POLICY BRIEFING: Forest biomass for energy in the EU – current trends, carbon balance and sustainable potential

Under existing EU renewable energy polices, forest biomass is expected to play a significant role in Europe's renewable energy mix until 2020 and is set to further increase under future policies with a 2030 horizon. European environmental NGOs Birdlife Europe, the European Environmental Bureau and Transport & Environment have therefore commissioned the International Institute for Sustainability Analysis and Strategy (IINAS) in cooperation with the European Forest Institute (EFI) and Joanneum Research (JR) to carry out a study on the sustainability of woody bioenergy in the EU.

This study aims to assess what the implications of increasing forest bioenergy use are for the natural environment and climate, and at estimating the amount of forest-derived woody biomass that could sustainably be supplied for energy use within the EU up to 2030. The premise for this study is that EU bioenergy polices should not be based on expanding the EU global footprint and that a massive increase of wood imports (and the environmental and GHG impacts) would be very difficult to control. The potential of imported wood for energy is therefore not considered.

This summary for decision makers represents the NGOs' understanding of the study's results, meaning and implications.

MAIN FINDINGS

1. The EU's use of wood is already close to the maximum domestic potential of woody biomass in 2030 if we are to see only low risks to the environment and climate

The potential of the EU's woody biomass consists of the potential directly from forests and of the potential of secondary sources such as by-products and residues of the industries. Wood from non-forest land such as landscape care, gardening and from short rotation coppice also adds to the potential. The overall potential of woody biomass from these **sources corresponds roughly to 8700 PJ[1] of energy in 2030. In 2010 the EU was already using 7010 PJ of wood**, of which 3000 PJ were used for energy.

The EU's potential for woody biomass directly from forests (for both material and energy uses) is estimated at 590 million cubic meters (Mm^3) in 2030, corresponding to 5100 PJ of energy. The low risk potential assumes that additional measures to stop forest biodiversity loss in the EU will be taken up (eg. 5% more protected forest areas) together with measures to protect the soil, water and productivity of land. The vast majority of this potential is stemwood from final harvests (343 Mm^3) and stemwood from thinning (189 Mm^3).

[1] Petajoules (PJ) are the units of measure used in the study to allow comparison between different biomass potentials, even if the end use will not be for energy.

The potential from other woody biomass sources in 2030 such as landscape care wood, by-products and industrial residues corresponds to roughly 3600 PJ of energy.

The EU's use of wood for material and energy purposes in 2010 was already relatively close to the estimated 2030 potential of wood, if we are to see only low environmental and climate risks. A significant increase in the use of wood compared to 2010 will likely lead to increased reliance on imports, displacement of wood use in other sectors and increased pressure on forests both in the EU and outside. The domestic (low risk) potential of wood as estimated in this study would be already exhausted if the use of wood for energy is increased just 50% from the 2010 level of use.

2. Using stemwood for energy does not deliver GHG savings compared with fossil fuels

When evaluating the GHG balance of wood used for energy, accounting for the changes in forest carbon stocks and sinks due to the harvesting of biomass is essential. The emissions from the changes in forest carbon stocks over a short-time frame (20 years) are 2 to 10 times more than the life-cycle GHG emissions (eg. from transportation, processing) per unit of energy produced from woody biomass, depending on the type of biomass feedstock.

The amount of emissions emitted per megajoule of energy produced – also known as the greenhouse gas intensity (g CO2eq /MJ) – of single-use woody biomass for energy is below the intensities of fossil fuels (coal 88g CO2/MJ and natural gas 51g CO2/MJ) only in two categories of feedstock – in the 50 years following the burning of the wood. Those are harvesting residues and stumps (the latter however being more problematic in terms of other environmental impacts). All other feedstocks have higher emissions than fossil fuels and natural gas.

The greenhouse gas intensity of single-use woody biomass for energy in the 50 years following the burning of the wood is measured in emissions per megajoule of energy produced. In only two categories of feedstock is it below the intensities of fossil fuels (coal 88g CO2/MJ and natural gas 51g CO2/MJ): harvesting residues and stumps. (The latter, however, is more problematic in terms of other environmental impacts.) All other feedstocks have higher emissions than fossil fuels and natural gas.

The reference systems assumed in the study for the forests in case harvesting for bioenergy purposes had not taken place, are fairly conservative. The reference system assumes that forest management for other purposes would have still taken place. For example, for stemwood from final harvest the bioenergy system only assumes that the harvesting would have happened earlier than if it was not harvested for bioenergy.

This means that only the use of woody residues for energy, either from forest harvesting, industrial processes or landscape care offer real climate benefits within a policy relevant time scale, since they are the only woody biomass feedstock with greenhouse gas intensities below those of fossil fuels.

3. Potential for low-risk woody biomass in the EU is not enough to meet the expected demand for all uses by 2030

The proposal by the European Commission in its Communication for the 2030 climate and energy framework, for 40% GHG emission reductions and 27% renewable energy, is taken as the reference scenario of this study. The two other scenarios of the study, the GHG scenario and the sustainability scenario look at ways to use bioenergy within the limits of low-risk supply of woody biomass, while still reaching ambitious climate and energy targets, namely 40% energy savings and 45% renewable energy by 2030. The GHG scenario looks at ways to minimize the GHG emissions from woody biomass use and the sustainability scenario looks at ways to further minimize other environmental impacts on top of that.

The Commission's proposal assumes 3700 PJ of wood energy in 2030 (7% of overall energy demand), out of which 2400 PJ would come from forests and 1300 PJ from secondary woody resources. Wood demand for materials is expected to be 5100 PJ, amounting to a total of 8800 PJ by 2030. The potential of low-risk woody biomass in the EU as calculated in this study (8700 PJ, which excludes post-consumer wood) would be nearly enough to meet these needs, but only if practically all potential would be exploited which would be a very high cost option.

The sustainability scenario shows that woody bioenergy could sustainably contribute to the EU's energy needs with up to 4300 PJ by 2030, covering 7% of all energy production demand with minimal environmental impacts and without relying on imports. This would require increased cascading use of wood for paper and packaging to reduce wood demand for materials by 1000 PJ, increased recycling of post-consumer wood from which 1200 PJ of energy could be recovered, as well as increased use of short rotation coppice (SRC) instead of wood from forests. As a result of this, the overall consumption of wood from forests available for different uses would be well below amounts which would pose a risk to the climate and the environment.

The Commission's 2030 framework communication (reference scenario) would set the EU on an unsustainable track of woody biomass use for energy if taking into account that there is demand for wood also by other sectors. This would seriously stretch the limits of what EU forests can sustainably supply. The actual demand for woody bioenergy may turn out to be even higher than assumed since the Commission's 2030 framework Impact Assessment expects a major share of bioenergy to come from cropland for perennials and SRC rather than through harvests in existing forests. Findings of another study commissioned by BirdLife Europe, the EEB and Transport & Environment indicate that only a very limited amount of land (around 1.3 million hectares) is potentially available for perennials or other energy crops.

Measures are needed to radically reduce the overall energy demand, in order to be able to move ahead with ambitious renewable energy policies until 2030. Ambitious renewable energy polices where bioenergy plays a significant role cannot be achieved without environmental damage and increased biogenic emissions from biomass, unless measures are also taken to radically reduce overall energy demand.

4. Current policies will lead to significant GHG emissions from the use of wood energy by 2030

The use of wood energy in the EU in 2010 created an additional 100 Mt of annual CO2eq emissions, when biogenic emissions (due to changes in the forest carbon stocks) are considered over a 20-year time frame. These emissions are not considered in the current policy framework and not accounted for when measuring our progress towards the EU climate targets. According to

the reference scenario, in 2020 and 2030 the annual emissions from use of woody bioenergy would be between 100 – 150 Mt CO2eq. *This is of the same magnitude as the annual GHG emission reductions of EU27 between 2005 and 2012, which have on average been around 100 Mt CO2eq.*

Even if biogenic emissions from woody biomass are considered on a 100-year timeframe, the GHG balance of woody biomass use would still not reach carbon neutrality but be 75-50 Mt CO2eq annually in 2020 and 2030.

Climate neutrality of woody bioenergy use, i.e. nearly zero net GHG emissions, can be reached by 2030 if only woody biomass feedstocks with a low climate impact are used and if wood is increasingly used to substitute other construction materials, as suggested by the GHG and sustainability scenario of this study.

The biogenic emissions, as well as the emission reduction potential of woody biomass, are nevertheless small compared to the overall amount of GHG emissions from fossil fuel use. The major GHG savings of the GHG and sustainability scenarios compared to the reference scenario result mostly from ambitious energy savings.

Current policies are so far failing to deliver significant emissions savings and the expected annual biogenic GHG emissions from the use of wood for energy threatens to annul these minor GHG saving efforts of the EU if no measures are taken to constrain the use of woody bioenergy. Without additional measures, woody bioenergy use will not reach carbon neutrality even in a 100-year timeframe.

With the correct policy choices promoting cascading use of wood and disincentivising the use of wood with high GHG intensity like stemwood, net biogenic GHG emissions of woody bioenergy use can be brought to nearly zero by 2030.

POLICY RECOMMENDATIONS

Based on the main findings of this study, the NGOs make the following policy recommendations:

- Transition to a low-carbon economy and deployment of renewable energies in harmony with nature requires that energy demand is radically cut simultaneously. The EU's 2030 climate and energy framework needs to include bold and binding energy efficiency measures.
- The EU needs to introduce new bioenergy policies that incentivise only the use of residues, wastes and other sources of woody biomass with low-risk environmental and climate damage and with little competing demands to ensure that sustainable types of woody biomass also get access to the energy markets.
- Renewable energy policies should be based on, and limited to scenarios which favour the low risk potential of (woody) biomass for energy use, by capping the allowed contribution of bioenergy towards the renewable energy targets and by limiting the policy incentives to the amount of sustainable supply. Measures to minimize environmentally negative impacts of biomass use for energy also need to be included in the policy incentives.
- The full climate impacts of woody bioenergy use, including the biogenic emissions from changes in forest carbon stocks in the long term, need to be accounted for in the EU's

climate and energy scenarios and modelling for the 2030 framework in order not to provide misleading guidance to decision makers. The 2030 framework impact assessment's scenarios should be built on the low-risk potential of woody biomass from the EU's forests and secondary wood resources.

- To prevent harmful impacts on the environment and the climate, the EU urgently needs an overall vision of biomass supply and use for all end uses. The vision should be based on reducing the energy demand and thus reducing the need for bioenergy in turn, using bioresources efficiently and on ensuring a balance between overall biomass demand and sustainable supply. Enforcing the cascading use of wood, by increased recycling and by increasing the re-use of woody products, should be part of such a vision.