

Effective and low-disturbing biofuel policies

WP 3 – Inventory and analysis of relevant policies in other sectors

WP 3 **Deliverable 3.2**

Inventory of policies, programmes, strategies and market tendencies in selected EU countries

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November 2008, updated September 2009

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Executive summary

The current market introduction of biofuels and the anticipated increase in the future may have significant impacts on other commodity markets. Such policy-induced market disturbances can become a major barrier for industry and public support for biofuels. Therefore, the ELOBIO project aims at developing policy options that minimize the impacts of biofuel production and use on e.g. food and feed markets, and markets of biomass for power and heat production while enhancing biofuel use. The project consists of a review of current experiences with biofuels and other renewable energy policies and their impacts on other markets, iterative stakeholder-supported development of low-disturbing biofuels policies, model-supported assessment of these policies' impacts on food & feed and lignocellulosic markets, and finally an assessment of the selected optimal policies on biofuels costs and potentials. Elobio project reviews the current experience with biofuels and other relevant policies in order to develop policy options that minimize those impacts.

Lignocellulosic biomass such as wood residues, municipal paper waste, agricultural residues, and dedicated energy crops is used by a number of sectors (such as heat and electricity production, pulp and paper industry, bio-based material manufacturing) in addition to biofuel production. Thus, policies supporting lignocellulosic biomass for other uses are highly relevant in defining policy options to minimize the impacts of biofuels on other commodity markets.

This report makes an inventory of relevant policies, programmes, strategies and market tendencies in the field of renewable electricity and heat production as well as agricultural and forest policy and wastes and co-products management. The inventory includes both European and National policies. The national data is provided by project partners and subcontractors from the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Italy, Lithuania, Netherlands, Poland, Spain and Sweden. While this report introduces the policies, programmes, and strategies that directly and indirectly effect lignocellulosic biomass use their further assessment will be elaborated in the next report.

European policies

CAP and Rural development policies

The Common Agricultural Policy (CAP), one of the key policy tools, is based on market orientation and rural development. It encourages farmers to produce high quality products and seek new development opportunities such as renewable energy sources (Agriculture and Rural Development, 2009). It supports both the supply and the use of bioenergy on farms and rural areas. Specific regulations were included to stimulate energy crops through area payments to grow energy crops on set aside land. However, on 20 November 2008, a political agreement on the Health Check of the CAP has been reached. This agreement abolished the requirement of arable set aside and direct payments to farmers are reduced and the money is transferred to Rural Development Fund.

Rural development policy for the period 2007-2013 specifies important goals for the rural areas and people who live there. The focus is on improving the competitiveness of the agricultural and forestry sector, improving the environment and quality of life in rural areas as well as encouraging diversification of the rural economy. This policy sets a budget for each of

the priorities. The diversification of farm activities based on biomass production for energy and biofuels is an important focus of this policy.

Forestry policies and the wood processing industry

The Forestry Strategy of the European Union (1998) and the 2006 EU Forestry Action Plan (FAP) are the two important policy documents that established a framework for forestland action to support sustainable forest management, and to implement forestland action. The Action Plan serves as an instrument of coordination between EU level actions and forest policies of the Member States. The EU Forest Action Plan, among other things, promotes the use of forest material as an energy source. This could be particularly important for the use of renewable energy for heating and cooling, electricity as well as future production of second generation biofuels.

Wood processing industry, including pulp and paper, is the most important consumer of forestry wood. The use of wood in these sectors depends mainly on market conditions and market demand for wood processing industry products. Even though these sectors are not regulated directly the wood supply is affected by the Forestry Strategy and the EU Forest Action Plan that requires sustainable wood procurement. The EU Forest Law Enforcement, Governance and Trade (FLEGT) regulation considers importing only legally harvested timber into the EU.

EU Renewable energy policies

Renewable energy at the EU level has been promoted since 1997. The European Commission White Paper set a general target to increase the share of renewable energy from 5.2% of primary energy supply in 1995 to 12 % by 2010. In 2001 the Directive on Promotion of Electricity Produced from Renewable Energy Sources (2001/77/EC) was adopted. This was followed by the Biofuel Directive to address the EU transport sector. As the bioenergy use was lacking behind the expectations the European Commission committed to producing a Biomass Action Plan in 2004. This action plan sets out measures to increase the development of biomass energy by creating market-based incentives and removing barriers to ensure the development of market.

On 23 January 2008, the Commission put forward a proposal for a new Directive on renewable energies to replace the existing measures adopted in 2001. This was adopted by the Parliament in a plenary vote on 17 December and published on June 5, 2009. This directive (2009/28/EC) sets mandatory renewable energy targets for each Member States to meet 20 % of the EU's overall energy consumption from renewables by 2020. As part of the overall target, a binding minimum target for each member state to achieve at least 10 % of their transport fuel consumption from renewable sources is also included. The Directive furthermore obligates each Member States to elaborate the National Renewable Energy Action Plans, which will set the specific targets for each of the energy sub-sectors and resources to reach them.

Waste management

The EU Waste Framework Directive setting a revised framework for waste management in the EU (2008/98/EC) lays down measures to prevent or reduce the adverse impacts of waste through limiting the production of waste, as well as encouraging the use of waste as a

resource by recycling and recovery. This Directive is relevant for lignocellulosic waste materials generated by different industries, services or just inhabitants. They are commonly part of the biodegradable fraction of the municipal wastes. Among others the Directive imposes regulations to recover most of the materials containing lignocellulosic biomass, e.g. paper, used, furniture, old wood construction materials, etc. Thus, the Waste Framework Directive is likely to increase the lignocellulosic waste materials for recycling or energy production.

National Policies

National policies concerning lignocellulosic biomass are in general designed to support and implement the EU level policies. For example the main policy documents regarding the agricultural sector are the rural development programmes, which set the framework for the development of agriculture and rural areas. According to the Council Regulation (473/2009/EC) the rural development programmes have to be amended until 31 December 2009 with activities having, among others, the climate change and renewable energies. This means specific goals and measures will be implemented to promote the use of biomass for energy and transportation fuels production.

The national forestry strategy and national forestry action plans are promoting sustainable forest management, which would also affect wood use for energy production and biofuels. More specific regulations to promote forestry biomass for energy production and climate change mitigation are observed in Finland and Sweden. In most countries regional forestry programmes or laws are defined regarding the specific type of forests and the public priorities of the region, i.e. tourism development, wood industry sector development, bioenergy production, etc.

In most of the countries there are no significant policy documents dedicated only to wood products. Usually the production of the sector is being regulated by the more general documents e.g. Forest Law, General Forest Law etc. The European countries with the highest forestry potential however, have important policies regulating the wood sector e.g. Sweden, Finland, Norway, Austria.

At the national level several specific regulations for renewable electricity and heat production are investigated. As indicated previously these regulations are mainly stemming from the EU Directives promoting renewable energy production, such as the renewable electricity directive in 2001 (2001/77/EC) and the new renewable energy directive (2009/28/EC). There are also specific regulations strongly affected by the country conditions and market trends. For example, in Poland there are regulations dedicated to the biomass co-firing with coal in large-scale power plants.

All Member States have regulated their waste sector as part of the environmental regulations. Within the management of biodegradable wastes, countries such as Belgium, Finland, and Spain have policy documents dedicated to the lignocellulosic waste materials. These materials are required to be kept separately and used for energy recovery or composting. In Germany, Netherlands and Sweden the management of the packaging waste is also regulated through dedicated policy documents.

Consequently, demand for lignocellulosic biomass is driven by a large number of policies, programmes, strategies and market tendencies that can create interactions. These interactions can be complementary and synergistic, yet they can also reduce the effectiveness of one another and undermine meeting the objectives of each policy objective if the targets are contradictory.

1. Introduction

The current market introduction of biofuels has significant impacts on other commodity markets. Such policy-induced market disturbances can become a major barrier for industry and public support for biofuels. Therefore the aim of the project ELOBIO is to develop low-disturbing policy options, enhancing biofuels but minimizing the impacts on e.g. food and feed markets, and markets of biomass for power and heat.

The project consists of a review of current experiences with biofuels and other renewable electricity (RES) policies and their impacts on other markets, iterative stakeholder-supported development of low-disturbing biofuels policies, model-supported assessment of these policies' impacts on food & feed and lignocellulosic markets, and finally an assessment of the selected optimal policies on biofuels costs and potentials.

The overall objective of work package 3 (WP 3) is to identify and analyze the policies directly or indirectly supporting the use of lignocellulosic biomass, which could be used for biofuel production. The scope of the analysis covers relevant policies, programmes, strategies and market tendencies in the field of renewable electricity and heat production as well as agricultural and forest policy and wastes and co-products management.

The aim of this report is to identify policies, programmes, strategies – both at the national and European level – which influence the supply and demand of different kinds of biomass. The analysis of such policies, which will be presented in the next report – Deliverable 3.3 of work package 3-, will be based on the National data provided by project partners and subcontractors from the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Italy, Lithuania, Netherlands, Poland, Spain and Sweden.

In principle, the data collection process was intended to be based on the methodological tool described in the first deliverable of work package 3 (Deliverable 3.1). However, due to the lack of data, such methodological approach had to be modified to take into account existing reports both at the national and international level.

2. Ligno-cellulosic biomass resources

Generally, ligno-cellulosic biomass is produced in two main sectors: agriculture and forestry. Wood and agricultural crops are the primary biomass products, which are utilised by various sectors, such as the food industry, wood processing industry, energy sector, etc. Domestic resources of agricultural and forestry sectors may play an important role as suppliers of ligno-cellulosic biomass for various purposes. Figure 1 shows an overview of the area devoted to the agricultural and forestry sector in the Member States (Malta and Cyprus are excluded due to lack of data). France and Spain have the largest agricultural land resources followed by Germany, Poland, United Kingdom, Italy and Romania. Concerning the forestry sector, the leading countries are Sweden and Finland.

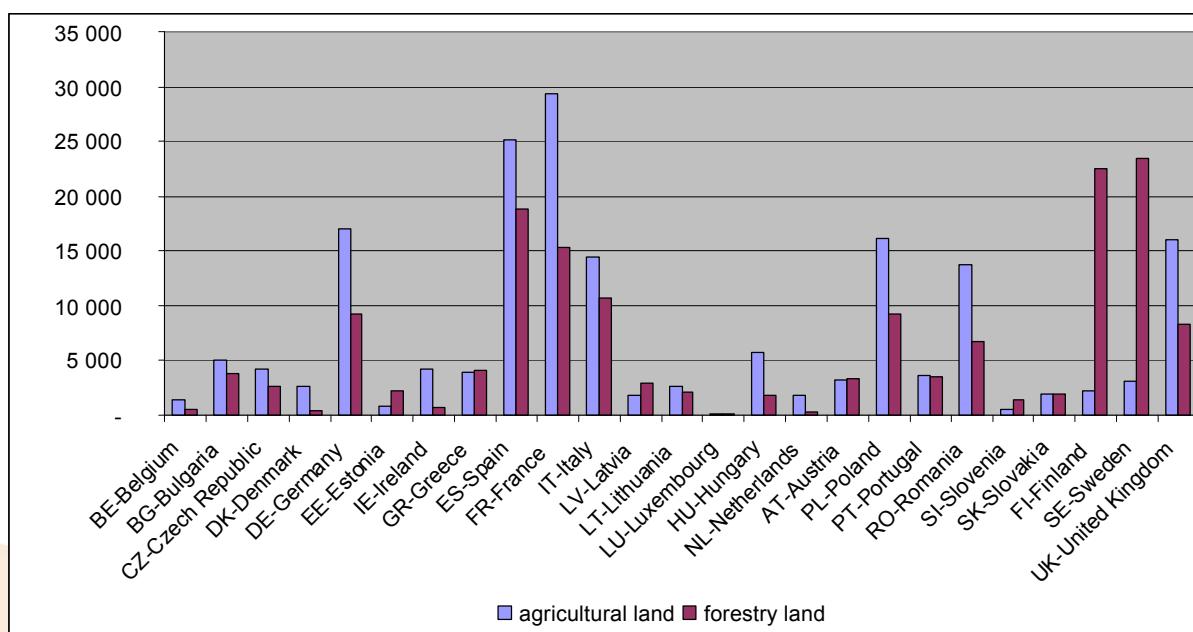


Figure 1. Total agriculture and forestry area in 1000 ha (EUROSTAT 2005-2007)

As shown in figure 2, the agricultural and forestry land area per capita may provide a good idea of the possible supply for ligno-cellulosic biomass and its availability per person. Concerning agricultural land, Ireland has the largest area per person followed by Bulgaria, Ireland, Latvia, Lithuania, Spain, Hungary, Poland, France and Denmark (this includes permanent grasslands). This parameter also indicates the potential to produce ligno-cellulose energy crops domestically. The largest availability of forestry ligno-cellulose biomass per person is in Finland, Sweden, and then in Estonia and Latvia.

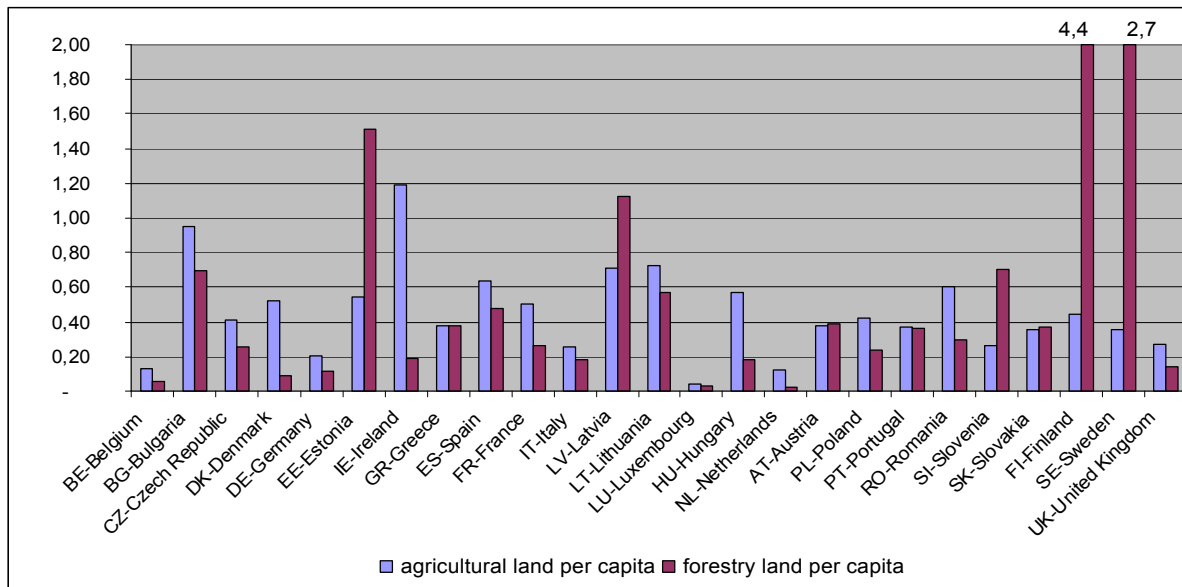


Figure 2. Available agricultural and forestry land resources in hectares per capita (EUROSTAT 2005-2007)

The ligno-cellulose biomass produced in agriculture and forestry is distributed among different sectors, see Figure 3. Agricultural ligno-cellulose biomass is mainly used by: (i) the heating sector, (ii) the electricity sector (including CHP), and, to a minor extend, into (iii) liquid biofuels for transport and (iv) bio-based materials manufactured in chemical industry. Concerning forestry biomass it is primarily used by (i) wood processing industry, (ii) heating sector, and (iii) electricity sector (including CHP). There is a growing competition among the sectors for biomass feedstock.

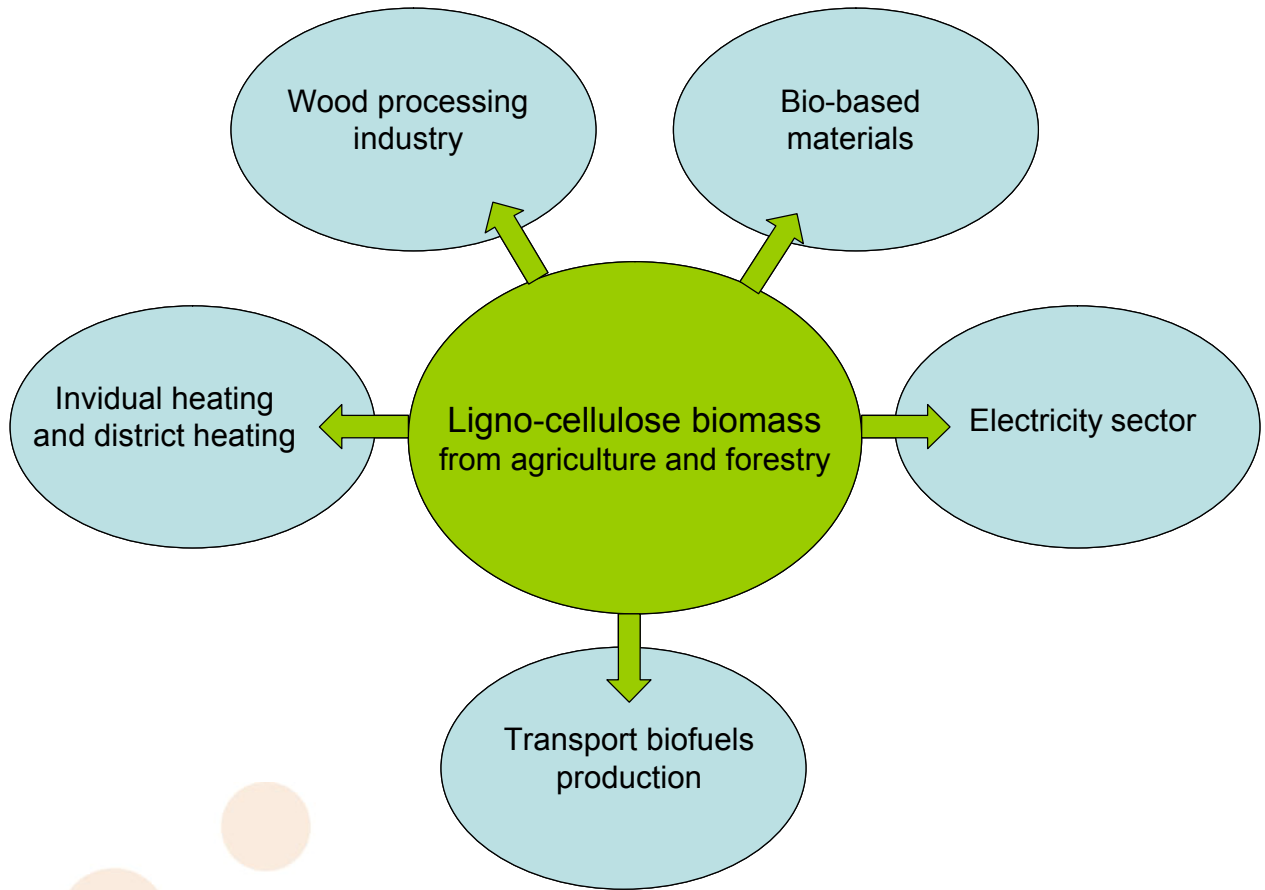


Figure 3: Scheme of ligno-cellulose distribution into the main sectors

3. Review of agricultural policy

3.1. European Level

3.1.1. Common Agricultural Policy

The CAP is one of the key policy tools within the EU, accounting for half of the EU budget. It is aimed at supporting farmers' incomes while also encouraging them to produce high quality products demanded by the market and to seek new development opportunities, such as renewable environmentally friendly energy sources (Agriculture and Rural Development, 2009).

The Cap's origin dates back to 1950s in Western Europe, when its early emphasis was on encouraging better agricultural productivity and guarantying a stable supply of affordable food. The policy was very successful in meeting its objective. Important changes to the CAP took place in the beginning of the 1990s when a new emphasis was placed on environmentally sound farming. Farmers had to look more to the market place, while receiving direct income aid, and to respond to the public's changing priorities (as an effect of the Mac Sharry reform of 1992). Then, the "Agenda 2000" reform brought a major new element – a rural development policy encouraging rural initiatives while also helping farmers to re-structure their farms, to diversify and to improve their product marketing.

In 2003 a further fundamental reform was agreed which shapes the current situation in the agricultural sector. The significant change was in terms of the support schemes provided to EU farmers. The subsidies were decoupled from the production volume and the type of crop cultivated. After the CAP reform farmers can produce according to market demands, provided that it is profitable for them in terms of knowledge, experience, availability of equipment and that the agro-climatic conditions support it. With the decoupling of income support, farmers can adapt their production to new markets, e.g. to energy demand, without loss of income. The specific measures relevant for biomass production on agricultural land in the form of energy crops are presented below.

Energy crop aid and set aside land under CAP

Non-food production on agricultural land such as growing energy crops has been given special attention in the CAP reform of 2003. First, area payments for energy crops were implemented. Second, permission has been granted to grow energy crops on set aside land.

Another relevant policy development for energy crops was the compulsory set aside land initiated in the CAP reform in 1992. The initial idea was to limit the excessive food production in the EU. The set aside obligation was fixed as a proportion of the area dedicated to arable crops and for which a claim was made and left in set-aside. The amount of compulsory set aside is established on a yearly basis and depends on the fluctuations of the world cereal markets. Typically it was approximately 10% across the EU. Farmers were not allowed to use the set aside land for any food and fodder activities, but they were allowed to use it for non-food crops, which are energy crops or other industrial crops (DEFRA 2006).

Nevertheless, the EU decided a temporary interruption of the set aside regime (between autumn 2007 and spring 2008) in order to mitigate the shortage of EU cereals experienced during that period. Finally, in November 2008 the CAP Health Check agreed to abolish set-aside completely as a way to maximise the agricultural production potential.

In addition, to support biomass production from ligno-cellulosic perennial plantations, the CAP allows the Member States to grant additional national aid of up to 50% of the costs of establishing multi-annual energy crop plantations (Summa 2008).

3.1.2. Rural Development Policy (2007-2013)

Background: Definition of strategic context, priorities and measures for rural development

The European Union has an active rural development policy to achieve valuable goals for the countryside and for the people who live and work there. The rural development policy has been defined for the period 2007 to 2013, as well as the policy measures available to Member States and regions set out in Council Regulation (EC) No. 1698/2005. Under this Regulation, rural development policy for 2007 to 2013 is focused on enhancing three main themes (EUROPA internet service 2009):

- Competitiveness of the agricultural and forestry sector;
- Environment and the countryside;
- Quality of life in rural areas and encouraging diversification of the rural economy.

To help ensure a balanced approach to policy, Member States and regions are obliged to spread their rural development funding between all three of these themes. A new feature for 2007 to 2013 is a greater emphasis on coherent strategy for rural development across the EU as a whole.

As the rural development policy sets the major goals and funding for the activities in the rural areas it is relevant also for the production and use of ligno-cellulose biomass for biofuels and other bioenergy purposes.

Definition of rural support framework

Council Regulation (EC) No 473/2009 of 25 May 2009 is amending both Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development and Regulation (EC) No 1290/2005 on the financing of the common agricultural policy. This regulation obligates all Member States to provide their rural development programmes for any activities under the following priorities:

- climate change,
- renewable energies,

- water management,
- biodiversity,
- measures accompanying restructuring of the dairy sector,
- innovation linked to the priorities mentioned in points (1) to (4),
- broadband Internet infrastructure in rural areas.

The new challenges have been identified and will have to be implemented to the rural development programs. The first four points will strongly affect the production of ligno-cellulosic biomass for energy purposes. All the listed priorities have to be implemented in the rural development programmes till 31 December 2009.

3.2. National level

EU Member States are obligated to transpose all EU regulations to their national law. The regulations defined under the EU agricultural policy, including the Rural Development Policy for the period 2007-2013, have been implemented into national laws, programmes and strategies.

For the agricultural sector, the main documents in the Member States are the rural development programmes, which set the framework for the development of agriculture and rural areas. Every Member State (or region, in cases where powers are delegated to regional level) must set out a rural development programme, which specifies what funding will be spent on which measures during the period 2007 to 2013. Most analyzed countries under the ELOBIO project have implemented such a programme or strategy, see Table 1. In most cases, the responsible institutions for creating and monitoring the implementation of the programmes are the ministries of agriculture.

The rural development programmes or strategies are typically defined in the medium-term. They set strategic goals that need to be achieved in the rural areas and specify the funding required to reach such goals. As they refer to the activities undertaken in rural areas they are relevant for the ligno-cellulose biomass production for bioenergy and transportation biofuels.

Some countries have specific regulations relevant for energy crops, such as the subsidies for perennial energy crops established in Poland. Most countries have also implemented the energy crop premium with a specific document, e.g. Belgium, Lithuania, Poland, and Sweden. These regulations have special impact on biomass production on agricultural land.

In that regard, it is worth mentioning that this year France has implemented two agricultural programmes with direct impact on ligno-cellulosic biomass production. The PPE – Energy Performance Plan in Agriculture- refers directly to the promotion of biomass and bioenergy productions and consumption at farms.

Table 1. Agricultural policy overview on the national level in the project partner countries (provided by project partners)

| | Policy documents | Application time | Unit responsible |
|--|---|-------------------------|--|
| AT | Law: Laendliche Entwicklung (Rural development) | | Ministry of Agriculture, Forestry and Environment |
| BE | Programme: Flemish Agricultural Investment Fund | Not limited | Flemish government |
| | Programme: Premium for energy crops | 2009 | Flemish government |
| DK | Programme: Rural Development Programme 2007-2011 | 2007-2011 | Danish Food Industry Agency |
| FI | Law/Policy: CAP-based support for energy crops cultivation | Since 2005 | Ministry of Agriculture and Forestry |
| | Strategy: Development strategy for the Finnish countryside | 2007-2013 | |
| | Programme: Updated Action Plan for Renewable Energy | 2003-2006 | Ministry of Trade and Industry |
| FR | Programme: "PPE": Energy performance plan in agriculture | 2009-2013 | Ministry of Agriculture |
| | Strategy: "Objectif Terres 2020" : towards a new French agricultural model | 2009-2020 | Ministry of Agriculture |
| | Strategy: "PVE": vegetal plan for environment | 2006 | Ministry of Agriculture |
| DE | Programme: Rural development programmes (RDP) established at the regional level of the Länder. | 2007-2013 | Federal Ministry of Food, Agriculture and Consumer Protection |
| IT | Law: L. 244/2007 art. 2 paragraphs from 134 to 176 | from 2008 | Italian Parliament/Italian Government |
| LT | Sector Strategy: Development Strategy for Agriculture and Rural Areas | 2000-2006 | Ministry of Agriculture |
| | Strategy: State long-term development strategy | from 2002 | Ministry of Economy Ministry of Agriculture |
| | Order: On direct payment for agricultural land, under crop and energy crops for year 2008 | 2008 | |
| | Order: Support for biofuel production facilities development | 2008 | Ministry of Agriculture |
| | Programme: Lithuanian rural area expansion development 2007-2013 | 2007-2013 | Ministry of Agriculture |
| Strategy: National Strategy plan 2007-2013 for rural development | 2007-2013 | Ministry of Agriculture | |
| NL | Programme: The Dutch Rural Development Programme 2007-2013 | 2007-2013 | Ministry of Agriculture |
| PL | Strategy: Development Strategy for Rural Areas and Agriculture for years 2007-2013 | 2007-2013 | Ministry of Agriculture and Rural Development Council of Ministers Ministry of Agriculture and Rural Development Agricultural Market Agency |
| | Policy: Energy Policy of Poland till 2025 | 2005-2013 | |
| | Ordinance: The energy crop premium | 2008 | |
| | Announcement: Circumstantial conditions to obtain additional payments for perennial crops plantations in 2008 | 2008 | |
| ES | Plan: Rural development plans in Spain: National rural network (Programa de la Red Rural Nacional 2007-2013) | 2007-2013 | Ministry of Agriculture |
| SE | Programme: Agricultural Programme for Sweden 2007-2013 | 2007-2013 | Swedish Board of Agriculture |
| | Law: Directive for the EU support to farmers 2004 | from 2004 | Ministry of Agriculture |

4. Review of forestry policy

4.1. European level

4.1.1. Forestry Strategy

On 15 December 1998, the European Council adopted a Resolution on a Forestry Strategy for the European Union. This document established a framework for forest-related actions in support of sustainable forest management, based on the co-ordination of the Community and Member State's forest policies and initiatives relevant to forests and forestry. Although its contents are not legally binding and its primary objective is simply to improve coordination between the Commission and the various Member States, the Forest Strategy is still the only comprehensive document on European forests in the European Community.

The Strategy emphasizes the importance of the multifunctional role of forests and sustainable forest management for society's wellbeing. It identifies a series of key elements, which form the basis for its implementation. The strategy states that forest policy lies in the competence of the Member States, but that the EU can contribute to the implementation of sustainable forest management through common policies, based on the principle of subsidiary and the concept of shared responsibility. The Strategy also emphasizes the implementation of international commitments, principles and recommendations through national or sub-national forest programmes or equivalent instruments, and active participation in all forest-related international processes. It also stresses the need to improve co-ordination, communication and co-operation in all policy areas of relevance to the forest sector.

In March 2005 the Communication to the Council and the European Parliament on the implementation of the EU Forestry Strategy was published. It contained the main conclusions on the achievements in the implementation of the EU Forestry Strategy. The Communication stated that a more pro-active approach to addressing forestry issues is needed in the future and proposed to prepare an EU action plan for sustainable forest management as the main instrument to address the emerging policy context. The Commission believed that the development of an Action Plan could provide the necessary impetus to transform the Strategy into a dynamic process capable of responding to the newly emerging expectations of society.

4.1.2. Forest Action Plan

The EU Forest Action Plan (FAP) was adopted on 15 June 2006. It builds on the report on implementation of the EU Forestry Strategy and consequent conclusions by the Council. FAP sets four main objectives (and contains 18 key actions). The main objectives are:

- to improve long-term competitiveness,
- to improve and protect the environment,
- to contribute to the quality of life,

- to foster coordination and communication.

In order to achieve these objectives, the European Commission developed the FAP work programme in cooperation with the main stakeholders. This programme is updated annually in cooperation with the Member States. Eighteen key actions are proposed by the Commission to be implemented jointly with the Member States during the period of five years (2007–2011). The European Agricultural Rural Development Fund (EARDF) is the main financial instrument supporting implementation of the FAP.

The EU Forest Action Plan, among other things, promotes the use of forest material as an energy source. This could be particularly important for the use of renewable energy for heating and cooling, electricity as well as future production of second generation biofuels (Summa 2008).

4.1.3. Sustainable forest management and trade

The Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan was adopted by the European Commission in May 2003 as part of the EU's response to the call for action at the World Summit on Sustainable Development to the global problem of illegal logging and the international trade in illegally-harvested timber. Council Conclusions were adopted in October 2003 and the European Parliament passed a motion of support in January 2004. Finally the FLEGT licensing scheme was adopted in December 2005.

A key element of the FLEGT Action Plan is a voluntary scheme to ensure that only legally harvested timber is imported into the EU from countries agreeing to take part in this scheme through bilateral FLEGT Voluntary Partnership Agreements (VPA) with the EU.

The Council Regulation (EC) No 2173/2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community establishes a Community set of rules for the import of certain timber products for the purposes of implementing the FLEGT licensing scheme.

This licensing scheme is a measure to ensure that only timber products that have been legally produced in accordance with the national legislation of the producing country may enter the Community and it should not impede legitimate trade. Consequently, this licensing scheme guarantees the legality and reliable tracking of timber products exported from partner countries.

In accordance with the FLEGT Regulation, a FLEGT Committee has been established. Detailed rules for the FLEGT Regulation within the EU are currently under discussion. The European Commission has been given a mandate from the Council of Ministers to conduct negotiations in view of concluding such FLEGT VPAs.

4.2. National level

The forestry sector is much smaller in the EU compared with agriculture, both in terms of land area, employees and contribution to the total budget. However, in the countries with high

proportion of wooded area in the total country area, such as Finland, Sweden, Latvia, Slovenia, forestry plays an important role.

Most of the studied countries have some policy regulations dedicated to the forestry sector. Commonly this is the national forestry strategy or national forestry action plan. Only for Denmark and the Netherlands no relevant document was found, which may be due to the minor role of the forestry sector in these countries.

Finland and Sweden have the highest contribution of forestry area to the total land among the analyzed countries, 66% in Finland and 52% in Sweden (Eurostat, 2009). The annual procurement of wood for industries is large. In Finland, a specific regulation was implemented on the support for energy wood harvesting and chipping, which has been in force since 1996. This document has had a great impact on wood consumption in the energy sector (heat and power). In Sweden an interesting document is the Swedish Forest Industries Federation Climate Manifesto, which was elaborated by the forest industry sector and is dedicated to the impact of forestry on the mitigation of climate change as a source of bioenergy.

In some countries, there are specific documents aiming to increase the share of forest area in the country area. For example, the National Program for Increasing the Forests Areas in Poland sets goals on the increase of afforestation and defines specific activities to be undertaken in this regard. Afforestation is particularly promoted on abandoned agricultural land. The increase in forest areas will enable higher biomass procurement volumes in the future. Similarly, in Belgium a decree for the promotion of short rotation coppice on agricultural land aimed at increasing the biomass production for energy use has been put in force.

Poland is a specific country as a great majority of forests (85%) belongs to the State Forests National Forest Holding. This ensures a good coordination of the forest related activities across the whole country under 17 Regional Directorates of the State Forests. The forest management is based on forest management plans that are drawn up for each Forest District for a ten-year period. These plans have a relatively high status as they are approved at the level of the Ministry of Environment. The forest management plans include regulations on the total amount of wood that can be harvested during the ten-year period, and thus are very relevant for the wood processing industry as well as the energy sector.

Table 2. Forestry policy overview on the national level in the project partner countries (provided by project partners)

| | Policy documents | Application time | Unit responsible |
|----|---|------------------|---|
| AT | Programme: The Austrian Forest Program | from 2007 | Ministry of Agriculture, Forestry and Environment |
| BE | Decree: Short rotation coppice on agricultural land | Continuous | Flemish government |
| DK | No specific policies or regulations in this field | | |
| FI | Programme: National Forest Programme 2015 | Since 2008 | Ministry of Agriculture and Forestry |
| | Law: Forest Act | Since 1996 | Ministry of Agriculture and Forestry |
| | Regulation: Support for energy wood harvesting and chipping | | Ministry of Agriculture and Forestry |

| | | | |
|----|--|--|---|
| FR | Strategy: Forest Action Plan Law: Fiscal support to forestry in the 2009 finance law Law: "Grenelle" of the environment I, art. 4 & 34 | 2008 2009 from 2009 | Ministry of Agriculture Ministry of Finance Ministry of Environment |
| DE | Law: Federal Forest Act | Since 1975 | Federal Governments |
| IT | Law: L. 244/2007 art. 2 paragraphs from 134 to 176 | Since 2008 | Italian Parliament/ Italian Government |
| | Law: L. 203/2008 art. 2 par.12 | Since 2008 | Italian Parliament/ Italian Government |
| LT | Law: LR forest Law | Since 1994 | Ministry of Environment |
| | Regulation: Forest cutting rules | Since 2003 | Ministry of Environment |
| | Strategy: Lithuanian forestry policy and strategy for it's implementation | 2002-2015 | Ministry of Environment |
| NL | No specific policies or regulations in this field | | |
| PL | Legal Act: General Forests Act | Since 1992 | Ministry of Environment |
| | Programme: National Program for increasing the forests areas | 2003-2020 | |
| ES | Law: Law 43/2003 of woodlands | Since 2003 | Ministry of Environment and Rural and Marine Affairs |
| | Law: Regional forestry laws | Different depending on the region | Regional Governments |
| | Plan: Spanish forestry plan | 30 years | Ministry of Environment and Rural and Marine Affairs |
| | Plan: Regional forestry plans | Different depending on the region | Regional Governments |
| SE | Strategy: The Swedish Forest Industries Federation Climate Manifesto | Till 2020 | The Swedish Forest Industries Federation |
| | Strategy: National Wood Construction Strategy | Not decided yet (probably from 2009 or 2010) | Ministry of Enterprise, Energy and Communication |

5. Policies and strategies on electricity and heat sector

5.1. European level

5.1.1. Background

Kyoto Protocol

Under the Kyoto protocol, the developed countries commit themselves to reduce their collective emissions of six key green house gasses by at least 5% and each country's emissions target must be achieved by the period 2008-2012. Within the European context, the emission reduction is 8% which has to be jointly met by all member countries. Figure 4 shows the different emission reduction targets (based on 1990 levels) that each member country will have to undertake in order to achieve the EU global target.

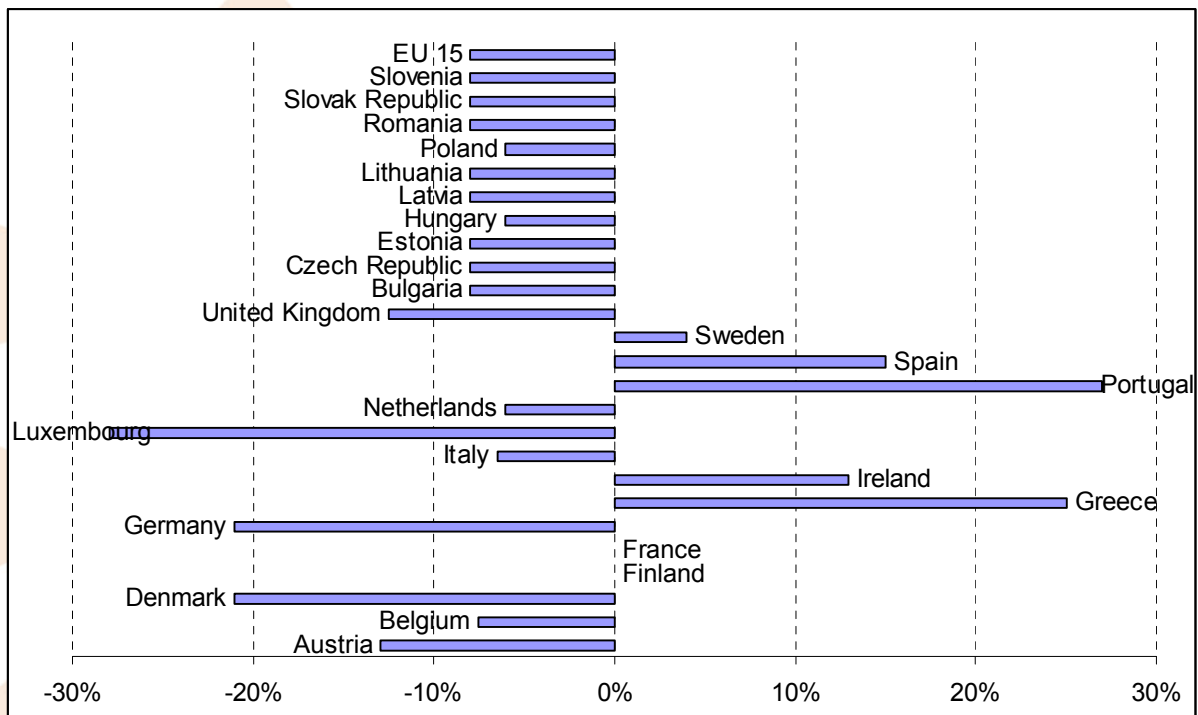


Figure 4. Emission reduction targets by country (based on 1990 level) (EC, 2009)

In order to achieve the global emission reduction target, the Protocol envisages three market-based mechanisms: Emissions trading, Joint Implementation and the Clean Development Mechanism. These allow industrialized countries to meet their targets through trading emissions allowances between themselves and gaining credits for emission – curbing projects abroad. The backbone of the Commission's effort to implement the Protocol is the European

Climate Change Programme, which was launched in March 2000. The document indirectly influences the future demand for ligno-cellulose biomass since the reduction of green house gasses emission can be achieved through increasing renewable energy production.

Green Paper on security of energy supply

In November 2000 the Commission adopted the Green Paper on supply security. This document is mentioned here as it had an important impact on the renewable energy production development in the EU over the last years. However, now the Directive 28/2009/EC has higher enforcement level.

The Paper is the response to Europe's growing future energy dependence on imports which has been growing at a rate of 1-2% a year since 1986. Security of supply does not try to maximize energy self-sufficiency. Instead it aims at reducing risks associated to such dependency. Curbing the growth in demand will be complemented by taxing the internal energy market, promoting energy-saving and diversification plans as well as disseminating new technologies. In any case, promoting EU energy security must involve policies which tackle both energy supply and demand. The policy had a direct influence on increasing the demand for biomass for renewable energy production, however the new Directive 2009/28/EC has a higher enforcement level than all documents presented in this chapter.

First Directive on Renewable Energies (also named 'RES-E Directive')

Directive 77/2001/EC (also named 'RES-E Directive') was adopted in 2001 and its purpose was to promote and increase renewables contribution to total electricity production in Europe. The Directive has been amended and subsequently repealed by the Directive 2009/28/EC. Until now it had an important impact on the renewable electricity production. The Directive 77/2001/EC included the following issues: setting national targets for green electricity consumption, evaluating national support schemes for green electricity producers, taking the necessary measures to ensure transparent rules and fair treatment for RES producers, establishing guarantees for green electricity and streamlining the administrative procedures for new producers.

The Member States were required to set their own indicative targets for RES electricity consumption for a ten year period taking account of the European target and ensuring compatibility with national commitments under the Kyoto Protocol. By creating national targets, the Directive provides a quantitative framework under which each Member State can plan and implement the most appropriate measures given their own particularities. At present Member States operate various support schemes for RES: feed-in tariffs, tradable green certificates, fiscal and financial measures and investment support.

Undoubtedly the Directive 77/2001/EC had a significant impact on the increased demand for biomass for renewable energy production. It can be even assessed as a motivating force for the beginning of production of renewable energy in some of the European countries, i.e. the new member states.

Biomass Action Plan

In December 2005, the Commission launched a Biomass Action Plan which is part of the overall EU objectives of improving competitiveness, sustainability and security of supply. The Action Plan sets out measures to increase the development of biomass energy from wood, wastes and agricultural crops and encompasses measures to promote biomass in heating, electricity and transport, followed by cross-cutting measures affecting biomass supply, financing and research. In the area of heating and electricity, the Commission guided its efforts towards a proposal for EC legislation in 2006 in order to encourage the use of renewable energy, including biomass for heating and cooling.

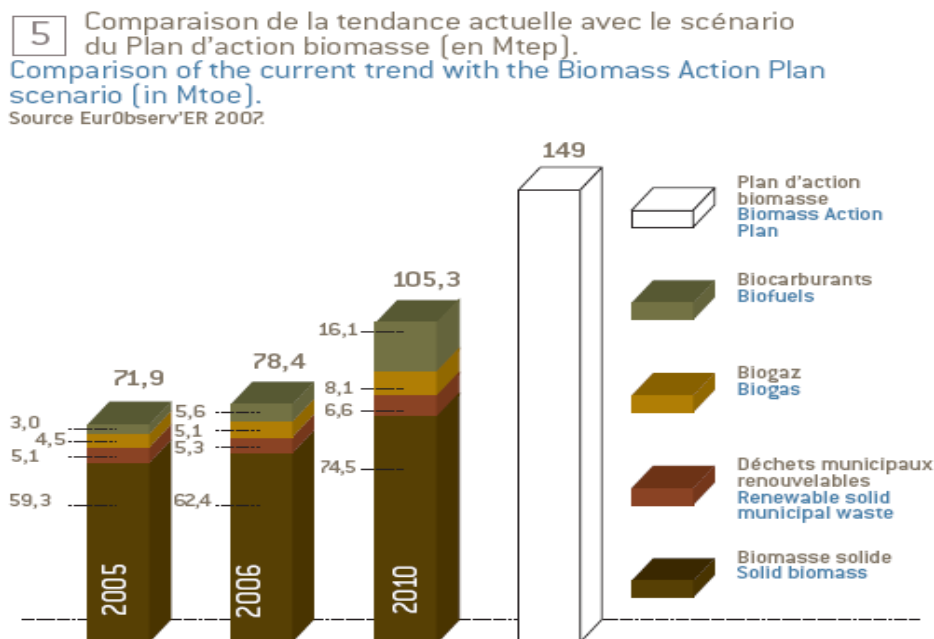


Figure 5: Comparison of the current trend with the Biomass Action Plan scenario (EurObserv'ER 2007)

Figure 5 shows the comparison between current trends and Biomass Action Plan goals. The current trends show the division of different kinds of biomass used. The greatest share is provided by solid biomass.

5.1.2. Climate Package and new Renewable Energy Directive

The package is based on the “20/20/20 by 2020” rule, comprising 20% renewable energy in final energy consumption, 20% GHG emission reduction and 20% energy efficiency by 2020 agreed by EU leaders in 2007 and put forward by the Commission in January 2008 to deliver a unilateral commitment of reducing GHG emissions by 20% below 1990 levels by 2020; plus the possibility to move to 30% reductions as part of a global climate deal. There are four key elements in the Climate Package: (i) Revision of the EU Emissions Trading Scheme (ETS) for

Phase III in 2013-2020; (ii) GHG targets for non-ETS sectors; (iii) Renewable energy targets; and (iv) measures to support CCS technologies.

The Climate Package consists of the following directives:

- Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
- Directive 2009/30/EC amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC.
- Directive 2009/29/EC amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.
- With regard to biomass management and its use for energy (electricity, heat and biofuels), the Directive 2009/28/EC is especially relevant. Among the topics brought up by the Directive 2009/28/EC it is possible to list the ones below as the most important [EURLex, 2009]:
 - To promote the use of energy from renewable sources.
 - To set mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport (in 2020 it is at least 10% of the final consumption of energy in transport in that Member State).
 - To highlight that energy prices should reflect external costs of energy production and consumption, including, as appropriate, environmental, social and healthcare costs.
 - To establish sustainability criteria for biofuels and bioliquids.
 - To emphasize the need to integrate renewables into the transport sector, construction and urban development.
 - Underline the need to develop transmission and distribution grid infrastructures, intelligent networks, storage facilities and the electricity system, in order to allow the secure operation of the electricity system as it accommodates the further development of electricity production from renewable energy sources, including interconnection between Member States and between Member States and third countries

The Directive includes legislation to enable the EU to achieve its target of increasing the proportion of renewable energies in the EU's total energy consumption to 20% by 2020 (the level is currently 8.5%). This includes differentiated mandatory targets for Member States (see Table 3), ranging from 10% to 49%, taking into account starting points, potential, energy mix and per capita GDP. The renewable energy targets include increased support for

electricity from solar, wind, geothermal, hydro and biomass; new support policies for use of renewable heating and cooling, including installation of renewable technologies in all new or refurbished buildings; and a sub-target of 10% share of transport fuel consumption to come from renewable fuels by 2020.

Table 3. National overall targets for the share of energy from renewable sources in gross final consumption of energy in 2020

| COUNTRY | Share of energy from renewable sources in final consumption of energy, 2005 | Target for share of energy from renewable sources in final consumption of energy, 2020 |
|----------------|---|--|
| Belgium | 2.2% | 13% |
| Bulgaria | 9.4% | 16% |
| Czech Republic | 6.1% | 13% |
| Denmark | 17.0% | 30% |
| Germany | 5.8% | 18% |
| Estonia | 18.0% | 25% |
| Ireland | 3.1% | 16% |
| Greece | 6.9% | 18% |
| Spain | 8.7% | 20% |
| France | 10.3% | 23% |
| Italy | 5.2% | 17% |
| Cyprus | 2.9% | 13% |
| Latvia | 34.9% | 42% |
| Lithuania | 15.0% | 23% |
| Luxemburg | 0.9% | 11% |
| Hungary | 4.3% | 13% |
| Malta | 0.0% | 10% |
| Netherlands | 2.4% | 14% |
| Austria | 23.3% | 34% |

| | | |
|-----------------|-------|-----|
| Poland | 7.2% | 15% |
| Portugal | 20.5% | 31% |
| Romania | 17.8% | 24% |
| Slovenia | 16.0% | 25% |
| Slovak Republic | 6.7% | 14% |
| Finland | 28.5% | 38% |
| Sweden | 39.8% | 49% |
| United Kingdom | 1.3% | 15% |

5.2. National level

Undoubtedly, renewable heat and electricity production are the strongest regulated sectors among the analyzed. There are many national documents both putting strict obligations on the producers and users, as well as promoting production of renewable heat and electricity by additional payments, tax reductions and subsidies.

It is expected that as soon as the national plans for implementing the Directive 2009/28/EC will be ready in each Member State, they will become a primary document in the sector.

Although the great majority of the analyzed documents were or are being implemented on the obligatory enforcement level, the targets are not always defined precisely or are specific but not comparable. They refer to different parts of the production, transport or use chain. For example, while some documents set targets for the production of renewable energy from particular sources (Biomass Action Plan – Austria), others treat available subsidies (e.g. Increased fiscal deduction for enterprises – Belgium) and some others provide very general background, not indicating any particular target which could be compared with the others (e.g. Disposition for annual and multi-annual State budget, financial law 2009 art. 2 par.12, Italy). Almost in every country there is a National Renewable Energy Action Plan which regulates the future development of the sector and indicates targets to be reached. In some cases the raw material amounts are predicted while in the others the sectors (power, heat and biofuel) are being regulated by setting targets concerning the MWh of energy produced. In general, the main sources of biomass for the energy sector are expected to be the agriculture sector, forestry residues and by-products together with bio-waste. Most specific issues and detailed targets exist for the agricultural biomass.

The renewable energy policy in Belgium is supported by a large number of documents compared to Austria, Denmark or Sweden.

It is possible to distinguish three groups among all the listed policies, concerning the application timeline: 1) Time-limited policies, usually setting a target which should be fulfilled until set date or presenting an action plan for a particular period of time e.g *Biomass Acton Plan 2006-2020* [Austria], *Agreement RES- E, 2008-2011* [Denmark]; 2) Policies with

a start date but not limited, which will be repealed by other policies when necessary, e.g. Law: *Government Decree No 625/2002 on General Conditions in Granting the Energy Aid*, since 2002 [Finland], *Lithuanian Energy Law*, since 2002 [Lithuania]; 3) Continuous polices, which are being updated when necessary, e.g. Programme: *Increased fiscal deduction for enterprises*, continuous [Belgium], *Act on the Promotion of Renewable Energies in the Heat Sector*, not limited [Germany]. It is possible to assess that the policies implementing programmes for managing the resources are rather long-term policies presenting an action plan for at least 10 years.

The list of the most important policies in the renewable electricity and heat production sector in each of the analyzed Member States is shown in Table 4.

Table 4. Renewable energy policy overview on the national level in the project partner countries (provided by project partners)

| | Policy documents | Application time | Unit responsible |
|----|---|---|--|
| AT | Law: Ökostromgesetz (Law for renewable energy) | Until 2011 | - |
| BE | Decree: Flemish Decree on electricity Decree: Walloon Decree on electricity Decree: Decree on qualitative CHP Decree: Decree on rational energy use Programme: Ecological investment support Programme: Increased fiscal deduction for enterprises Programme: Support for demonstration projects on innovative renewable energy technologies Programme: Support for sustainable energy use | 2000-2020 2001-2010 2006-2012 2004-continuous 2004-continuous Continuous 1992-continuous - | Flemish Government Walloon Government Flemish Government Flemish Government Flemish Government Flemish Government Flemish Government Walloon Government |
| DK | Agreement: RES-E Order: RES-E Order: RES-E | 2008-2011 2004-up to 20 years 2004-up to 20 years | Danish Energy Agency Danish Energy Agency Danish Energy Agency |
| FI | Strategy: National Strategy to Implement Kyoto Protocol Law: Government Decree No 625/2002 on General Conditions in Granting the Energy Aid Law: Fiscal support for electricity produced from renewable energy sources Programme: Updated Action Plan for Renewable Energy | Until 2025 Since 2002 Since 1996 2003-2006 | Ministry of Trade and Industry Ministry of Trade and Industry Ministry of Trade and Industry Ministry of Trade and Industry |
| FR | Law: Law relative to the modernization and development of the electricity Programme: "PPI" : pluriannual investment plan Law: Decrees instauring feed-in tariffs for power production from : solid biomass, biogas from anaerobic digestion plants, landfill gas. Programme: Call for tender for power production from biomass | Since 2002 Since 2002 Since 2002 Since 2005 | Ministry of Environment Ministry of Environment Ministry of Environment Ministry of Environment |
| DE | Act: Act on granting priority to renewable energy sources | Not limited | Federal Ministry for the Environment, Nature Conservation and Nuclear Safety |
| IT | Law/Programme: Disposition for annual and multi-annual State budget (financial law 2008 art. 2 paragraphs from 134 to 176 Law: Ministerial Decree February 2007 | From 2008 to goal achievement Since 2007 | Italian Government Italian Government |
| LT | Strategy: Lithuanian national energy strategy | Till 2025 | Ministry of Economy |

| | | | |
|----|---|---|--|
| | <p>2007</p> <p>Law: Lithuanian energy law</p> <p>Law: Lithuanian electricity law</p> <p>Regulation: Procedures for promoting generation and purchasing of RES-E</p> <p>Regulation: Electricity market rules</p> | <p>Since 2002</p> <p>Since 2000</p> <p>2001-2020</p> <p>Since 2001</p> | <p>Ministry of Economy</p> <p>Ministry of Economy</p> <p>Ministry of Economy</p> <p>Ministry of Economy</p> |
| ND | <p>Regulation: Subsidieregeling Duurzame Energie (SDE), Variable Feed-in premium</p> <p>Regulation, Fixed Feed-in premium, Milieu-effecten elektriciteitsproductie (MEP)</p> <p>Covenant, Coal Covenant</p> <p>Programme, Clean and Efficient</p> | <p>Since 2008</p> <p>2003-2006</p> <p>Since 2001</p> <p>2008-2012</p> | <p>Ministry of Economic affairs, SenterNovem is the executive agency</p> <p>Ministry of Economic affairs, SenterNovem is the executive agency</p> <p>Ministry of Economic Affairs</p> <p>Ministry of Environment</p> |
| PL | <p>Strategy: Development strategy of renewable energy sources</p> <p>Policy: Energy Policy of Poland till 2030</p> <p>Law: Energy law</p> <p>Law: Energy law – Regulation</p> | <p>Since 2001</p> <p>2005-2025</p> <p>Since 2005 (probably until 2010)</p> <p>2008-2017</p> | <p>Ministry of Environment</p> <p>Ministry of Economy</p> <p>Ministry of Economy</p> <p>Ministry of Economy</p> |
| ES | <p>Law: Law 54/1997 of the Power Sector</p> <p>Plan: Spanish Renewable Energy Plan 2005-2010</p> <p>Royal Decree: RD 661/2007, setting, among other, the feed-in tariffs for renewable and CHP electricity</p> | <p>Since 1997</p> <p>Since 2005</p> <p>Since 2008</p> | <p>Ministry of Industry, Tourism and Trade</p> <p>Ministry of Industry, Tourism and Trade</p> <p>Ministry of Industry, Tourism and Trade</p> |
| SE | <p>Law: The Electricity Certificates Act 2003</p> | <p>2003-2030</p> | <p>Swedish energy agency, Svenska Kraftnät</p> |

The new renewable energy directive requests EU member states to prepare new renewable energy action plans (based on the template published by the Commission) and submit them to the Commission not later than June 2010. In this document biomass potential figures are requested in details.

6. Policies and strategies in wood processing sector

6.1. European level

According to the analysis and the information provided by many Member States, the wood processing sector is not regulated enough, neither on a European level, nor in the national legislation systems. The industries within the sector such as furniture production, pulp and paper production, particle board production etc are much dependent on the market and can not be well predicted for ten or twenty years ahead. The long history of production methods and a tradition of these industries performance lead to rather slow and predictable development pathways which are not changing rapidly. Due to the sector's stability it is possible to say that there is no need to strongly regulate it. It is rather more likely to find paragraphs or sections dedicated to this sector in the forestry or industry policies than to find a separate document regulating this sector. As many of the policies referring to the wood products management are in general forest policies for broader view, please refer to the chapter 4 of this report.

Apart from the Forest Action Plan (mentioned in chapter 4), the UNECE Timber Committee Market Statement on Forest Products Markets (annually published) is highly relevant to the wood processing sector. The statement does not have political content but it is relevant as it analyses current market trends in the sectors industries, concerning different wood materials. The scope of its analysis covers the European region as well as Russia and United States. There are no regulations included in the documents, however some future trends are predicted and forecasted as a relevant document. According to the UNECE Timber Committee and the International Softwood Conference Market Discussions, a new market situation is developing based on governments' commitments and industries' actions to fight climate change, mainly through the promotion of renewable energy sources, especially wood fuels (UNECA, 2009) All wood markets are affected, both positively and negatively, and new opportunities and challenges are evolving for the sector, from forest owners, to wood processors and wood energy consumers. The short-term forecast for forest products in North America is a declining market, and dramatically for sawn softwood, due to the crash in the United States housing market, in contrast to positive developments in Europe and Russia.

6.2. National level

As with the European policies, the national policies in the sector of wood processing are also limited if it comes to number. This situation can be explained by the same reasoning that applies to international policies. The sector includes traditional production and its rapid development is not expected. The sector is much dependent on the market and demand so the production of the sector is rather adjusted to current needs than to set obligations and targets.

Many purchasers are now insisting on that forest products must come from sustainable, or at least legal, sources, and that this must be verifiable, in order to maintain credibility with public opinion. Purchasers also aim to minimise the environmental impact of the whole building systems, for instance through 'green building' requirements aimed to reduce energy

requirements of creating and occupying buildings. How these requirements, whether for sustainability of forest management or for energy efficiency, are specified in detail is already influencing markets for forest products. The increased public knowledge about the advantages from using green buildings will increase the demand for woody biomass for the wood processing sector.

Policies concerning renewable energy and the demand for renewable wood fuel together with reduction targets for green house gasses emissions will influence the sector production. It is possible that within the next few years there will be competition for raw material among industries like: renewable energy production, furniture production, particle board production etc.

The national policies within the sector are rather short-term, covering a period of time not longer than ten years. As it was with international policies, in national legal acts the issues concerning the sector of wood processing are very often included in the general forest policies or sometimes in the energy policies (e.g. Law: *The Electricity Certificates Act* Sweden, *Royal Decree 252/2006 that revises the objectives of recycling and energy recovery previously fixed by the Law 11/97 of packaging and packaging waste* (that transposed the Directive 94/62/CE Spain, *National Forest Programme 2015*, Finland)

Only three of the policies listed (Spain, Sweden, and Poland) of all the analyzed countries are implemented on the enforcement level, and none of them are dedicated only to the wood processing sector. Most of the policies listed are strategies or plans, written by different associations and have no legal background, although they include some plans for the sectors development in the future and production forecasts.

The most important policies in the sector of particle board and furniture industry and pulp and paper industry are listed in Table 5.

Table 5. Wood industry related policy overview on the national level in the project partner countries (provided by project partners)

| | Policy documents | Application time | Unit responsible |
|----|--|------------------|--|
| AT | No specific policies or regulations in this field | | |
| BE | Study: Bio-energy and the European Pulp and Paper Industry | 2007 | Cobelpa - association of the belgian pulp, paper and boards industries |
| | Study: Wood resources availability and demands - implications of renewable energy policies - A first glance at 2005, 2010 and 2020 in European countries | 2007 | Cobelpa - association of the belgian pulp, paper and boards industries |
| | Press conference: Renewable energy and impact on the European paper industry | 2007 | Cobelpa - association of the belgian pulp, paper and boards industries |
| DK | No specific policies or regulations in this field | | |
| FI | No specific policies or regulations in this field | | |
| FR | Programme: "PNAQ" : National Quota Allocation Plan | 2008-2012 | Ministry of Environment |
| DE | No specific policies or regulations in this field | | |

| | | | |
|----|--|-----------------------------|--|
| | | | |
| IT | No specific policies or regulations in this field | | |
| LT | No specific policies or regulations in this field | | |
| ND | No specific policies or regulations in this field | | |
| PL | Strategy targets for the sector of pulp and paper industry until 2007 Law: Development strategy of paper industry in Poland till 2013 | Since 2007 Till 2013 | Prepared for the Ministry of Economy and Ministry of labour and social policy Association of Polish Papermakers |
| ES | Royal Decree: Royal Decree 252/2006 that revises the objectives of recycling and energy recovery previously fixed by the Law 11/97 of packaging and packaging waste (that transposed the Directive 94/62/CE) | Until 2008 | Ministry of Environment and Rural and Marine Affairs |
| SE | Law: The Electricity Certificates Act | 2003-2030 | Swedish energy agency, Svenska Kraftnät |

7. Policies and strategies on wastes and bio-based materials

7.1. European level

7.1.1. Directive on waste

Directive 2008/98/EC of the European Parliament And Of The Council of 19 November 2008 on waste lays down measures to protect both the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and overall impacts of resource use as well as improving the efficiency of such use.

By December 12, 2010 national governments must transpose this directive into national laws. Also, by December 2013, each Member State must draft a national waste prevention plan and by 2015 must set up separate collection systems for paper, metal, plastics and glass.

The Directive aims at harmonizing waste management practises across EC and emphasizing priorities such as waste reduction recovery and use of clean technologies. The Directive encourages Member States to use wastes as a source for energy. Therefore, Member States will have to undertake several measures to promote those options that deliver the best overall environmental outcome (taking into account the complete life-cycle analysis) and will have to achieve the following targets:

By 2020, materials such as paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be decreased to a minimum of overall 50 % by weight.

By 2020, recycling and other material recovering, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17.05.04 in the list of waste shall be decreased to a minimum of 70 % by weight

This Directive is also relevant for ligno-cellulose waste materials generated by different industries, services or just inhabitants. They are commonly a part of the biodegradable fraction of the municipal wastes. This Directive imposes regulations to recover much of the materials containing ligno-cellulosic biomass, e.g. paper, used furniture, old wood construction materials, etc. In that sense the Directive makes the waste ligno-cellulose materials available for recycling or energy production.

7.1.2. Landfill Directive

Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste issued by the European Union to be implemented by its Member States.

The Directive's overall aim is to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the

global environment, including the greenhouse effect, as well as any resulting risk to human health, from the landfilling of waste, during the whole life-cycle of the landfill. This legislation also has important implications for waste handling and waste disposal.

Together with the Directive 2008/98/EC on waste, it promotes waste material recovery including ligno-cellulose materials, for recycling or energy production.

7.1.3. Biobased materials

Part of the biomass used to produce fuels and energy is also seen as a ‘green’ raw material that can be used in the chemical industry and other non-food sectors to produce products and materials such as plastics, adhesives and paints.

The term of bio-based economy is promoted all over the world. It is believed that bio-based economy can and should be to the 21st century what the fossil-based economy was to the 20th century (Hardy 2002). Agriculture will be the core of the bio-based economy, providing source materials for commodity items, e.g. liquid fuels and value-added products such as chemicals and materials. Here we focus on engineering materials manufactured in chemical industry from agricultural feedstock.

On the EU level the Common Agricultural Policy and the RES Directive 28/2009/EC would affect mainly the development of bio-based materials; however no direct regulation dedicated to engineering bio-based materials exists so far.

Among Member States the Netherlands has the leading position in promoting bio-based materials. The Dutch government’s Vision on the Bio-based Economy was published on October 8th 2007. The particular aspects defined in the Vision are that there are significant economic opportunities for the Netherlands in the production of high-grade applications. Greater sustainability can be realized by making full and intelligent use of the available resources and by-product and residual flows. Firstly, the development of new technology to convert green resources needs to be accelerated. The business sector stands to gain from these developments. The bio-based economy offers an alternative to oil, which is both scarce and expensive. Products can be made more safely and with less risk to health. This also appeals to consumers.

The development of a bio-based economy is creating a significant demand for biomass, including ligno-cellulose, resources. So far biomass use for energy production and biofuels has been significantly developed and new ambition targets are established already. However, it is likely that specific targets for the increased use of bio-based plastics, adhesives, paints, etc. will be also implemented to better reach the climate policy goals.

7.2. National level

All Member States have some policy regulations relevant for the waste sector with regard to its importance and high environmental risks. The waste management policy has usually three main themes: (i) waste avoidance, (ii) waste recycling, (iii) waste that can neither be avoided

nor recycled and shall be properly treated or disposed in an environmentally friendly way. The overview of the waste policy documents is presented in Table 6.

Ligno-cellulose is an important part of biodegradable waste. Belgium, Finland, and Spain have policy documents dedicated separately to the management of biodegradable wastes. Commonly there is a requirement to keep this fraction separately at the waste generation point and use it for energy recovery or composting.

In Finland there are separate governmental documents on construction and packaging waste. Also in Germany, Netherlands and Sweden there are dedicated documents for the management of the packaging waste. The main policy solutions relevant for biodegradable wastes and specifically ligno-cellulose biomass are energy recovery or recycling.

Table 6. Waste industry related policy overview on the national level in the project partner countries (provided by project partners)

| | Policy documents | Application time | Unit responsible |
|----|---|-------------------------|--|
| AT | Law: Waste Management Law | Since 2002 | Ministry of Agriculture, Forestry and Environment |
| BE | Plan: Strategic plan organic-biological waste | Since 2000 | Flemish Waste Agency |
| | Plan: Strategic plan wood waste | Since 2004 | Flemish Waste Agency |
| | Plan: Strategic plan high calorific waste | Since 2004 | Flemish Waste Agency |
| FI | Strategy: National Strategy of Biodegradable Waste | Since 2004 | Ministry of Environment |
| | Strategy: National Waste Plan | 2008 - 2016 | Ministry of Environment |
| | Law: Waste Incineration Act 362/2003 | Since 2003 | Ministry of Environment |
| | Government Decision on Construction Waste | Since 1997 | Ministry of Environment |
| | Government Decision on Packaging Waste | Since 1997 | Ministry of Environment |
| FR | Strategy: Municipal waste action plan | 2006-2015 | Ministry of Environment |
| | Law: "Grenelle" of the environment II (project) | - | Ministry of Environment |
| DE | Law: German government's policy on wastes | Since 1996 | |
| | Law: Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal | | |
| | Law: Federal Immission Control Act (relevant for waste incineration) | Since 1991 | |
| | Law: Packaging Ordinance (Verpackungsverordnung) | | |
| IT | L. 244/2007 art. 2 paragraphs from 134 to 176 | Since 2008 | Italian Parliament/ Italian Government |
| LT | Plan: Lithuania National Energy strategy implementation plan for 2008-2018 | 2008-2012 | Ministry of Economy |
| | Law: Waste management | Since 1998 | Ministry of Environment |
| | Plan: National Plan for Waste Management | 2007-2013 | Ministry of Environment |
| NL | Plan: National waste management plan | 2003-2012 Since 1999 | Ministry of Environment, SenterNovem as executive agency |
| | Law, Waste Tax Act Regulation: Regulation on management of paper and carton packaging | | |

| | | | |
|----|--|--------------------------|--|
| PL | Law: Law concerning an obligation imposed on entrepreneurs in the field of waste management, product fee and deposit fee | Since 2001 | Ministry of Environment |
| | Law: Waste Law Plan: National Plan for Waste Management | Since 2001 Since 2006 | Ministry of Environment Minister of Environment, Main Inspector for Environmental Protection, Regional Governments |
| ES | Law: Law 11/97 of containers (cans, bottles, ...) and containers' residues. | Since 1997 | Ministry of Environment and Rural and Marine Affairs |
| | Law: Law 10/98 of residues | Since 1998 | Ministry of Environment and Rural and Marine Affairs |
| | Plan: Wastes Integrated National Plan (PNIR) | 2008-2015 | Ministry of Environment and Rural and Marine Affairs |
| | Royal Decree: RD 1481/2001 which regulates waste disposal in landfills | Since 2001 | Ministry of Environment and Rural and Marine Affairs |
| SE | Strategy: Spanish strategy for the reduction of biodegradable wastes sent to landfill | 2008-2015 | Ministry of Environment and Rural and Marine Affairs |
| | Strategy: A Strategy for Sustainable Waste Management | 2005 till 2010 | Swedish Environmental Protection Agency |
| | Law: Waste Tax Act | Since 1999 | Swedish Tax Agency |
| | Law: Producer Responsibility for Recycled Paper Ordinance | Since 1994/1997 | Swedish Environmental Protection Agency |
| | 1994/Producer Responsibility for Recycled Packaging 1997 | Since 1997 | Swedish Environmental Protection Agency |

8. Overall summary

- Agriculture and forestry are the main sources of the primary ligno-cellulose biomass. The biomass can be used for many different purposes and various industries. This results in a growing demand for biomass feedstock to produce different market commodities. The main sectors competing for ligno-cellulose biomass resources are wood processing industry (including pulp and paper), heating sector, electricity sector (including CHP), bio-based material manufacturing and the growing biofuels sector.
- The Common Agricultural Policy (CAP) has an important impact on the shape and direction of agricultural production in the European Union. It is a large consolidated policy, also including specific regulations for energy crops. The most important are the energy crop premium, the subsidies for the establishment of perennial energy crop plantations and the possibility to use set-aside land for energy crops production. These measures occurred to be very efficient for the development of biomass production on agricultural land.
- Rural development policy for the period 2007-2013 specifies important goals for the rural areas and people who live there. The focus is on improving the competitiveness of the agricultural and forestry sector, improving the environment and quality of life in rural areas as well as encouraging diversification of the rural economy. This policy sets a budget for each of the priorities. It should be noticed that farm activities diversification based on biomass production for energy and biofuels is an important focus of the policy.
- On the national level the main policy documents regarding the agricultural sector are the rural development programmes, which set the framework for the development of agriculture and rural areas. According to the Council Regulation (EC) No 473/2009 the rural development programmes have to be amended until 31 December 2009 with activities having, among other, the following priorities: climate change and renewable energies. This means specific goals and measures will be implemented to promote the use of biomass for energy and transportation fuels production.
- The Forestry Strategy of the European Union and the EU Forestry Action Plan (FAP) are the most important policy documents for the forestry sector on the EU level. These policies were established to support sustainable forest management, based on the co-ordination of the forest policies of the Member States and initiatives relevant to forests and forestry. The EU Forest Action Plan, among other things, promotes the use of forest material as an energy source. This could be particularly important for the use of renewable energy for heating and cooling, electricity as well as future production of second generation biofuels.
- On the national level most of the studied countries have some policy regulations dedicated to the forestry sector. Commonly this is the national forestry strategy or national forestry action plan. The main objective of these regulations is sustainable forest management, which would also affect wood use for energy and biofuels. Only for Denmark and the Netherlands no relevant document was indicated, which could be due to the minor role of the forestry sector in these countries. On the other hand, in

Finland and Sweden, where forestry is a very important part of the country area and the economy, specific regulations have been dedicated to promote forestry biomass use for energy production and climate change mitigation. In most countries regional forestry programmes or laws were defined regarding the specific type of forests and the public priorities of the region, i.e. tourism development, wood industry sector development, bioenergy production, etc.

- Biomass use for energy and biofuels is a part of the renewable energy sector which is very strongly promoted at the European level. The most important is the Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. This Directive has become the most relevant policy for the renewable energy in the EU. This Directive sets mandatory national targets for the overall share of energy from renewable sources in gross final energy consumption and for the share of energy from renewable sources in transport. Ligno-cellulose biomass is a very important feedstock to reach the targets. Biomass will be used for the electricity production, for heating and cooling and finally for transportation biofuels. The Directive obligates each Member States to elaborate the National Renewable Energy Action Plans, which will set the specific targets for each of the energy sub-sectors and resources to reach them.
- At a national level there are many regulations dedicated to green electricity and heat production. Commonly they originate from the Directive 2001/77/EC and had substantial impact on the green electricity and heat development so far. There are also specific regulations strongly affected by the country conditions and market trends. For example, in Poland there are regulations dedicated to the biomass co-firing with coal in large-scale power plants. A crucial role for the shape of the biomass used for heat and power will result from the National Renewable Energy Action Plans, which will define how the Directive 28/2009/EC targets will be reached in each of the Member States.
- Wood processing industry, including pulp and paper, is the most important consumer of forestry wood. The use of wood in these sectors is regulated on both the supply and demand side only in a few member states in Europe - it depends on the wood procurement in the forestry sector and on the market demand for wood processing industry products. The wood supply is affected by the regulations set by the Forestry Strategy and the EU Forest Action Plan – the rules of sustainable forest management must be regarded. Another important document is the EU Forest Law Enforcement, Governance and Trade (FLEGT) regulation which requires that only legally harvested timber is imported into the EU.
- In most of the countries there are no significant policy documents dedicated only to wood products. Usually the production of the sector is being regulated by the more general documents e.g. *Forest Law*, *General Forest Law* etc. The European countries with the highest forestry potential however, have important policies regulating the sector e.g. Sweden, Finland, Norway, Austria.
- The Directive 2008/98/EC lays down measures to prevent or reduce the adverse impacts of waste. This Directive is also relevant for ligno-cellulose waste materials generated by different industries, services or just inhabitants. They are commonly part

of the biodegradable fraction of the municipal wastes. Among others the Directive imposes regulations to recover most of the materials containing ligno-cellulose biomass, e.g. paper, used, furniture, old wood construction materials, etc. In that sense the Directive makes the ligno-cellulose waste materials available for recycling or energy production. The same kind of impact would come from the Directive 1999/31/EC on the landfill.

- At national level all Member States have some policy regulations relevant for the waste sector with regard to its importance and high environmental risks. Concerning the ligno-cellulose waste materials Belgium, Finland, and Spain have policy documents dedicated separately to the management of biodegradable wastes. Commonly there is a requirement to keep this fraction separately at the waste generation point and use it for energy recovery or composting. In Finland there are separate documents on construction waste and packaging waste. Also in Germany, Netherlands and Sweden there are dedicated documents for the management of the packaging waste. These materials include paper and cartons, which are ligno-cellulosed biomass. The main policy solutions relevant for biodegradable wastes and specifically ligno-cellulose biomass are energy recovery or recycling.

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9. Annex – general country overview

Austria

In the first quarter of 2008, Austria's real GDP growth rate was 1.8% while per capita GDP taking into account PPS (Purchasing Power Standards (PPS) (EU-27 = 100)) was 125.5. Like most advanced economies, Austrian economy is dominated by services which account for two thirds of the gross value added. About 31% comes from the “secondary” sector (production), and only about 2% comes from agriculture and forestry (the “primary” sector).

Austrian industry is characterized by a large number of small and medium sized enterprises and has become a high performance and leading technology centre for the European automotive industry. According to 2007 data, Austrian automotive industry, which comprises 700 companies and 175 thousand employees, generates 22, 5 billion euros.

Due to its strong research and industrial ventures, Austria becomes an attractive location for business development. A total of 2,8 thousand research stations – including university institutes – work closely with industry, especially in the key fields of IT, automotives, materials research and electronics.

The chemical industry is still one of Austria's key economic sectors producing a large variety of high quality products. About 330 companies with over 42 thousand employees are currently operating in this industry. Similarly, Austria is a significant producer of machinery and over 60% of production is exported. Machine construction and plant engineering employs 90 thousand people.

With regards to energy, Austrian gross domestic energy consumption in 2006 was 1.4 PJ. With a share of 42.2%, oil remains the most important energy source, followed by renewable energy sources (22.4%), natural gas (21.9%) and coal (11.8%). Final energy use in 2006 was 1.1 thousand PJ with the following shares by economic sector: 29% industry, 31% transport, 25% residential and 14% other. Gross inland consumption of renewable fuels in 2006 was 323 PJ, while final energy use of renewables was 127 PJ.

Belgium

Real GDP growth rate in Belgium was 1.6% in the first term of 2008. GDP per capita in PPS (Purchasing Power Standards (PPS) (EU-27 = 100)) is forecasted at 1.2 thousand in 2008. Main branches of industry (secondary sector) are: construction, food & feed industry, chemical industry, metallurgical industry, vehicle assembling, construction of metal products & machinery, paper & printing industries and textile industry. Most workers in Belgium (568 thousand people) are employed in a sector related to electricity, gas and water supply.

Belgium industry is mostly focused in the processing of imported raw materials into semifinished and finished products, most of which are then exported. Steel production is the most important sector of industry, with Belgium ranking high among world producers of iron and steel. The chemical industry manufactures a wide range of products, from heavy chemicals and explosives to pharmaceuticals and photographic supplies. The automotive industry has a high concentration of assembling capacity in Belgium.

In terms of innovation and development, the most active sectors are the chemical industry, the manufacturing sector for electronic equipment and devices, the metallurgic sector and the machinery manufacturing sector.

Denmark

Real GDP growth rate was 1.1% in the first term of 2008 while per capita GDP taking into account PPS (Purchasing Power Standards (PPS) (EU-27 = 100)) was 119.8.

Industry plays an important role in the Danish Economy. Main branches of industries are: mining industry (especially: peat, crude oil, brown coal), engine industry, metal industry and cellulose-paper industry.

Manufacturing sector in Denmark has greatly expanded since the end of World War II and now accounts for a far greater share of national income than does agriculture and employs the majority of the working age population. Food and beverages industry as well as meat packaging industry play an important role in the economy. The chemical, metalworking, and pharmaceutical industries have made notable progress.

In Denmark Forests present only 12% surface of the whole country while arable land occupies 63% of the surface of this country.

Renewable energy primary production in 2006 was mainly based on the wind energy (1,2 PJ). However, other renewable energy technologies also played important roles such as biomass (0,1 PJ), hydropower (0,1 PJ), geothermal (0,5 PJ) as well as solar heating and electricity production (0.4 PJ).

Finland

Real GDP growth rate in Finland was 2.6% in the first term of 2008 (year to year) and per capita GDP taking into account PPS (Purchasing Power Standards (PPS) (EU-27 = 100)) was 115.8.

Industry accounted for 26% of GDP in 2007, and employed 22% of the labour force. Finland's main industries include: wood industry, steel production, steel industry, engine industry, metal industry and cellulose-paper industry. Main industrial products include paper and board, electronics and metal products, chemical products. Finland was the world's leader in cellular telephones production, paper machinery, medical devices, and instruments for environmental measurements. Biotechnology is an increasingly important sector, with strength in pharmaceuticals, biomaterials, diagnostics, and industrial enzymes. It is important to say that forests continue to be Finland's most important raw material resource and the majority of people are employed in the different sectors of manufacturing.

With respect to energy, renewable energy has accounted for 22-25% of primary energy in the past few years and the overall use of renewable energy is extremely dependent on the development of the forest industry.

The share of electricity generated from renewable energy sources accounts for 27% of the overall total electricity consumption. Biomass is the most important renewable energy source in Finland, representing approximately 20% of primary energy consumption.

France

After the US, Japan, and Germany, France is the fourth-leading industrial country. In 2007, industry accounted for 21%, agriculture 2%, and services sector 77% of GDP. Leading industrial sectors in France are construction and civil engineering with the annual production of \$159.4 billion, Agri-foodstuffs with annual turnover of \$127.8 billion. The leading sectors within this branch are meat and dairy production, cereals, confectionery, soft and alcoholic beverages.

France has centered its RES (Renewable Energy Sources) approach around feed-in tariffs on the one hand, and a tendering procedure on the other. Hydro power has traditionally been important for electricity generation, and the country ranks high when it comes to biofuel production. France has vast resources of wind, geothermal energy and biomass, and wind power. Geothermal electricity has experienced a remarkable growth. In addition, there is growth potential in the area of solid biomass. In 2006, 3.9 TWh of electricity were produced from biomass, along with 385 PJ for heat production.

The nuclear energy has always provided the greatest share of a total produced energy in France. In 2007 the total amount of generated nuclear energy reached 4.7 PJ which was about four times more than the amount of renewable energy produced (solar, biomass, wastes, geothermal, wind, hydro). It is however interesting that the ratio between these two kinds of energy changing slowly and the amount of nuclear energy has been decreasing over past years.

Germany

In the first term of 2008, Germany's GDP growth rate reached 2.6 %. Most important industries include: electromechanical industry, refining industry, energy industry, chemical industry and metallurgical industry.

Share of people employed within the main sectors and the other sectors in 2006 was as follows: mining and quarrying 1,1%, manufacturing 8,6%, electricity, gas and water supply sector 0,3%, transport, storage and communication 2,3%, and the sector of wholesale, retail trade, motor vehicles garages 5,4%.

The most successful German industry is mechanical engineering. Other important industries in Germany are steel and coal mining, both heavily subsidized and still with the large number of employees.

Germany is one of the EU leaders in wind, PV, solar thermal installations and biofuel production. Its onshore wind capacity accounts for approximately 50% of the total installed capacity in the EU. A stable and predictable policy framework has created the favorable conditions for RES (Renewable Energy Sources) penetration and growth. Germany has already exceeded its 2010 biofuel target of 5.75% (in 2006, it already achieved 6.3%).

Italy

In the first term of 2008, GDP growth rate in Italy was 0.8%. Italy's main industries include car industry, food industry and wine production. Manufacturing sector employs the largest number of people in Italy. Other than automotive, engineering industry is another very important industry, which represents 41% of the entire manufacturing industry.

In 2006, renewable energy primary production from biomass amounted approximately 0,2 PJ, hydropower 0,1 PJ, geothermal energy 0,2 PJ, wind energy 10,7 PJ and solar energy 1,6 PJ.

Over the last few years, wind power production, biogas and biodiesel have shown a remarkable growth. At present, the Italian government is working out the details of more ambitious support mechanisms for the development and use of RES.

Lithuania

In the first term of 2008, Lithuania's GDP growth rate was 3, 7%. Per capita GDP in PPS (Purchasing Power Standards (PPS) (EU-27 = 100)) was 62, 7. In 2003, prior to joining the European Union, Lithuania had the highest economic growth rate amongst all candidate and member countries, reaching 10, 2%.

Main industries in Lithuania are furniture making, food processing, petroleum refining, fertilizers, machinery and electronic components.

Chemical industry and textile industry are two of the most profitable sectors. Wood and paper processing industry also have a significant economic role. In total, Lithuanian plants processed some 3 million cubic meters of timber, accounting for about 5.4 % of exports.

Lithuania depends to a large extent on the nuclear power which currently generates over 70% of total electricity produced. The National Energy Strategy plans a new nuclear power plant which will result in a major rise of electricity generation output in 2016. In order to provide alternative sources of energy Lithuania has set a National target of 12% RES by 2010 (8% in 2003). The largest potential for RES in Lithuania can be found in the field of agricultural biomass mainly due to the long tradition in this sector. Furthermore, electricity from wind is expected to rise by 54 times between 2006 and 2017.

In Lithuania a significant effort have made to developing biomass (wood, chips, wood waste, straw, biogas). The total capacity of installed wood-chip-fuelled boilers in Lithuania has reached over 250 MW. No major obstacles can be seen for the extension of wood fuel usage. In Lithuania agricultural land occupies about 45% surface of the country while forests stands for approximately 32% and pastures for about 9% of the total area.

Netherlands

The GDP growth rate in the first term of 2008 was 1.8 and per capita in PPS (Purchasing Power Standards (PPS) (EU-27 = 100)) was 129.8. Main industries in the Netherlands include food-processing, chemical industry, petroleum refining and electrical machinery. In 2005, the employment profile within different sectors in the economy was as follows: mining and quarrying (9 thousand persons), manufacturing (786 thousand persons), electricity, gas and water supply (28 thousand persons), transport, storage, communication (462 thousand

persons). Food and chemicals industries are among the sectors, which implement the greatest amounts of innovative technologies.

In 2006, renewable energy primary production was as follows: biomass 0,1 PJ, hydropower 0,4 PJ, wind energy 9,8 PJ, solar energy 0,9 PJ (with regards to geothermal energy production, no data was available).

Poland

In 2007, Poland's GDP amounted 443 billion €, GDP growth rate reached about 7% and per capita figures was 11,2 thousand €. The structure of national GDP is divided as follows: agriculture 6%, industry 32% and services 66%. Despite Polish economy is currently undergoing a great economic development, there are many challenges ahead. The most notable task on the horizon is the preparation of the economy (through continuing deep structural reforms) to allow Poland to meet the strict economic criteria for entry into the European Single Currency (Euro).

Poland's main industries include: mine industry (especially: peat, crude oil, brown coal), wood industry, electrochemical industry, steel production, metallurgic industry, engine industry and chemical industry. The majority of Polish citizens are employed within manufacturing sector, however, significant amounts of people are also employed in trade and agriculture sector.

Biomass is the most promising source of renewable energy in Poland. Biomass technical potential amounts 755 PJ/year [GUS], and the greatest opportunities for biomass technology implementation are found in forestry, wood processing and agriculture sectors.

Spain

GDP growth rate in Spain has experienced a significant drop from 4.1% in the first term of 2007 to 2.7% in the first term of 2008. Real GDP growth rate was 1.8. GDP per capita in PPS (Purchasing Power Standards (PPS) (EU-27 = 100)) was 104.3.

In 2006, Spanish expenditure in R+D was 1.2% of GDP. The biggest contribution came from the private sector companies which represented 0.7% of total GDP, 20% more than in 2005. R+D activities were mainly financed by the private (47.1%) and the public (42.5%) sectors.

Main economic sector is services, including those dedicated to give market -trade, computing, tourism-, and non market services -public administrations, domestic services, non profit institutions-, followed by the energy sector. Regarding employment, the services sector employs more than half of the total followed by industry and energy. Construction and real state sector, which has played a very important role in the Spanish economy in the last years, is now in recession and no improvement is foreseen in the near future, which will lead to an important loss of jobs.

In 2007, RES (Renewable Energy Sources) represented 7% of primary energy consumption and 19.8% of power generation. Wind power installed capacity and power production grew 29% and 16% respectively regarding the previous year.

Sweden

In the first term of 2008, real GDP growth rate in Sweden was 1.8%. GDP per capita in PPS (Purchasing Power Standards (PPS) (EU-27 = 100)) was 124.5. Sweden main industries include: mining industry (especially: peat, crude oil, brown coal), wood industry, electrochemical industry, steel production, steel industry of uniron metals, engine industry, metal industry and chemical industry.

Sweden is an export-oriented market economy featuring a modern distribution system, excellent internal and external communications, and a skilled labour force. Timber, hydropower, and iron core constitute the resource base of an economy heavily oriented toward foreign trade. Sweden's engineering sector accounts for 50% of output and exports. Telecommunications, the automotive industry and the pharmaceutical industries are also of great importance. Agriculture accounts for 2 percent of GDP and employment. Sweden has the largest number of biotechnology companies per capita in the world.

Sweden is moving away from its RES-E (Renewable Energy Sources - Electricity) target. In absolute figures, RES-E production has decreased between 1997 and 2004, mainly due to a lower level of large-scale hydro production. Other RES like bio-waste, solid biomass, off-shore wind and PV have, however, shown significant growth.



