How much sustainable biomass does Europe have in 2030?

November 2016

Summary

European heads of state have agreed that in 2030, 27% of Europe's energy should come from renewable sources, up from 16% in 2014. Not all renewables are sustainable though; for instance, food-based biofuels as well as burning whole trees imported from the US in EU power plants has come in for a lot of criticism.

Therefore, Birdlife and T&E investigated how much sustainable biomass is likely to be available for bioenergy in Europe in 2030. We chose 'in Europe' not because we think there should not be any trade, but rather because Europe should not increase its ecological footprint beyond what the continent can sustain.

We found that about 152 Mtoe (million tonnes of oil equivalent) of sustainable biomass is foreseen to be available for bioenergy in 2030 in the EU. This is 15-21% below the projected EU bioenergy use in 2030, depending on the scenario.

In addition to insufficient availability, there is also a mismatch in the type (e.g. roundwood, forestry and agricultural residues, waste) of biomass currently used for energy and the type of sustainable biomass available. Policies on bioenergy sustainability need to ensure that bioenergy demand is limited to the amount of sustainable biomass supply for energy and apply binding criteria to ensure (i) significant greenhouse gas (GHG) emissions savings from bioenergy, (ii) no adverse impacts to the natural environment, and (iii) resource efficient use of biomass, in line with cascading use principle and the waste hierarchy.

1. Introduction

In Europe, there is an increasing demand for biomass to be used for energy. This alongside its existing use for production of e.g. construction materials, pulp and paper, and even for more novel uses such as chemicals. More than half of the EU's renewable energy target for 2020 is expected to be made out of bioenergy, and demand for other wood using sectors is also projected to increase. Biomass producing ecosystems also provide a wide range and abundance of other vital ecosystem services.

Transport & Environment and Birdlife have commissioned and taken part in a range of studies on the availability of biomass resources in Europe that could be used for energy with low environmental and climate risks.

This briefing is based on four studies: (i) evaluating sustainable potential of woody biomass (IINAS 2014)[1], (ii) the availability of land to grow energy crops (IEEP 2014)[2], (iii) the sustainable potential of wastes for biofuels (ICCT 2014)[3] and (iv) a study summarizing the total available biomass supply (BRE 2015)[4]. Together, these give a good indication of the maximum level of sustainable bioenergy available in 2030, and compare it to the expected demand in 2030.

Biomass considered to be available for energy use with low environmental and climate risks in these studies would contribute to the following objectives:

1. Significantly reduce GHG emissions within a timeframe relevant to EU climate policy objectives;
2. Minimize negative impacts on the environment;
3. Prevent displacement of other uses of the same biomass resources which causes for example indirect land use change (ILUC);
4. Ensure that the overall demand of biomass does not significantly increase the EU's global land footprint.

2. Sustainable biomass potential for energy in 2030

In order to calculate the sustainable biomass potential for energy, the studies examined: the technical potential of biomass resources (including land availability); as well as existing and foreseen competing uses together with environmental, economic and social criteria related to forest and agricultural biomass. The following competing demands and sustainability constraints were considered for the different feedstocks:

Type of biomass	Competing demands	Sustainability constraints
Forest stemwood	Construction timber Non-construction timber Pulp and paper Packaging	No policy driven increase in logging activities An additional 5% of areas set aside from any exploitation from forestry
Forest residues	n/a	No stump extraction A maximum of 70% of residue removal and stricter limits on poor soils No fertilizer application No extraction on peatland soils
Non-forest woody residues	Wood panel manufacturing	n/a
Agricultural waste	Animal husbandry Polymers Composting	33% should be left on the ground to maintain soil conditions
Manure	Land care	n/a
Sewage	Land care	n/a

[1] IINAS, EFI, JR (2014) Forest biomass for energy in the EU: current trends, carbon balance and sustainable potential http://www.eeb.org/EEB/?LinkServID=FE1EAF33-5056-B741-DBEF3F46BC26A1E1

[2] IEEP (2014) Space for energy crops http://www.ieep.eu/work-areas/climate-change-and-energy/sustainable-land-use/2014/05/space-for-energy-crops-an-assessment-on-the-potential-contribution-of-europe-s-energy-future

[3] ICCT (2014) Wasted: Europe's untapped resource http://www.theicct.org/wasted-europes-untapped-resource-report

[4] BRE (2015) Potential and implications of using biomass for energy in the European Union

Ligno-cellulosic waste	Composting Recycling Animal bedding Wood panel manufacturing	Increased recycling and reduction in line with EC 2014 Waste Package proposal (which is still in co-decision), including: phase out of landfilling by 2025, increased recycling rate of municipal solid waste to 70% in 2030 and increased packaging waste recycling rate to 80% in 2030 Additional 30% reduction of food waste by 2025
Used cooking oil	n/a	n/a
Landfill gas	n/a	n/a
Land for energy crops	Food and feed Nature conservation and ecosystem services (Overall aim to reduce EU's land footprint)	No conversion of natural habitats No displacement of existing uses of land Maintenance of existing agri-environmental and beneficial agronomic practices such as rotational fallow land

The evaluation of sustainable biomass potential is based on what could be produced in the EU. Trade will naturally still take place, nevertheless the level of biomass use needs to be in line with EU's sustainable biomass potential, according to the ecological footprint concept[5]. In other words, we should 'live within our means'.

In line with the constraints listed above, the level of biomass available for energy use in the EU in 2030 is 152.2 Mtoe. This is a decrease from 171.9 Mtoe in 2020 due to increasing competing uses, and decreasing waste availability for bioenergy, itself due to better implementation of waste management and the circular economy.

When the sustainable biomass potential is compared with the EU targets of 20% renewables by 2020 and at least 27% by 2030[6], sustainable biomass could account for 45% of all renewables in 2020 and 30% in 2030. In 2014 biomass and renewable wastes accounted for 64.1% of renewables or 129 Mtoe[7]. So it is clear that the possible contribution of sustainable biomass to European renewable energy must become more modest in the future. The share of other renewables should significantly increase in the near future to allow the EU to reach its renewable energy targets in a sustainable manner.

3. The sustainable feedstocks

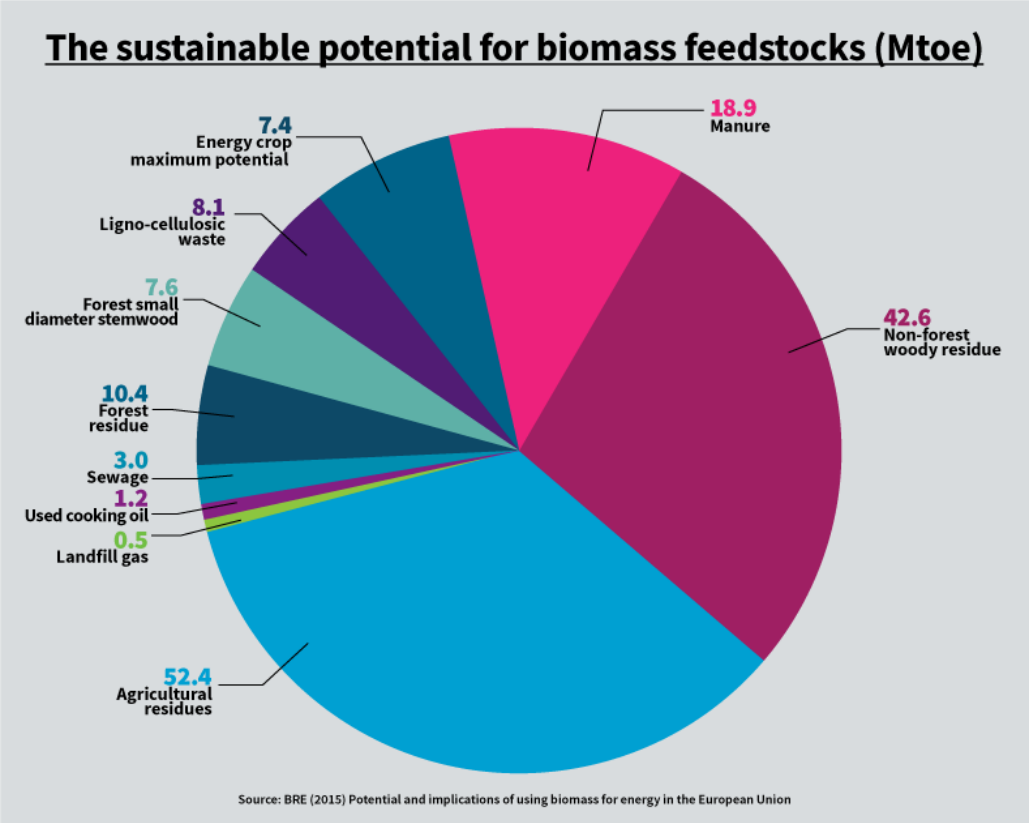
Within the sustainable biomass potential, agricultural waste and residues are the largest single feedstock with 52.4 Mtoe (see figure below). This is closely followed by 42.6 Mtoe of non-forest woody residues, which are processing residues of the forest industry such as sawdust, bark, and black liquor. If limits on overall biomass volumes and sufficient sustainability safeguards are applied as outlined in the NGO recommendations for the EU's new bioenergy sustainability policy[8], these biomass feedstocks could be considered of a low environmental and climate risk.

[5] An ecological footprint is a measure of human impact on Earth's ecosystems, so the amount of land and sea needed to sustain one's lifestyle

[6] Policy framework for climate and energy for the period 2020-2030

[7] Eurostat - Supply, transformation and consumption of renewable energies (nrg_107a)

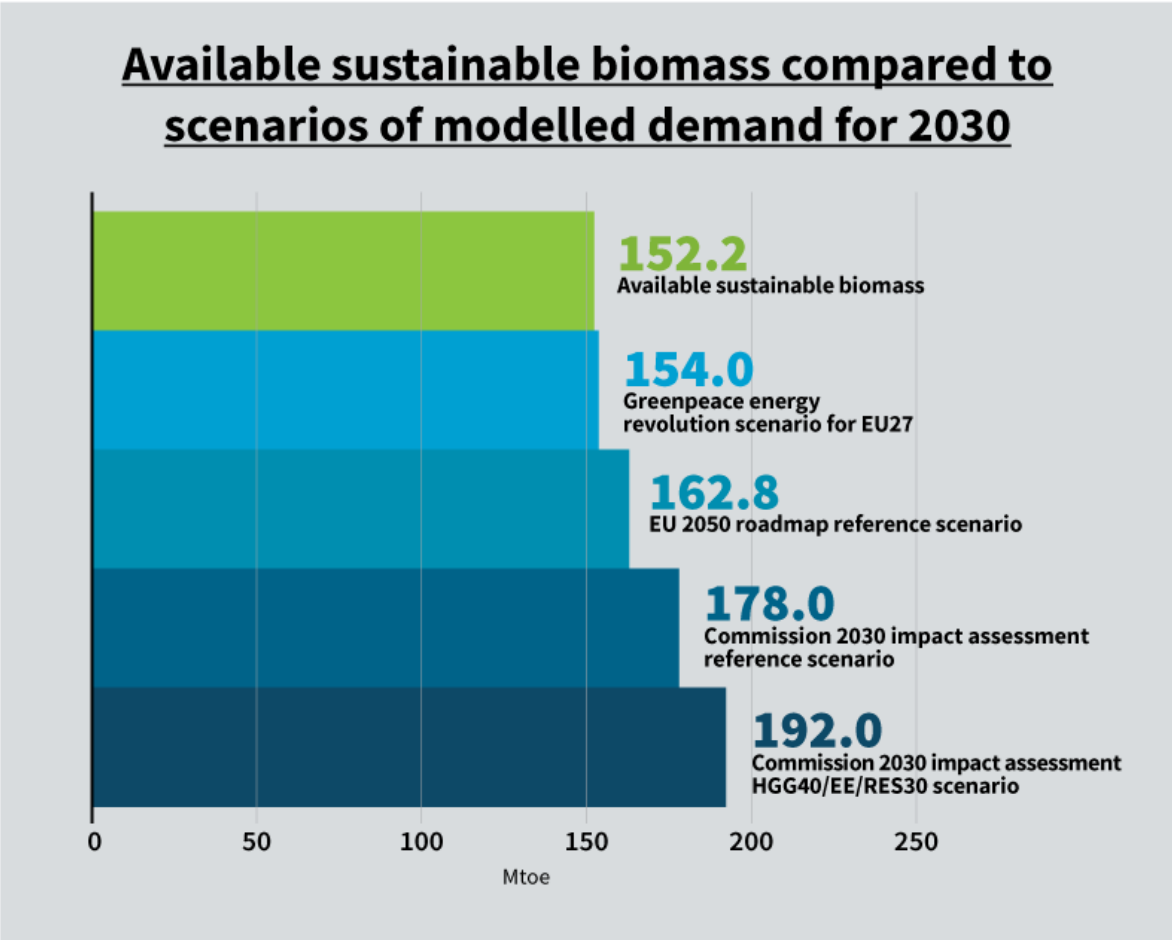
[8] http://www.birdlife.org/sites/default/files/a_new_eu_sustainable_bionenergy_policy_2016.pdf



Comparing these figures to the European Biomass Association (AEBIOM) estimations of current biomass use for energy by type, **there is a clear mismatch between the available sustainable bioenergy types in 2030 and the current use of feedstocks**. AEBIOM estimated that in 2013 70% of EU bioenergy came from forests and forest industries and 17% from agriculture. According to the above image, 40% of 2030 sustainable biomass comes from forests or forest industries and 52% from agriculture. Therefore, it is essential to decrease the use of woody biomass in favour of agricultural residues. The share of wastes is also decreasing, and for instance, the waste biogas potential decreases to 22.4 Mtoe in 2030 mainly due to a lowering of the amount of land-fill gas and manure.

4. Biomass demand in 2030

Different scenarios have been considered to compare the estimated sustainable biomass supply to modelled demand in 2030. The figure above illustrates a higher demand compared to the sustainable potential available in all scenarios. The Greenpeace energy revolution scenario for EU27 assumes a 42.6% share for renewables and total energy demand of 1024 Mtoe in 2030. The roadmap 2050 Reference scenario is a 'business as usual scenario' with current trends combined with the EU meeting its 2020 and 2050 climate targets as well as the 20% renewable target for 2020. The Commission's 2030 impact assessment reference scenario assumes current policies with no new legislation, while the GHG40/EE/RES30 scenario assumes GHG savings of 40%, increased energy efficiency and 30% renewables.



5. Conclusions and policy recommendations

The contribution made by sustainable biomass to the European renewable energy mix will be relatively modest and not enough to meet projections. To ensure sustainable use of bioenergy the EU should set strict conditions for the kind of biomass used and set a limit to energetic use of biomass.

We recommend the following in order to ensure that the EU to reaches its 2030 renewable energy and GHG emissions savings targets in a sustainable way:

- **Adopt an EU-wide limit** on the amount of bioenergy used to meet the EU's 2030 climate and energy targets, including a phase out of biofuels from food and energy crops;
- **Exclude high-risk biomass sources** such as biomass from protected areas, stumps and roundwood and crops from agricultural land (unless evidence is provided that this enhances the environmental conditions of the habitats in question);
- **Limit the extraction** of agricultural and forest residues to safe levels;
- Ensure that **biomass for energy doesn't displace other existing uses** of the biomass and is in line with the principles of cascading use and the waste hierarchy;
- **Ensure affected communities**' Free Prior and Informed Consent and respect of their human, labour and land rights in the production and use of biomass for energy;
- **Introduce a minimum efficiency threshold** for energy installations and fuel manufacturing producing bioenergy or biofuels;
- **Increase investments for the development of renewable energies other than bioenergy** that have significantly more cost-effective growth potential.

Further information

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Annex 1.

Technical potential, Potential for energy use and sustainable potential (Mtoe) of bioenergy in the EU

	Technical potential		Potential for energy use		Sustainable potential	
Feedstock	2020	2030	2020	2030	2020	2030
Forest stemwood	132.8	134.2	35.9	28.2	15.6	7.6
Forest residues	51.2	52.4	51.2	52.4	10.3	10.4
Non-forest wood and residues	59.2	53	48.2	42.6	48.2	42.6
Agricultural waste	148.2	157.2	98.8	104.8	49.4	52.4
Manure	27.7	24.9	21.7	18.9	21.7	18.9
Sewage	4.7	4.9	2.9	3	2.9	3
Used cooking oil	2.1	2.2	1.1	1.2	1.1	1.2
Ligno-cellulosic waste	27.4	17.8	20.2	9.1	12.6	8.1
Landfill gases	2.9	0.5	2.9	0.5	2.9	0.5
Energy crops	34.7	36.4	34.7	36.4	7.2	7.4
Total	490.9	483.5	317.6	297.1	171.9	152.2

Technical potential is the available biomass for all uses under normal current framework conditions with the current technological possibilities including existing harvesting techniques, infrastructure and accessibility and processing techniques.

Potential for energy use is a proportion of the technical potential after satisfying other existing and projected competing uses of the same biomass feedstocks.

Sustainable potential constricts energy potential based on the sustainability criteria.