Competition in wood waste: Inventory of policies and markets

>> Focus on energy and climate change
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Although this report has been put together with the greatest possible care, NL Agency does not accept liability for possible errors.
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1 Introduction

The quality of recovered wood in different waste streams varies considerably and different end uses can utilize different types depending on their technical and commercial capabilities. Biomass facilities can consume a variety of different biomass feedstock, including wood waste.

The EU Waste Framework Directive (2008/98/EC) prescribes a certain hierarchy of wood waste use, in which the cascading should be envisaged: waste management options are ranked in order of environmental preference with the first priority being waste reduction. Recovering energy from waste is only appropriate for waste that cannot be prevented, reused or recycled with less greenhouse gas emitted.

When further up-scaling the use of wood waste for energy, it is important to understand the competition with other end-uses of wood waste, both from a market and sustainability perspective.

This research will focus on the competition and use of wood waste (pellets), with a focus on clean post-consumer wood, in the Netherlands and in close by EU countries: the UK and Belgium.

This assignment is carried out under the Technical Assistance program to support projects of the Global Sustainable Biomass Fund (‘Duurzame Biomassa Mondiaal’, or DBM fund) and Sustainable Biomass Import Fund (‘Duurzame Biomassa Import’ or DBI fund).

This report is a public version of the original Technical Assistance report and findings and conclusions are therefore generalized to share the information to a wider group of stakeholders.

Chapter 2 will discuss the legislative framework of wood waste in Europe and in the selected European countries. Chapter 3 will focus on the market developments of wood waste in Europe, both from a supply and a demand perspective. Chapter 4 will finish the report with concluding remarks whether competition is visible in the wood waste market, followed by recommendations on how sales of wood waste pellets can be increased while avoiding negative indirect sustainability effects to competitive markets.
2 Consequences of EU Waste Framework Directive and national interpretations

2.1.1 European legislation

2.1.2 EU Waste Framework Directive

The EU Waste Framework Directive (2008/98/EC) prescribes a certain hierarchy of wood waste use, in which cascading should be envisaged: waste management options are ranked in order of environmental preference with the first priority being waste reduction. The preferred waste hierarchy is shown in figure 1.

Figure 1: EU Waste hierarchy (WtERT, 2013)

2.1.2.1 Recovery and the R1 status

Illustrated by the figure above, recovering energy from waste is only appropriate for waste that cannot be prevented, reused or recycled with less greenhouse gas emitted. Under certain conditions, efficient waste to energy (WtE) plants can be classified as energy recovery operations rather than waste disposal. This applies to incineration facilities dedicated to the processing of municipal solid waste with the energy efficiency equal to or higher than 60% (installations permitted and in operation before 1 January 2009) or 65% (installations permitted after 31 December 2008). High energy efficient WtE plants can be assigned a R1 status, which gives operators the opportunity to accept waste more easily from abroad as competent authorities may only raise objections to waste shipments that are destined for disposal.

2.1.2.2 What is waste?

Waste is officially defined in the EU Waste Framework Directive. It refers to any substance or object, which the holder discards or intends or is required to discard. In other words, waste does not have an intrinsic value any more. In Europe, waste is classified under the so-called EURAL codes (Probos, 2007).

Article 2 of the Directive excludes animal carcasses and the following agricultural waste from the EU Waste Framework Directive: faecal matter and other natural, non-dangerous substances used in farming, where they are already covered by other legislation. Since April 2012, this includes non-hazardous agricultural or forestry material as straw.
The EU Waste Framework Directive does not apply to by-products or materials that obtain a new status as product through end-of waste criteria.

2.1.2.3 By-product or waste?
A by-product is defined as a substance or object, resulting from a production process, the primary aim of which is not the production of that item. Article 5 of the EU Waste Framework Directive specifies that a by-product must meet the following conditions:
- Further use of the substance or object is certain;
- The substance or object can be used directly without any further processing other than normal industrial practice;
- The substance or object is produced as an integral part of a production process;
- Further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

On this basis, measures may be adopted to determine the criteria to be met for specific substances or objects to be regarded as a by-product and not as waste.

2.1.2.4 Criteria for the end of classification of waste:
End-of-waste criteria specify when certain waste ceases to be waste and obtains the status of a product (or a secondary raw material). According to the EU Waste Framework Directive, a given waste may only cease to be a waste when:
- The substance or object is commonly used for specific purposes;
- A market or demand exists for such a substance or object;
- The substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products;
- The use of the substance or object will not lead to overall adverse environmental or human health impacts.

The concept of end-of-waste criteria implies that the waste material has reached a stage of processing whereby it has an intrinsic value, so it is unlikely to be discarded (the very definition of waste) and has been processed to a point at which its use does not represent a risk to the environment.

Conclusion:
- All European countries have translated the EU Waste Framework Directive into national legislation following the basic requirements;
- Post-consumer wood waste is considered a waste and therefore needs to follow the waste hierarchy. Industrial timber residues are not waste;
- The end-of-waste criteria seem to apply for imported energy pellets but this needs to be evaluated from country to country.

2.1.3 EU Timber Regulation
Wood products are subject to the EU Timber Regulation (EUTR) since March 2013, except for waste (EC, 2010). The waste exemption applies to: timber products of a kind covered by the Annex, which are produced from material that has completed its lifecycle and would otherwise have been discarded as waste.
The exemption does not apply to: by-products from a manufacturing process involving material, which has not completed its lifecycle and would otherwise have been discarded as waste.

**Conclusions:**
- Primary and secondary forest residues that are used for energy pellets fall under the EUTR; this requires due diligence reporting;
- Post-consumer wood waste does not fall under the EUTR.

### 2.1.4 EU Waste Shipments Legislation

This EU Regulation implements the Basel Convention on the control of trans-boundary movements of hazardous wastes and their disposal, and the OECD Decision on Control of cross-border movements of waste destined for recovery operations. The EU has ratified the Basel Convention, whereas the US has adopted it, but not yet ratified it. The Regulation applies to shipments of waste:

- Between EU Member States, within the EU or with transit through third countries;
- Imported into the EU from third countries;
- Exported from the EU to third countries;
- In transit through the EU, on the way from and to third countries.

Wastes subject to notification under the Regulation are set out in the “Amber List”. Wastes subject to information requirements are only set out in the “Green List”. Wastes for which export is prohibited are listed separately. The Green List procedure, only for non-hazardous wastes, may only be followed for waste:

- That is mentioned on the Green list;
- Goes to certain countries;
- Are aimed for useful recovery.

The Annex III of the Green List mentions “untreated cork and wood waste”, under number B3050. This includes (EC, 2011):

- Wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms;
- Cork waste: crushed, granulated or ground cork.

As a common understanding of correspondents it was agreed that wood waste comprising of wood that has not been subject to any type of treatment, except purely mechanical types of treatment such as cutting or chipping, can be appropriately classified under entry B3050 (EC, 2007).

**Conclusions:**
- The EU Waste Shipments Legislation only applies to waste products and not to products.
- In case non-hazardous wood waste is imported from OECD countries to the EU (Green List), a mandatory notification is needed, when the waste is destined for useful recovery (which includes energy as main use);
- In case the energy products are not considered a waste, the Customs regulation for products applies.

### 2.1.5 Other relevant EU Directives

There are various other EU Directives, which do not directly focus on wood waste for energy recovery but may have affect on the demand of wood pellets within the EU.
These are for example:
- The RES Directive sets an overall EU target of 20% renewable energy in total energy consumption by 2020, as well as a 10% share of renewable energy in the transport sector. Solid biomass and forestry biomass are a major source for bioenergy within the European Union to reach the targets;
- The Large Combustion Plant Directive (LCP) has been implemented to reduce acidifying pollutants, particles, and ozone precursors, emitted by combustion plants. Emissions from – among others – NOx and SOx are bound to strict limits. In case energy and heat plants using wood pellets for their generation are forced to closure, due to NOx and SOx compliance issues, the demand from these plants will be off the market.

2.2 Netherlands

2.2.1 Legislation in the Netherlands
The National Waste Plan (LAP) in the Netherlands prescribes how waste should be dealt with in various sectors. Sector plan 36 discusses the wood sector. In terms of quality, used wood waste is categorized as follows (LAP, 2010):
- A wood: unpainted and untreated wood;
- B-wood: not falling under category A-or C, including painted, varnished and glued wood;
- C-wood: impregnated wood, being treated timber where sometimes substances are used (pressurized) in order to extend the lifetime of the product.

The National Waste Plan (version November 2009 / May 2010) gives a minimum standard for processing for all three categories (LAP, 2010). The minimum standard for A (and B) wood, as of interest to this research, is recovery¹. Minimum recovery for A and B wood includes various options:
- Recovery of material²;
- Recovery of products;
- Main use of waste as a fuel or other means to generate energy (based on R1 status).

The Netherlands gives no preference between the options (Afvaldesk, 2013).

The energy plant must have a permit to receive energy pellets of waste for useful recovery (Afvaldesk, 2013).

2.2.2 Waste or not
The processing, use and transport of waste, is subject to specific rules and licensing procedures. Jurisdiction and the EU Waste Framework Directive provide criteria to determine whether one speaks about a waste product or about a by-product or non-waste product (see section 2.1 for criteria). The question whether a product is waste, or not, is at the end determined by the Province and municipalities on a case-by-case basis.

The question till when timber keeps the status of waste is found in Jurisdiction: the status only expires after the recovery has been completed. Thus:
- When after the application as raw material a new product was created; or
- When after application as fuel, the generated heat / energy is utilized.

¹ In Dutch: “Nuttige toepassing”
² Note: Recycling (earlier in the waste hierarchy) only includes material recovery
One still speaks about waste, even when the waste timber is processed so that it meets the requirements laid down by those who want to use timber for raw material or fuel.

2.2.3 Trans-boundary imports/exports

When the material can receive the status of by-product or has received the end-of-waste status according to the Netherlands, the imported or exported material does no longer fall under the EU Waste Shipments Legislation (EVOA in Netherlands). This rule is applied under the condition that the competent authority in a foreign country considers as well that the material is no (longer) a waste product. Consequently, the most stringent regime is applied (Afvaldesk, 2013).

Requirements on trans-boundary transport of wood waste are described under section 2.1 of this report. In case a material is no longer waste (and thus a product), the material falls under the Product Customs Regulations (Afvaldesk, 2013).

2.2.4 Translation for wood waste for energy

The procedure of criteria categorization for waste and end-of-waste criteria for post-consumer waste is reflected in figure 2.

Figure 2: Criteria categorization and end-of waste criteria applied for post-consumer waste (based on Senter Novem, 2005)
Conclusions:

- Based on the value chain and the intended end-use of the material, an energy pellet from post-consumer wood waste is likely to fall under the end-of-waste criteria and thus no longer considered waste;
- This means that the energy pellet could be considered a product only under the condition that the exporting country shares the same view (and does not consider the energy pellet as waste either);
- The Netherlands works on a case-by-case status. An individual project can check with EVOA for a final statement, that the material is not considered waste;
- Post-consumer (clean) wood waste from within the Netherlands is waste until the moment of further processing. It should be destined for useful recovery, which includes both material recovery and energy use as main use;
- In all cases, the energy plant receiving the feedstock should have the right permit, which allows the burning of certain types of feedstock.

2.3 Belgium

2.3.1 Flemish Regulation on Waste

The VLAREA (Flemish Regulation on Waste Prevention and Management) implements most of the provisions of the Belgium Waste Decree. The waste policy in Flanders is performed on the basis of different implementation plans. Biomass is discussed in several of them, including the Implementation Plan on Wood (OVAM, 2010). The Implementation Plan on Wood 2004-20083 covers (OVAM, 2010):

- Secondary processing of wood waste (plate production, wood processing);
- Wood waste from the final processing: wood waste that is released during the production of furniture, packaging, timber, joinery;
- Wood waste from businesses: construction and demolition wood, packaging, furniture;
- Wood waste from households: construction and demolition wood, furniture, garden wood such as wood fences or wood garden houses;
- Wooden railway sleepers.

OVAM judges whether or not a substance is categorized as waste. The following wood streams are not addressed in the Implementation Plan on Wood (OVAM, 2010):

- Short-rotation wood (wood grown for the purpose of energy): not regarded waste;
- Residual wood released during logging and maintenance of forests: this is not considered waste;
- Wood waste from primary processing: the wood waste from sawmills and veneer companies that exploit their raw materials directly from the forest: this untreated wood should be defined as 'waste' but is not further discussed because there is no need for planning or actions for responsible further processing;
- Green waste (including thinnings): covered under organic waste materials.

In addition, OVAM also prescribed to the VREG (see below) that wood pellets are not considered waste either (ODE, 2010), provided they meet the DIN standard4, the Önorm or the Belgian product standard (in development).

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3 Implementation Plan is not renewed since 2008. Remains valid until a revision is published.
It is recognized that biomass, as part of the renewable energy targets, offers a large potential for energy production. It is also recognized that this places (possibly) recycling of certain waste streams under strong pressure. VLAREA has therefore included various restrictions on the burning of biomass (OVAM, 2010). It is forbidden to process the following wastes for incineration in an establishment that is located in a Flemish Region (OVAM, 2010):

1. Selectively collected streams that are eligible for material recycling. This prohibition is not valid for the burning of the following wastes, provided they have a caloric content > 11 500 kJ/kg, for the generation of renewable energy:
   - Vegetable waste from agriculture and forestry;
   - Vegetable waste from the food industries;
   - Fibrous vegetable waste from sorting, screening and washing the raw pulp and paper production;
   - Wood;
   - Waste cork.
2. Unsorted industrial waste; unsorted household waste.

2.3.2 Decree on Green Power (VREG)

Article 5 of the Green Power Decree lists biomass as a renewable energy source to receive green certificates. Green certificates are granted to restricted categories of biomass (VREG, 2008) and coupled to receiving subsidies.

The following wood waste streams are eligible for green certificates in the Flemish region (VREG, 2008):

- Short rotation wood: always entitled to green certificates;
- Wood / timber waste flows that are not used as industrial raw material, thus not eligible for material recycling;
- Wood fraction in organic residue waste: only entitled to green certificates when the installation has an energy recovery PEB (primary energy) of ≥ 35%;
- Any other timber flows: always entitled to green certificates.

These wood flows must be used in an installation where the urban and environmental applications are submitted after June 1, 2007. Wood flows that are industrial raw material can only receive green certificates if they are processed in old installations or installations with no environmental license (which will not be common practice).

In all cases, the energy plant must have the permit to use certain wood streams for burning. Electricity production from wood waste will only receive green certificates when its combustion is admitted according to the sectoral implementation plan.

Wood flows that are not considered industrial raw material are consisting of (VREG, 2008) bark, dust, fine pruning, twigs and trugs, all with size and diameter specifications. In addition, other wood flows are not considered industrial raw material in case Cobelpa and Fedustria declare that they are not used as industrial raw material (derogation of legal conditions). Fedustria represents the textile, woodworking and furniture industry’s companies. Cobelpa is the association of the Belgian pulp, paper and board industries. Additionally, Fedustria has made an agreement with electricity producers - and in particular with Electrabel - that a guarantee must be given for the supply of wood from abroad that it does not come from regions where the timber industry buys its raw materials. Nonetheless, price competition has developed; see also section 3.3 of this report (De Standaard, 2010).
Applicants for Green Certificates have to prove, on the basis of an audit report, that a particular timber flow falls under "wood flows that are not used as industrial raw material". This is prepared by an accredited inspection body (VREG, 2008).

Thus, wood waste that is suitable as raw material for the production of e.g. chipboard cannot be used to produce green electricity. De Standaard (2010) mentions that only contaminated wood wastes are used for green electricity in Flanders.

Conclusions:
- The destination of clean wood waste in Belgium is in principle raw material for industry, unless it is not considered of use. Contaminated wood waste can be used for the energy market;
- There is a negotiation with Fedustria and Copelba about the sourcing of material to avoid competition in resources;
- Imported wood energy pellets are not considered waste in Belgium when they meet the DIN standard. This is the general norm for industrial pellets to place them on the market;
- In all cases, the energy plant needs to have the right permits to burn wood waste (or energy pellets).

2.4 United Kingdom (UK)

2.4.1 UK legislation on wood waste
The waste management hierarchy from the EU Waste Framework Directive was transposed into UK law, through the Waste (England and Wales) Regulations in 2011. The hierarchy of waste management follows this order: prevention, preparing for re-use, recycling, other recovery (e.g. energy recovery through incineration and pellet production), and disposal (see also figure 1). Except for lower grade wood waste, energy recovery is considered in this case a better environmental option than recycling.

The legislation gives a differentiation for the suitability of disposal between grade A wood waste, mixed grade wood waste (grade B), and lower grade wood waste (grade C) (DEFRA, 2008). Concerning grade A wood – which is clean wood – the hierarchy stated above is the most appropriate pathway to follow, as this wood waste is highly suitable for recycling and energy recovery. Concerning mixed grade wood, the suitability for recycling is medium, as is the energy recovery suitability, but still the mentioned hierarchy may prevail.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Recycling</th>
<th>Energy recovery</th>
<th>Landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade A</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Mixed grade (B)</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Lower grade (C)</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

When collected and sorted, grade A wood waste shall go to higher value markets, as agriculture for animal bedding, panel manufacturers, and any incineration.
plants. Grade B wood waste shall go to panel manufacturers and WID (Waste Incineration Directive) compliant incineration plants (PAS, 2012).

Recovering energy from wood waste, through burning, is covered in the Waste Incineration Directive. Plants that only use clean wood (grade A) are exempted from their requirements. Clean wood, exempted from WID’s requirements, should be fully clean, covering both the feedstock and production processes (treatments). Pallets are considered clean wood, even in case pallets get contaminated unintentionally or accidentally. Contaminated wood – grade C in particular – can be segregated and sent to either a WID-approved plant for energy recovery or an energy-from-waste plant approved by the Integrated Pollution Prevention and Control (IPPC).

It is important to note that there are currently no penalties, nor incentives linked to applying the hierarchy in UK legislation, except for the landfill tax – which stimulates the uptake of wood waste in previous stages than landfill (DECC, DEFRA, Environment Agency).

2.4.2 What is waste?

Wood waste (UK produced or imported) may be considered a waste, residue or product, based on its source:

- Wood waste, used for other purposes (e.g. pallets) first and then discarded, is considered waste;
- Branches, thinnings, sawdust (e.g. by-products), are considered residues (no waste and no product);
- Wood waste out of forest management (e.g. cut trees) for energy purposes only, are considered products.

Pellets, produced out of wood waste may be considered a product, when the waste is understood to have ceased to be waste (see end-of-waste criteria). DEFRA provides guidance on the legal definition of waste (see figure 3). This figure shows the questions from which it is decided whether waste (or pellets produced out of waste) may be considered not waste anymore.

It must be stated that when energy plants wish to use pellets (either imported or UK produced) for their generation, the sourcing of the feedstock needs to be reported to the UK government (Ofgem) – as a sustainability check.
2.4.3 UK legislation on imported pellets for energy

Based on personal consultation with the UK Environment Agency, imported pellets that are produced out of wood waste, are still considered waste and hence need prior written consent before being imported. This is achieved through (1) applying with the relevant fee to the UK Environment Agency; (2) draw up contracts for recovery of waste with the business in the UK that will receive and recover the waste; (3) arrange assurance against liability for damage to third parties; and (4) obtain all necessary permissions from the competent authorities in all countries concerned.

2.4.4 UK regulations pushing biomass and pellet supply and use

Current regulations that push the uptake of biomass for electricity and heat generation in the UK, include the following:

- The Renewables Obligation (RO; introduced in 2002, revision in 2013): this mechanism provides for an obligation to licensed electricity suppliers, to generate a certain – increasing – amount of their electricity from renewable sources. Generators receive saleable certificates (ROC) for their eligible renewable electricity generated. This gives them the opportunity to receive a premium, on to the electricity prices, when producing renewable electricity.
Non-compliance to the obligation results in a penalty – buy-out price – paid by the generator;

- **Electricity Market Reform** (introduced in 2012): this reform stimulates investments in low carbon electricity generating technologies, through *Contracts of Difference* that ensure predictable revenue streams, that in turn encourage investments;

- **Feed-in Tariff** (introduced in 2010): the FIT scheme applies to small-scale low carbon electricity generation and use. It is a financial support on the investments in low-carbon technologies;

- **Climate Change Levy** (introduced in 2001, revision in 2013): provides for a tax on energy produced (and indirectly on consumption) from fossil fuels. It exempts energy generated out of renewable sources, such as wood pellets;

- **Renewable Heat Incentive (RHI)** (introduced in 2001): implemented to support the uptake of renewables, as pellets, in the generation of heat. The scheme provides financial incentives to organizations. The government is also working on the implementation of the RHI for households. The Renewable Heat Premium Payment scheme provides financial support to investments in renewable heating technologies – i.e. pushing the use of pellets for heating.

**Conclusions:**

- Following consultation with the UK Environment Agency, imported pellets – that are made out of wood waste – are still considered waste and need prior written consent by the Environment Agency before imported;

- The use of solid biomass (including waste and pellets) requires information about the source of origin of the waste from a sustainability perspective;

- The hierarchy used for (wood) waste management in the UK for grade A and B follows the pathway of re-using, recycling, energy-recovery, to finally end up as landfill;

- Comparing wood waste use in the conventional wood industry with the use of wood waste for wood pellets and energy recovery – with the knowledge that the waste management hierarchy is not obliged through penalties/incentives – for both A and B wood waste, energy recovery will need to compete with the material recovery by the conventional industry (i.e. animal bedding and panel manufacturing).
3 Trends in supply and demand and its market players

This chapter looks at the trends in demand and supply of the wood waste (pellets) market in Europe, the Netherlands, Belgium and the UK, as well as the most important business drivers, taking into account the major disposers and end-users.

International timber statistics (UNECE, FAO, Eurostat) make a distinction between used wood and industrial residue wood (Probos, 2007):

- **Residue wood** involves clean material as sawdust, shavings, sawdust and a stream of short wood;
- **Used wood** is defined as wood that is released at the end of the lifetime of a product. Used wood can be distinguished in three categories: A, B and C wood.

3.1 Europe

3.1.1 Trends in supply and trade of (clean) wood waste

Taken together, the EU-27 Member States plus Croatia, Norway and Turkey generated some 2.6 billion tons of waste in 2008, or roughly 5.4 tons per person, of which around 3.7% is hazardous. In general, 32% of the waste generated in the EEA countries is from construction and demolition activities.

Figure 4: Wood wastes (under category hazardous waste) from manufacture of wood and of products of wood and cork\(^5\) in the EU-25 from 2004-2010 in tons (EUROSTAT)

![Figure 4: Wood wastes](image)

Overall, and taking into account the limited data, the trend shows growing or stabilizing amounts of hazardous and non-hazardous waste in the EU (EEA, 2012). Part of the hazardous waste is wood waste – which is not clean. Figure 5 shows that most of the hazardous wood waste in the European region is used for energy recovery and incineration.

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5 Except furniture; manufacture of articles of straw and plaiting materials
Based on empirical research from EUwood (2010), the total supply of post-consumer wood waste in 2007 in the EU-27 is estimated to be 55.4 M m³ (M = mega). EUwood (2010) shows regional differences regarding the potential volume per capita:

- Eastern and Southern European countries generate lower volumes of post-consumer wood waste, compared to the other regions;
- Also, Northern and Western European countries have a relatively high rate of re-use of post-consumer wood compared to the other regions.

In 2007, 36 Mm³ post-consumer wood waste was used for panel production and for energy. Thus, about two thirds of the generated post-consumer wood waste is recovered. Table 2 shows that especially clean wood waste was recovered for particleboard production (18.1 Mm³).

### Table 2: Rates of supply, recovery and end-use of post consumer wood waste 2007. (EUwood, 2010)

<table>
<thead>
<tr>
<th>Supply and end-use</th>
<th>Volumes in M m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply of post-consumer wood waste 55.4</td>
<td>55.4</td>
</tr>
<tr>
<td>Recovery rate</td>
<td></td>
</tr>
<tr>
<td>• Destined for particle board production</td>
<td>36</td>
</tr>
<tr>
<td>• Destined for energy use</td>
<td>18.1</td>
</tr>
<tr>
<td>• Disposed volume of post-consumer wood waste</td>
<td></td>
</tr>
<tr>
<td>• From which land-filled</td>
<td>20.4</td>
</tr>
<tr>
<td></td>
<td>17.5</td>
</tr>
</tbody>
</table>

In 2007, a third of the total generated post-consumer wood waste (20.4 Mm³) was not used in the EU-27. In Eastern- and Southern European countries as well as in UK and Ireland the majority of post-consumer wood waste, approximately 17.5 M m³, was landfilled. The Northern and Western European countries have a higher rate of re-using post-consumer wood waste. The post-consumer wood waste in these regions is used as a resource for the panel industry or other material uses, or for the production of energy (EUwood, 2010).
EUwood (2010) estimates the potential, use and disposal of post-consumer wood waste for different scenarios, to 2030. Based on these scenarios, the volume of post-consumer wood waste, which is landfilled, is expected to decrease strongly (figure 6). The quantity of wood waste that is recycled will increase in the future, but the generated total volume of wood waste is not influenced by this (EUwood, 2010).

Non-hazardous wastes (including wood waste) can be traded between EU Member States and imported into the EU without any prior notification procedure if they are destined for recovery, see also section 2.1 of this report (EEA, 2012a). Trade in wood waste has increased steeply. Since 2003, EU imports of wood waste have exceeded exports (EEA, 2012a).

3.1.2 Primary disposers of (clean) wood waste

Post-consumer wood includes all kinds of wooden material that is available at the end of its use as a wooden product. It mainly comprises packaging materials, demolition wood, timber from building sites, and fractions of used wood from residential (municipal waste), industrial and commercial activities. The primary sources for post-consumer wood in Europe are (EUwood, 2010):

- Municipal solid wood waste mainly from households;
- Construction waste and demolition wood;
- Fractions of used wood from industrial and commercial activities (primarily packaging materials, including pallets).

The generation of construction and demolition wood waste is closely related to economic activity in the construction sector (EEA, 2012). Historically, the construction sector has been the primary catalyst for the demand of forest products. UNECE mentions that the housing market in Europe and in the USA has not yet shown any strong recovery from the housing crash of 2006 and the global economic recession of 2008 (UNECE, 2012).

---

6 The EU Landfill Directive 1999 set targets for the quantity of biodegradable municipal waste (BMW) that each EU member state can send to landfill.
Industrial timber residues are not defined as waste. They are an important resource for energy wood pellets and therefore shortly discussed here. Supply of industrial residues is directly dependent on the input of raw material and the output of products in the forest industries.

By-products from sawmills include e.g. chips, dust and slabs. Low-grade hardwood is most often used for industrial applications including pallets. Overall market conditions for European sawn hardwood deteriorated in the second half of 2011 and showed little improvement in the first half of 2012 (UNECE, 2012).

Some trends observed by (UNECE, 2012) for the roundwood, softwood and hardwood market are:
- Wood raw material market: removals of industrial roundwood in the UNECE region increased by 2.4% in 2011. Since 2009, industrial roundwood harvests have risen by 12%, a significant recovery after the more than 30% plunge that occurred between 2007 and 2009 (UNECE, 2012);
- Sawn softwood market: European sawmills continue to find themselves squeezed between a persistently high raw material cost and depressed global market prices for sawn wood (UNECE, 2012);
- Soft hardwood market: stagnant low figures – compared to the situation before the economic crisis.

Other industrial wood residues include wood residues from production of semi-finished wood products as well as from further processing of manufactured wood products (construction, furniture, etc.). Residues from semi-finished products include residues from e.g. wood-based panels (fibre board, particle board, veneer board). Figure 7 shows the shares of considered wood-based panels on production and their share on the total volume of other industrial wood residues.

Figure 7: Volumes of other industrial wood residues in the wood-based panel industry segments. (EUwood, 2010)

Residues from manufactured wood products come from the utilisation of sawn-wood and wood-based panels in construction, furniture industry, packaging and other processing of semi-finished wood products. Compared to production of semi-
finished wood products the share of wood residues from manufacturing processes is higher (EUwood, 2010). The share of other industrial wood residues from construction, furniture industry, packaging industry and other further processing industry is shown in table 3.

Table 3: Shares of residues in further processing industry branches. (EUwood, 2010)

<table>
<thead>
<tr>
<th>Industry branch</th>
<th>Share in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>10.3</td>
</tr>
<tr>
<td>Furniture industry</td>
<td>18.4</td>
</tr>
<tr>
<td>Packaging industry</td>
<td>9.7</td>
</tr>
<tr>
<td>Other</td>
<td>13.0</td>
</tr>
</tbody>
</table>

UNECE mentions that 2011 and the first half of 2012 proved difficult for paper and paperboard producers in all markets, as the recovery from the 2008 financial crisis stalled. The wood fibre consumption by the European pulp industry remained practically unchanged (+0.9%) in 2011 from the previous year. Approximately 20% of fibre consumed in Europe was imported (UNECE, 2012).

3.1.3 Trends in markets, demand (and prices) of (clean) wood waste

EEA (2012a) mentions that imports of wood waste are primarily driven by the large demand of the particleboard industry for wood material, especially in Italy, as well as by an increasing demand of biomass-fuelled power plants. Driven by policies for renewable energies and landfill bans for wood, biomass-based power plants seek fuel wood from sources outside national borders. Energy production from solid biomass grew by more than 50% between 1995 and 2008, resulting in competition for wood waste across Europe.

UNECE (2012) also mentions that the EU policies for renewable energy increased competition, and thus prices, for wood fibre. Prices for wood energy feedstock have increased. The Economist (2013) mentions that wood pellet prices rose from $116 a tonne in August 2010 to $129 a tonne at the end of 2012. Prices for hardwood from western Canada have risen by about 60% since the end of 2011. Although the bioenergy sector business model does not include saw logs as a raw material for power and heat generation, (UNECE, 2012) mentions that it is impossible to isolate a new demand for a certain part of the quality gradient of the fibre resource, as it causes a chain reaction throughout the total wood supply system.

Particleboard and medium density fibre board are manufactured primarily from wood residues from production of lumber and plywood. The board industry is concerned that the availability of wood residues is not keeping pace with demand and that the price is increasing. This has led some producers to look toward alternative sources of fibre, such as agricultural waste products and wood and paper waste (UNECE, 2012). Clearly, this is also an interesting resource for the energy market.
The price rise movement in raw material for pulp production has taken place in Europe since the end of 2009 for the majority of softwood and hardwood species. The growing competition of “wood for energy” is also visible (UNECE, 2012).

3.1.3.1 The energy wood pellet market

The world production volume of wood pellets was about 14 million tons in 2010 with US, Canada and Scandinavia among the largest producers. Between 2008 and 2010, wood pellet production in the EU increased by 20.5% and was estimated to meet about 81% of the EU demand for pellets. Wood pellet manufacturing in the EU has grown every year, with exception of 2009 because of the economic crisis (UNECE, 2012).

The countries that are most involved in the trading of industrial wood pellets within the EU are (Pelcert, 2012):
- Concerning users: Belgium, Netherlands, United Kingdom, Sweden and Denmark;
- Concerning suppliers: Germany, Lithuania, Estonia, Latvia, Portugal, Finland and Sweden.

The balance of import and export of wood pellets gives an idea of the major players in Europe. Figure 8 shows that both Belgium as well as the Netherlands largely rely on the import of wood pellets to meet demand in the energy market (Sikkema et al., 2011).

3.1.3.2 The conventional wood industry

Following the severe economic downturn, the wood-based panels industry has been slowly returning to better market conditions. It continued to face significant increases in the resin and energy cost, see figure 9 (UNECE, 2012).

The Economist (2013) mentions that about 20 large saw mills making particleboard for the construction industry have closed in Europe during the past five years. Higher wood prices are hurting pulp and paper companies, which are already in bad shape: the production of paper and board in Europe remains almost 10% below its 2007 peak.
3.1.4 Key drivers in demand (clean) wood waste

The two main drivers for particleboard production are the furniture industry and the construction sector (UNECE, 2012). The housing market is not recovered from the European recession. This, combined with high feedstock prices, puts pressure on the timber industry.

The EU is the world’s largest market for wood energy, and imports of woody feedstock continue to grow. The wood pellet market is growing strongly in Europe due to incentives for biomass power and heat from local authorities (Pellcert, 2012).

Renewable energy policies result into growing demand for wood for energy. This (amongst others) drives up the costs of woody feedstock resources – which puts pressure on companies that use wood as an input. The woodworking manufacturers feel that they are put at a disadvantage, with arguments related to the incentives provided to the wood energy sector in order to meet EU renewable energy targets (UNECE, 2012).

Conclusions:
- Potential from wood waste is available, mainly due to diverting wood waste from landfills to recovery;
- There is an increasing demand for wood waste and energy pellets, mainly driven by the energy sector (and related subsidies);
- Meanwhile, the traditional timber industry is coping with slowly recovering markets and increasing feedstock prices – wood waste being an interesting alternative.

3.2 Netherlands

3.2.1 Trends in supply and trade of (clean) wood waste

Table 4 shows that the total estimated amount of used wood and residue wood in 2007 is estimated at 2,125 kton, of which 1,485 kton used wood. Although production remained stable, there is a decrease in the export of used wood from
2007 and 2010. Besides this, there is a strong decrease in the import and consumption of wood waste from the wood processing industry.

Table 4: Production and consumption data for used wood and wood waste from industry. (Probos, 2010, 2011 and 2012)

<table>
<thead>
<tr>
<th>Year</th>
<th>2007</th>
<th>2010</th>
<th>2007</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>1485</td>
<td>1395</td>
<td>640</td>
<td>540</td>
</tr>
<tr>
<td>Import</td>
<td>70</td>
<td>80</td>
<td>1120</td>
<td>355</td>
</tr>
<tr>
<td>Export</td>
<td>1160</td>
<td>710</td>
<td>390</td>
<td>474</td>
</tr>
<tr>
<td>Consumption</td>
<td>395</td>
<td>765</td>
<td>1370</td>
<td>421</td>
</tr>
</tbody>
</table>

The production and consumption of roundwood in the Netherlands has recently shown a recovery, after years of decrease. In the Netherlands, wood is mainly destined for the paper and cardboard industry (48%), followed by sawn timber (32%) and the board industry (16%) (Probos, 2012).

3.2.2 Primary disposers of (clean) wood waste

In the wood waste market a number of main "primary disposers" can be distinguished. Only those are included in table 5, which represents a substantial flow of used wood.

The industrial residue timber market is less complex than the market of used wood. Around 20 wood fibre traders are active for the collection of residual wood from the forest industry. This includes clean materials as wood shavings, sawdust, wood dust and – as specific stream – short wood. Short wood is also often indicated as used wood (A-wood) (Probos, 2007).

Within the residue wood category, one can distinguish between the residue wood released by roundwood processors (also called "fresh" wood waste) and residue wood originating from wood fibre companies (planing and joinery industry) - with lower moisture content (12-15%) than fresh wood (Probos, 2007).

Fresh wood residues from wood processing companies: The Netherlands had around 70 roundwood sawmills in 2007, which processed around 587,000 m3 of roundwood (see table 7). This is 85% of the total generated residue wood from this category.
Table 5: Primary disposers of used wood in the Netherlands. (Probos, 2007)

<table>
<thead>
<tr>
<th>Disposers</th>
<th>Waste types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>Bulky household waste contains a considerable amount of wood. Often, this wood is separated as A, B, and C timber and stored into separate containers. This collection explains the growth in B timber waste of the recent years.</td>
</tr>
<tr>
<td>Enterprises (waste)</td>
<td>This waste is generated by industry. Large companies often collect their waste separately in separate containers. This leads to a considerable stream of A timber (packaging timber and clean production wood from the wood industry).</td>
</tr>
<tr>
<td>Construction and demolition waste</td>
<td>In large construction and demolition projects, waste is selected and separately removed. The containers often include separate A and B-wood. Smaller renovations often use mixed containers; sorting takes place partly manually and partly mechanically further onwards. This often results in the collection of mainly B-wood, virtually no A- and C-wood.</td>
</tr>
<tr>
<td>Trade, services and government</td>
<td>This includes industrial waste from the office, retail and services sectors. This is a broad waste stream and mixed collected. Wood that is available here is mainly packaging timber (A-wood).</td>
</tr>
</tbody>
</table>

Table 6: Amount of industrial residue wood in 2003 (Probos) and 2005 and 2006 (CBS data; Probos, 2007) in kton. Differences in trends partly explained by different data sources.

<table>
<thead>
<tr>
<th>Sector</th>
<th>2003</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary woodworking</td>
<td>290</td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td>Manufacture of veneer and chipboard materials</td>
<td>-</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Manufacture of carpentry</td>
<td>162</td>
<td>143</td>
<td>111</td>
</tr>
<tr>
<td>Manufacture of wooden containers</td>
<td>67</td>
<td>18</td>
<td>38</td>
</tr>
<tr>
<td>Manufacture of furniture</td>
<td>21</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Manufacture of other products of wood</td>
<td>620</td>
<td>257</td>
<td>238</td>
</tr>
</tbody>
</table>

Dry wood waste collected by wood fibre companies:
In 2007, around 351 kton of dry industrial residue wood was collected in the Netherlands (Probos, 2007), including mainly white sawdust and curl (48%) and brown sawdust and curl (30%). In addition, 78.5 kton of industrial residue wood is imported yearly to the Netherlands – mainly from Belgium and Germany. This gives a total amount of 430 kton of collected residue wood for 2007 (Probos, 2007).
Table 7: Processed amount of roundwood and the amount of residue wood in 2007 (Probos, 2007). Figures are presented in tons residue wood with a moisture content of 50%.

<table>
<thead>
<tr>
<th>Roundwood processors</th>
<th>Processed roundwood in m³</th>
<th>Residue wood in ton</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sawmills</td>
<td>587.011</td>
<td>259.944</td>
<td>85%</td>
</tr>
<tr>
<td>Clog manufacturers</td>
<td>12.872</td>
<td>6.324</td>
<td>2%</td>
</tr>
<tr>
<td>Impregnated wood to extend lifetime</td>
<td>36.643</td>
<td>15.162</td>
<td>5%</td>
</tr>
<tr>
<td>Paper and cardboard industry</td>
<td>113.839</td>
<td>12.526</td>
<td>4%</td>
</tr>
<tr>
<td>Pile manufacturers</td>
<td>27.300</td>
<td>200</td>
<td>0%</td>
</tr>
<tr>
<td>Sawmills (tropical wood)</td>
<td>34.571</td>
<td>11.940</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td>810.236</td>
<td>306.096</td>
<td></td>
</tr>
</tbody>
</table>

3.2.3 Trends in markets, demand (and prices) of (clean) wood waste
Figure 10 shows the market of used and industrial residue wood waste. Important end-users of wood waste are the chipboard industry and the energy market.

Figure 10: Market of used wood and industrial residue wood. (Probos, 2007)
Figure 11: Flowchart of Dutch consumption A, B, C wood and residue wood in kton (A, B, C wood: data are underlined, residue wood: data are italic). Based on data Probos (2007).

Figure 11 shows the numbers that are connected to the market of used wood in the Netherlands, based on 2007 (Probos, 2007).

3.2.3.1 Used wood
Three main final consumers can be distinguished in the market for used wood (for all categories) (Probos, 2007):
- Chipboard industry: fully present abroad;
- Energy companies: domestic and abroad;
- Wood enterprises: charcoal producers, wood briquettes and pressed shaped timber (especially pallets and pallet blocks). All need for their production clean, untreated wood. This is ‘A wood’ or residual wood from the wood industry.

1160 kton of used wood was exported in 2007, decreasing to 710 kton in 2010. Most of this used wood was exported to Germany, followed by Belgium. Figure 12 shows a continuing growing demand of used wood for the energy market in the Netherlands since 2007. The consumption of used wood for materials is stable. The energy market thus mainly drives the total growing consumption of used wood.

Pallet producers have indicated in a report from Probos (2013) that they prefer to use fresh and clean resources for their materials, being somewhat averse to the use of used or waste wood.
Table 8: Export of used wood from the Netherlands in kton for the years 2005, 2006 and 2007 – divided into material use and energy use. (Probos, 2007)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>91</td>
<td>167</td>
<td>219</td>
<td>3</td>
<td>5</td>
<td>10</td>
<td>94</td>
<td>171</td>
<td>230</td>
</tr>
<tr>
<td>Germany</td>
<td>244</td>
<td>340</td>
<td>313</td>
<td>445</td>
<td>555</td>
<td>582</td>
<td>689</td>
<td>895</td>
<td>895</td>
</tr>
<tr>
<td>France</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>51</td>
<td>18</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>51</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Sweden</td>
<td></td>
<td></td>
<td></td>
<td>47</td>
<td>52</td>
<td>31</td>
<td>47</td>
<td>52</td>
<td>31</td>
</tr>
<tr>
<td>UK</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>391</td>
<td>527</td>
<td>536</td>
<td>495</td>
<td>612</td>
<td>623</td>
<td>886</td>
<td>1138</td>
<td>1160</td>
</tr>
</tbody>
</table>

Figure 12: Consumption of used wood in the Netherlands (Probos, 2012) and use for material and energy.

3.2.3.2 Industrial residue wood

There is direct exchange in products from the fibre companies to the final consumer, domestically and abroad. Sawdust and shavings go to the agricultural industry, and also in small packages to consumers for pets. The chipboard industry abroad buys sawdust and remainder pieces. There is an increasing supply to power plants (Probos, 2007).

Fresh wood residues from wood processing companies:

Part (4%) of this residue wood waste from roundwood sawmills is used internally for energy. The remainder of the volume is destined for other markets, mainly the energy and chipboard industry.
Dry wood waste collected by wood fibre companies:
In total, 217 kton of residue wood (47% of the total) is used as fuel for energy generation in 2007. The majority (85%) is pressed into pellets. A small part of the residues is used for the chipboard industry, fully destined abroad (Probos, 2007).

Table 9: Destination final products from residue wood from wood processing industry 2007 (Probos, 2007). *Difference explained in the report because of data uncertainties.

<table>
<thead>
<tr>
<th>Product</th>
<th>Sale Netherlands (kton)</th>
<th>Export (kton)</th>
<th>Total (kton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litter</td>
<td>145,5</td>
<td>71</td>
<td>216,5</td>
</tr>
<tr>
<td>Energy</td>
<td>130</td>
<td>87</td>
<td>217</td>
</tr>
<tr>
<td>Chipboards</td>
<td>-</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>275,5</td>
<td>168</td>
<td>461,5*</td>
</tr>
</tbody>
</table>

3.2.3.3 The energy wood pellet market
The feedstock potential within the Netherlands for the production of wood pellets (sawdust or shavings) from domestic industries is rather limited. Residues (waste) from (re)-sawing processes of coniferous species (mostly spruce and pine) and white deciduous species (mostly poplar) are fully dedicated to other destinations. Such destinations are, for example, the particleboard industry in Belgium and the extensive Dutch dairy sector (stable litter).

Table 10: Use of energy wood for renewable energy (excl. private stoves) in 2007 and 2011. (Probos, 2012)

<table>
<thead>
<tr>
<th>In ktons</th>
<th>Fresh wood</th>
<th>Industrial residue wood / wood pellets (2011)</th>
<th>A, B and C wood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>425 500</td>
<td>340 130</td>
<td>755 985</td>
</tr>
<tr>
<td>Import</td>
<td>0 0</td>
<td>825 1270</td>
<td>0 80</td>
</tr>
<tr>
<td>Export</td>
<td>200 250 (estimation)</td>
<td>290 65</td>
<td>625 500</td>
</tr>
<tr>
<td>Consumption</td>
<td>225 250</td>
<td>875 1335</td>
<td>130 565</td>
</tr>
</tbody>
</table>

Wood pellets in the Netherlands are mainly used for co-firing and almost entirely handled as bulk. The use of wood pellets has increased from 450 kton in 2006 to 790 kton in 2008. Other important biomass fuels were wood waste, agricultural residues and various other waste streams. Figure 13 shows that the majority of the consumed wood pellets are imported from abroad (IEA Bioenergy Task 40, 2010).
3.2.3.4 The conventional wood industry

Board consumption in the Netherlands has remained relatively constant in the last years. Around 1240 km³ has been consumed in 2009, from which only 46 km³ has been produced within the country. In total, 1495 km³ of boards have been exported and 302 km³ imported. Table 11 shows the most important trading countries of chipboards and fibreboards: Germany and Belgium and, recently, the UK.

<table>
<thead>
<tr>
<th>Table 11: Important trading counties of boards (in %) for the Netherlands. (Probos, 2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country of origin</strong></td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>Belgium / LUX</td>
</tr>
<tr>
<td>UK</td>
</tr>
</tbody>
</table>

3.2.4 Key drivers in demand (clean) wood waste

In the Netherlands, most of the co-firing plants still have access to the previous subsidy scheme MEP, although these will end for most plants between 2012 and 2015. The government has, however, made clear intentions to consider a mandate of co-firing on biomass at all existing coal fired power plants (new ones excluded). This obligation would result in suppliers searching the market to find out where they can find green energy most cost-effective and sustainably (Pelletcert, 2012).

The Dutch packaging and pallet industry processes annually more than 1 million m³ of softwood to pallets, boxes, crates and industrial packaging. According to the Dutch Packaging and Pallet Industry Association (EPV), the pallet industry is under pressure from rising timber prices and lower volumes. The current crisis has caused a decrease in demand for wooden pallets, boxes and packaging in 2013 (Houtwereld, 2013).

At this moment, the market conditions are not favourable for large-scale and more high-quality recycling of recycled wood by waste companies and waste collectors.
for the use of the conventional timber industry. Main reason is the high cost (Probos, 2013).

EPV and the Platform 'Wood in the Netherlands (PHN), have signed a Green Deal with the government. In this Deal, the parties agree to stimulate the combustion of wood waste on their production facilities and to remove potential obstacles for this.

The chipboard industry in the Netherlands is largely characterized by import and export flows, with limited production within the country.

**Conclusions:**
- There is an increasing demand for wood waste, mainly driven by the energy sector;
- Demand for wood pellets (largely imported) is increasing;
- Consumption of wood waste for material use remains constant. One of the largest markets, the chipboard industry, is mainly abroad;
- The market conditions for the use of recycled wood for the conventional timber industry are at this moment not favourable because of high costs.

### 3.3 Belgium

#### 3.3.1 Trends in supply and trade of (clean) wood waste
Wood waste production in Belgium has slightly increased in the last years, while wood packaging waste has remained fairly constant (see figure 14). Most of the wood packaging waste (no quality defined) is used for energy. The trend in use for recycling and energy goes hand in hand and its ratio distribution remains constant over time.

**Figure 14: Wood packaging waste production and recycling rates in Belgium. (Statistics Office, 2013)**

#### 3.3.2 Primary disposers of (clean) wood waste
Wood waste comes mainly from the following sectors (OVAM, 2010):
- Primary processing (sawmills, veneer companies);
- Secondary processing (furniture, sheet metal production);

7 See also: https://zoek.officielebekendmakingen.nl/stcrt-2012-16773.html
• Households (furniture, demolition wood);
• Businesses (packaging timber, construction and demolition wood).

Waste from households and businesses usually consist of a heterogeneous mass of various wood wastes (OVAM, 2010).

Table 12: Wood waste production 2006 Flanders (OVAM, 2010) in tons.

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>900.000–1.000.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary processing</td>
<td>431.500</td>
<td>521.700</td>
<td>506.000</td>
</tr>
<tr>
<td>Companies excl wood sector</td>
<td>400.000-500.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households¹</td>
<td>232.000 – 245.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.3.3 Trends in markets, demand (and prices) of (clean) wood waste

The wood waste market in Flanders has a strong international focus. Flanders imports large quantities of wood, mainly for chipboard production. Imports and exports of untreated wood fall under the Green list regime (see also 2.1 of this report), which means that concrete information about these flows is missing (OVAM, 2010). Figures 15 and 16 show the amounts of treated wood waste. This is also imported in large quantities, mainly from the Netherlands, France and Germany (OVAM, 2010).

In 2007, 6.187 tons of wood waste was imported from the Netherlands and France for energy use in Flanders, while 204,509 tons were imported for recycling in the chipboard industry. In 2008, 6834 tons of wood waste for energy recovery and 158.353 tons for recycling were imported (OVAM, 2010).

Figure 15: Import and export of treated wood waste for energy use. (OVAM, 2010) Import: Blue, Export: Red.
In 2007, 35,540 tons of wood waste was exported to Sweden, Germany and France for energy recovery and 76,509 tons for recycling (Netherlands). In 2008, 40,761 tons of wood waste for energy recovery was exported – mainly to Germany. In the same year, 53,962 tons of wood waste was exported for recycling in the Netherlands and Germany (OVAM, 2010).

Table 13: Destinations of wood waste. (OVAM, 2010)
1) Secondary waste: results from the processing of waste. In other words: nature and composition of waste has been changed by a pre-treatment method (recycling centers, waste processors, etc.).

<table>
<thead>
<tr>
<th>In kilo ton</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1073.9</td>
<td>1343.0</td>
<td>1278.1</td>
</tr>
<tr>
<td>Deposit</td>
<td>1.5</td>
<td>0.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Incineration</td>
<td>186.8</td>
<td>304.0</td>
<td>177.6</td>
</tr>
<tr>
<td>Recycling</td>
<td>457.5</td>
<td>492.2</td>
<td>558.1</td>
</tr>
<tr>
<td>Secondary raw material</td>
<td>1.9</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Conditioning</td>
<td>426.2</td>
<td>545.9</td>
<td>540.0</td>
</tr>
<tr>
<td>Harmless</td>
<td>1051.9</td>
<td>1280.1</td>
<td>1221.6</td>
</tr>
<tr>
<td>Dangerous</td>
<td>22.0</td>
<td>62.9</td>
<td>56.5</td>
</tr>
<tr>
<td>Primary</td>
<td>799.4</td>
<td>926.7</td>
<td>813.9</td>
</tr>
<tr>
<td>Secondary 1)</td>
<td>274.5</td>
<td>416.3</td>
<td>464.2</td>
</tr>
</tbody>
</table>
The two most important markets for wood waste in Belgium are chipboard production and energy recovery (OVAM, 2010). Curls and natural wood shavings are used as raw material in the chipboard industry, or sold as litter to households and farmers. Since a few years, this waste is increasingly used as a feedstock for the production of pellets and briquettes (OVAM, 2010).

3.3.3.1 The energy wood pellet market
Total pellet consumption in Belgium in 2008 was 920,000 tons of which around 800,000 tons were industrial pellets consumed for power production. Electrabel (GDF Suez) is the major consumer of industrial wood pellets in Belgium (Pellet Atlas, 2009). Table 14 shows some examples of licensed installations for wood incineration in Belgium.

<table>
<thead>
<tr>
<th>Name</th>
<th>Source wood waste</th>
<th>Ton/yr (max)!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrabel Kluisbergen (Ruien)</td>
<td>Wood dust</td>
<td>40.000</td>
</tr>
<tr>
<td>Electrabel Kluisbergen (vergasser)</td>
<td>Wood chips A/B wood</td>
<td>130.000</td>
</tr>
<tr>
<td>Electrabel Genk (Langerlo)</td>
<td>Wood dust (incl. sludge and olive pulp)</td>
<td>100.000</td>
</tr>
<tr>
<td>Electrabel, Gent Rodenhuize</td>
<td>Wood pellets (import from Canada)</td>
<td>400.000 (to 809.000 est. in mid 2011)</td>
</tr>
<tr>
<td>Electrabel Kluisbergen</td>
<td>Contaminated wood waste</td>
<td>150.000</td>
</tr>
</tbody>
</table>

Table 14: Some examples of licensed installations for wood incineration. (OVAM, 2010)

1) No waste product.

The large-scale energy sector largely relies on pellet imports from Germany, Eastern Europe and North America, and is expected to be growing significantly in the next years. In addition to the industrial sector, there is also a significant residential pellet heating market. This is in contrast to other industrial pellet markets in the Netherlands and the UK (Pellet Atlas, 2009).

Wood waste was initially used mainly for energy recovery within the timber sector. By stimulating the production of renewable energy, the incineration of wood waste in Flanders has increased strongly.

8 Several of the renewable energy plants in Flanders are also licensed for other waste streams, so the actual capacity will be filled with wood (waste) will be lower than the licensed capacity.
3.3.3.2 The conventional wood industry
Fedustria indicates that good statistics about the availability of clean wood waste are not present in Belgium. Clean wood waste is in principle used by chipboard producers. This is about 500,000 dry ton in terms of consumption. In Flanders, the cascade use of wood is closely followed. This means that 'clean wood waste' should in principle be used for materials, rather than for energy applications (Fedustria, 2013).

OVAM (2010) mentions three main chipboard producers in Flanders (Unilin, Spano and Linopan). The sector gets about 30% of its recycling timber from Belgium, which corresponds to an amount of approximately 240,000 tons / year (see also table 15).

Table 15: Capacities (in tdm) of recycling wood and chipboard in Flanders. (OVAM, 2010)

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity recycling wood (tdm)</th>
<th>Total processing capacity (tdm)</th>
<th>Share of recycling wood (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>405,000</td>
<td>1,247,000</td>
<td>33</td>
</tr>
<tr>
<td>2004</td>
<td>474,000</td>
<td>1,264,000</td>
<td>38</td>
</tr>
<tr>
<td>2005</td>
<td>492,000</td>
<td>1,239,000</td>
<td>40</td>
</tr>
<tr>
<td>2006</td>
<td>550,000</td>
<td>1,239,000</td>
<td>44</td>
</tr>
<tr>
<td>2007</td>
<td>600,000</td>
<td>1,200,000</td>
<td>50</td>
</tr>
<tr>
<td>2008</td>
<td>620,000</td>
<td>1,200,000</td>
<td>52</td>
</tr>
</tbody>
</table>

Experiences in Belgium (2010) learn that the particleboard industry has problems to get enough wood waste at a competitive price, even during periods of
recession. The energy companies offer higher prices for wood waste. The price of recyclable B-wood has increased by around 6 Euros in 2010 compared to the price in late 2008 – indicating that the price is determined primarily by the customers in the energy sector (OVAM, 2010).

De Standaard (2010) mentions that wood prices have increased in 2010 due to subsidies for green energy. This happened despite legislation to avoid competition. Electricity producers can pay more for wood than the conventional wood industry, because of the subsidies they receive. Legislation (see 2.3) has not prevented that the price for clean wood shows little or no difference with the price of contaminated wood waste. According to Fedustria, this indicates for 2010 that still a lot of the wood in Flanders, to be destined for wood processors, finds its way to the electricity producers elsewhere in Europe. Besides this, the recovery rate of industrial packaging pallets (mainly used for the traditional timber industry) was decreasing – suspecting that a larger share of the wood is used to make electricity.

3.3.4 Key drivers in demand (clean) wood waste
According to OVAM (2010), prices for wood waste strongly depend on the quality of wood, availability, the economic situation and the prices for fossil fuels.

The Green Certificate Scheme in Belgium contributed to stimulating the demand for solid biofuels, including pellets, for electricity generation by (co-) combustion.

Conclusions:
- There is an international dimension of the wood waste industry (imports, exports);
- Despite legislation to avoid competition in demand of clean wood waste, the wood processing industry has mentioned price increases for clean wood;
- This, due to distorting effects of subsidies on renewable energy and growing demand for woody feedstock.

3.4 United Kingdom UK
3.4.1 Trends in supply and trade of (clean) wood waste
In the UK, wood waste mainly comes from construction and demolition activities. Various estimates put the number of wood waste generated in the UK at 5.1 million tons (Mt) in 2007 to 4.3/4.1 Mt in 2010. From this, 1.4 Mt was recovered in 2004, leaving a further 1.5 Mt of high-quality wood waste and two to three Mt of low-quality wood waste for large commercial users and power generation. These figures (based on 2004) exceeded the total estimated UK demand of 10.000 to 20.000 tons a year, for all uses except power generation.

Since the start of the recession, the number of companies using wood and producing wood waste has fallen. These were mainly construction and furniture companies. Recent data do, however, show signs of a rebound in production of wood waste as of 2010 (WRAP, summer 2011).
Table 16: UK wood waste arising by source in 2007 and 2010. (DEFRA, 2012)

<table>
<thead>
<tr>
<th>Source of wood waste</th>
<th>WW production 2007</th>
<th>WW production 2010</th>
<th>Production change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging</td>
<td>1.169 (Kt)</td>
<td>998 (Kt)</td>
<td>15%</td>
</tr>
<tr>
<td>Industrial</td>
<td>463 (Kt)</td>
<td>393 (Kt)</td>
<td>15%</td>
</tr>
<tr>
<td>Construction</td>
<td>1.184 (Kt)</td>
<td>854 (Kt)</td>
<td>28%</td>
</tr>
<tr>
<td>Demolition</td>
<td>1.138 (Kt)</td>
<td>1.068 (Kt)</td>
<td>6%</td>
</tr>
<tr>
<td>Local Authority Collected Waste</td>
<td>491 / 619 (Kt)</td>
<td>1.015 (Kt)</td>
<td>15% (increase)</td>
</tr>
<tr>
<td>Total</td>
<td>5.064 (Kt)</td>
<td>4.327 (Kt)</td>
<td>15%</td>
</tr>
</tbody>
</table>

Government policies have supported the supply and demand of wood waste (all types) for energy recovery since 2002. Following this, for instance (and discussed in more detail below), pellet production has increased by 12 times from 2005 to 2011.

Figure 18: Wood waste collection and recycling supply chain, UK. (PAS, 2012)

3.4.2 Primary disposers of (clean) wood waste
In 2010, total wood waste was amounted to be 4.1 to 4.3 Mt. Primary disposers of wood waste in the UK are shown in figure 19 and further explained in this section.
The construction industry generated around 1.2 Mt of wood waste in 2009. Wood waste mainly comes from consumed wood based panels and sawn wood. Wood waste from this industry is estimated to have a recycle rate of 75-80%; 
- Demolition activities generated just over 100,000 tons of wood waste in 2009 while construction generated just over one Mt of wood waste. Wood waste from this industry is often treated and estimated to have a recycle rate of 80-90%; 
- The industrial sector (furniture and joinery) generated nearly 0.5 Mt of wood waste in 2009, 0.4 Mt in 2010, mainly coming from sawn wood (for joineries) and particleboards and MDF (for furniture producers); 
- The packaging industry generated nearly 1.17 Mt of wood waste in 2009. This wood waste mainly comes from domestic packaging manufacturing. It is considered clean – i.e. from pallets – and is mainly used by panel board manufacturers and for animal bedding. The great demand leaves little room left for energy recovery out of this wood waste.
Table 18: Recovered wood suitability by end-uses. (WRAP, 2011)

<table>
<thead>
<tr>
<th>End use</th>
<th>Wood waste stream</th>
<th>Wood waste arising by waste stream (in tons)</th>
<th>Proportion of waste stream suitable for end use</th>
<th>Estimated total wood waste suitable for end use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and horticultural use</td>
<td>Packaging</td>
<td>1.107.000 tons</td>
<td>100%</td>
<td>1.107.000 tons</td>
</tr>
<tr>
<td>Panel board</td>
<td>Packaging</td>
<td>1.107.000 tons</td>
<td>40%</td>
<td>2.078.700 tons</td>
</tr>
<tr>
<td></td>
<td>Industrial</td>
<td>328.000 tons</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>1.066.000 tons</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demolition</td>
<td>1.066.000 tons</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Municipal</td>
<td>533.000 tons</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Biomass (energy)</td>
<td>Packaging</td>
<td>1.107.000 tons</td>
<td>100%</td>
<td>4.100.000 tons</td>
</tr>
<tr>
<td></td>
<td>Industrial</td>
<td>328.000 tons</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>1.066.000 tons</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demolition</td>
<td>1.066.000 tons</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Municipal</td>
<td>533.000 tons</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 18 illustrates the suitability of different sources of wood waste, for different end-uses. Although wood waste suitability is 100% for energy recovery, not 100% is dedicated for this end-use, as energy recovery will need to compete with conventional uses for the available wood waste.

3.4.3 Trends in demand (and prices) of (clean) wood waste

Until 2007, by far the largest consumers of wood waste were construction and furniture industries, using panels produced out of recycled wood waste (see figure 20). This accounted for 58% of total demand. Since the recession started in 2008, this demand has fallen – although there are signs of a rebound (WRAP, 2011).
Although use of recovered wood for panel manufacturing has slightly fallen, pellet production from wood waste and dedicated biomass (using wood waste) was in steep rise. Electricity generation from these resources was counted at 318 MW in 2008.

Agricultural use, in particular for animal bedding and equine surfaces, also has a large share in the use of wood waste. It is estimated that even in the recession, this demand remained fairly constant due to the depreciation of sterling and the rise in prices of animal bedding from alternative material.

Market reforms from governmental policies to support the renewable energy generation (such as the RO and RHI) in combination with increasing energy demand, impact the demand from this sector on wood waste. Generated electricity and heat from wood waste, i.e. pellets, has started to take off and is still climbing.

In the UK, wood pellets are primarily consumed by industry – e.g. large scale biomass co-firing power plants. Households also consume wood pellets for electricity production. Demand for pellets for heat generation is smaller although this is increasing due to policy support (e.g. through the RHI, see also section 2.5 in this report). Overall, consumption of wood pellets in 2008 was counted at 176,000 tons, and 683,000 tons in 2010. Pellet demand specifically for heat consumption is climbing from 50,000 tons in 2011 to an estimated 500,000 tons in 2015.

Figure 21 shows the trends and gap between high and lower grade wood waste prices. The lower demand, and prices, of lower grade wood waste can be explained by the costs associated with its processing, compared to higher-grade wood waste. These costs may increase even further, due to governmental policies such as the Landfill Tax and the Landfill Allowance Trading Scheme (LATS). Table 19 shows this comparison.
Wood waste prices (see figure 21) slightly increased between 2008 and 2011, followed by a small decrease in 2012. This price drop was stronger for lower grade wood waste, due to higher relative processing difficulties, than for higher-grade wood waste. Fluctuations cannot be explained by one factor, being influenced by changes in demand and supply, as well as price fluctuations.

It is expected that increased demand from the biomass energy sector and domestic wood pellet production – which are financially supported by governmental policies – may push back up prices for wood waste. The conventional industry of panel manufacturing and end-uses as construction and furniture manufacturing will hence have increasing difficulty to pay for their part of wood waste (WRAP, 2011). The Economist (2013) mentioned recently that: "Furniture-makers complain that competition from energy producers will lead to the collapse of the mainstream British furniture-manufacturing base, unless the subsidies are significantly reduced or removed".

Table 19: Income/cost of disposal of wood, in UK. (DEFRA, 2008)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Example methods of recovery and disposal</th>
<th>Recovery/disposal cost/income (per tonne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade A</td>
<td>Animal bedding, equestrian use, panel board industry, garden mulches</td>
<td>Potentially income of up to £150</td>
</tr>
<tr>
<td>Mixed grade</td>
<td>Processed / sorted for use in panel board industry</td>
<td>Cost of £5 to £30</td>
</tr>
<tr>
<td>Low grade</td>
<td>Landfill</td>
<td>Equivalent landfill cost (£35 to £45 in 2008), plus LATS cost (when from MSW source)</td>
</tr>
</tbody>
</table>

3.4.3.1 The energy wood pellet market
Pellets within the UK are mainly produced out of sawdust, clean wood waste, energy crops and forest thinnings. Growth from sawdust is considered to be limited due to feedstock competition with animal bedding and furniture board companies. Growth from forest thinnings is considered high in potential – among
other things, due to the incentive to grow through the Government’s Energy Crop Scheme. For this feedstock, competition will exist between pellets and woodchips.

Since the implementation of governmental policies supporting bioenergy, pellet production within the UK has increased from 25,000 tons/year in 2005 to 300,000 tons in 2011. Production capacity in this year was 480,000 tons. Within the EU, the UK exports wood pellets to primarily Denmark (AEBIOM, 2012). Total exports of wood pellets to Denmark developed from an increase until 2011 – from close to 1.7 Mt in 2008 to nearly 2.14 Mt in 2011; to a decrease between 2011 and 2012 (this latter being back at nearly 1.7 Mt) (Eurostat statistics). Pellet imports to the UK, primarily from North America (Canada and the US), have been declining until 2010, after when the climb started to take off from slightly over 9.15 Mt in 2010 to over 16.2 Mt in 2012 (Eurostat statistics).

3.4.4 The conventional wood industry

Conventional industries using wood waste include:

- Construction and furniture industry: wood waste is especially consumed for the production of panels for these industries – as explained earlier, this demand is declining;
- Agriculture and farming: wood waste is consumed for this industry to produce in particular animal bedding and equine surfaces – which is likely to remain the same or slightly climbing, due to high prices of substitutes such as straw;
- Converted coal power plants: wood waste is used for energy generation from combustion – likely to decline due to reducing UK government support for converted plants, while maintaining its support for new and dedicated biomass plants.

Figure 2: Market segmentation of wood product types and consumption, 2010. (WRAP, 2011)

Figures 23 and 24 show the changing composition of end-uses of wood waste. Recovery (i.e. re-using and recycling) from conventional wood industry is remaining at same levels or declining, while incineration (i.e. energy recovery) is rising.
3.4.5 Key drivers in demand (clean) wood waste

UK’s legislation supporting the energy from wood waste covers both the supply and demand side of the chain. Policies are implemented to boost domestic supply through the (New) Biomass Strategy (2007/2012) while grants are provided to domestic industries and households to install pellet boilers/stoves for (own) energy provision. Demand is also boosted through the RHI and the RO.

The use of wood waste as biomass is financially supported by the government (through ROCs). Therefore, the biomass industry has a competitive advantage compared to conventional industries to pay for the wood waste.

Another business driver – from both the government and the market – is the increase in fossil fuel prices. Government policies are driving up the prices, e.g. through the Climate Change Levy or the carbon price put on fossil fuels. Expected price increases and the (increasing) volatility of fossil fuel prices are also pushing the use of pellets. Wood pellets for energy and heat are already price compatible with fossil fuels.

A primary barrier, caused by the increased demand and relative lower increased supply, is the (potential) increase in wood waste prices. This will put an upward
pressure on the conventional industry’s place in the competition for this feedstock – although it would create a competitive advantage for energy recovery from wood waste.

Other, less influencing barriers, may include:

- The decreasing value of ROCs, and coal fired plants closing down rather than implementing the Large Plant Directive’s environmental reform requirements;
- High investment costs are associated with the implementation of pellet boilers or stoves; Grants through the RHI may take on this problem, but support needs to be certain;
- Concerning both a driver and barrier, is a policy possibly indirectly impacting the wood waste and pellet demand. This is the LCP Directive, which may impact the wood pellet market either negatively or positively (see also section/paragraph 2.1 above).

Conclusions:

- Wood waste production declined from 5.1 Mt in 2007 to about 4.2 Mt in 2010 – decline was noted especially in construction and demolition industry;
- Since implementation of governmental policies, production, consumption/use and imports of wood pellets have increased, while exports have been declining;
- Consumption of wood waste by the conventional industry is declining, while consumption by the energy industry is increasing due to policy support for energy recovery.
4 Cascading and impacts to the energy pellet industry

When further up-scaling the use of wood waste for energy, it is important to understand the competition with other end-uses of wood waste, both from a market, legislative and sustainability perspective. This report focuses on the competition and use of wood waste (pellets) in the Netherlands and in close by EU countries: UK and Belgium.

Wood waste comes from various sources. The construction and demolition sector and the packaging industry are large suppliers. Wood waste has multiple end-uses, largely determined by its grade of quality. Both A and B wood can be used by the traditional timber sector, particularly for boards, and by the renewable energy sector. Note that fresh wood (not considered a waste under the EU Waste Directive) is also used for energy – especially for local applications on small scale. It does not play a large role in the competition between the timber and large-scale energy sector but does decrease pressure on total demand.

The traditional timber market is experiencing difficulties, slowly recovering from the economic recession and the downturn in the housing market. Competition is therefore fierce as the timber sector is dealing with lower demands, competition from other international markets (e.g. Asia) and higher feedstock prices.

The wood energy market in Europe is – on the other hand - expanding strongly, largely pushed by green energy policies in the European countries. Demand and imports of wood pellets are growing strongly. At the same time, energy is also increasingly recovered from wood waste. Wood demand in Europe for material use, and to meet the renewable energy targets, is expected to increase further.

Both markets find their resources in competitive markets. Competition in demand for wood waste is mentioned in the UK and in Belgium, both in terms of demand and increasing prices. Competition is less visible in the Netherlands, also because board production is not significantly present within the country.

Both the conventional timber markets and wood energy markets function in an international dimension: resources and products are traded globally and extend countries and European boundaries.

4.1 Place of wood waste in sustainability hierarchy

The EU Waste Framework Directive prescribes that clean wood waste (grade A) is destined for useful recovery. Individual member states have translated the Directive into their national legislation.

- Wood waste (grade A and B) in the Netherlands can be destined for useful recovery including material/product recovery and energy use as main use. No distinction is made between these options;
- The destination of clean wood waste in Belgium is raw material for industry, unless the waste is not of use for the industry. Agreements are made with the involved industry associations. Contaminated wood waste can be used for the energy market;
Wood waste in the UK follows largely the EU waste management hierarchy. Wood waste shall go to the highest useful end-uses. For higher-grade wood waste (A) these are both material and energy recovery – agriculture for animal bedding, panel manufacturers, and any incineration.

Belgium has stricter rules in waste hierarchy for clean wood than the Netherlands or the UK, also through a stronger involvement of the board industry.

4.2 Place of wood pellets in sustainability hierarchy

The EU Waste Framework Directive gives end-of-waste criteria, meaning that a product is no longer a waste when certain criteria are met. For example, the product needs to have a market and a destined end-use.

Based on expert opinions and literature, imported wood pellets into Europe seem to meet the end-of-waste criteria and are thus no longer considered waste in Belgium and in the Netherlands. This is only under the condition that the exporting country (USA in this case) agrees as well that the material is no longer a waste product. This means that imported energy pellets fall under the Customs Product Regulations and not under the Waste Regulations.

This does not seem to be the case in the UK, where imported pellets are still considered waste according to personal consultation with the UK Environmental Agency.

Given the different country approaches and found uncertainties under government agencies, it is highly confirmed to receive a final assurance on the status of the energy pellets from the responsible government agencies in the respective countries.

Note that most of the imported energy pellets in Europe are made from timber processing residues, which do not fall under the waste classification (unlike post-consumer wood waste). Timber or forestry residues, also as feedstock for pellets, do fall under the EU Timber Regulation.

In case energy pellets are produced domestically from post-consumer wood waste, the story becomes slightly different:

- The post-consumer wood waste does fall under the EU Waste Directive until the material is converted to energy pellets (following the end-of-waste criteria);
- This possibility is thus restricted in Belgium where the wood waste is in principle first destined to the conventional timber market, unless it cannot be used by this sector.

In all cases, it is required that the energy plant receiving the pellets or woody feedstock has the correct permits and meets the country’s obligations.

4.3 Competition markets and indirect effects

The EU Waste Framework Directive gives a preference on the use of wood waste. Clean wood waste is destined for useful recovery including material recovery or energy use as main use (in the UK and NL and in Belgium under restrictions only),
while avoiding as far as possible that wood waste is destined for landfills and disposal.

Although clean wood waste is exclusively destined for useful recovery within Europe, dynamics in competition continue to exist for other competitive feedstock resources such as timber processing residues. Given the growing expected demand, competition in woody resources will increase. This will be strengthened when the construction sector recovers from the economic recession. Current trends show that this will most likely result in increasing prices and worldwide trade of wood residues, wood waste and pellets.

Figure 25 shows that, even though the clean wood waste market in the EU is protected to some extent by legislation, its price and supply dynamics cannot be seen separately from fluctuations in alternative resources and end-uses.

The handling and definition of waste from non-European countries is regulated under the EU Shipment Directive: the most stringent regime applies. The EU Waste Directive does not regulate whether the waste hierarchy is applied to the (clean) wood waste in the exporting country. Important pellet and wood exporting countries, as the US, have solid country legislation on waste. This does not have to be the case for other countries.

**Figure 25: Dynamics in competition between alternative resources and end-uses**

The presence of a strong timber industry, and removal of useful wood waste to the European markets, may indirectly impact the sustainability of the timber sector in those countries: companies may need to shift towards primary wood resources instead of wood waste, which has impact on pricing and harvesting rates. Understanding potential competitive effects of wood resources is therefore of importance, also outside Europe.
Of course, the opposite can also occur: earlier disposed wood waste in countries can be destined for useful recovery.

Note that the mentioned possible indirect effects in this section are not specific for wood waste. They are also visible at, for example, forest processing residues, which are not covered by the EU Waste Framework Directive.

### 4.4 Recommendations to mitigate indirect effects (NL Agency):

- Monitoring the impact of green energy policies in Europe on wood resources demand and competition in prices and demand is key to steer negative sustainability impacts;
- Promoting waste hierarchy policies and recycling of wood. This is especially of importance in wood producing countries;
- Exploring the opportunities to further decrease the disposal of wood waste on landfills through e.g. improvement of infrastructure and logistics;
- Promote the possibilities of biomass cascading through biofineries. This option is especially of interest for streams that are close to the biomass resource. Biorefineries are preferably located close to industries that can use higher value products as proteins and/or close to the energy plant;
- Also promote the possibility of cascading of used wood for higher-value purposes in the conventional timber industry, for example for the production of furniture;
- Stimulate cooperation between stakeholders to improve logistics in the collection of used wood, which will benefit the availability and the collection costs;
- Stimulate companies to take measures to ensure that wood supplies from other regions are truly sustainable, so that European demand (especially if it is large scale) is not subject to excessive risk, and does not export Europe’s resource demand to other, possibly more vulnerable, regions;
- This can include a check of competition in the wood (waste) value chains for energy at the source of origin. Certification schemes can play a role here.
5 References

- AEBIOM (2012) 'European Bioenergy Outlook 2012'
- Afvaldesk (2013), Phone conversation with Ms. Jennifer van Dijk on 3 April 2013
- CostGard on Climate Change Levy, http://costgard.co.uk/climate_change Levy_ccl.html
- DEFRA (2011), UK Government, Department for Environment, Food and Rural Affairs, Guidance on applying the Waste Hierarchy
- EEA (2012), Material resources and waste, 2012 Update – state and outlook 2010, European Environmental Agency
- EEA (2012a), Movements of waste across the EU's internal and external borders, EEA report 07/2012, European Environmental Agency
- Energy Crops Company (2007), Wood Pellet Fuel Utilisation design guide
- Fedustria (2013), email communication with Mr. G Van Steertegem, Direction of Fedustria, Association of textile, wood and furniture industry, Belgium
- IEA Bioenergy Task 40 (2010), Country report the Netherlands in 2010
- Houtwereld (2013), EPV luidt noodklok houten pallets, nieuwsbrief mei 2013
ISCC (2013), System Basics Supplement for the certification of waste and residues based liquid and gaseous biofuels, ISCC 13-01-31 V 1.0 EU DRAFT, under public consultation

Laborelec GDF Suez (2012), Industrial Wood Pellets Report

Landelijk Afval Plan, sector 36 Hout (2010)


ODE (2010), Biomassa-afval en het beleid daarover (wat brengt de toekomst?), presentatie door F. van Gijzeghem, April 2010

OVAM (2010), Inventarisatie biomassa 2007-2008 (deel 2009) met potentieel 2020, Mechelen, April 2010

Parsons Brinckerhoff (2011), Continued Operation of ‘Opted-Out’ Large Combustion Plants under the IED


Probos (2012), Kerngegevens bos en hout in Nederland

Probos (2013), Inzetten op hergebruik van sloophout, rapport 2013 nr. 3


Senter Novem (2005), Afval of biomassa, een juridische onderbouwing


UK Government (2010), Environment Agency. Position Statement; The environmental regulation of wood


UK Government (2012), Department for Transport, Department of Energy and Climate Change, Department for Environment, Food and Rural Affairs. UK Bioenergy Strategy


• UNECE (2012), Forest Product Annual Markets Review 2011-2012, from UNECE and FAO
• VLAREMA (2012), Besluit van de Vlaamse Regering tot vaststelling van het Vlaams reglement betreffende het duurzaam beheer van materiaalkringlopen en afvalstoffen, April 2012
• WRAP (2009), Wood Waste Market in the UK
• WtERT (2013), information from website: [link](http://www.wtert.eu/default.asp?Menue=14&ShowDok=25)
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