This briefing shows how little forest biomass is available, and proposes an EU strategy for a more efficient use of the scarce wood resource:

1. Halt subsidies for the use of forest biomass for energy and promote alternatives

2. Promote energy efficiency and reduction measures

3. Design a biomass policy that supports a circular economy

4. Promote sustainable forest management

The limited availability of wood for energy

The European Union (EU)'s renewable energy policy aims to cut carbon emissions by replacing fossil fuels with sustainable alternatives, and one of its main tools is the promotion of bioenergy. Heating and electricity produced with biomass accounts for more than half of the renewable energy produced in the EU.[1]

About 70 per cent of bioenergy is produced with 'woody biomass', in the form of direct forest harvests or residues from forest-based industries. If Member States were to use biomass according to their renewable energy plans, by 2020 the amount of wood used for energy alone would be equivalent to today's total EU wood harvest.[2]

The EU is currently considering how to meet its 2030 renewable energy target[3], and the European Commission is expected to propose new policies for renewable energy and sustainable biomass early in 2017.[4]

This will be welcome, as continuing with the EU's current renewable energy policy would likely lead to the further loss of forests and biodiversity, without mitigating climate change effectively.

In this briefing, we argue that the new EU policies for renewable energy should recognise that there is not enough wood available for a sharp increase in the use of biomass; and that using woody biomass does not necessarily reduce carbon emissions. The EU should therefore not allow subsidies for the use of forest biomass after 2020.

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1 Commission SWD (2014) 259, 'State of play on the sustainability of biomass for electricity, heating and cooling.' According to the Commission's 2015 renewable energy progress report, bioenergy accounts for 84% of renewable energy used in heating and cooling.
2 EU Forest Strategy, COM (2013) 659 final.
3 On 23 October 2014 the European Council agreed on an overall EU renewable target of 27%; see Council conclusions SN 79/14.
4 Communication on the Energy Union, COM (2015) 80 final; the current EU renewable energy policy does not include volume limits or sustainability criteria for the use of biomass (as opposed to biofuels) for heating and electricity.

Forest in the south-east of the United States cleared for wood pellets. Photo: Dogwood 2015

How much wood is available?

The EU's demand for wood for energy has increased dramatically over recent years, and it is expected to continue to grow unless the EU's renewable energy policy is changed. In 2010, total EU demand for wood was estimated to be around 800 million cubic metres (m^3), 43% of which was for energy and 57% for other uses[5,6].

Under the A1 scenario of the Intergovernmental Panel on Climate Change (IPCC)[7], which assumes steady economic growth, total EU wood demand is expected to grow by 75% between 2010 and 2030 to almost 1400 million m^3.[8] Under this scenario, demand for material wood uses, partly driven by the development of the bioeconomy, is expected to increase by 35% between 2010 and 2030. However, projected growth can largely be attributed to bioenergy demand, which is expected to grow by 117%[9]. Hence, in 2030, 56% of total wood use would be for energy: more than twice the amount used today in absolute terms.

Wood for energy consists of wood sourced directly from the forest, and 'non-forest wood'. Wood from forests includes stumps, residues and stem wood; non-forest wood includes wood from other landscapes, industrial processing residues, waste, and recovered wood. Projected demand for both forest- and non-forest wood is expected to exceed the amount the EU can supply. This puts increasing pressure on forests and land use globally.

Traditionally, biomass has come from non-forest wood (mainly sawdust and shavings), but there is a limited supply of these industrial residues, meaning that wood for bioenergy

5 In 2010, the total wood removals from EU forests were estimated at 537 million m^3; other sources of wood were imports and non-forest wood, such as industrial residues. See also Mantau et al. (2010) 'EUwood – real potential for changes in growth and use of EU forests.' Final report. Hamburg/Germany, June 2010. 160p.

6 Around half of wood used for energy was used in households, the other half in industrial energy plants. See also EUwood Mantau et al. (2010), op. cit., and Mantau (2012), Wood flows in Europe.

7 The leading international body for the assessment of climate change, the Intergovernmental Panel on Climate Change (IPCC) has produced different scenarios for future world energy demands and supply. The A1 scenario is based on the assumption of steady economic growth and relatively great dependency on fossil fuels.

8 See EUwood Mantau et al. (2010), op. cit., p. 29. The Indufor study (2013) on wood raw material supply and demand states that between 2000 and 2011, wood for bioenergy already grew by 82 million m^3, i.e. more than double the growth in the pulp, paper and wood product sector.

9 On the basis of the figures in EUwood Mantau et al. (2010), op. cit, p. 129. Wood demands for electricity plants specifically are expected to increase under the IPCC's A1 scenario, to 353% between 2010 and 2030.

Table 1: Total available wood supply in millions of m^3 in the EU. Source: Verkerk (2015)

Type	2010	Low mobilisation 2030	High mobilisation 2030
Stem wood	619	555	625
Residue	100	55	150
Stump	10	0	101
Other	12	10	15
Total	**741**	**620**	**891**

is increasingly sourced directly from forests and short-rotation plantations.[10] This is visible in the intensification of harvests (e.g. increased removal of stumps and residues) and the development of wood plantations.

What is known as the 'theoretical' potential of available wood depends on factors such as the availability of land, forest cover and tree growth, the age and state of the forest, and the existence of a developed forestry sector.[11] The 'realistic' potential of a forest is gained by assessing the same factors, but also considering forestry sector dynamics such as the application of resource efficiency practices, technical limitations, and restrictive environmental, social or climate policies.

It is no surprise then that there are large variations in the potential wood supplies of different EU Member States.[12] Forest cover, forest types and forest policies differ greatly among European regions. Estimates of the EU total available 'realistic potential' – following different models and policy scenarios used – range between 620 and 891 million m^3.[13]

Sustainable Forest Management (SFM) policies may also interfere with available supply. Table 1 shows potential available supply per type of wood in the year 2030 for a low- and high-mobilisation scenario, reflecting different socio–economic scenarios, and stronger and weaker environmental protection levels.[14]

Effective production from EU forests in the year 2010 was estimated at 537 million m^3.[15] Hence it is clear that an increase in demand for wood to 1,400 million m^3 by 2030 would exceed the available supply by hundreds of millions of m^3.[16] It is therefore widely recognised that mobilising more wood could have significant negative trade-offs with other forest functions such as biodiversity, water and soil protection, and mitigation of climate change.[17] Growing demand would also lead to an increase in imports (mainly from North America, Russia, Ukraine and Belarus) from forests where protection levels are minimal and where further negative ecological and climate impacts are likely. Other sectors that depend on wood, such as the paper and panel industries, would suffer further from rising wood prices.

What are the impacts of increased consumption of biomass?

Biodiversity impacts

The EU has set a target to halt biodiversity loss and degradation of ecosystem services by 2020, and doing what it can to reverse the process.[18] In its report 'Measuring the state of nature between 2007 and 2012', the European Environmental Agency (EEA) indicates that although the EU's forest area has increased by 17 million hectares (ha) since 1990, biodiversity is decreasing fast. Unless current management practises are improved, the EU will not meet its biodiversity objectives. Despite most EU countries stating that they manage their forests sustainably, this is not supported by the data. 80% of EU forest and woodland habitats of community interest have an 'unfavourable' status.[19] In the Boreal region, all forest habitats are 'unfavourable', with over 80% being considered 'unfavourable–bad'.

10 Indufor (2013), pp 107–10 and pp 231–4. Future demand for round wood, industrial residues, and particularly for forest residues and recovered wood, is strongly driven by additional demands for bioenergy. Between 2000 and 2016, forest residues are expected to almost triple from 25 million m^3 to 70 million m^3. The European Commission (SWD (2014), 259, final) also confirmed that demand until 2020 will largely be met by additional forest thinnings and fellings (83 million m^3) and imports (15% of total bioenergy supply).

11 e.g. EUwood Mantau et al. (2010) (op. cit.), and Verkerk (2015) 'Assessing the impacts of increased biomass removal and biodiversity protection on European forests'.

12 See also 'Forest biomass for energy in the EU: current trends, carbon balance and sustainable supply' (IINAS, European Forest Institute and Joanneum Research, 2014), p.11.

13 Verkerk (2015) and IINAS, EFI, JR (2014) provides a range between 590 and 931 million m^3, also depending on different policy scenarios. These scenarios include (environmental) protection levels, and socio–economic aspects.

14 The low- and high - mobilisation scenarios imply, respectively, a higher and lower protection level for forest biodiversity, water and soil, and carbon stocks.

15 Mantau (2012).

16 The EU wood study projects that a maximum of 375 million tonnes of wood will be available in 2030 from non-forest sources. The Commission's 2005 Biomass Action Plan, on the basis of data from Eurostat and the EEA briefing 'How much biomass can Europe use without harming the environment?' estimated that between 2010 and 2030 there was an annual forest biomass potential between 39 and 72 MTOE, respectively 95 and 175 million tonnes of wood. It is clear that projections go far beyond these amounts.

17 See Verkerk (2015) and Mantau (2010).

18 EU Biodiversity Strategy, COM (2011) 244, final; see also the EU 7th Environmental Action Plan, Decision no. 1386/2013/EU. The EU also committed to the International Convention on Biological Diversity.

19 Habitats referred to are those covered by Annex I of the Habitats Directive 92/43/EEC. The parameters for habitats are (a) range, (b) area, (c) structure and functions, and (d) future prospects. Unfavourable–inadequate is used for situations where a change in management or policy is required to return the habitat or species to favourable status but there is no danger of foreseeable extinction in the future. The status unfavourable–bad indicates that habitats or species are in serious danger of becoming extinct, at least regionally.

The EEA underlines that forests in Europe are increasingly at risk due to human-induced pressures, including excessive harvesting to meet rising demand for biomass. Bioenergy demands in particular drive the removal of dead or dying trees, roots, logs and branches that are crucial habitats for the single biggest group of threatened species in Europe.[20] The intensification of harvests also leads to fragmentation of forest landscapes, which stops species from being able to move from one forested area to another, endangering their ability to survive.

European forests are in a precarious state. Increasing harvest intensity and harvest areas to meet the growing demand for wood will further endanger forest biodiversity, as well ecosystems, soils and water levels.[21]

Climate impacts

Bioenergy production and use is subsidised by the EU and many Member States because wood is seen as a renewable alternative to fossil fuels. Such subsidies are based on the flawed assumption that emissions from bioenergy production will be compensated by the future growth of trees.[22] In reality, the question of whether carbon emitted during the production of bioenergy is compensated by future growth of biomass depends on many factors, and in some cases bioenergy can be more polluting than coal.[23]

The impact of biomass on the climate also depends on the extent to which intensified harvesting reduces the amount of carbon stored in forests and its future potential to sequester carbon. European forests store an estimated 430 million tonnes of carbon annually, which is more than they emit in CO_2, making forests a net carbon sink.[24] However, growing biomass demand for energy is expected to contribute to a decline of this sink, with some countries' forests expected to become a source of emissions before 2030.[25] Also, if harvests exceed certain levels, it will impact the forests' ability to sequester carbon.[26]

Afforestation or the development of wood plantations can also have an impact on the climate. Replacing forests with plantations usually has a negative effect on carbon sequestration since large carbon stocks in old trees are replaced by younger trees with smaller carbon stocks,[27] and using more agricultural land for wood production could also lead to agricultural production moving to forested areas elsewhere. Making land available for agricultural purposes is a major source of emissions, and is responsible for around 70% of all deforestation.[28]

Rosalia alpina, stated as vulnerable on IUCN red list. Czech republic 2011. Photo: Dušan Klenovšek

Keeping biomass in forests is not only an effective climate change mitigation strategy: it is also essential for enhancing forests' resilience to climate change. Climate change is already having an impact on forest growth and conditions (increasing the incidence of forest fires, extreme weather events and

20 See WWF (2004) 'Deadwood – living forests, the importance of trees and deadwood to biodiversity'.
21 See e.g. Verkerk (2015) and Mantau (2010).
22 This assumption is also referred to as 'carbon neutrality'; see e.g. JRC technical report, Carbon accounting of forestry bioenergy, European Commission Joint Research Centre, Institute for Energy and Transport (2013).
23 More detail will be included in Fern's forthcoming briefing on biomass and climate.
24 A European map of living forest biomass and carbon stock, European Commission, Joint Research Centre (2012); 430 million tonnes of CO_2 is equivalent to about 10% of the EU's annual greenhouse gas emissions.
25 Verkerk (2015); also see 'Impacts on the EU 2030 climate target of including LULUCF in the climate and energy framework', Oko-Institut (2015).
26 Verkerk (2015).
27 Evans (2009) 'Planted forests, uses, impacts and sustainability', FAO; see also Mackey et al. (2013), 'Untangling the confusion around land carbon science and climate change mitigation policy.'
28 http://www.forest-trends.org/documents/files/doc_4718.pdf

disease, and of insects affecting forests), as well as on the amount of wood available for harvesting.[29]

Global impacts

The EU has committed to contribute to halting global forest loss by 2030 and reducing tropical deforestation by 2020 by at least 50%. It has also stated it will step up the EU's contribution to averting global biodiversity loss.[30] Demand for wood (energy and material use combined) is expected to exceed domestic supply before 2020, leading to an increase in imports. For bioenergy, the share of imported biomass is expected to have reached 15%–27% of the total supply by 2020.[31] This means that EU bioenergy demands are putting more pressure on global land use and forests, as shown in Box 1.[32]

By promoting wood as a renewable energy source, the EU is setting a bad example. Land and forests are scarce resources and should be used to meet local demands first, e.g. for food and energy production. With a growing population and increasing demand for natural resources (e.g. food, feed and fibre), the potential for land and forests to provide biomass is severely limited. The World Resources Institute has indicated that if a 20% bioenergy target is pursued globally, by 2050 demand for bioenergy alone will be equal to the entire human plant harvest in the year 2000.[33]

Impacts on the wood market and resource efficiency

Bioenergy subsidies and the rapid increase in demand for wood for energy have led to a distorted market for raw materials. Several institutions and industries that rely on wood for the production of materials, e.g. construction, have complained about increasing wood and (agricultural) land prices in the EU. Eurostat reports that wood is becoming increasingly sought after and expensive due to its use as a renewable energy source and an emerging source for bio-based products.[34]

Renewable energy policies were based on the assumption that biomass would come from waste and residues from existing industries. But wood for energy increasingly comes directly from forests, thereby making it more difficult to use wood to replace carbon-intensive materials used in construction, furniture or the bioeconomy, such as concrete, steel or plastic. Even 'waste and residues' could be used more efficiently in the bioeconomy than for bioenergy. Burning wood thus stands in the way of the efficient use of resources. The EU has as an objective to work towards a circular economy. Using biomass for energy would undermine this objective.[35] Europe should make more from less for longer.

Box 1: EU demand is already having a devastating effect outside of the EU

EU imports of wood for industrial energy use have an impact on forest ecosystems and habitats outside the EU. A key example is the South-East United States (US). This region provides the bulk of wood pellets for export to the EU. Exports more than doubled between 2012 and 2014, from 2.1 to 4.4 million tonnes, and are expected to grow at a similar rate in the coming years. The EU is the main driver, as it is the destination for 98% of US exports.[36] The UK is responsible for 75% of US exports.[37]

One of the biggest producers in this region admits using whole trees and round wood to produce these pellets – which has reportedly led to clear-cuts of high-biodiversity wetlands.[38] As much of the forest in this region is privately owned, protection levels are low.

29 Eurostat confirm that in recent years (e.g. 2000, 2005 and 2007), round wood production had to cope with unplanned numbers of trees that were felled by severe storms.
30 7th Environmental Action Plan, Decision No 1386/2013/EU; Communication on Deforestation and Forest Degradation, COM (2008) 645 final; and EU Biodiversity Strategy, COM (2011) 244.
31 The Commission (SWD (2014) 259 final) expects that imports will amount to a level of 15–27% of the bioenergy supply in 2020.
32 On global impacts, see also Fern's report 'Burning matter' (Brack, 2015), which is part of a series of reports calling upon the EU to develop an Action Plan on Deforestation and Forest Degradation.
33 Searchinger et al. (2015) 'Avoiding bioenergy competition for food crops and land', WRI.
34 See http://ec.europa.eu/eurostat/statistics-explained/index.php/Forestry_statistics; see also p. 245 of the Indufor study (2013). Increasing prices also have the possible side effect of discouraging owners from investing in longer rotations, resulting in a shortage of quality timber that is needed in other sectors.
35 See e.g. http://ec.europa.eu/environment/circulareconomy/index_en.htm
36 http://www.eia.gov/todayinenergy/detail.cfm?id=20912
37 In July 2015 the White House Administration publicly rejected the idea that forest biomass should be considered carbon-neutral. This statement followed a letter sent by a number of leading scientists to the US Environmental Protection Agency in February 2015 that highlighted accounting loopholes related to biomass carbon emissions.
38 http://www.dogwoodalliance.org/tag/enviva/

Conclusions and recommendations

Promoting the use of wood for energy, under the EU's renewable energy policy, conflicts with EU objectives to protect biodiversity, reduce deforestation and emissions, and create a circular economy. Growing demand will further harm forest biodiversity, water and soil quality, and the ability of forests to sequester and store carbon. It hampers the replacement of carbon-intensive materials in other sectors, where there are fewer alternatives, and slows down the development of real renewable energy solutions such as wind and solar power. Further imports will also lead to an increase in deforestation globally, and the loss of agricultural land needed for food production.

Some argue that Sustainable Forest Management (SFM) certification schemes can verify whether biomass for energy is sustainably produced.[39] This is a misconception. SFM objectives, requirements and verification methods differ widely across the EU, while forest management is regulated at national level with little scope for the EU to intervene. More importantly, focusing on SFM disregards the problem of increased demand and limited supply. Nor do SFM criteria necessarily address bioenergy-specific issues such as greenhouse gas impact, land use effects or resource efficiency.

In the coming period, the European Commission will work on several policies relating to whether and to what extent bioenergy, and thus wood, can be part of the EU's energy mix. From 2016 onwards, proposals for a post-2020 renewable energy policy and a sustainable biomass policy are foreseen. The EU is also working on proposals towards a circular economy and is considering an Action Plan to reduce deforestation.

In light of these policy developments, Fern has the following recommendations for the EU:

1. Halt subsidies for the use of forest biomass for energy and promote alternatives.

Ending subsidies for the use of forest biomass for energy would reduce excessive demand for wood, and the resulting deforestation and forest degradation. It would also level the playing field with other sectors reliant on wood, such as the construction industry and the bioeconomy. Using wood to replace carbon-intensive materials (such as plastic, steel and concrete), rather than burning it, would be a more effective way of mitigating climate change. Renewable technologies such as wind, solar and geothermal power must develop more quickly to create a shift to a low-carbon economy.

2. Promote energy efficiency and reduction measures

Reducing energy demand, by measures such as increasing energy efficiency, should be the primary focus of mitigating CO_2 emissions as no energy is produced without greenhouse gas emissions. For example, it would be more effective to promote the insulation of buildings or improve the efficiency of energy systems than to support the use of wood for heating, which still leads to CO_2 emissions.

3. Design a biomass policy that supports a circular economy

There is only a limited amount of wood available to meet demands for the production of materials and energy and the further development of a bioeconomy. The EU must acknowledge this limited supply for when developing its future biomass policy. Proposals should be designed in the light of a 'circular economy', i.e. making more, from less, for longer. This means discouraging the incineration of wood that can still serve other purposes. The EU could consider ways of limiting the use of wood in (low-efficiency) household stoves, and restricting the use of wood for industrial electricity and heating generation to non-forest wood.

4. Promote sustainable forest management

Without subsidies, locally sourced wood may provide an important energy source, for instance in households and smaller combined heating and power systems, contributing to energy security and employment in rural areas. In this context, the EU and Member States should focus on promoting and improving current forest management practices through EU structural funds and Natura 2000, to prevent an intensification that leads to negative trade-offs for the ecological, climatic and social functions of forests.

39 A Commission report on biomass sustainability (COM (2010) 11 final) indicates the reason for not proposing binding sustainability criteria for solid biomass for heating and electricity: 'In the EU, as most biomass comes from European forest residues and by-products of other industries (processing industries), and as forest management structures are strong, the current sustainability risks are considered low.'

Enviva's facility in Ahoskie, North Carolina. Wood cut in US forests is converted into pellets here before being transported to the Drax power plant in the UK. Photo: Dogwood Alliance

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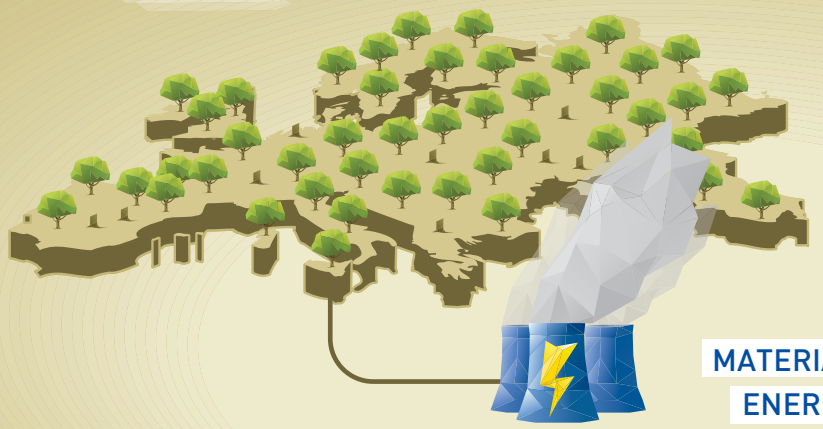
EU subsidises wood for energy

but Europe's forests can't meet growing demand

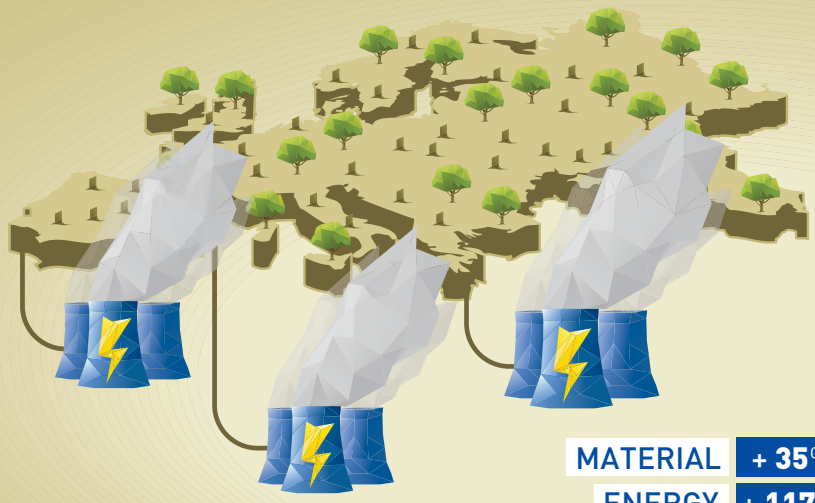
EU WOOD DEMAND IN **2010**

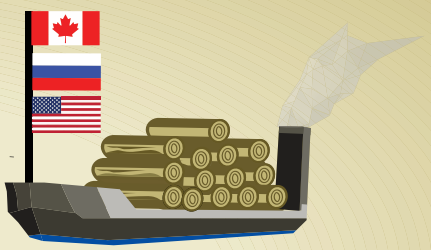


MATERIAL **458** MILLION CUBIC METERS

ENERGY **346** MILLION CUBIC METERS

PROJECTED EU WOOD DEMAND IN **2030***





MATERIAL **+ 35%** **620** MILLION CUBIC METERS

ENERGY **+ 117%** **752** MILLION CUBIC METERS

* Figures are based on the EUwood study - Mantau et al. (2010) and assumptions of the Scenario A1 of the International Panel on Climate Change (IPCC)

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