of the EU on biomass from the South East US**⁸. 2016. This report, commissioned by the European Commission, concluded that EU biomass demand is being met with wood pellets that are primarily sourced from whole trees in the Southeastern United States, validating concerns raised for years by US NGOs. The report also states that harvesting of hardwoods is forecast to increase. The authors conclude that the rapidly expanding wood pellet industry poses a serious risk to species found only in Southeastern forests. This brings with it serious risks of countries failing to meet legally binding GHG emission reduction targets, as well as biodiversity targets.
7. **Carbon accounting of forest bioenergy - Conclusions and recommendations from a critical literature review** by the Joint Research Centre (JRC) of the European Commission⁹. 2014. This report concluded that, "...the use of stemwood from dedicated harvest for bioenergy would cause an actual increase in GHG emissions compared to those from fossil fuels in the short and medium term (decades), while it may start to generate GHG savings only in the long-term (several decades to centuries), provided that the initial assumptions remain valid."
8. **The Impacts of the Demand for Woody Biomass for Power and Heat on Climate and Forests** by Chatham House¹⁰. 2017. This report concluded that, although most renewable energy policy frameworks treat biomass as carbon-neutral at the point of combustion, biomass emits more carbon per unit of energy than most fossil fuels. The report's author Duncan Brack said: "For any biomass facility that is burning wood for energy, unless they are only burning stuff like saw-mill residues or post-consumer waste, their activities will be increasing carbon emissions in the atmosphere for decades or centuries. We shouldn't be subsidising that." This report was widely criticized by the biomass lobby. Duncan Brack published a point by point response. Both can be seen at the link below.
9. **Multi-functionality and sustainability in the European Union's forests** by the European Academies Science Advisory Council¹¹. 2017. This study, represented the consensus conclusions of a body made up of the national science academies of all EU Member States, was published just months after the release of the Chatham House study described above and echoes its conclusions. It states that, "Increasing the carbon storage in existing forests is a cost-effective measure to decrease net carbon emissions, but EU policies are currently biased towards the use of forest biomass for energy with potential negative effects on the climate over the short to medium term."
10. **NRDC Briefing note: A critical analysis of the government's BEaC follow-on report on use of high carbon North American woody biomass in UK electricity generation**¹². 2017. The BEaC follow-on report was commissioned and published by BEIS, and carried out by industry consultants, Ricardo AEA. The report surveyed stakeholders – 60% of whom were from the industry which had a financial stake in biomass being found to be 'low-carbon'. No new on-the-ground research was conducted. The report found that High Carbon Scenarios *are* happening. There was 'no consensus' on several

key scenarios - mostly based on disagreements on technical or definitional issues – but no finding indicating that the scenarios are ‘unlikely’ to occur.

11. **Carbon impacts of biomass consumed in the EU: quantitative assessment** published by UK Government research agency Forest Research¹³. 2015. This analysis shows that the greatest emissions savings that can be achieved between now and 2050 are those in the energy sector scenarios with the lowest contribution from biomass (and conversely that the highest levels of emissions from land use are caused by the scenarios with the highest contributions of biomass to energy generation).

Biomass damages forests (carbon sinks) and biodiversity. Forests in North America and elsewhere are clear-felled for fuel, liquidating carbon stocks, harming biodiversity and violating protection goals of the Paris Agreement, the Convention on Biological Diversity, Aichi goals, and Sustainable Development Goals.

1. **European Imports of Wood Pellets for “Green Energy” Devastating US Forests**¹⁴ collates on-the-ground evidence gathered by US NGOs and journalists which shows that a significant proportion of biomass sourcing in the Southeastern US is whole hardwood trees clear-felled from carbon rich native wetland forest (corresponding to BEaC scenario 13).
2. **Forestry Bioenergy in the Southeast United States: Implications for Wildlife Habitat and Biodiversity**¹⁵ lists the species negatively impacted by biomass exploitation.
3. **Announcing the World’s 36th Biodiversity Hotspot: The North American Coastal Plain**¹⁶. This region is where most US wood pellets are sourced.
4. **Map of Southeast U.S. Wood Pellet Plants Exporting to Europe**¹⁷ plotted on the Biodiversity Hotspot.
5. **In the U.S. Southeast, Natural Forests Are Being Felled to Send Fuel Overseas**¹⁸. This report and maps reveal the potential scale of the threat from pellet operations in the region to southeastern bottomland hardwood forests. Millions of acres of vulnerable bottomland hardwood forests—which provide critical habitat to a host of rare species and deliver important ecosystem services to local communities—are in the bull’s eye of existing and proposed wood pellet mills’ potential sourcing areas.

The UK Biomass Sustainability Standard does not protect forests – even clear-felling is considered ‘sustainable’ so long as land is not converted to another use.

1. **Biomass Sustainability Standards – a Credible Tool for Avoiding Negative Impacts from Large-scale Bioenergy?**¹⁹ Two-page joint briefing by Global Forest Coalition, Biofuelwatch and Eonexus in January 2014 on why Sustainability Standards don’t and can’t work. They are flawed, industry self-reports and there is no enforcement.

2. **Why the UK's new Sustainability and Greenhouse Gas standards for Biomass Cannot Guarantee sustainability or low carbon impacts**²⁰. Four-page briefing by Biofuelwatch from January 2016 on why the UK's sustainability standards are ineffective and contradict the principles of the UK Bioenergy Strategy 2012, as well as scientific findings published by DECC and evidence about biomass greenhouse gas emissions.
3. See **Chatham House report**²¹ above "In principle, sustainability criteria can ensure that only biomass with the lowest impact on the climate are used; the current criteria in use in some EU member states and under development in the EU, however, do not achieve this as they do not account for changes in forest carbon stock."
4. **The Sustainable Biomass Program: Smokescreen for Forest Destruction and Corporate Non-Accountability**²². A new study that spotlights critical flaws in the Sustainable Biomass Program (SBP) standard and raises serious questions about the standard's ability to provide credible assurances of biomass sustainability and carbon emissions intensity.

Biomass pollutes communities, emitting particulate pollution, smog and dust, damaging human health and the environment.

1. **Rising up with Richmond County**²³ film showing the case against the proposed Enviva pellet mill to supply UK demand from MGT Power Teesside plant. Previous Enviva pellet plants have increased particulate pollution by > 75% over pre-operational levels.
2. **Drax's Coal-to-Biomass conversion increases levels of dangerous small particles**²⁴ by over 135%, the equivalent of 3 million new diesel cars on the road.

Bioenergy relies on expensive subsidies (> £800m in 2016 rising to > £1bn per year by 2020)—scarce taxpayer resources that could support cheaper, truly clean energy technologies and demand reduction. Subsidies lock in inefficient facilities that are likely to become stranded assets, while truly low-carbon solar and wind are already cheaper and have significant scope for further cost reduction.

1. **Money to Burn II**²⁵. NRDC commissioned an independent economic analysis of the UK power sector, conducted by VIVID Economics in London, which showed that wind and solar could reliably meet the UK's need for new electricity generation through 2025, and at lower cost than biomass. This analysis takes a whole system view of costs, incorporating not just falling technology costs but also the costs of integrating solar and wind into the electricity grid. Biomass is more expensive even if its carbon emissions, and thus their costs, are ignored.
2. **Why Biomass Electricity should not receive renewable energy subsidies**²⁶. A very short overview of all the arguments.

Scientist Letters

1. **Need for a scientific basis of EU climate policy on forests**²⁷. Letter from 190 scientists to European Parliament in September 2017
2. **Concerns about UK Bioenergy Policy**²⁸. Letter from 54 scientists to UK Secretary of State, March 2017: 'UK policies subsidizing biomass energy are accelerating forest harvesting internationally and hindering efforts to combat climate change. We understand you are currently formulating the UK's Energy Policies and Industrial Strategy, and we accordingly urge you to reduce threats to forests and the climate by ending subsidies for large-scale biomass electricity...'
3. **Problems with burning wood from Southern US forests to generate electricity in the UK**²⁹. Letter from more than 60 top US scientists to DECC Secretary of State, April 2014.

¹ <http://www.eea.europa.eu/about-us/governance/scientific-committee/sc-opinions/opinions-on-scientific-issues/sc-opinion-on-greenhouse-gas>

² <http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52010DC0011>

³ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48337/5142-bioenergy-strategy-.pdf

⁴ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/349024/BEAC_Report_290814.pdf

⁵ http://luc4c.eu/system/files/findings_and_downloads/downloads/LUC4C%20The%20potential%20effects%20of%20land-based%20mitigation%20on%20the%20climate%20system%20and%20the%20wider%20environment%20-%20A%20synthesis%20of%20current%20knowledge%20in%20support%20of%20policy%202017.pdf

⁶ <https://www.nrdc.org/sites/default/files/bioenergy-modelling-IB.pdf>

⁷ https://www.southernenvironment.org/uploads/audio/2015-05-27_BEAC_calculations_SE_hardwoods.pdf

⁸ <http://bookshop.europa.eu/en/environmental-implications-of-increased-reliance-of-the-eu-on-biomass-from-the-south-east-us-pbKH0116687/>

⁹ http://publications.jrc.ec.europa.eu/repository/bitstream/JRC70663/eur25354en_online.pdf

¹⁰ <https://www.chathamhouse.org/publication/woody-biomass-power-and-heat-impacts-global-climate>

¹¹ http://www.easac.eu/fileadmin/PDF_s/reports_statements/Forests/EASAC_Forests_web_complete.pdf

¹² https://www.nrdc.org/sites/default/files/media-uploads/nrdc_ricardo_memo.pdf

¹³

<https://ec.europa.eu/energy/sites/ener/files/documents/EU%20Carbon%20Impacts%20of%20Biomass%20Consumed%20in%20the%20EU%20final.pdf>

¹⁴ <https://www.nrdc.org/sites/default/files/european-imports-wood-pellets-greenenergy-devastating-us-forests.pdf>

¹⁵ https://www.southernenvironment.org/uploads/publications/NWF_Biomass_Wildlife_Full_Report.pdf

¹⁶ http://www.cepf.net/news/top_stories/Pages/Announcing-the-Worlds-36th-Biodiversity-Hotspot.aspx#.WcVHesiGPDc

¹⁷ https://www.southernenvironment.org/uploads/maps/SELC_WoodPelletExportMap_2017_0707_map+table.pdf

¹⁸ <https://www.nrdc.org/sites/default/files/southeast-biomass-exports-report.pdf>

¹⁹ <http://www.biofuelwatch.org.uk/wp-content/uploads/Biomass-sustainability-standards-handout.pdf>

²⁰ <http://www.biofuelwatch.org.uk/wp-content/uploads/Biomass-Sustainability-standards-briefing1.pdf>

²¹ <https://www.chathamhouse.org/publication/woody-biomass-power-and-heat-impacts-global-climate>

²² <https://www.nrdc.org/sites/default/files/sustainable-biomass-program-partnership-project-ip.pdf>

²³ <https://www.dogwoodalliance.org/2017/06/press-release-rising-up-with-richmond-county-to-stop-a-proposed-enviva-pellet-mill/>

²⁴ <http://www.biofuelwatch.org.uk/2017/briefing-drax-coal-to-biomass-conversion-increases-levels-of-dangerous-small-particles/>

²⁵ <https://www.nrdc.org/resources/money-burn-uk-needs-dump-biomass-and-replace-its-coal-plants-truly-clean-energy>

²⁶ <http://www.biofuelwatch.org.uk/end-biomass-subsidies/>

²⁷ <http://www.euractiv.com/section/energy/opinion/need-for-a-scientific-basis-of-eu-climate-policy-on-forests/>

²⁸ <http://www.pfpi.net/wp-content/uploads/2017/03/Scientists-bioenergy-letter-March-15-2017.pdf>

²⁹ <http://im.ft-static.com/content/images/0ee06ecc-d3ae-11e3-8d23-00144feabdc0.pdf>