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Research on the Ecotoxicity of Burning Woody Biomass



Emissions from biomass plants are very hazardous. Besides the massive damage caused to the environment & wildlife it is also especially [harmful to our own health](#).

[Emissions](#) from biomass burning contain [particle pollution](#), nitrogen, hydrochloric acid, sulfur dioxide, hydrogen fluoride, ammonia, heavy metals and dioxins and furans.

These emissions cause diseases such as lung disease, heart failure and cancer. On average people die 13 months sooner due to particle pollution.

[Nitrogen emissions](#) destroys nature's biodiversity. It causes one plant to grow excessively and therefore other plants don't stand a chance. Nitrogen kills marine life and it gets into our drinking water which can [cause cancer](#) and Alzheimer's disease. Nitrogen also makes bones weak. Baby birds born in a nitrogen deposit area currently break their legs when they first try to walk.

[Warning for quick fix that does not lead to the solution](#)
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This document written by Johan Vollenbroek from the Mobilisation for the Environment organisation warns against another quick fix and states biomass power plants should be shut down immediately.

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"...It often remains unmentioned that the excessively high nitrogen emissions in the Netherlands also cause billions in damage every year..."

"...The Dutch Environmental Assessment Agency estimates damage to health and nature between € 2.5 and 12.6 billion damage per year, of which more than half due to premature death and health damage..."

"...The critical deposition limit is exceeded in 70% of nature, what leads to natural damage and a reduction in rare plants and animal species..."

"...Measures that lead reduced nitrogen deposition in nature areas will therefore also lead to less health damage..."

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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.

"...Air pollution is a considerable health concern in the EU. A report from the European Environment Agency (EEA)²⁶ concluded that in 2013, the estimated number of premature deaths in EU-28 attributed to PM_{2.5} (particulate matter 2.5 microns in diameter and below) NO₂ (nitrogen dioxide) and O₃ (ozone) exposure was 436,000, 71,000, and 16,000, respectively..."

"...Biomass power plants generally use emissions controls and thus emit less pollution on an energy-output basis than residential wood-burning, but the emission of hundreds of tonnes of pollution from a single smokestack makes them a health concern like any other power plant. Given the same emissions control efficiency on a heat-input basis, a wood-burning plant can emit more particulate matter per megawatt-hour than a coal plant, because biomass power plants tend to be less efficient than coal plants, and thus require more fuel to generate a given amount of electricity. This in turn emits more air pollution on an energy-output basis. This is especially true if the plant is burning green wood chips, because this material is around 50% water by weight, which reduces the efficiency of the power plant. However, particulate

[2016-06-14-ers-health-impacts-of-anthropogenic-biomass-burning-in-the-developed-world-english.pdf](#)

2016-06 \\ ERS

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matter emissions from plants burning dried wood pellets do not tend to differ from coal emissions to the same degree..."

"...Even biomass burners with modern pollution controls emit significant pollution. A survey of permitted emissions at new biomass power plants built in the USA shows that emissions are significant even when using efficient fabric filters to capture PM. For instance, a new 70 MW wood-burning plant in New Hampshire is permitted to emit 37.1 tonnes of PM per year. Emissions data from a small wood-burning CHP plant in Belgium illustrate that wood-burning power plants can be disproportionately polluting. A plant at Ham is reported by the company to have a generating capacity of 9.6 MW. Reported emissions for 2016 include 55.5 tonnes of particulate matter (PM10, a calculated value) and 137 tonnes of NOx (a measured value). fuel storage yards at biomass power plants can also create pollution from wood dust, a known carcinogen..."

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Adverse Impact Biomass Power Plant Emission Standards [2019-03-26-mob-onderzoek-resultaat-opgeleverd-gemeenteraad-nadelige-invloed-biomassacentrale-emissionormen.pdf](#)

This report is commissioned by the Mobilization for the Environment organization which won major court cases against the Dutch Government forcing them to take immediate action against climate change and pollution.

"...since 12 November 2018, stricter standards are in force... However, emission standards have been wrongly not been included for hydrochloric acid, sulfur dioxide, hydrofluoric acid, ammonia, heavy metals and dioxins and furans..."

"...Summary of the effects of replacing gas firing with wood firing:

- 1. Climate change is being strengthened or a negative effect on global warming.*
- 2. A range of air pollutants will be blown out through the chimney such as nitrogen oxides, sulfur oxides, hydrochloric acid, hydrochloric acid, ammonia, mercury, cadmium and thallium, other heavy metals, and dioxins and furans, including ZZS substances for which the minimization obligation applies with ultimately a zero emission.*
- 3. The air quality on site will deteriorate as a result of the far too wide emission standards in combination with the low chimney of only 20 m.*
- 4. Deposition of nitrogen, sulfur oxides, hydrochloric acid, hydrochloric acid, ammonia, mercury, cadmium and thallium, heavy metals and dioxins and furans in nature areas is not, or insufficient, recognized.*
- 5. The permitted emissions of NOx, SO2 and dust are broader than the*

European / Dutch requirements waste incineration plants. More than 20-year-old waste incineration plants show much lower emissions [than currently the case for the biomass plants].

6. The HVC biomass plant in Alkmaar, which is more than ten years old, performs many times better than this one new installation of Bio Forte.

7. No licensing standards are included at all for ZZZ substances. This is particularly true because the oven temperature around 400 gr. C is what facilitates dioxin formation.

8. The permitted emissions For NOx, SO2 and dust can and must be much sharper. For dust, the licensed emissions would be reduced by a factor of 10 if BAT were applied, which is a legal obligation..."

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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 contains new research by a leading independent expert draws attention to serious impacts on human health of burning solid biomass, mainly wood, for heating and power generation in the European Union.

"...The promotion of any combustion technology runs counter to efforts to improve air quality. Biomass burning is recognised as a significant source of fine particles (PM2.5) and polyaromatic hydrocarbons, and is also associated with emissions of oxides of nitrogen and various other pollutants linked to the substances present in the wood. Some of these pollutants can react in the atmosphere to form further pollutants, including 'secondary particles' (such as ammonium nitrate) and ozone, which are also damaging to health..."

"...The World Health Organisation's (WHO) 2013 HRAPIE (Health Response to Air Pollution in Europe) study identified several health impacts of PM2.5, NO2 and O3 for which evidence of causality and the exposure-response relationship were considered sufficiently robust that quantification should be undertaken to inform the development of EU policy..."

"...The European Environment Agency reports that there is a 'compliance gap' on air pollution at present, with respect to both the reduction of emissions and the meeting of ambient limit values.

- With respect to emissions, eleven Member States exceeded the National Emissions Ceiling (NEC) Directive for one or more pollutants in 2015: Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Ireland, Luxembourg, Spain and Sweden.²⁶

- Projected emissions reported by 23 Member States show that 18 do not consider themselves on track towards meeting their reduction commitments set for 2020 for NO_x, NH₃, NMVOCs, SO₂ and/or PM_{2.5} on the basis of the policies and measures they currently have in place. Similarly, 22 Member States are not on track to meet one or more of their 2030 commitments.

- In 2014, 16 per cent of the EU-28 urban population was exposed to PM₁₀ levels above the EU daily limit value with 8 per cent exposed to PM_{2.5} levels above the EU target value. However, when compared to the stricter WHO Air Quality Guideline values set to protect human health, approximately 50 per cent and 85 per cent of city dwellers were exposed to PM₁₀ and PM_{2.5} concentrations exceeding the WHO's recommendations.

- In 2014, 7 per cent of the urban population in the EU-28 were exposed to NO₂ concentrations above the identical WHO and EU standards.

- 20 and 88 per cent of the EU population were exposed to levels of Benz[a]pyrene (BaP) above (respectively) the EU limit and the WHO guidelines in 2014. The difficulty in meeting limit values is highlighted by the fact that there is still non-compliance despite the limits entering into force as long ago as 2005 for PM₁₀, 2010 for NO₂ and 2012 for BaP. Adding to existing emission levels in any sector will clearly make this job harder..."

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Burning Biomass Creates Proven Harm to Human Health [2016-09-13-lung-health-organizations-letter-burning-biomass-creates-proven-harm-to-human-health-english.pdf](#)

This report is commissioned by a dozen health organizations who oppose policies that would encourage or expand the use of biomass for electricity production.

"...Burning biomass from any source generates immediate dangerous air pollution that puts health at risk..."

"...Among the most dangerous of these emissions is particulate matter, also known as soot. These particles are so small that they can enter and lodge deep in the lungs, triggering asthma attacks, cardiovascular disease, and even death. Particulate matter can also cause lung cancer..."

"...Biomass combustion also creates nitrogen oxide emissions, which are harmful in their own right and also contribute to the formation of ozone smog and particulate matter downwind..."

"...Ground-level ozone pollution can trigger asthma attacks and cause premature death, and newer research shows possible links to reproductive

and central nervous system harm..."

"...Burning biomass also creates carbon monoxide, which leads to headaches, nausea, dizziness, and in high concentrations, premature death;v and carcinogens, including benzene and formaldehyde..."

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Impacts of Anthropogenic Biomass Burning

[2016-06-14-ers-health-impacts-of-anthropogenic-biomass-burning-in-the-developed-world-english.pdf](#)

This report is commissioned by 22 universities and public health organizations worldwide and discusses the types of pollution released when burning woody biomass.

"...Studies have estimated that wood/biomass combustion contributes 10–30% or $\sim 1\text{--}4 \mu\text{g}\cdot\text{m}^{-3}$ to the annual average fine particle concentrations measured in different parts of Europe..."

"...In a few studies looking at woodsmoke tracers, significant differences (66–80%) were observed for potassium, calcium and zinc as well as 1,3-butadiene and benzene..."

"...The physicochemical properties of biomass combustion PM varies between different combustion conditions. As discussed in the online supplementary material, the heterogeneity of biomass PM characteristics is high. Accordingly, evaluation of the respiratory and cardiovascular toxicity of biomass emission PM is complex..."

"...Woodsmoke particles constitute a complex and variable mixture of organic-dominated particles, soot agglomerates and inorganic ash alkali particles; three particle types that differ considerably in shape, size, solubility and chemical composition..."

"...Overall, in vivo and in vitro experiments demonstrate that woodsmoke PM can induce inflammatory responses, cytotoxicity, genotoxicity, oxidative stress and immunosuppressive effects..."

"...Across Europe, the Renewable Energy Directive has set a goal to produce 20% of energy from renewable sources by 2020, increasing wood/biomass combustion for power generation. As mentioned in the Introduction, biomass combustion is expected to become the major source of primary PM emissions over the next 5–15 years. This will compromise efforts to reduce ambient PM

concentrations to below the current WHO Air Quality Guidelines. This, in turn, will probably result in large numbers of avoidable, premature deaths across Europe over that time period..."

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