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A comparison of national sustainability schemes for solid biomass in the EU

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Author: Kenneth Richter
The report was edited by Fern

Cover photo: Fred Pearce (Bioenergy plant, Bardejov, Slovakia).
Other photos: Linde Zuidema

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Foreword

There are no harmonised sustainability criteria for bioenergy or the sourcing of biomass across the European Union (EU). EU Member States have therefore largely relied on domestic Sustainable Forest Management (SFM) rules to guide the way they source biomass. Some have introduced sustainability criteria to determine whether bioenergy projects are eligible for renewable energy subsidies.

Fern commissioned Kenneth Richter to research some Member State policies and compare them with the European Commission's (EC) recommended biomass sustainability criteria. This report is the result of that research. It is not an exhaustive analysis of all the ways Member States ensure biomass is produced sustainably, but it provides valuable insights into where there are gaps. The report concludes with suggestions for how EU policies could begin to address some of these shortcomings.

The report is not intended to be a final answer to the complex problem of ensuring EU use of biomass for energy is truly sustainable, renewable and low carbon. Instead we hope it will open up and help guide discussion. We welcome comments, corrections and suggestions to help build a picture of what works to ensure biomass production is sustainable, and where there needs to be improvements.

Recommendations

To achieve a sustainable bioenergy policy, EU policy makers cannot solely rely on SFM. Any policy must tackle demand and ensure biomass is only used where it has verifiable climate benefits, is resource efficient and has no negative impacts on the environment and people.

We recommend that the EU:

1. **Adopts a binding sustainability policy for bioenergy** that covers all bioenergy types and sources, and puts the responsibility for proving bioenergy is sustainable and efficient on the energy operator.

2. **Introduces safeguards that go beyond SFM** and focus on quality as well as quantity. This will restrict overall amounts of biomass use for energy to levels that can be sustainably supplied and halt the use of biomass sources that have negative impacts on the climate, the environment and people, or would hamper efficient use of the limited wood resource.

3. **Adopts further measures to ensure biomass is used in the most efficient way.** For example, by requiring minimum conversion efficiency and by applying the cascading-use principle and/or the principles of the waste hierarchy.

4. **Adopts more detailed and ambitious requirements for systems to verify compliance with binding sustainability criteria.** This will ensure only best practices are promoted.

Linde Zuidema

Introduction

Since 2009, the EU has been promoting renewable energy production with the aim of reaching its target of producing 20 per cent of all energy consumption from renewable sources by 2020.[1] Its financial incentives have driven a huge surge in bioenergy, which today accounts for 65 per cent of EU renewable energy consumption and is expected to remain at this level until 2020.[2,3]

Around three-quarters of bioenergy comes from biomass used for electricity, heat and cooling. The main material used is wood,[4] and demand is increasing rapidly.[5]

Increased use of wood for bioenergy is controversial, because of the negative impacts on the climate, the environment and people.[6,7] In a 2014 report on solid biomass, the EC stated: "Biomass for bioenergy production can negatively affect forest biodiversity and carbon stocks through direct land use change (deforestation) and unsustainable forest management (e.g. forest degradation due to excessive removal of raw material)."[8] Research shows that carbon stock changes in forests can have a significant negative effect on the ability of bioenergy to reduce carbon emissions.[9]

Fern's briefing note *'The limited availability of wood for energy',* shows that increasing bioenergy demands are likely to intensify EU forest management, and increase land use, deforestation and forest degradation in other parts of the world.[10]

The European Environmental Agency has also warned that growing biomass demand is already increasing pressure on forest ecosystems and biodiversity.[11] Further intensification of forest management could reduce forests' capacity to sequester and store carbon, and affect their resilience to climate change.[12] Other negative impacts of subsidised bioenergy production include increased competition between industries reliant on biomass resources, and deteriorating air quality.[13,14]

1 The EU Renewable Energy Directive (2009/28/EC) provides the legal basis for Member States to implement subsidy schemes for the production of renewable energy in the EU.
2 EEA Report No 4/2016, Renewable Energy in Europe 2016, Recent growth and knock-on effects
3 Commission SWD (2014) 259, 'State of play on the sustainability of solid and gaseous biomass for electricity, heating and cooling.'
4 Around 70 per cent of the feedstock used for bioenergy is wood; wood accounts for approximately 45 per cent of the total renewable energy production today. See EEA report No 4/2016, Renewable Energy in Europe 2016, Recent growth and knock-on effects
5 UNECE/FAO Forestry and Timber Section, Joint Wood Energy Enquiry shows between 2007 and 2013, the amount of wood used for energy in Europe increased annually by 5.4 per cent. The proportion of energy produced from wood grew from 4.4 to 5.8 per cent during the same period. The report further confirms that a larger share of the wood supply is being mobilised for energy purposes (from 38.9 per cent in 2007 to 46.5 per cent in 2013).
6 The Renewable Energy Directive only includes sustainability criteria for biofuels, not for biomass use for the generation of electricity, heating and cooling.
7 The results of a public consultation carried out by the Commission in 2011 showed that a number of stakeholders are concerned that large-scale biomass use in the heat and power sectors may lead to negative impacts in the EU and in third countries.
8 Commission SWD (2014) 259, 'State of play on the sustainability of solid and gaseous biomass for electricity, heating and cooling.'
9 JRC report (2013) Carbon accounting of forest bioenergy. Agostini A et al., Forest Research (2016) Carbon impacts of biomass consumed in the EU: quantitative assessment, Matthews R et al.
10 Fern (2015) Bioenergy briefing note 1: the limited availability of wood for energy
11 European Environmental Agency report (2015) Measuring the state of nature in the EU. See also EEA report No 5/2016, European Forest ecosystems, state and trends
12 Commission SWD (2014) 259, 'State of play on the sustainability of solid and gaseous biomass for electricity, heating and cooling.' See also Verkerk PJ (2015) Assessing impacts of intensified biomass removal and biodiversity protection on European forests. Dissertationes Forestales 197
13 Paper and pulp companies are experiencing increased competition over the biomass resource from subsidised bioenergy facilities in the EU and the US; see for instance the response from CEPI to the EC Consultation on the Renewable Energy Directive, and (regarding impacts in the US) Risi (2015) An Analysis of UK Biomass Policy, US South Pellet Production and Impacts on Wood Fiber Markets, Walker S et al., and Forisk Consulting (2015) How can global demand for wood pellets affect local timber markets in the US South? Lang AH et al.
14 See for instance PFPI (2011) Air pollution from biomass energy.

The EU has acknowledged the need for sustainability criteria for solid biomass.[15] In the absence of binding EU sustainability criteria, some Member States have designed their own sustainability policies for the use of solid biomass for electricity, heating and cooling – sometimes based on recommended criteria designed by the EC.[16]

The European Council has agreed a renewable energy target of at least 27 per cent by 2030 and the EC is currently developing proposals for how to achieve that. As part of this, the Commission has committed to proposing a post 2020 sustainable bioenergy policy to:

> *"maximise the resource-efficient use of biomass in order to deliver robust and verifiable greenhouse gas savings and to allow for fair competition between the various uses of biomass resources in the construction sector, paper and pulp industries and biochemical and energy production. This should also encompass the sustainable use of land, the sustainable management of forests in line with the EU's forest strategy and address indirect land-use effects as with biofuels."*[17]

This report profiles and compares existing sustainability standards for solid biomass, and provides insights relevant to the debate on the post-2020 sustainability bioenergy policy. Policies and schemes analysed include that of EU Member States, the US state of Massachusetts, and Sustainable Biomass Partnership voluntary standards. The conclusions are intended to feed into upcoming discussions around post 2020 renewable energy and bioenergy policies.

Clearcut alongside Roanoke river, North Carolina. This is a sourcing area for Enviva.

15 See for instance the European Parliament's resolution on the 2030 climate and energy framework (2013/2135(INI), in which the EP requested that the Commission proposes sustainability criteria for solid and gaseous biomass, taking into account lifecycle greenhouse gas emissions in order to limit the inefficient use of biomass resources.

16 Report from the Commission to the Council and the European Parliament, COM(2010)11, on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling.

17 See Communication from the Commission, COM(2015)80 final, A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy; and Commission's Energy Union strategy, COM/2015/080 final

Sustainability issues related to bioenergy

Ensuring that forests are managed sustainably

Careful forest management (including biomass removals) can help forests become more productive, increase the quality and quantity of soil and water, improve their carbon sequestration potential, and secure a safe habitat for biodiversity. It can also help prevent forest fires.

However, intensification of management can endanger the necessary healthy mix of tree ages and species, and lead to fragmentation and increasing use of harmful fertilisers. Intensifying biomass removals can reduce biodiversity protection, carbon sequestration, water and soil quality and local community benefits.[18] Sustainability criteria aim to balance out the economic, social and ecological functions that forests provide.

The EU's current renewables policy was initially aimed at increasing the use of industrial residues (such as saw mill dust) and forest harvest residues (such as small branches). However, economic and technical constraints limit the availability of these residues for bioenergy production, and so roundwood, directly sourced from the forest, is also currently used.

The removal of residues, deadwood and roundwood each pose threats to the sustainability of forests, as they all have important roles to play for soil and water quality, biodiversity protection and carbon storage. Exceeding sustainable harvest levels such as by removing stumps or whole trees has an immediate negative effect on the forest ecosystem.

SFM is an area of national competence and the EU has not defined criteria or indicators. To ensure forests are managed sustainably, Member States have developed their own rules. Most Member States rely solely on domestic SFM regulations to ensure the sustainable sourcing of biomass for energy. Other Member States such as the UK and the Netherlands have introduced specific criteria for sourcing biomass for energy.

SFM rules, and the ways they are applied and enforced, vary greatly across the EU, some being more robust and effective than others.

SFM rules, and the ways they are applied and enforced, vary greatly across the EU, some being more robust and effective than others.[19] There are also problems that go beyond SFM such as unsustainable demand for biomass and how to ensure bioenergy reduces greenhouse gases, is used in the most efficient manner and doesn't increase competition for raw materials.

The Netherlands sustainability standards for bioenergy include specific SFM requirements, which provide criteria for the protection of water and soil quality and the "long-term

18 UN Economic Commission for Europe (2001), European Forest Sector Outlook Study II. See also Verkerk PJ (2015) Assessing impacts of intensified biomass removal and biodiversity protection on European forests. Dissertationes Forestales 197.

19 See e.g. Results Integral project; European Environment Agency (2015) The European Environment – state and outlook 2015: an integrated assessment of the European Environment; EEA (2016) European forest ecosystems – state and trends; Standing Forestry Committee ad hoc working group, Final Report (2015) Sustainable Forest Management Criteria and Indicators.

conservation of carbon stocks."[20] This standard also includes a limit on the amount of biomass that can be removed from a forest site for bioenergy purposes as a share of the total harvest. This approach aims to ensure that a forest is not harvested primarily for bioenergy. The Dutch government has further adopted a volume cap on biomass co-firing in coal-fired power plants, which has been implemented as another precautionary measure to avoid excessive environmental and climate impacts.[21]

The US state of Massachusetts has also adopted specific measures limiting the harvest rate of forest residues, to ensure that soil nutrients are replenished. The range extends from a maximum of 30 per cent of the weight of the forest products removed, in the case of highly productive soils, to zero per cent for poor soil conditions.[22]

There is a specific challenge with regard to biomass imports from third countries, some of which have weak or no rules on SFM. The south-eastern US, for example, is the most important source of wood pellets for bioenergy production in the UK, Belgium and the Netherlands.[23] Investigations by the Natural Resources Defense Council (NRDC) and Dogwood Alliance have shown that the regions' last remaining wetland forests are under imminent threat of clear-cuts because of the sudden rise of wood pellet production for the EU market.[24,25]

Ensuring social criteria protect people and livelihoods

Bioenergy production can have an impact on peoples' lives and livelihoods. Perhaps the most obvious social impacts come from the increased use of agricultural land and deforestation in the global South for the production of crops for biofuels. In the latest revision of the Renewable Energy Directive, the EU adopted a volume cap on biofuels produced with food crops, with the aim of avoiding excessive competition leading to food scarcity or food price volatility.

There is a danger of more land being used to grow energy crops – this can lead to increasing land conflicts and harm communities livelihoods.

However, there are also potential negative social impacts in the case of woody biomass use. Because European forests can only provide a limited amount of biomass, increasing demand leads to increasing competition over wood resources and to further imports from third countries. As a result there is a danger of more land – especially agricultural land – being used to grow woody bioenergy crops. This can lead to further pressure for land use change, can increase land conflicts and can harm communities' livelihoods.

In some Member States, the social aspect is integrated in the general SFM requirements. Of the Member States examined, only the Netherlands has included a social dimension in its bioenergy standard; this specifically aims to promote reasonable employment and training activities for the local population and opportunities for the timber market, as well as activities that develop the local infrastructure and social services.[26]

20 Netherlands Enterprise Agency (2015) SDE+ sustainability requirements for co-firing and large scale heat production
21 Sociaal Economische Raad (2013) Energieakkoord voor duurzame groei (Energy Agreement for Sustainable Growth).
22 Renewable Energy Portfolio Standard, Massachusetts Department of Energy Resources 2012.
23 According to the US's NGO Southern Environmental Law Center, no south-eastern state has laws or regulations that prohibit or restrict wetland logging or clearcutting, protect old growth or endangered forests, prevent the conversion of natural forests to plantations, restrict the size of forestry operations, or regulate rotation cycles; SELC, NRDC and Dogwood Alliance (2014) letter to Minister Henk Kamp, Netherlands.
24 Natural Resources Defense Council (NRDC) Report, 'In the U.S. Southeast, Natural Forests Are Being Felled To Send Fuel Overseas,' October 2015.
25 NRDC (2014) 'Wood Pellet Feedstock Investigation in Ahoskie, North Carolina.'
26 Netherlands Enterprise Agency (2015) SDE+ sustainability requirements for co-firing and large scale heat production.

The Sustainable Biomass Partnership voluntary standard requires that "legal, customary and traditional tenure and use rights of indigenous peoples and local communities related to the forest are identified, documented and respected."

Ensuring that greenhouse gas emissions are reduced

Biomass emits carbon-dioxide (CO2) when it is combusted for energy. Burning wood inherently emits more CO2 per thermal unit than other fuels such as gas and coal.[27]

The current EU renewable energy policy promoted bioenergy as a low-carbon energy on the basis of two assumptions:

1. that bioenergy is a carbon-neutral energy source. That the carbon emitted during the bioenergy production process is fully compensated for by future growth of trees, and

2. that bioenergy emissions are correctly accounted for.

Both these assumptions have been challenged, and the question of how emissions should be dealt with under a future policy is still open.[28]

Greenhouse gases are emitted at different stages of the bioenergy production process. There are biogenic emissions from a reduced forest carbon stock, peripheral emissions, and emissions from indirect effects, such as land use changes.[29]

Biogenic emissions

Biogenic emissions are caused by the reduction in the carbon stock of the forests, caused by biomass removal or by natural decay of the biomass. The higher the impact of biomass removal on the forest carbon stock and the forest's ability to sequester carbon from the atmosphere, the more difficult it will be to recuperate these by future growth. If harvest levels increase because of bioenergy production, sufficient regrowth is not possible to recuperate the emissions from the initial biomass combustion.

Peripheral emissions

Peripheral emissions are those greenhouse gas emissions that result from fossil fuel use during the cultivation, harvesting, processing and transport of biomass.

Indirect emissions

Bioenergy consumption can increase global land use and thus indirectly increase deforestation and associated emissions. This phenomenon is referred to as indirect land-use change (ILUC).[30] When biomass production (for energy) displaces agricultural production, it might result in the conversion of forest land to agricultural land. In the case of solid biomass, ILUC emissions can

27 See e.g. briefing by the Partnership for Policy Integrity 'Carbon emissions from burning biomass for energy', and Volker Quaschning (2015) Regenerative Energiesysteme

28 JRC scientific report (2013) Carbon accounting of forest bioenergy; Chatham House working paper, 'Forest-based biomass energy accounting under the UNFCCC: finding the "missing" carbon emissions.' Nora Greenglass, June 2015. Why LULUCF cannot ensure that bioenergy reduces emissions www.fern.org/lulucf&bioenergy.

29 One tonne of dry wood burnt in a power station emits 1.8 tonnes of CO2 into the atmosphere.

30 Ecofys, IIASA, E4Tech (2015), The land use impact of biofuels consumed in the EU.

be caused by the increase of plantations for trees or short-rotation coppices. Increased use of wood for energy can also indirectly increase emissions in other sectors. For example, increased use of woody raw materials for bioenergy can mean the construction sector displaces their wood use with more carbon-intensive materials, such as concrete.[31]

The EC's policy recommendations only cover peripheral emissions. They fail to account for biogenic and indirect emissions. A carbon calculation tool designed by the UK's Department for Energy and Climate Change (DECC) demonstrates that including biogenic emissions in the calculation can nullify the presumed emission reductions from bioenergy production, or even result in more net emissions than burning coal. Burning roundwood is particularly carbon intensive.[32]

The EC's policy recommendations only cover peripheral emissions. They fail to account for biogenic and indirect emissions.

Several Member States have followed the EC recommendations and have implemented sustainability frameworks that set thresholds for peripheral emissions from bioenergy. The Dutch standard demands a 70 per cent greenhouse gas reduction of bioenergy compared to fossil fuels.[33] It also includes measures to avoid bioenergy with high biogenic and indirect emissions. To prevent significant biogenic emissions, the standard allows industrial residues (such as saw dust), but excludes the use of stumps or wood from production forests that have been recently converted from natural forests. It also limits roundwood from forests with a rotation period of over 40 years. This follows a similar approach by the US state of Massachusetts that only allows forest residues and thinnings for bioenergy production, and limits the overall level of harvest of those feedstocks.

Limiting certain biomass sources would be more effective than simply relying on existing SFM rules. SFM rules provide no guarantee that carbon stocks will be enhanced in the long term. Another problem is that SFM cannot ensure that the limited wood resource is used in the most climate-beneficial way. Even if all wood was harvested sustainably, wood would still be burnt that could have been used much more efficiently from a climate perspective. SFM is also unable to deal with indirect emissions.

SFM cannot ensure that bioenergy reduces greenhouse gas emissions.

As yet the Netherlands is the only country to have introduced criteria for biomass that addresses ILUC:

> *"ILUC risks should be determined on the basis of the methodology and requirements of the LIIB (Low Indirect Impact Biofuels) methodology or those of an equivalent method. Only biomass that can be demonstrated to involve a "small risk of ILUC" is acceptable."*[34]

Ensuring that air pollution is reduced

Bioenergy production can also release other pollutants. Burning biomass emits particulates such as nitrogen oxides (NOx), heavy metals, carbon monoxide and polyaromathic hydrocarbons (PAHs).

31 JRC report (2013) Carbon accounting of forest bioenergy. Agostini A et al., Forest Research
32 Ibid.
33 A maximum of 56 g CO2eq/MJ for electricity and 24 g CO2eq/MJ for heat. Under the UK's criteria the relevant GHG emission threshold is 79.2 g CO2eq/MJ for electricity.
34 Netherlands Enterprise Agency (2015) SDE+ sustainability requirements for co-firing and large scale heat production.

This air pollution begins at the start of the bioenergy production chain - the pellet mills. Communities near pellet mills can experience increased levels of wood dust in the air, which is classed as a carcinogen by the International Agency for Research on Cancer.[35,36] This is a reason for the American Lung Association's opposition to biomass as a source of electricity production.[37]

The final combustion of biomass is also problematic. Traditionally, household biomass combustion has been the major source of particulate emissions in the EU, accounting for about one third of all EU-27 particulate matter (PM) emissions.[38] Now that biomass is also being used for industrial energy production, this share has become higher.

In particular, mono-nitrogen oxides (NOx) contribute to the formation of ground-level ozone, a potent greenhouse gas which impairs the ability of plants to fix carbon, and can lead to smog and air pollution.[39] PM emissions are a cause of respiratory health problems.

The EU has regulated some aspects of air pollution through various directives on specific pollutants and air quality.[40] These restrict the emissions of acidifying pollutants, particulates and ozone precursors from combustion plants.[41]

Some Member States, such as the Netherlands, the UK and Austria, have implemented regulations for bioenergy emissions as part of a support scheme for bioenergy.[42] The Renewable Heat Incentive (RHI), for example, provides a maximum threshold for emissions[43] and biomass boilers that do not have a RHI emission certificate will be ineligible for subsidies. The latest bioenergy call for tender in France (see France section) sets limits for particulate emissions and NOx depending on the size of the installation.[44]

Ensuring efficient use of limited biomass resources

Biomass is a limited resource, and with a growing world population and a developing bio-economy, the EU has realised that a resource-efficient use of biomass is key. The EU's 7th Environmental Action Programme recognises the importance of assessing the availability of sustainable biomass in light of energy demand and the ongoing debate about land use for bioenergy in relation to food security. The Action Programme states:

> *"it is vital to ensure that biomass in all its forms is produced and used sustainably and efficiently over its whole life cycle, so as to minimise or avoid negative impacts on the environment and climate and with due regard for the economic context of the various uses of biomass as a resource."*[45]

35 Dogwood Alliance (2016) 'The South Has a New Commodity Export (and not everyone is happy about it)'; see also blog by Markinch Biomass Concerns, 'Wood dust and public health.'
36 International Agency for Research on Cancer, List of Classifications.
37 See statement by the American Lung Association (2011), and an article by John Chandler, member of the leadership board of the American Lung Association in Maine, April 2016.
38 Commission SWD (2014) 259, 'State of play on the sustainability of solid and gaseous biomass for electricity, heating and cooling.'
39 Department for Transport, Department of Energy and Climate Change, Department for Environment, Food and Rural Affairs (2012) UK Bioenergy Strategy, p. 73.
40 See Directive 2004/107/EC, Directive 2008/50/EC, Directive 2001/80/EC.
41 Commission SWD (2014) 259, 'State of play on the sustainability of solid and gaseous biomass for electricity, heating and cooling.'
42 The Dutch Incentive Scheme for Sustainable Energy Production (SDE+), the UK Renewable Heat Incentive (RHI) and the Austrian Green Electricity Act, Feed-in tariff (ÖSG).
43 30 g PM per gigajoule (g/GJ) net heat input and 150 g/GJ for NOx (expressed as NO2).
44 Cahier des charges de l'appel d'offres portant sur la réalisation et l'exploitation d'installations de production d'électricité à partir de biomasse.
45 Decision No 1386/2013/EU of the European Parliament and of the Council of 20 November 2013 on a General Union Environmental Action Programme to 2020 'Living well, within the limits of our planet'.

In addition to preventing the overexploitation of natural resources, this focus on resource efficiency is important to prevent increased competition over natural resources. Subsidies for bioenergy have already distorted the market and increased competition for wood, particularly affecting the paper and particle board industries.[46]

Burning biomass is raw material leakage, as it leaves the circular economy at the point of incineration.

The EC's Circular Economy Package recognises the tension between bioenergy and the development towards a circular economy. It calls for a cascading use of renewable resources and aims to "promote synergies with the circular economy when examining the sustainability of bioenergy under the Energy Union."[47] Burning biomass is raw material leakage, as it leaves the circular economy at the point of incineration. The importance and usefulness of the cascading use principle has already been recognised by several EU institutions.[48]

An assessment of existing sustainability rules shows that in attempts to ensure the efficient use of woody biomass some Member States focus on:

1. an overall volume cap on use of solid biomass
2. a minimum threshold for combustion efficiency
3. application of the 'cascading use principle', and
4. prohibiting the use of certain feedstocks for energy, such as roundwood.

Generally speaking, biomass use for heating and combined heat and power (CHP) is more efficient than using it for electricity-only production. Energy conversion efficiency can be 60–90 per cent compared to an average of 30–35 per cent for dedicated electricity plants.[49] The EC's recommended biomass sustainability requirements stipulate that "to stimulate higher energy conversion efficiency, Member States should in their support schemes for electricity, heating and cooling installations differentiate in favour of installations that achieve high energy conversion efficiencies, such as high efficiency cogeneration plants as defined under the Cogeneration Directive."[50] The Austrian, German and French standards for bioenergy set energy efficiency thresholds of 60, 70 and 75 per cent respectively for different biomass combustion technologies, either as an absolute minimum or as a requirement for receiving a higher level of subsidy.[51]

The cascading use principle aims to ensure that biomass is used first for material uses such as high-grade wood for the construction sector, followed by use for lower-grade applications, such as particle board and other agglomerated materials. In a cascading approach, energy conversion is the last step in the use hierarchy.

Biomass from waste is not eligible for the Flemish Green Power Certificates if it has potential commercial value when recycled into materials. In Hungary, for waste biomass, power plants

46 WWF technical report (2016), Mapping study on Cascading use of wood products
47 Communication from the Commission COM(2015) 614 final, Closing the loop – an EU action plan for the Circular Economy.
48 Cascading use of biomass: opportunities and obstacles in EU policies, T&E/Birdlife/EEB.
49 Commission SWD (2014) 259, 'State of play on the sustainability of solid and gaseous biomass for electricity, heating and cooling.'
50 Report from the Commission to the Council and the European Parliament, COM(2010)11, on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling.
51 The Austrian Ökostromgesetz (ÖSG) requires a conversion efficiency of 60 per cent in order to qualify for feed-in tariff (FIT) subsidies. The German Erneuerbare Energien Gesetzt (EEG) requires minimum electrical efficiency factors: e.g. 70 per cent efficiency to qualify for support as a highly efficient CHP plant. In France the latest call for tender for biomass CHP plants to receive subsidies requires a minimum efficiency of 75 per cent.

have to possess a declaration from the Environment Authority that the waste cannot be used for purposes other than fuel.

Some Member States have attempted to avoid distorting the biomass market by limiting or prohibiting the use of certain feedstocks for bioenergy production that other sectors also rely on heavily. In Belgium, for example, woody feedstocks suitable for the wood-processing industry are not eligible for bioenergy subsidies. To determine whether specific timber flows may be used as raw material for bioenergy, the Flemish Energy Agency asks for approval from the Public Waste Agency of Flanders (OVAM) and the federations of the paper and wood-using industries. In Poland and Hungary, subsidies for bioenergy produced with stem wood with a diameter above a certain size are either limited or disallowed.[52] The Netherlands has stipulated that harvests for bioenergy can never be the main purpose of the primary harvest. Finland has recently adapted their tariff system for bioenergy to discourage the use of coarse round wood.[53]

Verification of compliance

Making bioenergy production subject to sustainability criteria also brings into question how compliance should be monitored and enforced.

In the context of biofuels, studies have shown that a plethora of national frameworks and voluntary certification schemes are being applied, some of which are insufficiently robust to ensure that biofuels are produced sustainably.[54]

A plethora of national frameworks and voluntary certification schemes are being applied.

With regard to showing compliance with SFM requirements, Member States allow the use of certification methods such as Programme for the Endorsement of Forest Certification (PEFC) or Forest Stewardship Council (FSC). The Netherlands requires that the management system used includes specific measures aimed at long-term conservation or expansion of carbon stocks.[55] Relying on certification to verify compliance with sustainability criteria is controversial, as certification systems can be weak in terms of standards, governance, stakeholder consultation, transparency, dispute resolution, audit practices and non-compliance.[56]

Despite concerns about how lax certification can be, some Member States weaken these rules even further. The UK also allows companies to submit "documentary evidence that proves the source is legal and sustainable", and a "risk-based approach" whereby constituting a low risk of non-compliance in a certain region is sufficient.

52 Commission SWD (2014) 259, 'State of play on the sustainability of solid and gaseous biomass for electricity, heating and cooling.'

53 For information on the Finnish standard see HE 360/2014

54 See WWF (2013) Searching for sustainability – comparative analysis of certification schemes for biomass used for the production of biofuels; and ClientEarth (2013) Achieving credible EU-wide verification of biofuel sustainability.

55 These include issues such as the current state of the management unit, long-term objectives, average allowable cut per forest type, and measures aimed at long-term conservation or expansion of the carbon stocks.

56 Climate for Ideas, Forest of the World, Greenpeace, et al. (2011) On the ground 2011: the controversies of PEFC and SFI. See also WWF (2013), Searching for sustainability, a comparative analysis of certification schemes for biomass used for the production of biofuels.

Existing bioenergy sustainability standards: a detailed assessment

Enviva wood pellet plant, Southampton North Carolina.

The European Commission's recommended criteria

The EU's 2009 Renewable Energy Directive (RED)[57] lays down binding sustainability criteria for biofuels for transport and bio-liquids used in other sectors, but not for solid or gaseous biomass used for electricity, heating and cooling. In February 2010, as required by Article 17(9) of the RED, the Commission published a report[58] on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling. It did not propose EU-wide sustainability criteria, but left it to "those Member States that wish to introduce a scheme at national level, in order to avoid obstacles for the functioning of the internal market for biomass."

The report stipulated two main differences with the RED criteria due to the different uses of biomass in heat and electricity installations and its uses as liquid fuels in cars:

— that a greenhouse gas methodology should be used that includes an energy conversion efficiency factor,[59] and

57 Renewable Energy Directive (2009/28/EC).

58 Report from the Commission to the Council and the European Parliament, COM(2010)11, on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling.

59 The RED GHG methodology for transport biofuels accounts only for GHG per MJ of transport fuel, but disregards the conversion into transport energy in the vehicle, as this is highly dependent on the car's fuel efficiency. The proposed GHG methodology for solid fuel in heat and electricity, however, includes a factor accounting for the efficiency of the conversion of the fuel into final energy commodity (heat, cooling or electricity), which depends on the efficiency of the installation.

— that support schemes should favour installations with high efficiency, for example CHP.

The EC-recommended criteria do not include SFM, social criteria, air quality or competition over feedstocks with other wood-using industries. The greenhouse gas accounting methodology ignores biogenic emissions and emissions from ILUC.

A brief overview of the criteria recommended by the EC is presented in Table 1.

Table 1: Overview of EC sustainability requirements

Issue	Criterion
Ecological criteria	Raw material should not come from high biodiversity value areas, high-carbon stock areas, or peatlands.
Social criteria	Not applicable.
Carbon reductions	Minimum greenhouse gas saving of 35 per cent, rising to 50 per cent on January 2017 and to 60 per cent from 1 January 2018. Based on the RED greenhouse gas calculation methodology accounting only for peripheral emissions.
Air quality	Not applicable.
Resource efficiency	National support schemes should favour installations with high efficiency.
Verification of compliance	Economic operators show compliance with the criteria using the 'mass balance' method for verifying the chain of custody. Compliance with the criteria can be proven in three ways: (1) voluntary schemes which address one or more of the sustainability criteria (2) bilateral or multilateral agreements with third countries (3) Member States' national verification methods
Other	Agricultural raw materials cultivated in the Community are obtained in accordance with specific agricultural regulations of the EU.
Comment	Wastes and residues only need to fulfil the minimum greenhouse gas requirements, not the other criteria.

Member States

An inventory commissioned by the EC found that in 2012 some form of sustainability regulation for biomass had been introduced in 20 Member States.[60] These regulations vary dramatically in their content and all fail to cover all sustainability issues discussed in the previous chapter. For example most disregard sustainable sourcing completely. This may be due to the lack of harmonised binding sustainability criteria at the EU level, and the different roles that bioenergy plays across the EU.

Some Member States have not set any mandatory bioenergy-specific sustainability requirements and rely on voluntary industry standards or existing rules for sustainable agriculture or SFM. Belgium, the Netherlands and the UK have developed relatively detailed sustainability criteria.

The choice of which Member States to cover in this section was primarily influenced by information availability, either online, or through interviews with partner organisations or governmental officials. This is not a comprehensive overview of all existing sustainability policies for bioenergy. It looks at a number of notable examples to give an idea of the approaches taken.

60 Vito (2012) Benchmarking biomass sustainability criteria for energy purposes, Pelmans L *et al.*

Belgium

In the federal country of Belgium, energy policy is devolved to the three regions of Flanders, Wallonia and Brussels, resulting in differences between the criteria for bioenergy. In all regions, bioenergy is supported by the introduction of green certificates.

Flanders has a mandatory obligation for electricity suppliers to produce a set percentage of renewable energy, supported by tradable green certificates. The amount of green certificates awarded to bioenergy depends on its life cycle energy balance. For example, if the energy input from the production and transportation of biomass equates to 20 per cent of the net energy output, the energy produced receives only 80 per cent of a green certificate.

A brief overview of the criteria applicable in Belgium is presented in table 2.

Table 2: Overview of Belgian criteria

Issue	Criterion
Ecological criteria	Not applicable.
Social criteria	Not applicable.
Carbon reductions	In the Walloon and Brussels region, the eligibility for the number of green certificates depends on the emissions reduction of bioenergy compared to fossil energy, per kWh of electricity generated (only accounting for peripheral emissions from biomass production and transport). In Flanders no emissions limit applies. Instead the life cycle energy balance determines the amount of subsidies received (see below).
Air quality	Not applicable.
Efficient use of biomass	In Flanders, regional woody resources are not eligible for green certificates if they can be used by the wood-processing industry, except in the case of bark, sawdust, fine pruning wood with a diameter less than 4 cm, twigs of tree crowns with a diameter less than 4 cm, and stumps up to 30 cm above the ground. To determine whether specific regional timber flows – other than the exceptions mentioned above – may be used for bioenergy, the Flemish Energy Agency asks for consent from the Public Waste Agency of Flanders (OVAM) and the federations of the paper and wood-using industries.*
Verification of compliance	Not applicable.

* Besluit van de Vlaamse Regering houdende algemene bepalingen over het energiebeleid.

The current bioenergy sustainability requirements are fiercely debated by the competing sectors (the energy, paper, and wood-processing industries). This has caused delays for some bioenergy facilities in the country.[61] Belgium's sustainability policy has two major loopholes: it does not deal with SFM and the criteria do not apply to imported wood. The Flemish government is working on a proposal for a more comprehensive standard, expected to be published in 2016.

Denmark

Denmark has not implemented any mandatory requirements for sustainable biomass. Instead the Danish District Heating Association and the Danish Energy Association have introduced a voluntary sustainability standard for biomass. This voluntary standard requires that between 2016 and 2019, CHP installations gradually work towards compliance of their biomass fuel input with the requirements (from 40 per cent in 2016 to 100 per cent in 2019).[62]

A brief overview of the voluntary criteria applicable under the Denmark industry standard is presented in the Table 3.

61 The Max Green facility was shut down a part of 2014 because the wood-based industry refused to give their consent to the use of more biomass for energy purposes.

62 Dans Energi, Dansk Fjernvarme, Brancheaftale om sikring af bæredygtig biomasse.

Table 3: Overview of Danish criteria

Issue	Criterion
Ecological criteria	The Danish industry standard is modelled on the UK's sustainability criteria and requires the same requirements of the UK's Timber Procurement Policy standard (see the UK section below).
Social criteria	Social and work-related rights must be respected.
Carbon reductions	The Danish industry standard requires a greenhouse gas reduction of 70 per cent from 2015. It uses the Biograce II methodology which accounts for peripheral emissions and includes an energy conversion efficiency factor as recommended by the EC. The standard does not account for emissions from carbon stock changes and ILUC. The agreement says "the industry will work to develop" criteria for these. In order to ensure a 'climate-appropriate carbon balance', the industry aims not to use biomass: (i) where there is regionally competing demand for high-value wood resources (ii) that comes from trees that are grown on fertile soil, which has been unwisely converted from agriculture to forestry (iii) which is to blame for deforestation in the region (iv) which negatively affects the quality and quantity of forest resources in the medium and long term.
Air quality	Not applicable.
Efficient use of biomass	Industry aims not to use biomass if regionally there is alternative demand for high-value production.
Verification of compliance	Fulfilment of the requirements must be documented through annual reporting written by third parties. The report is not subject to control by the authorities. Certification can be through FSC or PEFC.
Other	Not applicable.

France

In France, bioenergy is subsidised through a 'call for tender' system. Companies have to bid for contracts to supply energy at a set price, above market rates. The sustainability criteria are specific to each call for tender, and the criteria described in Table 4 are specific to the call for tender from 2016.[63] To be eligible for subsidies, depending on regional rules, between 8 and 22 per cent of the feedstock that is domestically sourced needs to be certified (PEFC or FSC). All imported wood for bioenergy use needs to be PEFC or FSC certified. Installations need to have a conversion efficiency of at least 75 per cent in order to be eligible for subsidies and roundwood is not eligible. French rules allow for exceptions in case there is a shortfall of (renewable) energy in a certain region.

A brief overview of the criteria applicable in France is presented in Table 4.

Table 4: Overview of French criteria

Issue	Criterion
Ecological criteria	SFM requirements.
Social criteria	Not applicable.
Carbon reductions	Roundwood is excluded.
Air quality	Limits for particulate and NOx depending on the size of the power plant.*
Efficient use of biomass	Conversion efficiency at least 75 per cent.
Verification of compliance	PEFC or FSC.

* Cahier des charges de l'appel d'offres portant sur la réalisation et l'exploitation d'installations de production d'électricité à partir de biomasse.

63 Cahier des charges de l'appel d'offres portant sur la réalisation et l'exploitation d'installations de production d'électricité à partir de biomasse

Germany

The German Renewable Energy Law provides different levels of subsidies for different types of bioenergy production.[64] For example, biogas from waste and manure are treated preferentially over the use of crops. Small-scale bioenergy installations are also treated preferentially. Its amendment decrees that the increase of total electricity production from biomass per year in Germany should not exceed 100 megawatt installed capacity. Additionally subsidies for biomass are set to decrease by 0.5 per cent every three months from 2016 and this figure will be altered to 1.27 per cent where the 100 megawatt limit has been breached.[65]

The German bioenergy sustainability act only applies to liquid biofuels, and has not implemented criteria for solid biomass use for heating and electricity.[66] However, the energy company Vattenfall and the state of Berlin have come to a voluntary agreement on biomass sustainability for Vattenfall's biomass power station there.[67]

A brief overview of the criteria applicable in Germany is presented in Table 5, mostly restricted to the voluntary Vattenfall agreement.

Table 5: Overview of German criteria

Issue	Criterion
Ecological criteria	Protection of ecosystems with high biodiversity, and preservation of carbon stocks and protection of environmental quality, including soil quality and structure, water quality and use. (Restricted to the voluntary Berlin–Vattenfall agreement).
Social criteria	(Restricted to the voluntary Berlin–Vattenfall agreement). Protection of employment rights, protection of land and land-use rights, protection of operational transparency, making a positive contribution to improvement of living conditions of stakeholders in the project environment and a responsible approach to the local population.
Carbon reductions	(Restricted to the voluntary Berlin–Vattenfall agreement). A 50 per cent greenhouse gas reduction over two years compared to coal, following the accounting methodology of the EC-recommended criteria. Preservation of carbon stocks.
Air quality	Some limits for dust and carbon monoxide emissions have been set under the Ordinance on requirements for small- and medium-scale heating installations.*
Efficient use of biomass	Erneuerbare Energien Gesetz (EEG) requires 70 per cent efficiency to qualify for support as a highly efficient CHP plant.
Verification of compliance	(Restricted to the voluntary Berlin–Vattenfall agreement). The Vattenfall agreement does not prescribe a particular verification scheme but recommends Roundtable on Sustainable Biofuels, International Sustainability Carbon Certification, FSC, PEFC and ISO TC 248 'Sustainability Criteria for Bioenergy'.

* Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen).

64 Erneuerbare Energien Gesetz – EEG.
65 This measure was implemented to make the renewables market more competitive.
66 Biomassestrom-Nachhaltigkeitsverordnung – BioSt-NachV.
67 Vereinbarung über die Nachhaltigkeit der Biomassebeschaffung zwischen dem Land Berlin und Vattenfall.

Hungary

Hungary's Electricity Production Act stipulates that it does not support the use of forest products that are not certified, or were not felled according to the prescriptions of the Forestry Act (including illegal logging), for the production of energy.[68] Nor does it support the use of forestry products that are of higher quality than firewood.[69] Specifically, no subsidies are provided for bioenergy produced from stem wood with a diameter above 10 cm.[70]

Power producers are required to provide proof that their biomass is obtained from sustainable forestry, by presenting a certificate from an EU forestry authority, or an FSC or PEFC certificate.[71]

For waste biomass, power plants need to have a declaration from the Environment Authority that the waste cannot be used for purposes other than fuel.

A brief overview of the criteria applicable in Hungary is presented in Table 6.

Table 6: Overview of Hungarian criteria

Issue	Criterion
Ecological criteria	Proof of SFM.
Social criteria	Not applicable.
Carbon reductions	Not applicable.
Air quality	Not applicable.
Efficient use of biomass	No use of stem wood over 10 cm. To use waste biomass, facilities need to show that the waste cannot be used for purposes other than fuel.
Verification of compliance	FSC, PEFC or EU forestry certificate.

Netherlands

In 2013 the Dutch government, the energy sector and environmental organisations negotiated an Agreement on Energy for Sustainable Growth which provided the basis for the Support Sustainable Energy Production (SDE+) programme.[72] This means that energy companies can sign subsidy agreements for the period 2015–23. The agreements run for eight years for co-firing plants and twelve years for steam plants. As part of the agreement, sustainability criteria for biomass are being negotiated by the energy sector and environmental organisations.[73]

A first draft of these sustainability criteria was published in 2015, with a final version due to be published in the spring of 2016. The main issue still to be negotiated was the certification standard.

The SDE+ criteria will apply to electricity production from biomass (including co-firing) and large-scale heat production.[74] They include criteria on SFM, greenhouse gas balance, carbon debt, ILUC, soil quality, legality and chain of custody.

68 Hungarian Electricity Production Act, 2007/LXXXVI, § 9.2.c.
69 Personal communication with Norbert Kohlheb, Szent István University, Hungary.
70 Commission SWD (2014) 259, 'State of play on the sustainability of solid and gaseous biomass for electricity, heating and cooling.'
71 Republic of Hungary, National Renewable Action Plan
72 http://www.rvo.nl/subsidies-regelingen/stimulering-duurzame-energieproductie-sde
73 http://www.energieakkoordser.nl/doen/engels.aspx
74 Netherlands Enterprise Agency (2015) SDE+ sustainability requirements for co-firing and large scale heat production.

A brief overview of the draft criteria in the Netherlands is presented in Table 7.

Table 7: Overview of Dutch criteria

Issue	Criterion
Ecological criteria	Exclusion of biomass sourced from: (i) sites of high conservation value or equivalent; (ii) converted forest land. Soil and water quality shall be maintained: "The quality of the soil in the forest management unit shall be maintained and, if necessary, improved. In this connection, particular attention should be paid to shores, riverbanks, erosion-prone sites and slopes… The water balance and water quality of ground-water and surface water in the forest management unit, as well as downstream (outside the forest management unit) shall be maintained, at the very least, and, where necessary, improved."
Social criteria	"Forest management shall provide reasonable employment opportunities for the local population, including indigenous peoples, and provides opportunities for the local processing of timber and non-timber forest products... Measures such as training activities must be introduced, to boost employment for the local population, including indigenous peoples… The forest manager shall implement additional activities, helping to develop the local physical infrastructure, social services, and programmes for the local population, including indigenous peoples. All such contributions are made in consultation with the local population."
Carbon reductions	Minimum threshold of 70 per cent greenhouse gas reductions compared to fossil fuels. Calculation method of EU RED methodology applies. Assumes carbon-neutrality of biomass combustion and thus only accounts for peripheral emissions. Carbon debt is dealt with by allowing/excluding certain feedstocks and requiring evidence to show that the forest is managed for the "long term conservation of carbon stocks." Feedstocks allowed are tops and branches and roundwood up to 23 per cent of the economic value of a timber harvest. Thinnings are also allowed. Stumps are excluded. ILUC emissions are addressed through a risk-based approach, based on the Methodology for Low Indirect Impact Biofuels.
Air quality	Not applicable.
Resource efficiency	Not applicable.
Verification of compliance	An SFM management system should consist of: (i) a description of the current state of the forest management unit (ii) long-term objectives (iii) average annual allowable cut per forest type and, if applicable, the annual allowable commercial exploitation of non-timber forest products, based on reliable and timely data (iv) measures aimed at the long-term conservation or expansion of carbon stocks (v) a budget for the implementation of the forest management plan. A management system can be implemented at the mill level, rather than at the level of an individual forest. A chain of custody system needs to be in place, and each member must register quantity, names and certificate numbers. It is permissible to mix material, and up to 30 per cent of non-compliant (though not illegal) material is permitted.
Other	Economic requirements are that the production capacity of the forest shall be maintained, that there shall be protection against illegal exploitation, and that biomass production shall contribute to the local economy through jobs and infrastructure.

This is the most comprehensive standard yet developed, dealing with most of the sustainability issues that are relevant for bioenergy production. The only issues not covered are resource efficiency and competition over raw materials in the forest-based sector. The social criteria do not prevent potential competition with food production. Another important flaw is the carbon accounting methodology, which ignores biogenic emissions (carbon stock changes).

United Kingdom

In 2013, the UK introduced SFM criteria for wood fuel based on the UK government's timber procurement policy (UK TPP), initially for reporting purposes only. The criteria became mandatory for wood fuel subsidised under the Renewable Heat Incentive (RHI) on 5 October 2015, and for wood fuel used for electricity generation subsidised under the Renewables Obligation on 5 December 2015.[75] Similar requirements are to be written into the UK's new subsidy scheme, Contracts for Difference, which is replacing the Renewables Obligation.

To be eligible for subsidies, energy generators must demonstrate that at least 70 per cent of all wood fuel in a consignment meets the definition of 'legal and sustainable' according to the criteria in Table 8.[76]

A brief overview of the criteria applicable in the United Kingdom is presented in Table 8.

Table 8: Overview of UK criteria

Issue	Criterion
Ecological criteria	To meet the UK TPP definition of sustainable sources, timber and wood products must meet legality requirements and come from a forest which is managed in accordance with a definition of sustainable that meets the requirements set out below. The definition of sustainable forestry must be consistent with a set of international principles and criteria defining SFM at the forest management unit level. Sustainable management of the forest must ensure: (i) harm to ecosystems is minimised and productivity of the forest is maintained (ii) forest ecosystem health and vitality is maintained, and (iii) biodiversity is maintained.
Social criteria	The UK TTP includes social sustainability requirements relating to the respect of legal, customary and traditional tenure rights, mechanisms for resolving grievances, and safeguarding basic labour rights.
Carbon reductions	These must meet the limit for peripheral greenhouse gas emissions. The carbon accounting methodology is based on RED methodology.
Efficient use of biomass	Not applicable.
Verification of compliance	SFM should be verified at the forest management unit level. Verification can take place through certification schemes (FSC or PEFC) or through bespoke evidence collected and submitted by the company itself (known as category B evidence).* The Timber Standard permits the use of a mass balance approach to trace sustainability through the supply chain.

* UK Government Timber Procurement Policy Framework for evaluating Category B evidence.

Although the UK standard for sustainable bioenergy was one of the first standards that apply in the EU, it is not very robust. The standard includes a minimum threshold for greenhouse gas reductions, but is based on a flawed calculation methodology, ignoring biogenic emissions from carbon stock and (indirect) land use changes. On SFM, the standard applies a risk-based approach, assessing merely the *risk* of unsustainable forest management at a regional level, not at the forest stand level.[77] It also allows for weak and controversial forest certification systems (such as PEFC) to verify sustainable sourcing of the wood. Another loophole is that the standard requires that only 70 per cent of the biomass used in a certain facility complies with sustainability criteria.

The following two sustainability frameworks are not EU Member State frameworks, but instead look at two alternative frameworks for comparison.

75 Electrivity, England and Wales, The Renewables Obligation Order 2015.
76 Woodfuel Advice Note.
77 Risk Based Regional Assessment: A Checklist Approach.

US state of Massachusetts

In Massachusetts, biomass is eligible for subsidies under the Renewable Portfolio Standard if it complies with certain sustainability criteria.

A brief overview of the criteria applicable in Massachusetts is presented in Table 9.

Table 9: Overview of Massachusetts criteria

Issue	Criterion
Ecological criteria	Restrictions that limit 'Eligible Biomass Woody Fuels', predominantly to timber harvest residues (tops and branches left after a logging operation), instead of whole trees.* A limit on the amount of eligible biomass residues removed from a forest site. This ensures that sufficient woody material is left on the forest floor to replenish soil nutrients and provide wildlife habitat. The rules also include measures to protect old growth forests, critical habitats, and sensitive soils.
Social criteria	Not applicable.
Carbon reductions	Strict criteria for carbon accounting ensure that the policy achieves emissions reductions. These include a requirement that biomass-fuelled power plants conduct lifecycle carbon emissions analyses and demonstrate emissions reductions of at least 50 per cent over 20 years. The greenhouse gas life cycle analysis includes a carbon debt emissions factor.**
Air quality	Generation units must possess a valid air permit.
Efficient use of biomass	A requirement that encourages the most efficient use of eligible biomass: overall efficiency of a biomass generation facility must be 50 per cent to qualify for one-half Renewable Energy Credit (known as a REC) per megawatt hour of electricity, with credits increasing linearly to a full credit once overall efficiency hits 60 per cent or above.
Verification of compliance	Companies need to submit 'Eligible Forest Biomass Tonnage Reports' certified by a professional forester. The Department shall conduct document inspections, audits, or site visits for the purpose of verification.
Other	Not applicable.

* NRDC (2012) New Rules in Massachusetts Offer Model for Rewarding Good Biomass.
** State of Massachusetts (2012) Renewable Portfolio Standard – Biomass Policy Regulatory Process.

Biomass Assurance Framework (BAF) of the Sustainable Biomass Partnership

The Sustainable Biomass Partnership was formed in 2013 by European large-scale bioenergy producers. The Partnership's Standard was developed as a voluntary certification framework to enable companies to assure end users that their feedstocks are 'legally and sustainably sourced', and to demonstrate compliance with mandatory sustainability legislation.

The definitions of 'sustainable' and 'legal' in the Partnership Standard are adapted from UK TPP category B evidence that allows companies to use their own evidence (rather than an independent certification scheme) to demonstrate sustainability. It permits 'a risk-based regional approach' that addresses legality and sustainability criteria at a regional rather than individual forest level.[78]

A brief overview of the criteria in the Sustainable Biomass Partnership Standard is presented in Table 10.

78 SBP Framework Standard 2: Verification of SBP-compliant Feedstock.

Table 10: Overview of Sustainable Biomass Partnership criteria

Issue	Criterion
Ecological criteria	Management of the forest ensures must ensure that: (i) features and species of outstanding or exceptional value are identified and protected (ii) the forest's ecosystem function is assessed and maintained (iii) productivity is maintained (iv) the forest ecosystem's health and vitality is maintained (v) appropriate mechanisms are in place for resolving grievances and disputes (vi) regional carbon stocks are maintained or increased over the medium to long term; and (vi) there is no use of genetically modified trees.
Social criteria	(i) legal, customary and traditional tenure and use rights of indigenous peoples and local communities relating to the forest must be identified, documented and respected (ii) basic labour rights of forest workers must be safeguarded (iii) appropriate safeguards must be in place to protect the health and safety of forest workers.
Carbon reductions	No depletion of carbon stocks.
Air quality	Biomass producers have to implement control systems to make sure that air quality is not adversely affected by forest management activities.
Efficient use of biomass	Not applicable.
Verification of compliance	Regional risk-based approach, which is based on a desk-based assessment against the criteria which results in a risk rating for each indicator. For risks identified in the supply base, appropriate mitigation measures must be defined, implemented and monitored.* Existing Chain of Custody certification systems are used based on the mass balance system. As such, the criteria allow a batch of certified feedstock to contain up to 30 per cent feedstock that does not meet criteria ('controlled feedstock'). Certification at pellet mill level.
Other	Compliance with the requirements of local, national and applicable international laws, and the laws applicable to forest management

* SBP Framework Standard 2: Verification of SBP-compliant Feedstock.

The risk-based approach is not robust, is poorly defined and vulnerable to potential exploitation. There is no exclusion of feedstocks. The Standard does not stipulate what evidence must be provided to demonstrate compliance with each indicator. Although it does provide examples of the means of verification, the examples are illustrative and not normative. This means that it is up to the producer to decide what type of evidence they provide. No greenhouse gas standard is supplied (as requirements differ according to country), instead the biomass producer collects relevant data (verified by a certification body) and the end user undertakes greenhouse gas calculations. NGOs have criticised the Biomass Assurance Framework as "not fit for purpose to support serious efforts to tackle the sustainability problems around a significant increase in biomass use for energy."[79]

79 'Joint NGO Consultation (2014) Feedback on the Biomass Assurance Framework of the Sustainable Biomass Partnership.

Overview of existing standards[80]

Issue / country	EU	NL	UK	DK	DE	BE	FR	HU	MA	SBP
Legally binding?	Non-binding	Binding, eligibility for subsidies for electricity and large-scale heat	Binding, eligibility for subsidies for electricity and heat	Non-binding (voluntary industry standard for CHP)	Non- binding (voluntary industry standard for state of Berlin); efficiency standards are binding	Binding, eligibility for subsidies	Binding, eligibility for subsidies; criteria newly defined for each tender	Binding, eligibility for subsidies for electricity	Binding, eligibility for subsidies	Non-binding (voluntary industry standard)
Scope of criteria	Excludes waste and residues from criteria apart from GHG requirement					Only applies to domestically sourced biomass, regionally different schemes				
Ecological criteria										
Excluding harvests from certain land, e.g. high biodiversity areas, high carbon stock areas, peatlands, etc.	Raw material should not come from high biodiversity value areas, HCS or peatland	No biomass from sites of high conservation value, no conversions of forests; soil and water quality must be maintained	Along the lines of EU RED land criteria: restrictions on the use of biomass sourced from land with high biodiversity or high carbon stock value such as primary forest, peatland or wetland	EU RED land criteria: restrictions on the use of biomass sourced from land with high biodiversity or high carbon stock value such as primary forest, peatland or wetland	Protection of ecosystems with high biodiversity, preservation of carbon stocks and protection of environmental quality; protection of environmental quality, including soil quality and structure, water quality and use, (Vattenfall agreement only)				Limit on the amount of eligible biomass residues that can be removed from a forest site	Risk assessment and appropriate mitigation measures must be defined, implemented and monitored. Features and species of outstanding or exceptional value are identified and protected – the forest's productivity and ecosystem's health and vitality should be maintained
Social criteria										
		'Shall contribute to local economy through jobs and infrastructure'			Protecting employment rights, protection of land and land-use rights, protecting operational transparency, making a positive contribution to improvement of living conditions of stakeholders in the project environment and a responsible approach to the local population (Vattenfall agreement only)					Legal, customary and traditional tenure and use rights of indigenous peoples and local communities relating to the forest, are identified, documented and respected Appropriate mechanisms are in place for resolving grievances and disputes The basic labour rights of forest workers are safeguarded Appropriate safeguards are in place to protect the health and safety of forest workers

80 EU, European Union; NL, the Netherlands; UK, United Kingdom; DK, Denmark; DE, Germany; BE, Belgium; FR, France; HU, Hungary; MA, US State of Massachusetts; SBP, Sustainable Biomass Partnership.

Issue / country	EU	NL	UK	DK	DE	BE	FR	HU	MA	SBP
Climate criteria										
Greenhouse Gas (GHG) savings threshold	Min. GHG savings threshold 35% rising to 60% by 2018	Max. of 56 g CO2eq/MJ electricity and 24 CO2eq/MJ heat	For most operators the relevant max. GHG emission threshold is 79.2 g CO2eq/MJ electricity)	GHG reduction of 70% from 2015, based on Biograce II methodology	A 50% GHG reduction over two years compared to coal (Vattenfall agreement only)	Level of green certificates depending on emission savings		-	Min. GHG savings threshold of 50% over 20 years	No min. GHG savings threshold applies. Biomass producer required to collect and report on GHG data
Carbon debt, carbon stock changes (biogenic emissions)		Only allows certain feedstocks (no stumps and limited roundwood), but no carbon accounting of carbon stock changes					Excludes the use of roundwood in last tender for bioenergy	Use of logs bigger than 10 cm diameter are is not eligible for subsidies	Limits 'Eligible Biomass Woody Fuels,' to timber harvest residues. The carbon accounting methodology includes carbon debt emissions	
ILUC (or other indirect emissions)		Only feedstocks with 'low ILUC risk'								
Air quality (specific to bioenergy)			Under RHI, the maximum permitted emissions are 30 grams per gigajoule (g/GJ) net heat input for PM and 150 g/GJ for NOx		Some limits for dust and CO emissions for small and medium-scale heating installations		Call for tender sets limits for particulate and NOx depending on the size of the power plant		Generation unit must possess a valid air permit	The biomass producers has to implement control systems to make sure that air quality is not adversely affected by forest management activities
Efficiency										
	Aims to favour most efficient uses of biomass for energy, e.g. by efficiency conversion threshold				Erneuerbare Energien Gesetz (EEG) requires 70% efficiency to qualify for support as highly efficient CHP plant	Cascading principle: Regional woody resources are not eligible for green certificates if they can be used by the wood processing industry (but exceptions); biomass from waste is not eligible for the Flemish Green Power Certificates if it has potential commercial value when recycled into materials	Cascading principle: No use of primary agricultural products; the latest call for tender requires 75% combustion efficiency	Cascading principle: For waste biomass, power plants have to possess a declaration from the Environment Authority that the waste cannot be used for purposes other than fuel; Electricity Generation Act that prohibits firing of logs bigger than 10 cm of diameter in power plants	Overall efficiency of a biomass generation facility must be 50% to qualify for one-half Renewable Energy Credit (known as a REC) per megawatt hour of electricity, with credit increasing linearly to a full credit once overall efficiency hits 60 percent or above; Only timber harvest residues are eligible wood fuels	
Verification of compliance										
	Mass balance method Voluntary schemes recognised by the EU agreements with third countries or national verification method	Mass balance or percentage-based claim; Certification to be decided; requires SFM management system. Can be at mill level	Mass balance; SFM verified through certification PEFC, FSC or through bespoke evidence)	Mass balance; SFM verified through certification PEFC, FSC or bespoke evidence	Recommends RSB, ISCC, FSC, PEFC and ISO TC 248		SFM verified through certification	Requires proof of SFM		Mass balance; does not stipulate what evidence must be provided to demonstrate compliance with each indicator. The standard does provide examples of the means of verification, but examples are illustrative and not normative

Conclusion

Despite a lack of harmonised sustainability requirements, the EU has put in place policy incentives that have led to biomass becoming the main renewable energy source in the EU. As wood is the main feedstock used, there has been a corresponding increase in demand for the limited wood resource. Today, around 45 per cent of renewable energy production is met by burning wood.

The EC has indicated that if Member States were to use the amount of biomass indicated in their renewable energy plans, by 2020 the amount of wood used for energy alone would be equivalent to today's total EU wood harvest.[81] The EC expects that demand will exceed available supply before 2020 and that the bioenergy market will increasingly rely on imports.[82] It has acknowledged the need for a sustainability policy to maximise the resource-efficient use of biomass, to deliver robust and verifiable greenhouse gas savings, and to use land and forests more sustainably, in line with the EU Forest Strategy.[83]

The increasing use of wood for energy could lead to negative impacts on forest ecosystems and peoples' livelihoods in Europe and beyond, exacerbate climate change, worsen air quality and present an obstacle to more efficient uses of wood. Demand for biomass for energy production is already placing a strain on European forests, particularly regarding their biodiversity levels.[84]

There is a need to look beyond how forests are being managed, and also consider how wood is being used.

SFM is a notoriously tricky concept, and one that is not part of the EU's competences. But even in a best case scenario where each Member State was able and willing to define and implement SFM policies that were strong enough to reduce harvesting to sustainable levels, there is a need to look beyond how forests are being managed, and also consider how wood is being used. The EU Renewable Energy Policy increases subsidies for bioenergy, which increases demand. This increased demand can reduce availability of wood for material uses, which are more climate-friendly as they lock-in, rather than release carbon. Increased use of biomass for energy is also a significant barrier to the development of a circular economy, as wood is burnt before being used for its myriad other possible purposes.

Only a few Member States have developed mandatory sustainability standards for bioenergy, but these vary significantly and most are not comprehensive in their approach. Some Member States have introduced only very specific requirements for subsidies to be allowed, such as a minimum conversion efficiency standard, or limits to the use of roundwood. The most comprehensive of these are in the Netherlands and the UK, countries that rely heavily on imports of biomass for energy generation.[85] The Netherlands has adopted a volume cap on bioenergy use, a minimum emission reduction threshold for peripheral emissions, and additional requirements to mitigate emissions caused by reduced carbon stock or ILUC. But even the UK and Dutch frameworks fail to fully address all aspects of bioenergy sustainability.

81 EU Forest Strategy (2013)
82 Commission SWD (2014) 259, 'State of play on the sustainability of solid and gaseous biomass for electricity, heating and cooling.' This document projects a reliance of imports for biomass between 15-27 per cent of total biomass supply by 2020.
83 EU Forest Strategy (2013)
84 See e.g. EEA Report No 5/2016, European Forest Ecosystems, state and trends
85 It follows from this dependency, that these Member States would support a harmonisation of sustainability rules in the EU, with the aim to secure their biomass supplies.

Recommendations

We recommend that the EU:

1. **Adopts a binding sustainability policy for bioenergy** that covers all bioenergy types and sources, and puts the responsibility for proving bioenergy is sustainable and efficient on the energy operator.

2. **Introduces safeguards that go beyond SFM** and focus on quality as well as quantity. This will restrict overall amounts of biomass use for energy to levels that can be sustainably supplied and halt the use of biomass sources that have negative impacts on the climate, the environment and people, or would hamper efficient use of the limited wood resource.

3. **Adopts further measures to ensure biomass is used in the most efficient way**. For example, by requiring minimum conversion efficiency and by applying the cascading-use principle and/or the principles of the waste hierarchy.

4. **Adopts more detailed and ambitious requirements for systems to verify compliance with binding sustainability criteria**. This will ensure only best practices are promoted.

Fern office UK, 1C Fosseway Business Centre, Stratford Road, Moreton in Marsh, GL56 9NQ, UK
Fern office Brussels, Rue d'Edimbourg, 26, 1050 Brussels, Belgium
www.fern.org