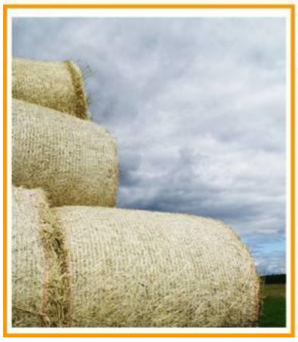



SolidStandards


Enhancing the implementation of quality and sustainability standards and certification schemes for solid biofuels (EIE/11/218)



D2.1b: Sustainability module



Co-funded by the Intelligent Energy Europe
Programme of the European Union

The SolidStandards project

The SolidStandards project addresses ongoing and recent developments related to solid biofuel quality and sustainability issues, in particular the development of related standards and certification systems. In the SolidStandards project, solid biofuel industry players will be informed and trained in the field of standards and certification and their feedback will be collected and provided to the related standardization committees and policy makers.

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About this document

This document is part of **Deliverable 2.1** of the SolidStandards project. It is the training guidebook for the general sustainability module and provides background information to the corresponding presentation slides. This document was prepared in **November 2011** by:

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Intelligent Energy Europe

The SolidStandards project is co-funded by the European Union under the Intelligent Energy Europe Programme (Contract No. EIE/11/218).

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1. Introduction

This chapter starts with a general description of sustainable development in the context of solid biomass use and shows current use and trade of solid biomass in the EU (section 1). In section 2, the calculation of avoided greenhouse gas (GHG) emissions is explained in more detail. Next, this chapter provides an overview of current legislation on the sustainable production and use of solid biomass in EU countries (section 3) and describes existing voluntary sustainability certification systems (section 4).

1.1. Why is sustainability important?

Over the past decades, the use of solid biomass to generate electricity and heat has strongly increased in Europe, driven mainly by government incentive programmes. These incentives are amongst others based on concerns regarding climate change and targets for the use of renewable energy. Next to mitigating climate change, development of bioenergy from solid biomass should also be part of a broader sustainable development strategy. While there are many different definitions of sustainable development, a common element is the ability to meet development needs for current and future generations: The United Nation Brundtland Commission's report defined sustainable development as *"development which meets the needs of current generations without compromising the ability of future generations to meet their own needs"*. In many definitions of sustainability, three main pillars are mentioned: environmental, social and economic sustainability. For the context of solid biomass sustainability standards, we discuss the most important issues in general terms below.

1.1.1. Greenhouse gas emissions

First of all, it is generally accepted by most scientists that current climate change is primarily caused by greenhouse gas (GHG) emissions caused by human activities. The increase of GHG concentrations in the atmosphere has led to the increase of global temperatures and subsequently it interfered with the climatic system. One of the most important reasons to utilize bioenergy is to partially substitute fossil fuel to reduce GHG emissions. However, as there are almost always some input of fossil fuel in the supply chains of solid biomass, GHG emission reductions are typically less than 100% (typically between 70-95%). As GHG emission reduction is generally deemed one of the most important sustainability aspects of solid biomass use for energy, we explain the principles to calculate the avoided GHG emissions in more detail in section 2.

1.1.2. Energy balance

Second, the overall energy balance is also one of the essential criteria to be taken into consideration to optimize the production of bioenergy from solid biomass. The energy balance basically shows how much energy is used as input in the supply chain of solid biomass, and how much (useful) energy is gained at the end of the chain. It is often related to GHG emission because most of the energy inputs along the chain of solid biomass are from fossil fuel. The overall supply and production chain of solid biomass should be carefully assessed to investigate the net emission reduction and energy production.

1.1.3. Land use

Third, for solid biomass produced from energy crops, or residues retrieved from the forest or the field, sustainable land use is important to ensure sustainable productivity of solid biomass and also a stable ecosystem. Many of the factors listed below are also included in sustainable forest management systems.

1.1.3.1. Preservation of carbon stocks

The top layer of many soils contains high organic materials that come from decaying leaves, branches and low quality trees. Also in food crops cultivation, agricultural residues disposed on the soil contribute to the organic content of the soil. These organic carbon stocks are circulated in local ecosystems. Soil carbon content is an important factor to secure productivity of biomass over time. Exploitation of forest (or agricultural) residues should be carried out carefully to minimize the risk on carbon cycle.

Furthermore, dedicated energy crops cultivation is usually associated with land use change issues. Direct land use change (LUC) occurs when energy crop cultivation displaces a different former land use that might have high carbon stock, such as natural forests. Plants capture carbon from the atmosphere and store carbon as biomass. Carbon is stored in a stable cycle if these lands are remained untouched by human. Rapid conversion of natural forest to cultivated use can result in a significant loss of terrestrial carbon through the release of CO_2 to the atmosphere, which may reduce or even cancel out the GHG savings expected from bioenergy. On the other hand, it must be pointed out that if woody energy crops are planted on marginal lands or degraded soils, they may actually improve carbon sequestration, and thus reduce further GHG emissions.

1.1.3.2. Preservation of nutrients

The productivity of forests and energy crops depends upon the nutrients in soil blankets. Plants use large amount of nutrients for their growth and survival. The primary nutrients include nitrogen (N), phosphorus (P) and potassium (K). Other important nutrients are calcium, magnesium, sulphur and other micronutrients. The nutrients return to the soil when biomass decays in the soil (e.g. foliage and dead wood). A balanced nutrient management is important to ensure removing biomass from forest does not increase the risk of negative site impacts. Nutrient replenishment using fertilizer and appropriate harvesting technique are key approaches to secure soil quality and biomass productivity. Certain nutrients such as potassium and calcium remain in ashes after combustion of biomass. Recycling (wood) ash back to the soil as nutrients source may reduce the dependence of energy input in the production of fertilizers, and subsequently improve the GHG savings of bioenergy.

1.1.3.3. Preservation of biodiversity

The potential impacts of dedicated energy crops cultivations (that involve land use change) on biodiversity should not be neglected. In many cases in the past, land use changes have dramatically altered the local biodiversity. Replacing natural ecosystems with simple monocultures of one or two energy crop species may cause dramatic reductions in the number of plant and animal species. Due to changes of land characteristics, many wildlife species may not be able to adapt to these changes. Certain species are invasive and may impose threats to the local species. Choosing suitable crop species and cropping practices is necessary to safeguard sustainable environment and healthy biodiversity. Please note that also the removal of residues (e.g. wood that would otherwise have remained as dead wood in the forest) can have an impact on biodiversity.

1.1.3.4. Minimize impacts on soil and water

Soil blankets are the foundation for the growth of trees and energy crops. Clearing of vegetation imposes risk of soil erosion. Typically this is caused by water flowing across the cleared surface. Removal of plant canopy and vegetation cover expose soil surface to rainfall. Soil may be detached and transported away from a forest or dedicated plantation by means of runoff in rills and gullies. As a result, soil quality is reduced due to loss of the nutrient-rich upper layers of soil. The runoff then moves the sediment into the watercourses and gives rise to off-site effects. Accelerated soil sediments can lead to silting-up of water bodies and contamination of drinking water. This may further lead to disruption of ecosystem and downstream flooding. Besides that, overuse of fertilizers to recover soil fertility may cause contamination of water streams and eutrophication. This does not only impose threats to the ecosystem but also give pressure to clean water resources. Nevertheless, certain species of energy crops (especially perennial crops) can actually provide better protection to soil and nutrients, for e.g. when they are grown on marginal lands. Converting these lands in some cases may actually improve the terrestrial carbon sequestration. Therefore, careful land management is essential to protect the soil blankets. A stable ecosystem with good maintenance of soil and water minimizes the risk of disasters.

1.1.3.5. Indirect land use change (iLUC)

Indirect land use change occurs when energy crops are cultivated on farm lands used for food or other commodities, shifting the original crops to other lands which could be rich in carbon stocks. Consequently, there is risk of releasing more carbon emissions due to conversion of high carbon stocks land into farmlands. Adding the impact of this CO2 emission into greenhouse gas balance may provide a more comprehensive measure of the impact of bioenergy on environment. However, it is difficult to investigate iLUC. Due to iLUC, carbon leakage may happen. Carbon leakage means the increase of carbon emission as a direct result of fostering bioenergy in the country. Therefore, production of energy crops that involves LUC and iLUC should be handled with care to prevent contradicting its original goal of climate change mitigation.

1.1.4. Gas emissions

Fourth, emission of substances (other than CO2) during combustion of solid biomass: these may include amongst others NOx, SOx (although most solid biomass has low sulphur contents) and especially particulate matter (PM). PM in the air is responsible for adverse effects on lung health. However, emission of PM is closely related to the types of wood boilers. Older type of wood boilers may cause more emissions compared to the modern boilers and pellet burners. It is very much depending upon the design of burners to ensure complete burning and filtering of particulate matter. Therefore, to ensure sustainability of the whole bio-energy chain, emission of particulate matter from wood fuels should be carefully controlled and minimized. Combustion of contaminated biomass (e.g. chemically treated waste wood) is only possible in specialized combustion plants to minimize emissions of e.g. heavy metals.

1.1.5. Socio-economic effects

Fifth, socio-economic elements are also part of sustainable development. Within the European context, the social conditions are considered somewhat less important, as generally no issues with child labor or minimum wages occur. Nevertheless, food security has to be ensured if expansion of energy crops cultivation is carried out. As the area globally available for agriculture is restricted, an expansion of biomass cultivation inevitably leads to an increased competition, above all with food production. Converting farmlands to energy crops cultivation may affect domestic food supply. Theoretically, all food needed in Europe could be imported, which would free all agricultural land within Europe for biomass production. However, large increase in food import from outside Europe may cause the rise of food price at global scale. There is a consensus that food security has to be given priority to keep food prices affordable – an issue that is especially relevant in developing countries.

1.1.6. Competition with other industries

In term of the economic sustainability, the most important aspect to point out is competition with other industries. Wood residues such as shavings and saw dust can also be used for e.g. panel board production. The wood panel manufacturing industry has objected to the use of wood residues as being unfair competition (arguing that due to the financial policy support for bioenergy, a higher price can be paid for the raw material by the bioenergy industry). In such situation, a careful and integral discussion is required in what way raw materials can be used optimally. On the other hand, the profitability of wood pellets may be greatly affected by slow growth of the domestic market, stiff export competition, and a depressed sawmills industry limiting feedstock availability. In more general terms, sustainable economic development should aim for a long-term profitable solid biomass trading business, with safe-guards against overexploitation of resources, and also allowing an affordable energy supply to the end-consumers, thus contributing to the stability of the supply and demand.

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1.2. Sustainability in relation to production and trade of solid biomass

In tandem with the renewable energy targets, the use of solid biomass as fuel has increased rapidly in Europe. Fig. 1 shows the solid biomass use in 2006 was 3178 PJ (76 Mtoe) reported by EUBIONET III partners and subcontractors (www.eubionet.net). This means that currently about 48% of the estimated biomass potential is exploited. Firewood is the most used biomass (30%), but the firewood figure is not very accurate because most of the firewood is not traded officially, and good statistics are often lacking. France and Latvia are the biggest users. Industrial by-products and residues represent the next biggest biomass types contributing to the total figure: use of solid by-products covers 20% of the total consumption, whilst the share of spent liquors (mainly black liquor) is 15%. Forest residues comes next with 11% share of the total figure, and is followed by herbaceous and fruit biomass resources (7%), used wood (6%) and refined wood fuels (5%). Forest residues, industrial wood residues and spent liquors are the main biomass sources in Finland, Slovenia and Spain. Herbaceous biomass, mainly straw, is used in Denmark and Poland. Use of wood pellets has strongly increased in many countries in the past decade. Pellets are produced from wood industrial by-products and residues and there might be some overlap with the solid industrial wood residue figures, so pellets are included in resources and use under industrial by-products and residues.

The figures reported by EUBIONET III of biomass use for the EU-24 (excluding Malta, including Norway) cover only solid virgin biofuels (3,115 PJ, 74.3 Mtoe). This is little higher than the EUROSTAT figures. According to EUROSTAT, the total primary bioenergy use in EU27 was 3,730 PJ (89.0 Mtoe) in 2006, which includes solid biofuels 3,052 PJ (72.9 Mtoe), biogas 200 PJ (5.0 Mtoe), waste 243 PJ (5.8 Mtoe) and liquid biofuels 221 PJ (5.3 Mtoe).

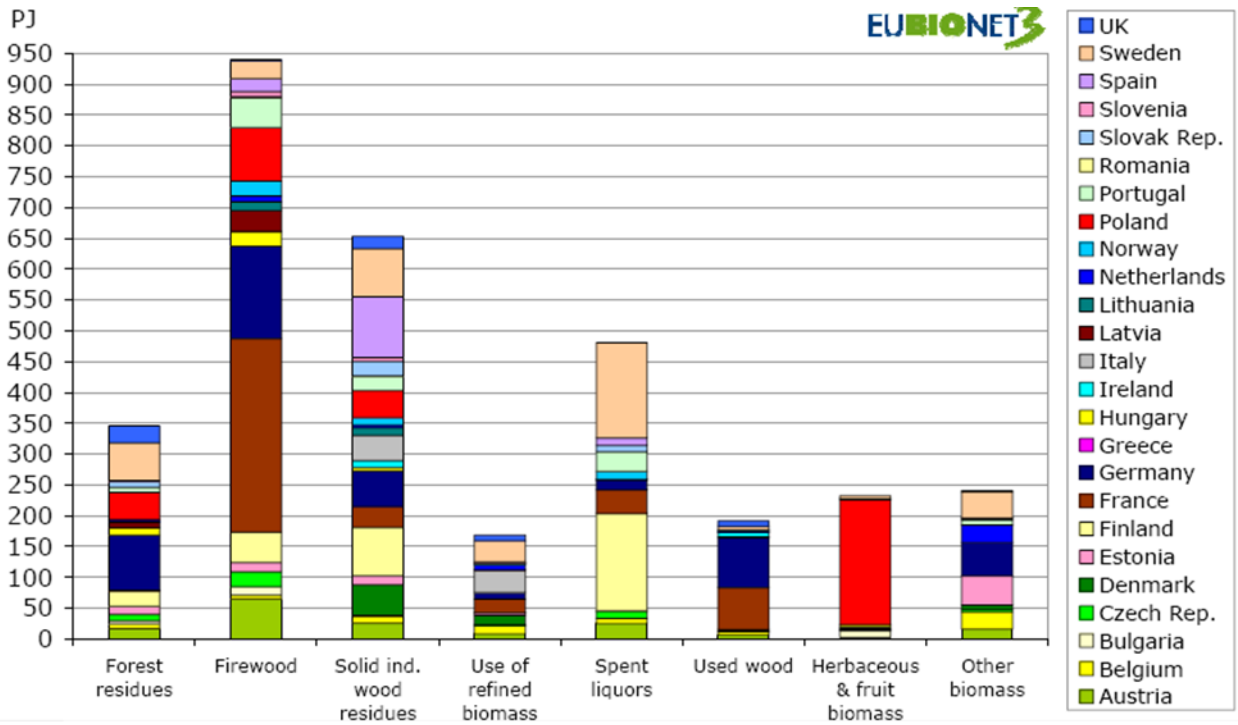

Figure 1: Biomass use in 2006 by sources and countries (Source: Junginger et al., 2010)

The increasing use of solid biomass has stimulated strong growth in solid biomass trading. More than 1.7 million tonnes of solid biomass commodities were traded in Europe in 2009 as reported by the EUBIONETIII project. Generally, solid biomass is traded in the forms of wood pellets (most European countries), wood chips (Denmark, Slovenia, Finland) and fuel wood. The growing demand in Europe has triggered international trading, especially import of wood pellets by countries with little biomass resources and high targets for renewable energy. Solid biomass trading is growing strongly and bound to expand in the future. Main trade routes within Europe reported are (1) Baltic countries, Finland and Russia to Sweden, Denmark, Belgium, the Netherlands and UK by vessel, (2) Austria, Germany and Slovenia (by truck) and Portugal and Spain (by ship) to Italy, and (3) Short distance border trade between Germany and Austria; Sweden and Norway. Apart from trade within Europe, in the last few years, intercontinental trading has shown a steady growth too. Wood pellets from North America (to Belgium, the Netherlands and Sweden) and North West Russia were increasingly imported.

Woody biomass (traded for energy purposes) can be divided into two groups based upon raw materials: (1) residues and waste streams, such as forest residues, agriculture residues and saw dust, and (2) energy crops, such as willow, poplar, pine and eucalyptus. The first group has been regarded as a by-product result from other economic activity over the years, but recently has become valuable materials. It is either traded for energy or incinerated on-site to provide energy for the mills. Due to the increasing demand of wood pellets, supply from residues and waste streams in Europe is gradually reaching its maximum economic potential. This has stimulated (a) increasing imports of solid biomass from outside the EU, and (b) the increasing production of wood pellets from energy crops (i.e. trees and crops grown for the purpose of converting them into energy). Invariably, crops with low cost and maintenance are chosen. In the last few years, wood pellets made from energy crops from US (southern pine species), North West Russia (northern pine species) and Canada (dead trees killed by the mountain pine beetle, a local pest) have entered the European market. However, use of virgin wood (e.g. pulp wood chips) for the production of wood pellets may also increasingly occur in Europe.

Currently, solid biomass is almost exclusively used for generation of heat and/or electricity. However, in the next decades, it is quite likely that demand for solid biomass will increase also for other applications: 2nd generation biofuels are likely to be produced form lignocellulose, and also bio-chemicals, bio-polymers and other bio-materials can be produced from various solid (woody) biomass. As the amount of solid biomass residues is limited, it is quite possible that in the future, increasingly energy plantations will be used, and also more biomass may be imported to the EU, as discussed below.

In the EU, the current sustainability concerns have so far been considered low as most biomass comes from residues and by-products, and also due to a generally healthy forest management governance structure. While intensive extraction of wood residues from forests gives rise to risk of nutrient depletion, the increasing use of energy crops brings up other sustainability issues, as described in section 1.1. Compared to wood residues and waste, the production of energy crops requires external resources such as land, water and fossil energy input. As the use of energy crops may increase in the future, and since sustainable development is the major goal of bioenergy development, the impacts to environment should be carefully investigated in the cultivation of energy crops. On top of that, it is important to inspect the net emission reduced and net energy produced by performing thorough overall emission and energy balance as well as life cycle assessment from planting, pelletization and transportation. Again, this will become more important in the future with more bioenergy from energy crops (and more imports).

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2. Emission and energy balance

Greenhouse gases (GHG) include water vapour, CO_2, methane, nitrous oxide and etc. CO_2 is the largest component in GHG gases besides water vapor. Bioenergy is generally regarded as carbon neutral because CO_2 released during combustion of biomass was in first instance fixed from the atmosphere, and (under sustainable conditions) is captured by newly-planted trees and crops again. Hence, it should therefore not contribute to the overall accumulation of carbon in the atmosphere. This emission-free characteristic is one of the main drivers for the promoting of bioenergy by policy makers. However, due to input of fossil fuel during the production and distribution phases, bioenergy is not entirely GHG emission free. In certain parts of the supply chain, fossil fuels are used to supply electricity, heat and transportation fuels. Emission from these inputs should be taken into consideration to evaluate the GHG savings performed by bioenergy. By conducting life cycle analyses (LCA) it is possible to determine GHG emissions in the chain, and the avoided emission compared to fossil fuel alternative. LCA is generally considered to be an appropriate method to evaluate the GHG performance of bioenergy compared to that of fossil alternatives.

Taking the example of wood pellets, Figure 2 shows the overall emission and energy flow in production of bioenergy using wood pellets. In Figure 2, the pellet chain is divided into five stages:

1. Stage I represents the cultivation of energy crops. This section should be excluded for wood pellets produced from wood residues and by-products. A significant input in this section is fertilizer. Fertilizer is often required to maintain the soil fertility and crops productivity. The GHG generated during the production of fertilizer should not be neglected from the emission balance equation. Besides that, diesels are also used in machineries for harvesting and collecting the woody biomass. For example, the harvesting of pine trees includes felling and skidding trees to land area, processing trees to logs, loading and transportation to the hauling points.

2. Stage II represents the first transportation step. In case of energy crops, harvested trees are transported to pellet mills or central wood chipping terminals that may be located some distance from the harvesting site. In case of wood residues or by-products, the first transport step is typically from a lumber mill to a wood pellet mill. Normally trucks are used for this purpose. Diesel is the major energy input in this stage. In some cases pellet mill can situate in same area with sawmill and transportation is carried pneumatically.

3. Stage III represents the processing of solid biomass. The major consumption of energy comes from grinding, drying, pelletization and cooling in the forms of electricity and heat. After cooling process can include also packaging. Drying and pelletization of woody biomass creates a dense and clean-burning fuel which is easier to transport. It is possible to significantly reduce the GHG missions associated with this stage by using renewable energy instead of fossil fuel such as coal, oil or natural gas to power and heat the processing mill. For example, on-site incineration of low-value solid biomass (e.g. bark) can be carried out to generate heat and electricity for drying and pelletization. In this scenario, the dependence on fossil fuel is greatly reduced and this reduction positively contributes to the overall GHG emission balance.

4. In stage IV, wood pellets are distributed to the end user as bulk material or in sacks (small and big sacks). Besides wood pellets, woody biomass is typically also traded and transported in the forms of wood chips (and in some EU countries small amount of briquettes). In this stage, the expense of energy and hence GHG emission is proportionate to the distance between mills and end-users. Trailer, train and trucks are employed for land-transport. Small vessels such as river barges or coasters are used for transport on canals and short distances over sea (e.g. in the Baltic sea), where as large dry bulk carriers are used for ocean transport for imports from continents. The pellets have to be transported by trucks or trains from pellet plants to port or to end-user e.g. power plant, and loaded on vessels to be transported across the oceans.

5. Stage V represents the production of electricity and heat from wood pellets generated in cofiring power plants, boilers, stoves and fireplaces. Part of the primary energy is lost as waste heat due to process inefficiency. Wood ashes generated after combustion can be recycled as fertilizer to forests and energy crops plantation for nutrients replenishment – if at least the ash is not contaminated, and the forest is near enough. This may reduce emission and energy consumption during the production of fertilizers for stage I.

By comparing Figure 2 with typical fossil power generation, a meaningful comparison of GHG emission can be made. The GHG balance of bioenergy systems varied with feedstock, location (transport) and conversion technologies to produce heat, CHP or electricity. There are also carbon stock changes due to land use change when energy crops are cultivated on existing vegetations. By using the concept of emission and energy balance, the energy flow can be calculated to provide useful indicators to evaluate the sustainability of bioenergy. Indicators such as GHG emission per unit kWh electricity generated gives information on how much GHG savings are achieved by bioenergy referring to fossil fuel energy scenario. Energy input is parallel or proportionate to GHG emission savings, particularly when fossil fuel is used to supply energy to the system. The energy input such as electricity, heat and vehicles fuel need to be deducted from the power generated. Similarly, GHG emitted from these input need to be added into the emission balance. To promote GHG savings, the use of fossil fuel should be minimized in the overall process. For example, using natural gas for drying saw dust should be avoided – rather use bark. Besides that, improving efficiency of electricity and heat generation using wood pellets can also significantly improve GHG savings. As the net energy production is increased, GHG saving is also improved since it is calculated per kWh electricity produced.

Currently there is no single / widely-accepted Life Cycle Analysis (LCA) methodology to calculate GHG emission for solid biomass. Please note that choices of methodology and boundary conditions will have significant effect of the GHG balance measured. Table 1 shows three examples of emission balance studies.

Table 1: Primary energy input and GHG emission balance in three wood pellets case studies (calculation on dry basis) (Source: Sikkema et al., 2010)

Note: Low heating value (LHV) or also referred as Net calorific value (Q) suppose that the products of combustion contains the water vapor and that the heat in the water vapor is not recovered.

Location	Sweden (Industrial)		Italy (Residential)		The Netherlands (Industrial)	
Origin	Saw mills, Europe		Saw mills, Europe		Saw mills, North America	
	Primary energy input (J_{LHV} / $J_{PelletLHV}$)	GHG emissions (kg CO_2 eq. / $GJ_{PelletLHV}$)	Primary energy input (J_{LHV} / $J_{PelletLHV}$)	GHG emissions (kg CO_2 eq. / $GJ_{PelletLHV}$)	Primary energy input (J_{LHV} / $J_{PelletLHV}$)	GHG emissions (kg CO_2 eq. / $GJ_{PelletLHV}$)
Stage I	-	-	-	-	-	-
Stage II	0.01	0.60	0.03	1.60	0.02	1.32
Stage III	0.20 – 0.23	0.30 – 0.41	0.09 – 0.36	4.41 – 6.14	0.28 – 0.32	3.44 – 12.41
Stage IV	0.36	0.21	0.23	4.65	0.07	5.63
Stage V	1.09*	0	1.17*	0	2.49**	0
Stage V (Using fossil input)	1.42*	0.09 per 1 J thermal	1.30*	0.08 per 1 J thermal	3.46**	0.30 per 1 J electricity

*Amount of primary energy consumed to produce 1 GJ thermal energy

**Amount of primary energy consumed to produce 1 GJ electricity

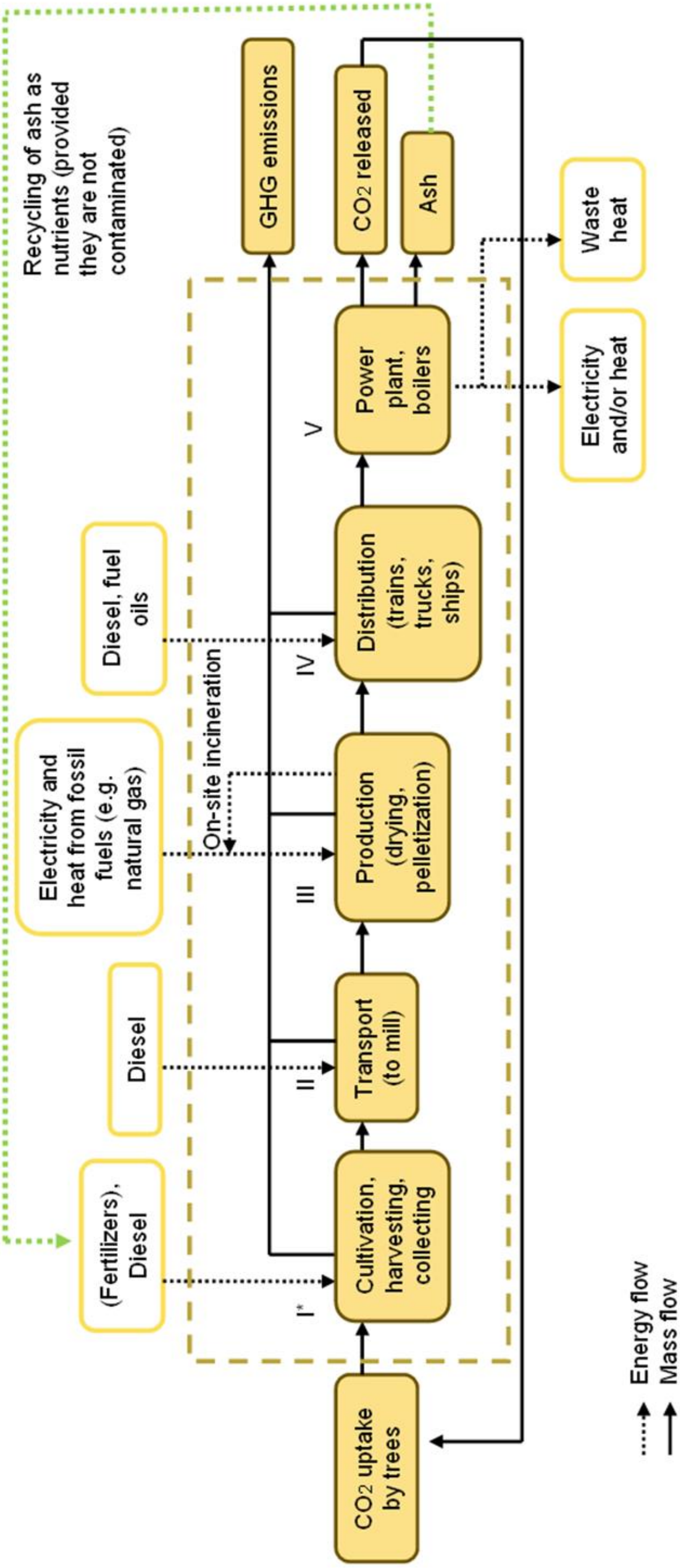

Figure 2: Emission and energy flow of a typical pellet chain and bioenergy power generation (* for energy crops only)

P/S: Energy and mass balances are not complete (solar energy input is omitted)

Figure 2

For the case of small producers, especially wood chips, there are several useful parameters to be used in the calculation of energy and emission balance, when only land transportations are involved (rough estimation is given in the brackets):

1. Train transport energy consumption (250 kJ/tonnes/km and therefore 20 g CO_2/tonnes/km)
2. Heavy trucks (2,500 kJ/tonnes.km and therefore 150 g CO_2/tonnes/km)
3. Drying of wood chips from 50% moisture to 20% (0.18 GJ/tonnes and therefore 30 kg CO_2/tonnes (Coal power))Woodchips (stemwood 1.1.3.3)
4. Net calorific value as received (Q) = 12,4 MJ/kg (Moisture content = 30%); Net calorific value (dry basis) = 18,8 MJ/kg

Please note that these are rough estimations and only for training purpose. Also please note that significant amount of energy is lost in conversion to electricity. Electricity is more "valuable" (higher quality) energy compared to thermal energy.

Example of case studies: Wood chip supply chain in Finland

Two case studies in Finland carried out by European Forest Institute (EFI) by programme ToSIA are interesting examples (Pekkanen, 2011). It is implemented for the North Karelia region, where wood is a major source of energy. Table 2 shows 2 different scales of wood chip bioenergy supply chains in Finland.

Table 2: Wood chip bioenergy supply chains in Finland

Case of Tuupovaara, Finland	Case of Outokumpu, Finland
• Small scale district heating plant in the village of Tuupovaara • Two separate boilers 0.5 MW_{th} and 0.6 MW_{th} • Uses mainly forest chips as fuel • Co-operative is responsible of fuel procurement and operating the DHP • Annual heat production ca. 3,300 MWh (11 880 GJ) • In fuel procurement co-operative makes contracts with local forest owners	• Medium scale district heating plant with 10 MW_{th} and 7 MW boilers for solid fuels • Activity almost fully automated • Main fuels forest chips and sawmilling by-products • Provides heat for over 200 customers in the area • Energy sales in 2008: 53,000 MWh (190 800 GJ)
• Manual whole tree harvesting from young stands by chain sawn • Forwarding of whole trees to roadside • Roadside chipping (chipping entrepreneur) • Transport of forest chips to district heating plant • Storing of forest chips • Heat production and delivery	• Mechanical whole tree harvesting from young stand (small harvester) • Collecting of logging residues from final felling • Roadside chipping of whole trees and logging residues (drum chipper) • Long distance transport of forest chips (chip trucks) • Storing of forest chips • Heat production and delivery

The aim of the two case studies is to analyse increased use of forests for bioenergy in the future and to screen the regional sustainability issues related to increased use of forest chips. Comparisons of centralized and distributed heat production using different sized of heating plants was carried out to determine overall sustainability. This study is being carried out to determine if sustainability of bioenergy production and forest usage can be accomplished without having an adverse effect on climate change or any livelihood of the region. Figure 3 is

the graphical representation of the wood chip supply chain. Table 3 depicts the sustainability indicators employed in these case studies.

Figure 4, 5 and 6 show the environmental, economic and social indicators of the two mentioned case studies. It was found that small scale DHPs (Tuupovaara) has better GHG savings compared to centralized DHP (Outukumpu). This difference is mainly caused by transportation of biomass. On the other hand, more jobs were created in Tuupovaara case (0,87 person / GWh) compared to Outukumpu (0,57 person / GWH). However, the production cost of Outukumpu is only approximately 3/5 of that of Tuupovaara without subsidies, or 2/3 with subsidies.

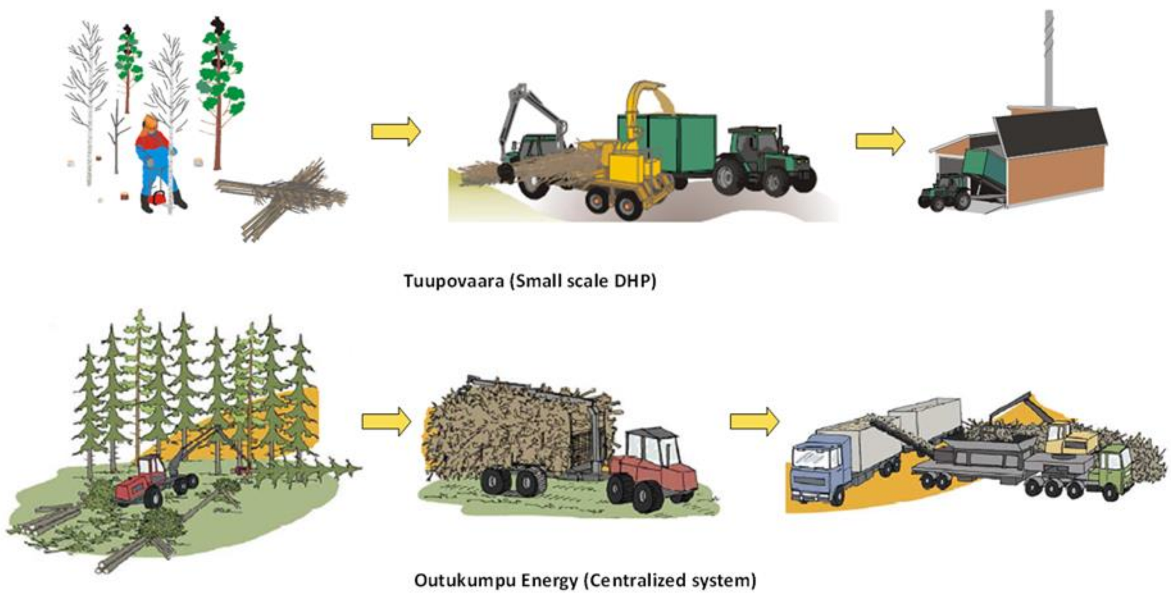

Figure 3: Example of wood chips supply chain in Finland (Source: Pekkanen, 2011)

Table 3: Sustainability indicators employed by ToSIA

3. Environmental	4. Social	5. Economic
• Energy generation and use • GHG emissions & carbon stocks • Transport distance and freight • Forest biodiversity • Forest resources • Water and Air Pollution • Generation of waste • Forest Damage • Soil condition • Transport • Water use	• Employment • Wages and salaries • Occupational safety and health • Education and Training • Innovation • Consumer behavior & attitude • Corporate social responsibility • Provision of public forest services • Wages and salaries • Quality of employment	• Gross value added • Production costs • Resource use • Total production • Labour productivity • Investment in Research & Development • Trade Balance • Enterprise structure

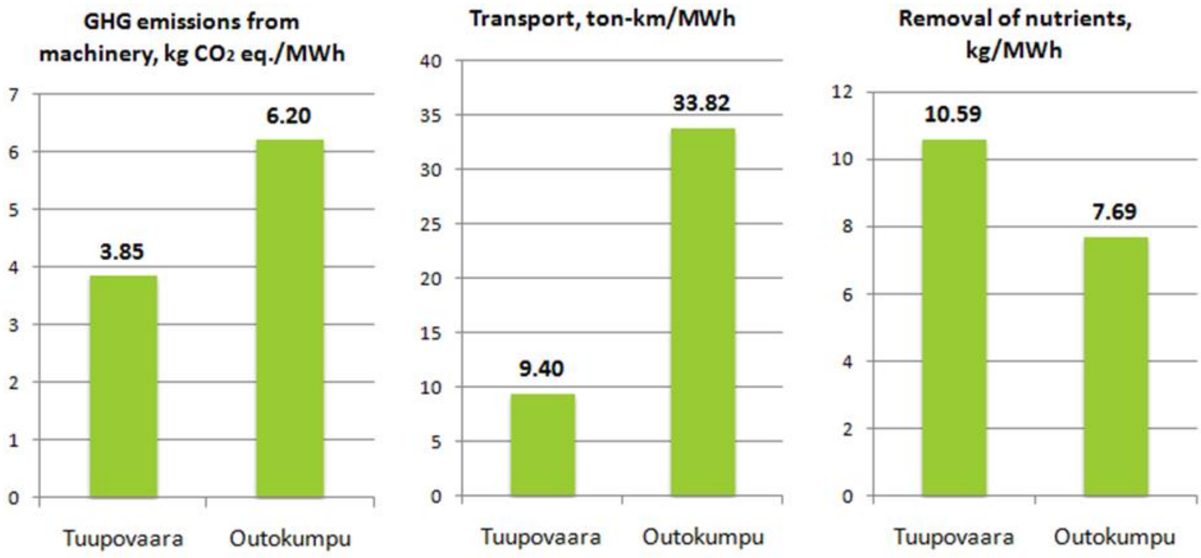

Figure 4: Examples of environmental indicators of two wood chips supply chains in Finland (Source: Pekkanen, 2011), Note 1 MWh is 3 600 MJ or 3.6 GJ

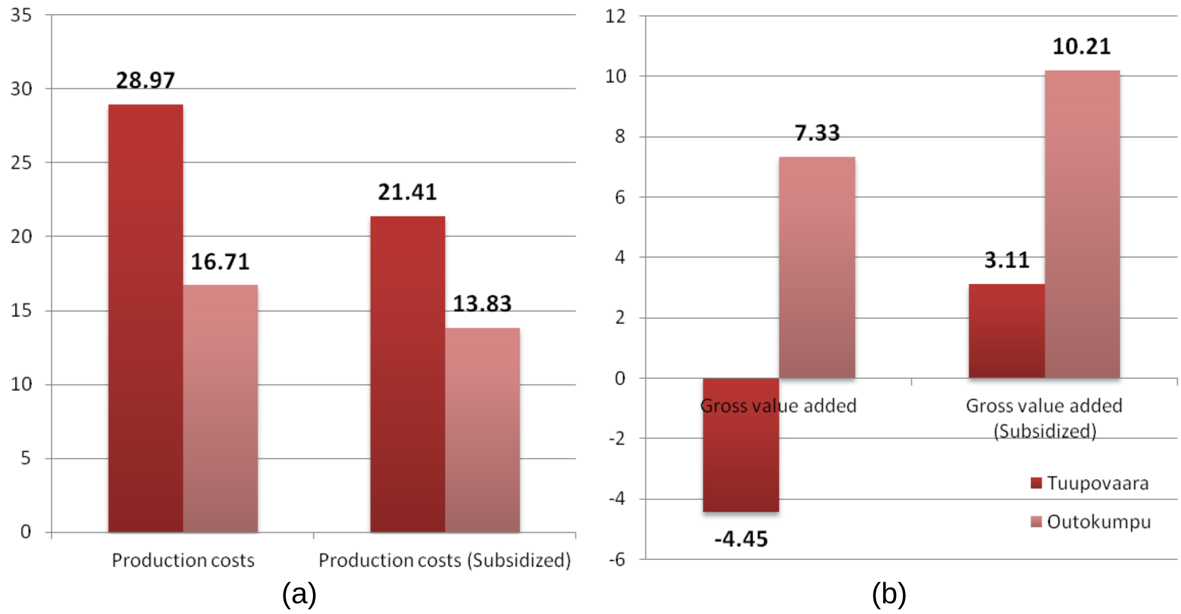

Figure 5: Examples of economic indicators of two wood chips supply chains in Finland – (a) production cost, €/MWh, and (b) gross value added, €/MWh (Source: Pekkanen, 2011), Note 1 MWh is 3 600 MJ or 3.6 GJ

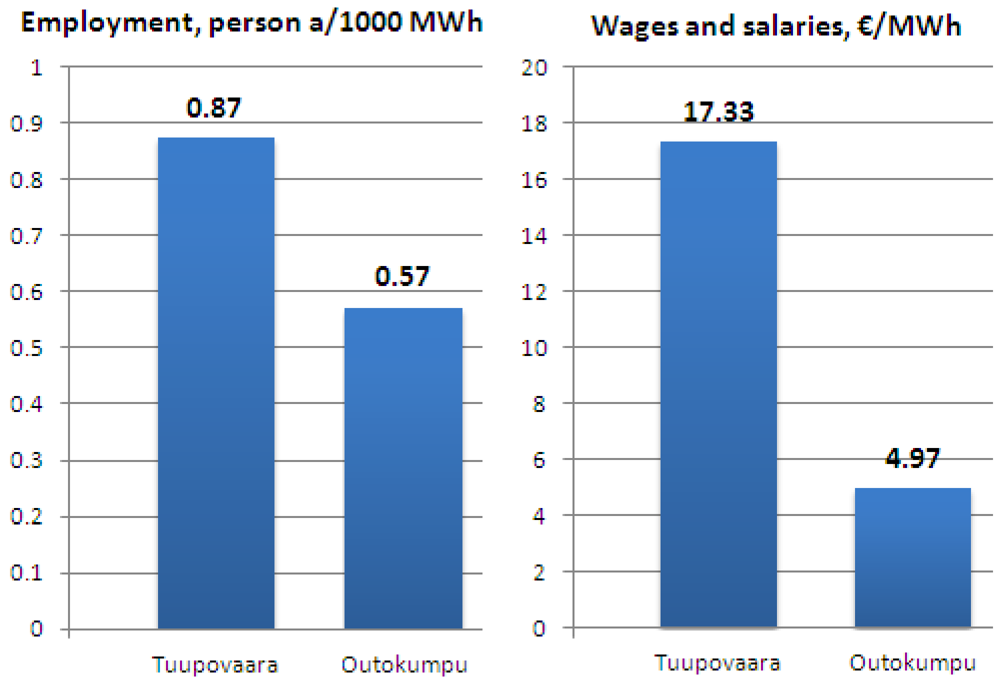

Figure 6: Examples of social indicators of two wood chips supply chains in Finland – (a) production cost and (b) gross value added, (Source: Pekkanen, 2011), Note 1 MWh is 3 600 MJ or 3.6 GJ

Reference and further reading

1. European Commission (2010) Report from the commission to the council and the European Parliament on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling.
2. Magelli F, Boucher K, Bi HT, Melin S, Bonoli A (2008) An environmental impact assessment of exported wood pellets from Canada to Europe. Biomass and Bioenergy 33, p.p. 434-441.
3. Sikkema R, Junginger M, Pichler W, Hayes S, Faaij APC (2010). The international logistics of wood pellets for heating and power production in Europe: Costs, energy-input and greenhouse gas balances of pellet consumption in Italy, Sweden and the Netherlands. Biofuels, Bioprod. Bioref. 4:132-153.
4. Dwivedi P, Bailis R, Bush TG, Marinescu M (2011) Quantifying GWI of Wood Pellet Production in the Southern United States and Its Subsequent Utilization for Electricity Production in The Netherlands/Florida. Bioenergy Resources 4, p.p.180–192.
5. Fantozzi F, Buratti C (2010) Life cycle assessment of biomass chains: Wood pellet from short rotation coppice using data measured on a real plant. Biomass and Bioenergy 34(12), p.p. 1796-1804.
6. Pekkanen M (2011) Tool for Sustainability Impacts Assessment (ToSIA): Measuring the Sustainability Impacts of Alternative Bio-energy Supply Chains. WES Conference, Koli, Feb 2011.

6. Overview of ongoing legislation on sustainability certification in EU countries

Sustainability certification of solid biomass guarantees the products maintain a certain "level of sustainability" according to predefined principles and criteria. It is similar to quality assurance. Sustainability certification carried out by an independent third party, guided by a framework document that formalizes the sustainability measures. These measures are designed based upon sustainability considerations as discussed in Section 1 and are normally agreed by all stakeholders. Currently, GHG gas emission and energy balance are the two main principles used to evaluate the performance of solid biomass in most of the existing schemes.

The main purpose of certification is to ensure and enhance sustainable production of solid biofuels. It provides a mechanism for the stakeholders to demonstrate their commitment for sustainability. With sustainability certification, the consumers are able to evaluate and recognize sustainable solid biofuels. It is also important to convince the policy makers to implement policies to support the industry, especially in term of financial aid. Consequently, it improves the competitiveness and profitability of solid biofuel, and creates a stable and healthy supply and production chain in terms of environmental, social and economic sustainability.

As the use of biomass to generate energy has been highly promoted across the Europe, it is important to ensure that bioenergy is produced in a sustainable manner. The current legal framework (related to agriculture and forest management) provides certain assurances to sustainability production of biomass within the EU, but countries outside the EU may lack such a framework. Establishment of proper standards and certification schemes is important to ensure biomass imported is produced in a sustainable way. However, few of the countries have taken initiatives to develop mandatory biomass certification system and regulations that cover the whole supply chain. To build consensus among its member states, the European commission is considering reviewing and implementing sustainability criteria on solid biomass. The remarkable forerunning member states are Belgium and the United Kingdom. Both countries have promulgated regulations cover the whole biomass chain in an integrated way. The Netherlands, Italy and Spain has also shown some initiatives but still at infancy. Up to date, most certifications of solid biomass are carried out on voluntary basis, which will be discussed in Section 4.

Up until November 2011, there are still no mandatory certification requirements at EU level. The two fore running countries in legislation of solid biomass certification schemes are Belgium and the UK, but the sustainability criteria used in these schemes are not uniform. Some countries have also shown initiatives to develop other legislations. By the end of 2011, the EC will make decision whether or not to legislate and/or harmonize solid biomass certification schemes. Currently, large utilities use different voluntary certification schemes for solid biofuel. They are looking for possibilities to harmonize the sustainability criteria for wood pellets through Industrial Wood Pellets Buyers (IWPB) initiatives. Please note that this content is based on the situation as of November 2011 and may be subject to change depending on the decision of EC (whether or not to legislate and/or harmonize solid biomass certification schemes) in the end of 2011.

6.1. European Commission

At the time of writing (November 2011), there are no binding sustainability criteria for solid biomass on an EU level. In a publication of February 2010 [1] the EC announced that for the time being, it would not introduce mandatory sustainability criteria for solid biomass, but it would review this decision at the end of 2011. In the meantime, the commission recommends that the same criteria as for liquid biofuels should be used in case member states consider implementing national binding sustainability criteria for solid biomass. The EU biofuels sustainability criteria described in the Renewable Energy Directives (RED) exclude liquid biofuel production on land with high carbon stocks and land with high biodiversity values. Furthermore a GHG saving of at least 35 % (50 - 60% from 2017/18), compared to fossil fuel is needed. Those criteria have to be met to enable counting towards the renewable energy targets and obligations and to be eligible for financial support. Current ongoing work by the Commission includes execution of external studies on benchmarking biomass sustainability criteria for energy purposes, evaluating the impacts of a national or an EU approach on biomass costs and availability. The Commission also received around 160 contributions from public consultation by end of spring 2011. The key messages conveyed are:

1. Biomass imports will increase and raise additional sustainability issues
2. The national approach (which is executed so far) can be problematic for an internal market perspective.
3. A general message is the need of consistency / coherence across sectors using biomass (e.g. transport heat and power). Some stakeholders called for sustainable forest management requirements;
4. Stakeholders have diverging views concerning the scope of possible EU sustainability criteria:
    a. Criteria should apply for all energy producers, regardless of their size (mainly pointed out by NGO’s and biofuel industry)
    b. Small and large scale bioenergy producers would like to see an exemption for small bioenergy producers (1 MW)
    c. Binding criteria only for large energy producers above 20 MW capacity

Reference and further reading

1. European Commission (2010) Report From the Commission to the Council and The EuropeanParliament on sustainability requirements for the use of solid and gaseous biomass sources inelectricity, heating and cooling. Available at: http://ec.europa.eu
2. Volpi G (June 2011). EU policy framework for biomass and biogas. Workshop on voluntary vs. mandatory sustainability criteria for solid biofuels, Berlin, Germany. www.solidstandards.eu

6.2. Belgium

The certification systems in Belgium are implemented at regional level. Brussels, Flanders and Wallonia employed different approaches in certification of solid biomass. The system in Flanders, namely Flemish Green Power Certificates (FL-GSC) is based upon the energy balance. The energy input in transport, biomass treatment, and on-site electricity need has to be deducted from gross electricity production for the assignment of green certificates. On the other hand, the systems in Wallonia (Walloon Green certificate granting system, Wall-CV) and Brussels (Brussels Green certificate granting system, Bru-CV) are compatible. They are based upon avoided GHG emissions of the entire chain. The reference for electricity generation is a steam and gas turbine combined cycle power plant with 55% efficiency, while for heat it is gas boiler with 90% efficiency.

Reference and further reading

1. Dam J van, Junginger M, Faaij APC, Jurgens I, Best G, Fritsche U (2008). Overview of recent developments in sustainable biomass certification. Biomass and Bioenergy 32:749-780.
2. van Stappen F, Marchal D, Ryckmans Y, Crehay R, Schenkel Y (20??) Green certificates mechanisms in Belgium: a useful instrument to mitigate GHG emissions. Available at: www.laborelec.com, Last accessed on 29 August 2011.

6.3. United Kingdom

The UK's regulation for renewable energy, namely the Renewables Obligation (Amend.) Order 2010 (RO) is basically based upon full chain reporting on feedstock source and origin, with the total GHG savings according to the Renewable Energy Directive (RED). A similar regulation specified for heat generation, namely Renewable Heat Incentive (RHI), was also drafted. On the other hand, Scottish Biomass Heat Scheme (SBHS) employs an emission evaluation using CO2 balance.

Reference and further reading

1. Department of Energy and Climate Change (UK) (2011) Renewable Energy Policies. www.decc.gov.uk Last accessed on 29 August 2011.
2. The Scottish Government. Scottish Biomass Heat Scheme. Available at: www.scotland.gov.uk Last accessed on 29 August 2011.

6.4. The Netherlands

The Netherlands has developed a norm for sustainable biomass (NTA 8080) but it has not (yet) been used in any legislation. Six principles were proposed by Cramer committee: (1) greenhouse gas emissions, (2) competition with food, local energy supply, medicine and construction materials, (3) biodiversity, (4) environment, (5) prosperity and (6) social well-being (social, human and property rights). Legislation can only be foreseen in the Netherlands with fulfillment of these six principles.

Reference and further reading

1. Dam J van, Junginger M (2011) Striving to further harmonization of sustainability criteria for bioenergy in Europe: Recommendations from a stakeholder questionnaire. Energy Policy 39(7), p.p 4051-4066.
2. NL Energy and Climate change (2011) Bioenergy Status Document 2010.

7. Overview of currently existing sustainability certification systems

Besides legislations and regulations by national government and European Commission, various efforts have been undertaken as steps towards certification for biomass trading by electricity suppliers. In response of sustainability considerations, electricity suppliers had started initiatives to develop voluntary biomass certification system concerning the sustainability criteria. Existing systems (particularly Sustainable Forest Management systems, SFMs) such as forest certification by Forest Stewardship Council (FSC) and Programme for the Endorsement of Forest Certification (PEFC) were also used as a base to develop a more comprehensive certification system. Both FSC and PEFC are called meta-standards. They provide guidelines and rigorous assessment for forest management, and hence ensure the import of woody biomass certified by FSC and PEFC does not violate sustainability concept (the criteria are constantly reviewed). Currently in the market, there are a few certification systems developed in Europe. Among these systems, Green Gold Label (GGL) and Electrabel Label are two major certification systems. However, none of these systems are fully harmonized at European level. A uniform and common approach is desired, but it can only be carried out only until EC has decided to revise its position at the end of 2011. Please note that this content is based on the situation as of November 2011 and may be subject to change depending on the decision of EC (whether or not to legislate and/or harmonize solid biomass certification schemes) in the end of 2011.

As a side-remark, each certification system has to implement a so-called chain-of-custody (CoC) system. A CoC system is used to track the information about each stage of the chain taken by products (wood pellets) from primary production at the crop site or collection of residues to the final user. It provides traceability of information right through the supply chain and assures the buyers about the origin of the wood.It includes each stage of processing, conversion, transformation, manufacturing, trading and distribution where progress to the next stage of the supply chain involves a change of legal and/or physical control, and applies to all kind of certification systems (not only sustainability certification). In the most stringent form, track and trace, mass flows are physically followed throughout the entire chain, and mixing with other commodities is not allowed. The mass balance system also traces products physically, but allows mixing of e.g. certified pellets with not certified pellets, as long as the exact percentages are known. Finally, under the book and claim system, certificates are issued at the production site, and can be traded separately from the physical commodity. For more information on these systems, see:

1. SGS. www.forestry.sgs.com
2. Biomass Technology Group (2008). Sustainability criteria and certification systems for biomass production - Final report. http://ec.europa.eu
3. EUBIONET III studies, see www.eubionet.net

7.1. Overview of Sustainable Forest Management systems (SFMs)

7.1.1. Forest Stewardship Council (FSC)

FSC is an independent, non-governmental, not-for-profit organization established in 1993 to promote the responsible management of the world’s forests. It is an international association of members consisting of a diverse group of representatives from environmental and social groups, the timber trade and the forestry profession, indigenous people's organizations, responsible corporations, community forestry groups and forest product certification organizations from around the world. FSC works with national initiatives to promote FSC in their country and to support the development of national or sub-national standards.

As a multi-stakeholder organization, FSC applies the directive of its membership to develop forest management and chain of custody standards, deliver trademark assurance and provide accreditation services to a global network of committed businesses, organizations and communities. FSC has ten principles:

- Principle 1: Compliance with laws and FSC Principles
- Principle 2: Tenure and use rights and responsibilities
- Principle 3: Indigenous peoples' rights
- Principle 4: Community relations and worker's rights
- Principle 5: Benefits from the forest
- Principle 6: Environmental impact
- Principle 7: Management plan
- Principle 8: Monitoring and assessment
- Principle 9: Maintenance of high conservation value forests
- Principle 10: Plantations

More information about FSC is available at www.fsc.org.

7.1.2. Programme for the Endorsement of Forest Certification (PEFC)

PEFC works throughout the entire forest supply chain, offering a certification system with criteria for good practice in the forest and ecological, social and ethical standards. PEFC is an umbrella organization, which works by endorsing national forest certification systems that are tailored to local priorities and conditions. Any national certification system seeking to obtain PEFC endorsement or re-endorsement is subjected to an assessment process, including independent evaluation and public consultation. PEFC sustainable forest management certification demonstrates that management practices meet requirements for best practice in sustainable forest management, including:

- Biodiversity of forest ecosystems is maintained or enhanced
- The range of ecosystem services that forests provide is sustained
    - they provide food, fibre, biomass and wood
    - they are a key part of the water cycle, act as sinks capturing and storing carbon, and prevent soil erosion
    - they provide habitats and shelter for people and wildlife; and
    - they offer spiritual and recreational benefits
- Chemicals are substituted by natural alternatives or their use is minimized
- Workers' rights and welfare are protected
- Local employment is encouraged
- Indigenous peoples' rights are respected
- Operations are undertaken within the legal framework and following best practices

More information about PEFC is available at www.pefc.org.

7.1.3. Sustainable Forest Initiative (SFI)

The Sustainable Forest Initiative (SFI) programme was launched in 1994 as one of the United States of America forest sector's contributions to the vision of sustainable development established by the 1992 United Nations Conference on Environment and Development. Its original principles and implementation guidelines began in 1995, and it evolved as the first SFI national standard backed by third-party audits in 1998.SFI is an independent, non-profit organization responsible for maintaining, overseeing and improving a sustainable forestry certification programme that is internationally recognized and is the largest single forest standard in the world. The SFI 2010-2014 Standard is based on principles and measures that promote sustainable forest management and consider all forest values. It includes unique fibre sourcing requirements to promote responsible forest management on all forest lands in North America. Participants of the SFI programme shall have a written policy to implement and achieve the following principles:

- sustainable forestry
- forest productivity and health
- protection of water resources
- protection of biological diversity
- aesthetics and recreation
- protection of special sites
- responsible fibre sourcing practices in North America
- avoidance of controversial sources including illegal logging in offshore fibre sourcing
- legal compliance
- research
- training and education
- public involvement
- transparency
- continual improvement

More information about SFI is available at www.sfiprogram.org.

7.1.4. Sustainable Forest Management programme of Canadian Standards Association (CSA)

The Canadian Standards Association (CSA) is a not-for-profit membership-based association serving industry, government, consumers and other interested parties in Canada and the global marketplace. CSA worked with a diverse range of stakeholders interested in sustainable forest management to develop Canada's national standard for sustainable forest management (SFM) CAN/CSA-Z809. A volunteer technical committee, representing consumers, environmental groups, government, industry, Aboriginal, academia and other stakeholders was established to develop the standard. CSA committees are created using a "balanced matrix" approach, which means that each committee is structured to capitalize on the combined strengths and expertise of its members - with no single group dominating over the content of a CSA standard. This voluntary standard, developed by an open and transparent multi-stakeholder consensus-based process, resulted in an endorsement by the Standards Council of Canada as a national standard of Canada. The CAN/CSA-Z809 SFM Standard, developed according to an internationally recognized and accredited standards development process, is based on the international Helsinki and Montréal processes. It incorporates Canada's own national SFM criteria, which were developed by the Canadian

Council of Forest Ministers. The standard links adaptive forest management to forest certification through three key requirements:

- performance requirements
- public participation requirements
- system requirements

More information about the SFM programme of CSA is available at www.csasfmforests.ca.

7.1.5. Finnish Forestry Certification System (FFCS)

In Finland, forestry land covers 87% of the country's land area (30.4 million ha), only 9% (2.8 million ha) is used for agriculture and the remaining 4% consists of housing and urban development and transport routes. 95% of forest area is certified by the Finnish Forestry Certification system (FFCS) which is based on PEFC system. This system has been used in Finland since 1999. The legislation regulating the use of Finnish forests dates back to the beginning of the 18th century. The use and exploitation of forests has gradually developed through hunting and fishing as well as slash-and-burn economy towards the current, multipurpose use of forests. The long-term sustainable use of forests has been targeted in Finland since the 1940s. State authorities, legislation, national and regional forest programmes as well as the activities and cooperation of private forest owners have all supported sustainable forestry. Due to the long history of forest use, hardly any pristine forests remain in Finland. Pristine forests exist only in some peatlands in Lapland and Eastern Finland. Finnish forests are regenerated with natural, domestic tree species and the development of mixed stands is promoted in forest management operations. Intensively managed one-species tree plantations do not exist in Finland.

Criteria #5: Energy wood shall be harvested in a sustainable manner when removing canopy biomass and stumps from harvested sites the applied methods shall take into consideration the wood production capacity of the site, its biodiversity as well as the aspects related to water protection.

Harvest of energy wood shall not substantially deteriorate the protection values of protected areas or areas belonging to Natura 2000 network nor endanger the preservation of monuments of antiquity specified in the Act on Ancient Monuments (295/1963).

The features of valuable habitats and the known habitats of endangered species shall be safeguarded in harvesting of energy wood.

Peatlands in their natural state shall not be transferred to energy wood cultivations

The organisation harvesting energy wood shall have in use guidelines prepared by actors and research bodies operating in the field. The guidelines shall address sustainable harvest of energy wood in final harvesting and thinning sites. The guidelines (The guideline specified in the criterion can be e.g. Harvest of energy wood –guidebook published by the Forestry Development Centre Tapio in 2006) shall specify, among others:

- the selection criteria for harvest sites
- the minimum target amount of biomass left in the sites of final harvest
- the water protection measures needed.

The harvest of energy wood in the area has been done according to the criterion when

I The proportion of sites considered as excellent or good in relation to the above-mentioned evaluation criteria (selection of harvest sites, minimum amount of biomass left in final harvest areas and water protection measures) shall be at least 90 % of the total harvest area based on the results from the monitoring of the quality of nature management;

II The protection values of protected areas defined in Criterion 2.9 have been safeguarded in a manner specified in the criterion;

III The features of valuable habitats defined in Criterion 2.10 have been preserved in

Reference and further reading

1. Eija Alakangas (2010) Country report of different criteria for sustainability and certification of biomass and solid, liquid and gaseous biofuels – Finland. EUBIONET III, Work package 4.3

   Available at: http://www.eubionet.net/

7.2. Green Gold Label

The Green Gold Label was established by Dutch energy company Essent and Control Union Certifications. GGL employs the track and trace system in the certification programme. It covers standards for specific activities in the supply chain of solid biomass, as well as for the supply chain as a whole. This includes production, processing, transport and final energy transformation. GGL requires the tracking custody of the biomass. Currently there are 8 GGL standards and 2 Clean Raw Material (CRM) certificates, different standards are specified for either producer of raw materials, user of biomass for power generation or power plant. GGL Standard 8 is prepared for compliance with greenhouse gas reduction targets, while CRM is the specific clean wood certificate for pretreated biomass. GGL also provides additional guidelines for pellets manufacturing and transportation on existing certification systems for forest management (FSC, PEFC and etc.) and agricultural certification systems (Organic and EUREGAP) which had been approved by GGL. The details of the GGL standards can be found on GGL websites (refer to the reference below the section).

Reference and further reading

1. Green Gold Label. Available at: www.greengoldlabel.org Last accessed on 25 August 2011.

7.3. The Electrabel Label

The Electrabel Label was developed by Laborelec (Electrabel, a European utilities company, is the major shareholder) to allow the potential suppliers to fulfill the auditing requirements for being accepted within the Belgian green certificate systems and the technical specifications of the product for firing it in a thermal plant. This is the only certification system that had been legally recognized by national government in Europe, but it was only within Belgium. Similar to GGL, track and trace system is also enforced at company level for the pellet product. The label was presented in a document called "Supplier Declaration" with signature and stamp by producer and certified inspection body. Following that, the inspection company SGS will carry out full audit of the plant and of the supply chain within the 6 months following the first time the biomass is fired [6]. Flemish certificates require the supplier to provide information of: (1) sourcing and management: origin of biomass, (2) production chain, including energy consumptions and (3) transport and storage, including rail and sea transport. It should be noted that IWPB also focus on analysis of ash.

Reference and further reading

1. Electrabel (2006). Wood pellets supplier declaration version 2006. Available at: http://bioenergytrade.org Last accessed on 25 August 2011.

7.4. Drax Power Sustainability Policy

Drax Power from the UK has promulgated sustainability policy based on the developing regulatory and policy initiatives of the UK. The GHG calculation has to be carried out before contract signed using actual supply chain information, and it should be audited annually. Many Drax requirements are also addressed by sustainable resource management standards such as FSC and PEFC. It also touches social aspect by addressing business ethics, fair labour practices, fundamental human rights and community health and safety issues that could be quite different scenarios in different countries.

Reference and further reading

1. Drax (2010). Drax Biomass Sustainability Implementation Process. Available at: www.laborelec.com Last accessed on 25 August 2011.

7.5. Nordic Ecolabelled biofuel pellets

The Nordic Ecolabelling of pellets includes requirements on manufacturing methods, transportation and storage. The aim is to identify the top-grade quality from an environmental perspective. The quality of the pellets shall mean that they are easy to use and thus meet the end-users' wishes when converting to a renewable energy source that reduces the emission of greenhouse gases. In addition, the energy required to manufacture the pellets is limited to ensure the energy efficiency. Finally the combustion shall not entail a risk to health or the environment.

It is possible to Nordic Ecolabel biofuel pellets intended primarily for private use in small to medium-scale burners. These boilers and stoves are often used in built-up areas.

To minimise the effects of emissions on health and the environment, combustion must be optimised. This means that the pellets must be of a consistent, non-perishable grade, and that the size of the pellets must be suitable for the fireplace. Physical properties, such as density, size and moisture content, must not vary too greatly.

These criteria enable the Nordic Ecolabelling of biofuel pellets that are suitable for use in boilers and stoves for private use. The boilers can however be so large that they are suitable for heating a small apartment block, school or similar.

Reference and further reading

http://www.nordic-ecolabel.org/

7.6. NTA 8080 certification system

With the NTA 8080 certificate an organization can demonstrate that the biomass it produces, processes, converts, trades or uses complies with international criteria for sustainability. With the support of NEN, the Netherlands Standardization Institute, a broad stakeholder panel representing market players, government and civil society organizations has determined the sustainability requirements with regard to biomass in the form the NTA 8080, Sustainability criteria for biomass for energy purposes. On the basis of this voluntary agreement a certification system has been developed. NTA 8080 certification system addresses solid, liquid and gaseous biomass for energy purposes (e.g. transport, electricity, heating and cooling) all over the world. NTA 8080 is based on the so-called Cramer criteria:

- greenhouse gases (emissions and carbon stock);
- competition with other applications;
- biodiversity;
- environment (soil, water and air);
- prosperity;
- social well-being.

More information about the NTA 8080 certification system is available at www.nta8080.org.

7.7. CEN/TC 383

Within CEN, the European Committee for Standardization, TC 383 "Sustainably produced biomass for energy applications" deals with standards development. The first aim of this technical committee was to develop standards that support the European industry with the implementation of the Renewable Energy Directive (2009/28/EC). This resulted in five topics, so far, that are published in separate parts of the EN 16214 series, Sustainability criteria for the production of biofuels and bioliquids for energy applications - Principles, criteria, indicators and verifiers for biofuels and bioliquids:

- Part 1: Terminology;
- Part 2: Conformity assessment including chain of custody and mass balance;
- Part 3: Biodiversity and environmental aspects related to nature protection purposes;
- Part 4: Calculation methods of the greenhouse gas emission balance using a life cycle approach;
- Part 5: Guidance towards definition of residue via a positive list (Technical Report).

Final publication of these standards is expected in the course of 2012. Sustainability criteria for solid and gaseous biomass is currently (September 2011) under discussion. CEN/TC 383 is considering starting standards development based on the standards for biofuels and bioliquids, but decision may depend on either the possible regulatory framework by the EC or the developments within ISO/PC 248.

More information about CEN/TC 383 is available at the CEN website. Parties interested in participation should contact their national standardization body.

7.8. ISO/PC 248

Within ISO, the International Organization for Standardization, PC 248 "Sustainability criteria for bioenergy" is developing an international standard (ISO 13065) with a similar title as the project committee. This standard will describe the sustainability criteria for production, supply chain and application of bioenergy and includes terminology and aspects related to the sustainability (e.g. environmental, social and economic) of bioenergy. ISO 13065 will be a process standard that provides sustainability principles, criteria and measurable indicators. Compliance with this international standard provides objective information for assessing sustainability, but does not determine sustainability per se. The standard is expected to be published in April 2014. The objectives of the standard are:

- comply with national and/or regional legislation;

- respect the Universal Declaration of Human Rights;
- use natural resources in a rational and sustainable way;
- bioenergy from production and up to use should be sustainable in relation to biological diversity
- reduce GHG emissions in relation to the fossil energy source it substitutes;
- promote economic and social development where the production up to use of bioenergy occurs;
- bioenergy production should be economically and financially viable in the long term.

More information about ISO/PC 248 is available at the ISO website. Parties interested in participation should contact their national standardization body.

7.9. Industrial Wood Pellets Buyer (IWPB) initiatives

Recently, a number of major utilities companies, certification experts and traders, includingLaborelec / Electrabel, RWE-Essent, E.On, Drax Power, Dong Energy, Peterson Control Union, Vattenfall, SGS, Argus Media, and Nidera started the Initiative of Wood Pellet Buyers (IWPB). The objective of this initiative is to facilitate trade between utilities through uniform contracting, amongst others through uniform sustainability criteria. To this end, they are developing a meta-system, which cover most of the existing voluntary schemes. The new system is focusing on wood, but not excluding agricultural biomass like cultivated wood. It will focus on 8 sustainability principles: 3 being verified in details (base RED Directive) and 5 being assessed and improved in time (environment + socio-economy). The work base includes a check-list based on 8 sustainability principles, and verification and report by independent body. The aim is to establish cross-compliance of meta-standards and legislation in country of origin (although it yet to be clarified how this would limit or change verification procedure). The final output will be a voluntary scheme, which is transparent (documented on a webpage) and compatible with obligations/recommendations by EC and key member states. For the latter aim, the initiative also plans to prepare a roadmap to move the harmonized scheme to an official EU standard.

More information on Laborelec - Renewables and biomass. Available at: www.laborelec.com Last accessed on 25 August 2011.

Reference and further reading

Marchal D, Ryckmans Y (2006). Efficient trading of biomass fuels and analysis of fuel supply chains and business models for market actors by networking. Country report, IEA Bioenergy Task 40, Belgium. Current situation and future trends in biomass fuel trade in Europe, EUBIONET II, CRAGx, Laborelec; 2006. Available at: www.bioenergytrade.org Last accessed on 25 August 2011.

Dakhorst J (2011). Standardisation and certification of sustainable biomass: Ongoing developments in CEN and ISO. Voluntary vs. mandatory sustainability criteria for solid biomass – A SolidStandards workshop, ICC Berlin, Germany, 7 June 2011. Available at: www.solidstandards.eu Last accessed on 25 August 2011.

Dam J van, Junginger M, Faaij APC, Jurgens I, Best G, Fritsche U (2008). Overview of recent developments in sustainable biomass certification. Biomass and Bioenergy 32:749-780.

Dam J van (2010) Update: initiatives in the field of biomass and bioenergy certification.Background document from: Dam et al (2010), from the global efforts on certification of bioenergy towards an integrated approach based on sustainable land use planning.