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Biofuel policies for dynamic markets

Effective and low-disturbing biofuel policies

WP 3

Deliverable 3.3

Assessment of Policy Schemes – identification of the key features having effect on the effectiveness and low-disturbing character of sector policies

Intelligent Energy Europe

Effective and low-disturbing biofuel policies

Assessment of Policy Schemes – identification of the key features having effect on the effectiveness and low-disturbing character of sector policies

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Executive Summary

The current market introduction of biofuels and the expected increase in the future is likely to 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 minimizes the impacts of biofuel production and use on 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 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.

Number of sectors e.g. heat and electricity production sector, wood processing sector use lignocellulosic biomass such as wood residues, municipal waste paper, agricultural residues, and dedicated energy crops. Therefore, policies supporting lignocellulosic biomass for other uses are highly relevant in defining policy options to minimize the impacts of biofuels on other commodity markets.

The aim of this report is to analyze relevant national and international policies in aspect of their impact on the biomass use and availability for diferent sectors. On the basis of significant policies the key features such as sustainability, fairness and time frame will be identified and assessed. The policies analysis and their impact assessment is a background for the next ELOBIO report aimed at assessing the future amounts of available biomass for sectoral use and the biomass supply from agriculture, forestry and waste management sectors.

Biomass flow and sectors' relationship

The biomass raw material is treated according to the pathway: raw material – transformation – energy – end use. However, the flow pathway is not always that simple and includes feedback and side flow pathways based on the material circulation. Besides, the by products of one sector can provide a perfect input material for the other sectors, but if the sectors are using similar raw material, the competition occurs.

The agriculture and forestry sectors provide material for all of the production sectors, while the wastes sector is considered to support only energy sector and pulp and paper production sector with the feedstock material. There was a competition detected among some sectors e.g. agriculture compete with the forestry if it comes to available land, however the competition is not too strong concerning the sector tradition and properties. The strongest competition for feedstock material exists within the energy sector, among biofuel, heat and electricity producers. The competition for feedstock among the sectors: energy, pulp and paper, particle board and furniture, food, fodder and fibre sector, is not so strong since the production and functioning of these sectors is quite balanced. There may be significant correlation between food production sector and energy production sector in the feedstock material from agriculture.

The competition for raw material can be noticed both within the sectors - among different branches of industry, as mentioned before – and among the sectors. The changing demand for forests product in the graphic paper industry is likely to influence the total demand for raw material by the sector, what in consequence has an effect on the other sectors dependent on the material from forests. The competition within the sectors is strongly dependent on the market balances and market characteristics.

Policies analysis

The strength, scope and timing of the policies within a particular sector influence the sectors in a different way. In the longer period of time it is possible to notice the general trends in the sectors development caused by implemented policies and market characteristics. The market, demand and productivity relationship of the sectors also reflect the sectors' development.
There are many policies' features which may be assessed, the identified significant ones were as follows:

- Sustainability
- Timeframe
- Transparent and overall approach
- R&D and technologies development and investment support for infrastructure
- Promotion and information of public opinion
- Adjustment of used instruments to the stage of market development and resources potential
- Area scope, national vs. international

Apart from the general analysis of the key features of policies in the analyzed sectors, in this work package all the policies were analyzed at national level by each partner and subcontractor. All partners were asked to assess each listed policy in aspect of three factors: fairness, effectiveness and efficiency. Each policy factor was estimated by given points from 1 (not fair, effective, efficient) to 5 (fully fair, effective, efficient). The policy assessment – points allocation- was done on the basis of available information e.g. consultation with the representatives of the analyzed branches, scientific reports, articles, overall partners experience and knowledge about the policies and sectors.

Key features

The majority of sustainable policies were listed in the renewable heat and electricity sector, which was however expected due to the general number of the policies listed in this sector. Among the countries analyzed the most sustainable policies were found in Finland. Almost all the policies assessed as the most sustainable are the long-term policies, mainly regulatory policies, influencing the whole sectoral production on the national level. Some of the policies assessed as sustainable were based on the incentives e.g. tax allowances (Finland) or mandatory uptake in the market (Germany).

The international policies implementing obligations for all the Member States and enforcing the national plans and strategies implementation were assessed to have the most significant impact on the sectors development.

The sectors characterized by a strong correlation between the international and national policies were assessed to develop more rapidly and are expected to consume/produce more

biomass material than the sectors in which the implemented policies on the international and national level stay in a loose relation.

Bioenergy is strongly promoted at EU level. The most important document is the Directive 2009/28/EC on the promotion of the use of renewable energy RES, setting mandatory national targets for share of energy from RES and for the share of RES 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. In practice it will stimulate the agricultural sector and the sector of forestry production. Significant increase is also expected in the energy crops production. The sector of renewable heat and electricity production will increase the productivity, while the other sectors using biomass as raw material may suffer from the increased competitiveness for the raw material.

The unification of the national policies on the base of international documents would increase the sustainability of the sectors regulations. Also the complexity of the documents and the wide scope concerning sectors would positively influence the sectors development and prevent the disturbances especially in the raw material availability.

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 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 objective of work package 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 analysis done within D 3.2 includes identification 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 management.

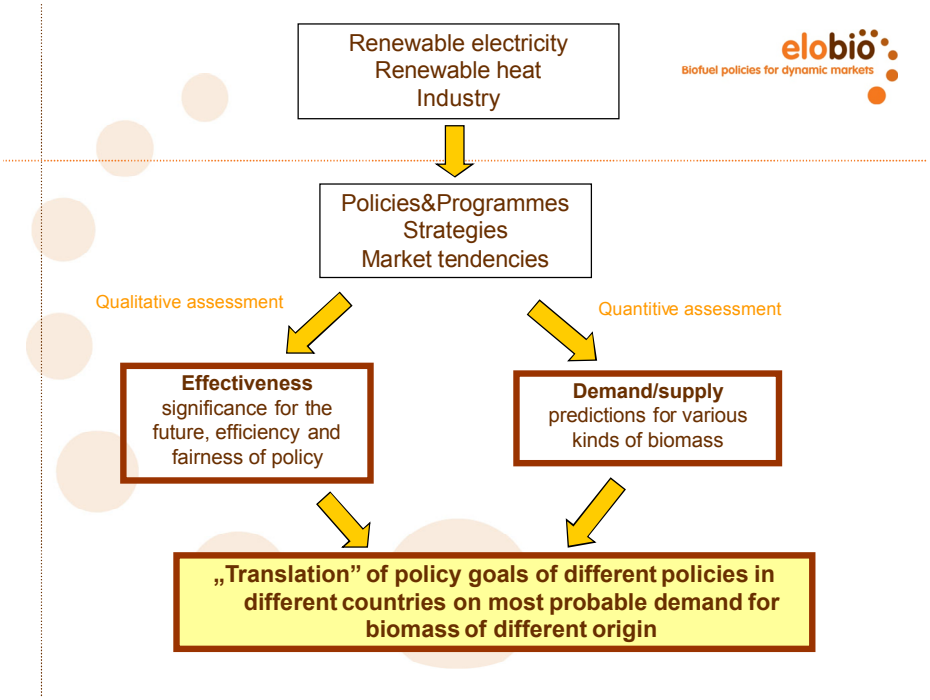

Figure 1Graphical presentation of WP3 activities and relations

The aim of this report is to assess policies, programmes and strategies both on the national and European level, which influence the biomass flows in different sectors in partner countries identified in deliverable D 3.2.

The analysis of the policies is partly based on the national data provided by the project partner countries, however the majority of data is based on the wide-European reports and available information. All the policies which are influencing each sector significantly have been listed by project partners and presented in the Annexes to this report. The assessment of the three features (efficiency, effectiveness and fairness) of the policies has been done in each country. The simplified assessment is aimed at giving the overall opinion about the policy application and suitability.

In the cases where there were no policies or important documents listed for a sector it was assumed that the European policies are regulating the sector. The key feature of the policies in the context of this report was their impact on expected amount of biomass flow among the sectors. The national documents are regulating sectors connected with biomass production and use different scenarios for the future, predicting the increase or decrease of biomass available to be used for different purposes. In some cases, however, the surplus amount of biomass was dedicated to particular use by a policy. There are documents, especially in the sector of wastes management, which predict the decrease of biomass surplus.

The amounts of biomass were presented in different units and for different periods of time, sometimes they were provided generally, without particular numbers. Therefore, finding the key features for the needs of this project has been simplified to assessing the possible increase or decrease of biomass as a result of each policy.

2. Current use of biomass for energy production

Bioenergy is a part of the renewable energy sector which is very strongly promoted at the European level. 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.

Prior to assessment of policy issues in analysed countries it is useful to make an overview of current state of bioenergy development and targets they have to reach.

Current use of biomass for energy production can be found in European wide statistics like EUROSTAT, Eurobserv"ER or AEBIOM. Well documented is share of bioenergy in electricity generation and share of biofuels in transport sector, due to obligatory annual reporting to European Commission. The problem is with heating sector - there is no common method for gathering data, some information is missing e.g. biomass used in individual heating systems.

Some European projects are looking more deeply into these problems. Within the EUBIONET III project the assessment of the economically and technically viable volume of solid biomass fuels of different categories as well as use in 2006 was done for all European countries [29]. The added value of that project is that partners were asked to report national economic biomass resources (i.e. the share of technical potential which meets criteria of economic profitability within given framework conditions) in energy units (PJ) – not theoretical ones. The estimation of resources and use do not include biodegradable waste.

The solid biomass use in 2006 was 3 178 PJ as reported by EUBIONET III partners and subcontractors (fig.2,3,4), they estimated that ca 48% of the calculated economic biomass potential is exploited [29]. Fig.2 shows the use of different solid biomass categories by different countries, firewood is the most often used biomass, however that number is not accurate as most of firewood is not traded officially.

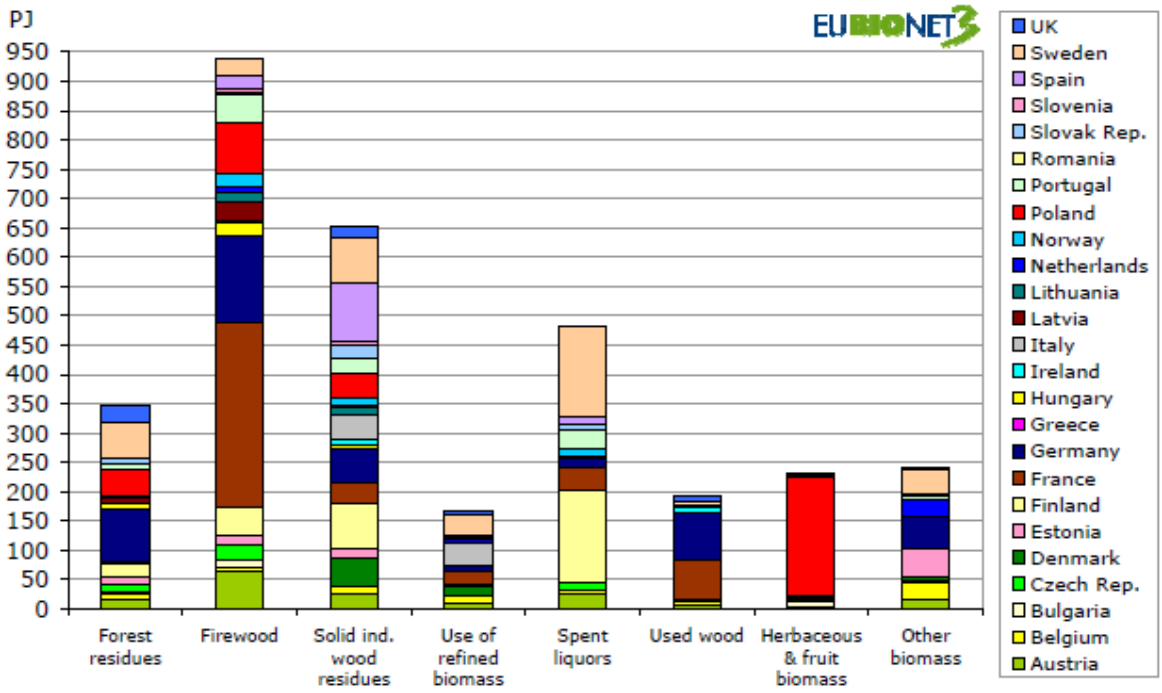

Figure 2 Use of different categories of solid biomass in different countries in 2006 [29]

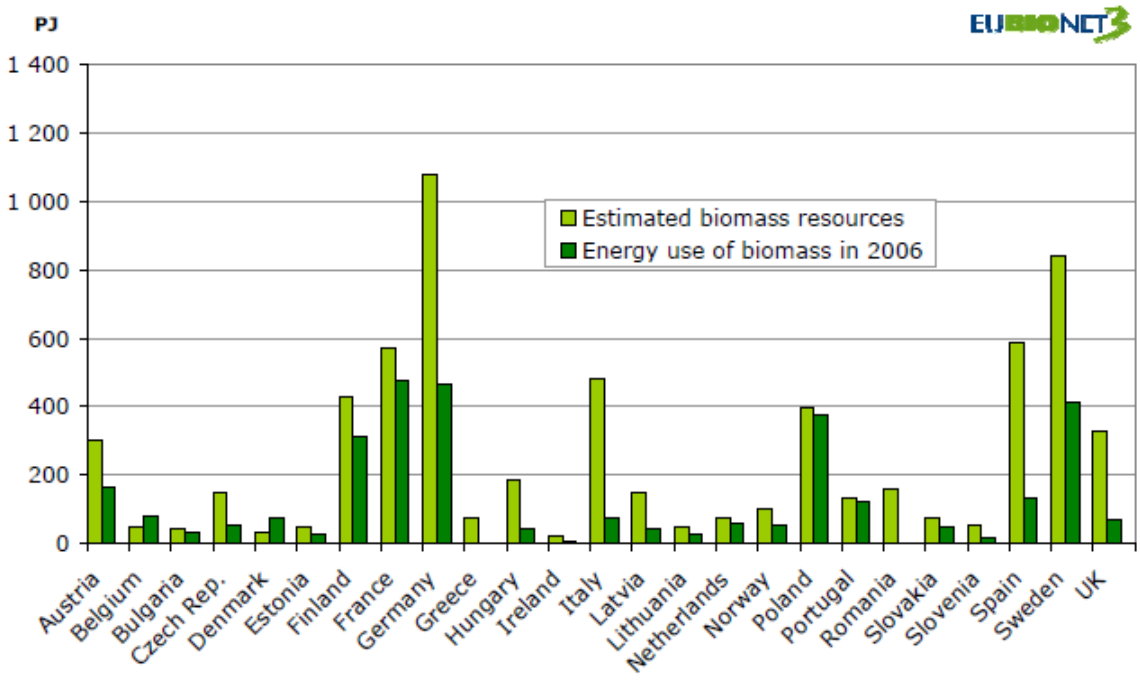

Figure 3 Biomass use compared to resources in different countries [29]

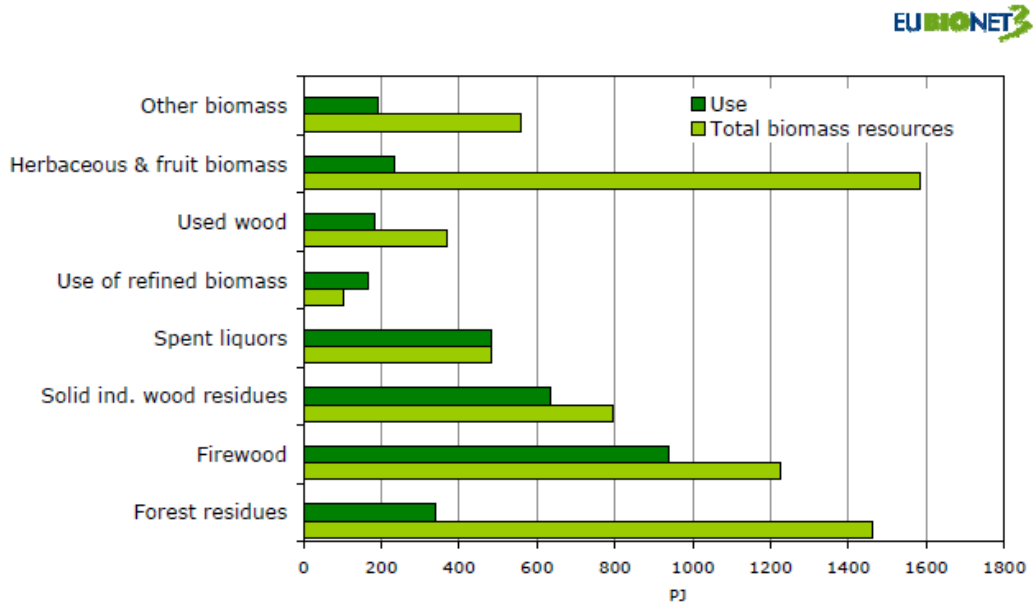

Figure 4 Biomass use in 2006 in EU24 and Norway compared to biomass resources [29]

Policy measures can change the above pictures (Fig.3,4) strongly – first of all it is estimation of an economic potential, it means it is changing with change of financial supporting measures. For example policy measures have trigged major trade flows especially wood pellets in past years. Now there is a competition for raw material e.g. with pulp & paper industry which is dictating the price. Sawmills industry is decreasing the production capacity so the amount of raw material is decreasing. Wood pellet industry is depending too much on one raw material (mainly saw dust) and subsidies – change can cause major market disruptions and problems for end-users.

According to Eurobserv"ER 2009 reports the share of biomass in renewable primary energy consumption was equal 66,1% in both years: 2007 and 2008. The solid biomass primary production in 12 analysed countries is given in Table 1 [10]. Share of biomass in renewable electricity generation was 17,3% in 2007 and 17,1% in 2008.
In Table 2 is given share of renewable energy in gross electricity consumption in 2008 in 12 countries in comparison with 2010 target as well as share of RES in primary energy consumption in 2008 in comparison with obligatory 2020 target.

Country	Wood 2007	Waste wood 2007	Organic waste 2007	Black liquor 2007	**Total 2007**	**Total 2008**
Austria	1,402	1,133	0,609	0,599	**3,743**	**3,934**
Belgium	0,200	0,245	0,055	0,040	**0,540**	**0,654**
Denmark	0,598	0,175	0,692	0	**1,464**	**1,389**
Finland	1,706	1,858	0,019	3,656	**7,238**	**7,146**
France	7,462		0,267		**8,545**	**8,959**
Germany	9,454			0,306	**9,759**	**10,311**
Italy	n.a	n.a	n.a.	n.a	**1,707**	**1,911**
Lithuania	0,337	0,395			**0,732**	**0,765**
Netherlands	n.a	n.a	n.a.	n.a	**0,799**	**0,893**
Poland	n.a	n.a	n.a.	n.a	**4,709**	**4,739**
Spain	2,898	0,299	0,933	0,102	**4,232**	**4,339**

Sweden	0,957	4,028		3,456	**8,441**	**8,303**

Table 1 Solid biomass primary energy production , Mtoe [10]

Country	RE-E 2008 estimation	2010 target	RES share 2008 estimation	2020 target
Austria	62,3 %	78,1 %	25,2 %	34 %
Belgium	4,7	6	3	13
Denmark	26,3	29	17,6	30
Finland	29,4	31,5	24,5	38
France	15,7	21	7,5	23
Germany	14,5	12,5	7,7	18
Italy	16	25	8,2	17
Lithuania	4,6	7	10	23
Netherlands	7,8	9	3,7	14
Poland	4,1	7,5	5,8	15
Spain	20,2	29,4	7,5	20
Sweden	53,9	60	31,8	49
Total EU-27	16,4 %	21 %	8,2 %	20 %

Table 2 Comparison of RE-E consumption in 2008 with 2010 targets and RES share in primary energy consumption in 2008 with 2020 targets for 12 countries [32].

There are two general observations included in Eurobserv"ER 2009 reports The first is that none of the three European objectives will be reached – neither the White Paper's 12% share of primary energy, nor the 21% share of electricity consumption and even less still the 5.75% biofuel share. Secondly, the EU Member States have more than an uphill task ahead of them if they are to achieve their individual goal with the exception of two countries. By the end of 2008 Germany had exceeded its 2010 renewable electricity goal and France had almost made its 2010 biofuel incorporation target.

3. Biomass flow and sectors' relationship

3.1. Characteristics of biomass flow

The biomass raw material is treated according to an established pathway: raw material – transformation – energy – end use. However, the flow pathway is not always that simple and includes feedback and side flow pathways based on the material circulation. Besides, the by products of one sector can be used as raw material for the other sectors, when the sectors are using similar raw material, the competition may occur.

The main feedstock providers, for the sectors using biomass as an input material, are actually two sectors – Agriculture and Forestry. However, the sectors of wood processing, paper production and food and fodder production also generate some by-products which can be used as a feedstock material. The material is then used for different purposes e.g. energy production, building material production, paper production, etc. During the production processes, different by-products are being released, some of which may be used again.

Agriculture is a very important sector in Europe. This sector is being regulated by many European and national documents and obligations in order to support the level of production which can fulfil the demands. Among the most important policies within the sector is the CAP – Common Agricultural Policy- and its national implementation strategies. It is important to

mention that agriculture in Europe is on the high level of development, both from the technical (mechanization and electrification) and biological (genetically modified organism GMOs) point of view. Agricultural sector is an important part of the national economy in many European countries. It is one of the most regulated sectors among the analyzed.

Compared to the agricultural production sector, the forestry sector seems to be more stable. Available raw material from the forests can not change significantly over few years because of the forests characteristics while agricultural yield can change over just one or two years. The raw material produced in the forests is differently used depending on the country and its resources. The forestry production is however less changeable in the short period of time, comparing to the sector of agriculture and the rapid increase of the sector productivity is not possible. There is however a possibility to change the purpose of the sectors raw material, which may cause stronger competitiveness. The traditional division of the raw material was done among the wood processing sector – including building purposes, paper production and energy production. The division and particular amounts of the raw material are different among the countries due to the different forestry potential in each country. The table below presents the percent of land covered by forests in the total land area of each country. The largest forest areas can be found in Scandinavia while the lowest percent of country covered by forests is found in Netherlands and Denmark. The amount of hectares covered by forests reflects the country wood material productivity which can be seen perfectly on the Scandinavian example.

The changes in the productivity of the sector and the demand for sector's products will influence directly both the sectors -pulp &paper production and the particle board and furniture production. On the other hand supplies from the forests will have an effect on the building sector which may also stop or stimulate the sector of particle board and furniture production.

The most regulated sector among the analyzed biomass consuming sector is the renewable heat and electricity production sector. The sector is both supplied by agriculture and forestry biomass. The demand from energy sector interested in agricultural residues, such as straw, generates competition e.g. with the agriculture using straw for field use and animals breeding.

	Belgium	Denmark	Germany	Spain	France	Italy	Lithuania	Netherlands	Austria	Poland	Finland	Sweden
Percent of the country covered by wooden area [2005]	22	12	32	36	28	34	33	11	47	30	74	67

Table 3 The percent of area covered by forests in analyzed countries [8]

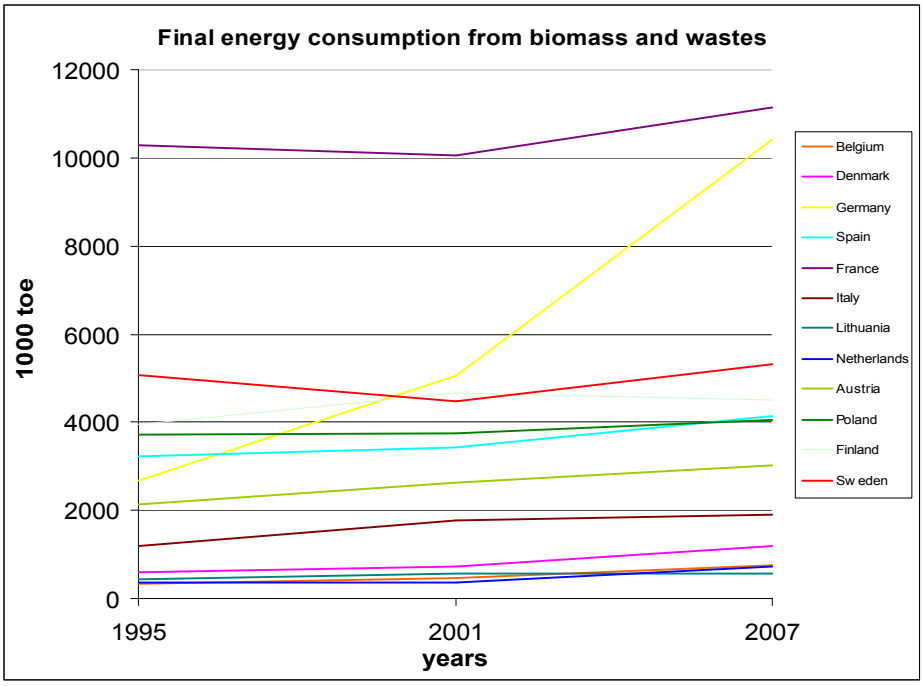

Figure 5 Final energy consumption from wastes and biomass [8]

As the energy generation sector is the most regulated by various policies and legislative instruments it is important to analyze the mechanisms better. The final energy consumption from wastes and biomass progresses in a different way in different countries (Fig.5). In some countries the increase in biomass&wastes energy consumption occurred only after 2001- Sweden, France - while in some others the growth was constant since 1995. There are also countries in which the growth was rapid and noticeably different than in the other countries – Germany. In some countries the fluctuations can be seen more clearly – Sweden, France, while in some others – Denmark, Netherlands, Austria, Spain, Sweden and Lithuania – the changes in the biomass&wastes energy consumption were not so big. The reason for such various changes can be explained by different country approach for the new EU legislation and different material availability. Also the national documents based on the EU legislation include various time-scope scenarios for biomass and wastes use for energy production, which may also influence the changes in final energy consumption from biomass and wastes, as shown in Fig.5.

The more noticeable changes in the energy consumption after 2001 can be explained by the wide implementation of EU policies which is also reflected in the national policies implemented. The overall need for more 'green' energy and the system of financial incentives and punishment influenced the biomass use and in consequence the biomass& waste energy consumption. Since most of the policies concerning green energy production and all the additional documents were implemented after 2001 not all the results can be seen by now. It is possible however, to assume that there will be an increase in the consumption of energy produced from biomass and wastes. Probable dynamics in the growth may be seen more clearly in the countries with the relatively slow growth now as these countries will have to reach up the targets set by EU and transformed by national governments.

According to the national data the sector of pulp and paper production requires more and more raw material. The sector is not regulated by legal acts as much as the renewable energy production sector or the two 'supply' sectors – agriculture and forestry, but is and will be strongly influenced by agriculture and forestry sectors productivity. The competition for raw

material among the pulp and paper production sector, wood processing sector and renewable energy production sector is likely to become stronger due to newly implemented Directive 2009/28/EC concerning renewable energy sources. However, more and more paper products are produced from the paper wastes material, so the competition for raw material among pulp&paper sector, wood processing sector and renewable energy production sector may not be significantly stronger than it is now.

	Belgium	Denmark	Germany	Spain	France	Italy	Lithuania	Netherlands	Austria	Poland	Finland	Sweden
Woodpulp	509	0	2938	2079	2422	502	0	109	1928	1061	13615	12414
Newsprint	265	0	2365	380	1110	219	0	422	424	191	585	2541
Printing and writing paper	1119	151	8346	1593	3191	3163	0	1008	2620	821	9159	3413
Paper and paperboard	1897	423	22656	6893	10006	10008	119	3367	5213	2857	14140	12066
Graphic papers	1384	151	10711	1973	4300	3381	0	1430	3044	1013	9743	5954

Table 4. Production of pulp and paper products in 2006 [thousand tonns] [8]

The pulp and paper industry is known to be the bioenergy driver in Europe. It is the largest producer and user of renewable energy sources with 52% of its primary energy consumption in 2006 coming from these [31]. It is also the largest user of solid biomass representing 25% of current volume and has invested heavily in bio-power and energy efficiency. It was also assessed that financial incentives for generating energy from wood have the potential to generate a shortage of raw material supply for the pulp & paper industry or at least increase the competition for raw material.

The other sector consuming biomass from the forests is the wood processing sector which includes sawmills industry, particle board industry, building & construction industry and furniture industry. There always have been slight competition for the raw material among the mentioned industries within the sector [5], however, due to the climate and energy package, the competition for raw material between the wood processing sector and renewable energy production sector may increase as it is expected with the pulp and paper sector. Some of the sectors' productions are shown in table 4.

	Sawnwood	Wood-based panels	Veneer sheets	Plywood	Particle board
Belgium	1555	2552	42	20	2225
Denmark					
Germany	25170	17791	392	229	10928
Spain	3332	5025	60	450	3295
France	10190	6709	80	378	4841
Italy	1700	5701	470	420	3600
Lithuania	1380	547	0	21	437
Netherlands	271	15	0	0	0
Austria	11262	3453	23	195	2500

Poland	4100	8299	80	390	5281
Finland	12477	1995	59	1410	400
Sweden	18600	928	55	92	627

Table 5 Production of particle board and materials for furniture industry, 2007 (thousand of tonnes) [8]

The wastes management sector, as a sector strongly influencing the environment, is also regulated by many documents and laws. Especially the regulations concerning the recycling and reuse of the wastes are important for the sector. Due to developing technology and increasing demand for raw material, especially in the energy sector, the wastes management sector is expected to be even more regulated and provide more input material which could be a solution for increasing demand for such a material among analyzed sectors.

3.2. Sectors' relations

Figure 6 presents sectors' relationship. The agriculture and forestry sectors provide material for all of the production sectors, while the wastes sector is considered to support only energy sector and pulp and paper production sector with the feedstock material. The amount of wastes is also not assessed to stand for a significant input for mentioned sectors. There was a competition detected among some sectors – the scope and field of competition is assessed to differ depending on the sectors. The sector of agriculture compete with the sector of forestry if it comes to available land, however the competition is not too strong concerning the sector tradition and properties. The strongest competition for feedstock material exists within the energy sector, among biofuel, heat and electricity producers. The competition for feedstock among the sectors: energy, pulp and paper, particle board and furniture, food, fodder and fibre sector, is not so strong since the production and functioning of these sectors is quite balanced. There may be significant correlation between food production sector and energy production sector in the feedstock material from agriculture.
However, it is important to emphasize that the energy sector is currently strongly regulated both by international and national laws what makes it much stronger comparing to e.g. pulp and paper production sector.

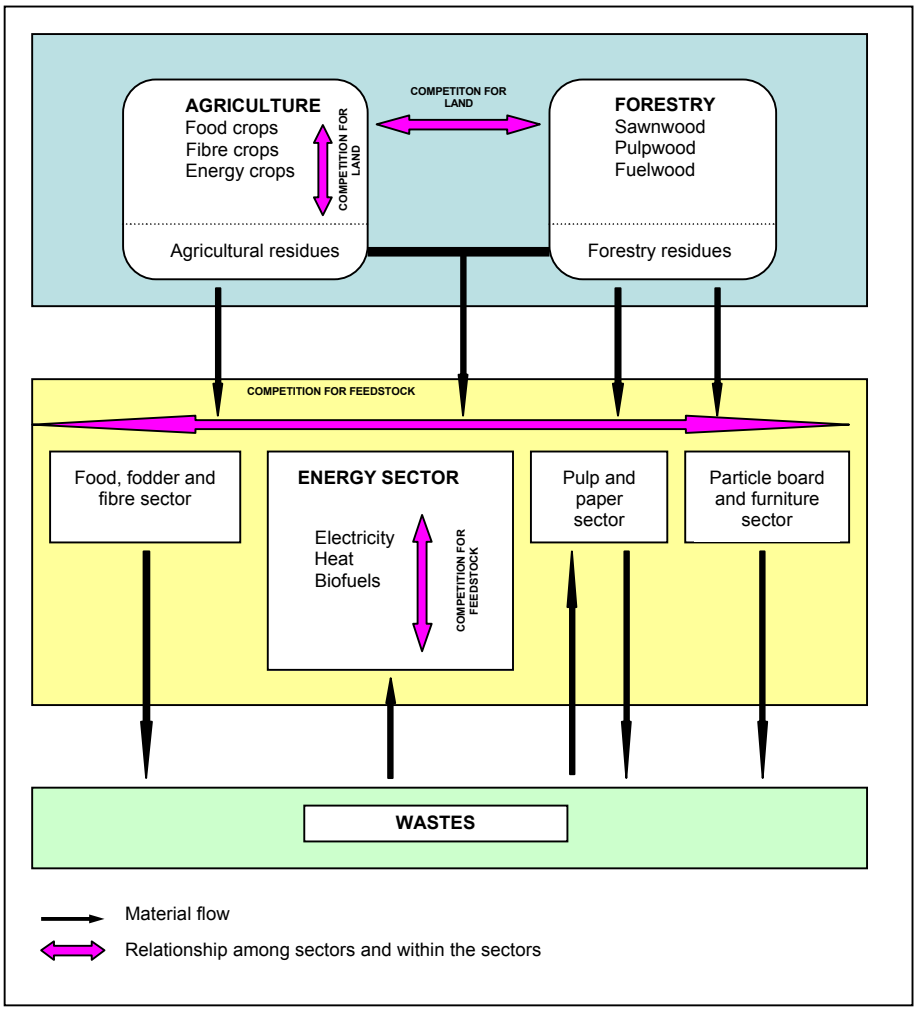

Figure 6 Analyzed sectors' relationship

Undoubtedly one of the important and influencing factors is the competition for land which is visibly seen among two 'supply' sectors – agriculture and forestry. There has always been such a competition especially in the countries where there is a lot of flat land usually utilized as agricultural but the forests areas are relatively small comparing to other countries.

Due to many changes in the international regulations concerning especially the sector of biomass and energy production, the need for land available for energy plantations increased.

The amounts of raw material used and demand for raw material within each of the analyzed sectors is short-time predictable on the national level. However, the introduced laws, regulations and other factors may influence the set amounts. The streams above are shown to present the scope of changes in the sectors. Products, by-products and materials from the wood processing sector and agricultural sector are included in both sides – material and product. The correlations among the sectors shown in the streams above show that possible changes in e.g. agricultural sector influence not only the energy sector and food an feed production sector (as a direct stream pathway of this sector) but also the other sectors on the base of feedback.

The competition for raw material can be noticed both within the sectors – among different branches of industry – and among the sectors. The competition among the sectors have already been discussed in the previous chapters but the differentiated demand for raw material among industries within the sectors seems to be more complicated matter. The changing demand for forests product in the graphic paper industry is likely to influence the total

demand for raw material by the sector, what in consequence has an effect on the other sectors dependent on the material from forests. The competition within the sectors is on the other hand dependent on the market balances and market characteristics.

3.3. Sectors trends overview

Renewable electricity and heat

Bioenergy is strongly promoted at EU level. The most important document is the Directive 2009/28/EC on the promotion of the use of renewable energy RES, setting mandatory national targets for share of energy from RES and for the share of RES 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. Significant increase is expected in bioenergy production, electricity generation from biomass (Fig.7) ,especially important bioenergy will be for heat sector (Fig.8).

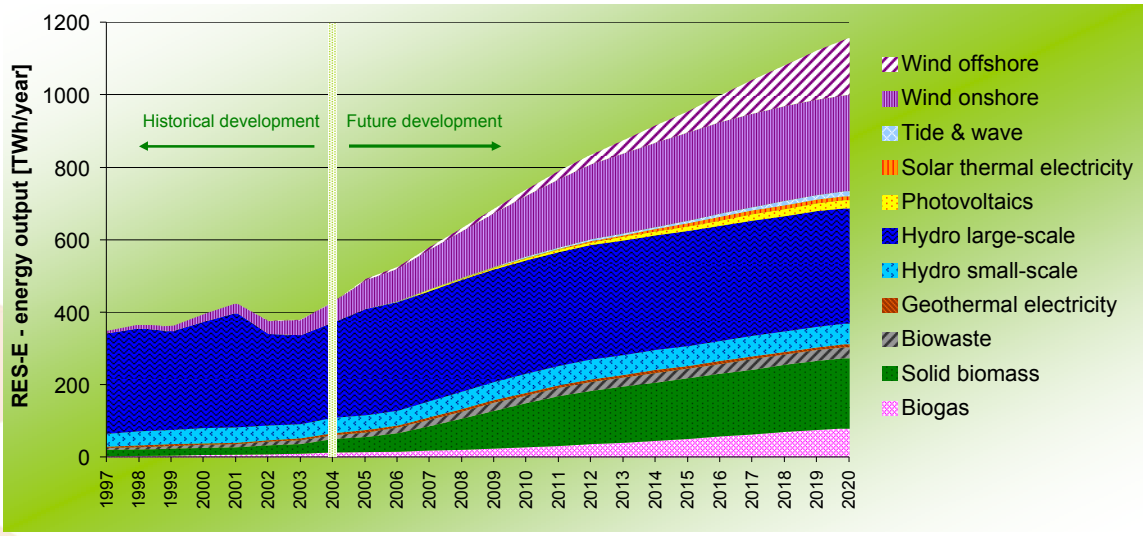

Figure 7 Electricity projections till 2020 [27]

Currently bioenergy accounts for about two thirds of the renewable energy in Europe and heating with biomass will play a crucial role in order to reach the ambitious 2020 targets. District heating and cooling (DHC) allows a high share of renewable heat in urban areas. The situation for district heating (DH) in European countries is very different. While the long established, on fossil fuel running DH networks in Eastern Europe tend to lose clients because of inefficiency and inconvenient handling (e.g. no temperature adjustment in houses), the markets in Sweden and Denmark are almost saturated and steadily increase the share of renewable fuels. Biomass availability is not the only prerequisite for a successful implementation of biomass DH, as only foresighted (city) planning, political will and the right incentives can create a favorable framework for DHC.

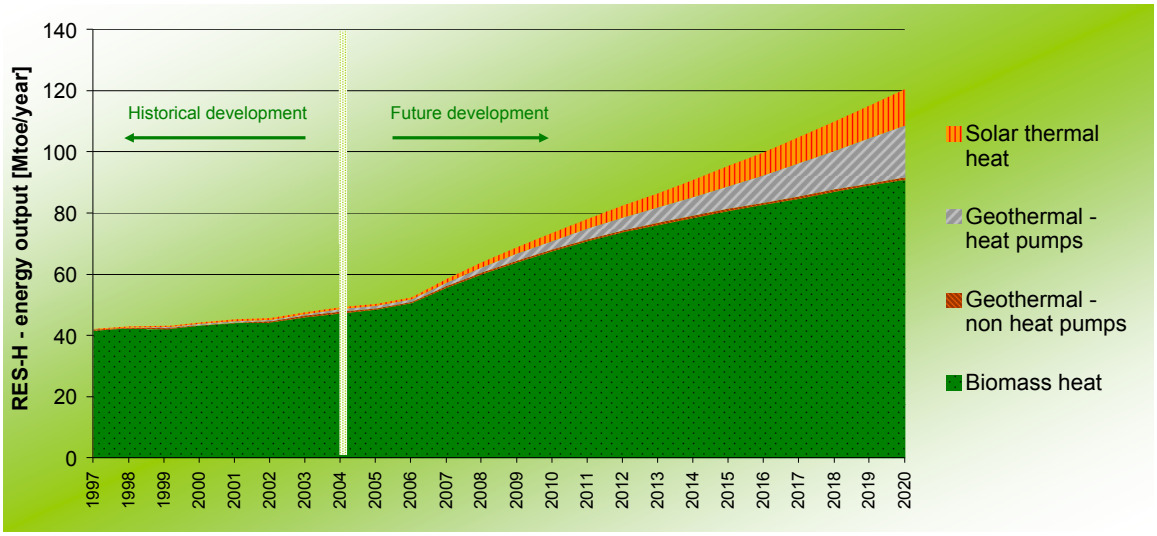

Figure 8 Heating and cooling projections till 2020 [27]

The production of electricity from RES differs among the countries and among the sources used. Significantly low level of electricity generation from hydro power plants can be noticed in Denmark, Netherlands and Lithuania which is connected with the lay of the land in those countries, while according to the data from 2006 significant amounts of geothermal electricity are produced only in Italy (see Table 5).
Gross electricity generation from the wind turbines is undoubtly the highest in Germany and only a bit smaller in Spain. It is important to mention that the total differences in the gross generation among all the analyzed countries are huge. e. g. Germany, as the country generating the biggest amounts of energy from wind turbines produces more than two thousand more energy than Lithuania (country with the lowest wind energy production).
If it comes to electricity produced from biomass the first place belongs to Germany, which is followed by Finland, with about half less gross electricity production.

	Gross electricity generation – hydro power plants	Gross electricity generation – Geothermal power plants	Gross electricity generation- wind turbines	Gross electricity generation – Biomass fired power station	% of electricity from RES within total electricity consumption
Belgium	1628	-	363	3002	3,9
Denmark	23	-	6108	3923	25,9
Germany	27304	-	30710	21265	12,0
Spain	29503	-	23020	3050	17,7
France	61631	-	2150	4996	12,5
Italy	43425	5527	2971	6565	14,5
Lithuania	802	-	14	25	3,6
Netherlands	106	-	2733	6638	7,9
Austria	37664	-	1722	3185	56,6
Poland	3021	-	256	2011	2,9
Finland	11494	-	156	10660	24,0
Sweden	61738	-	987	9211	48,2

Table 6 Gross electricity generation and consumption (2006) Eurostat, Gigawatthours. [8]

The relatively high energy density of pellets has made them an internationally traded commodity. While Europe is still the main producer and consumer of pellets, especially imports from North America will become more important in the future. Fig.9 shows the actual

and expected development of the pellet production and consumption form 2000 till 2010 (Source: ISO/TC 238 Business Plan, second draft 2009)

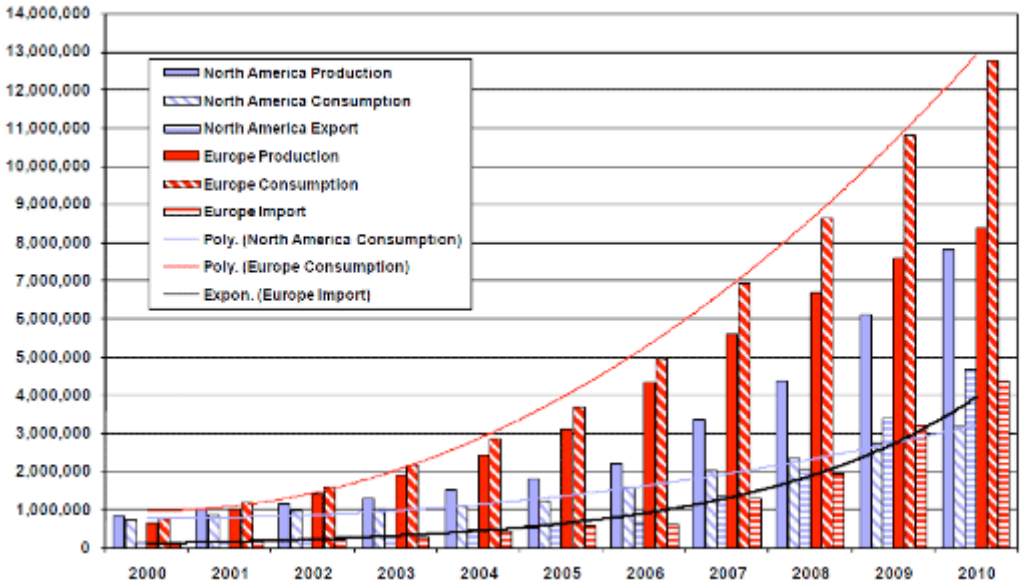

Figure 9 Development of pellets production and consumption in Europe and North America [6]

Wood processing sectors

Almost all the analyzed countries produces pulp and use wood biomass for paper production, however, there are some countries where the production of this sector is significantly high due to national resources. The richest national resources can be found in Scandinavian countries – Sweden and Finland but also in Germany (see Table 6).

	Woodpulp total	Newsprint	Printing and writing paper	Paper and paperboard	Graphics paper
Belgium	509	265	1119	1897	1384
Denmark	0	0	151	423	151
Germany	2938	2365	8346	22656	10711
Spain	2079	380	1593	6893	1973
France	2422	1110	3191	10006	4300
Italy	502	219	3163	10008	3381
Lithuania	0	0	0	119	0
Netherlands	109	422	1008	3367	1430
Austria	1928	424	2620	5213	3044
Poland	1061	191	821	2857	1013
Finland	13615	585	9159	14140	9743
Sweden	12414	2541	3413	12066	5954

Table 7 Production of pulp and paper products in 2006 [thousand tonns]

The Figure 10 shows the total amount of biomass used as fuel in pulp and paper mills. The total biomass used has been growing relatively slowly since 1995 while the use of black liquor has grown significantly since 2001.

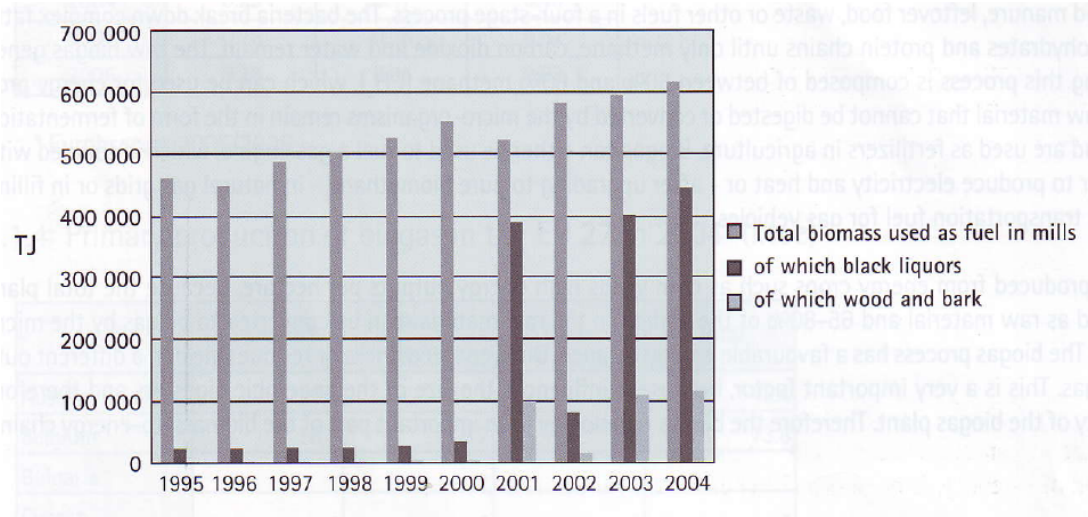

Figure 10 Biomass use as fuel in paper and pulp mills, 2005 [6]

The production of materials for the building sector and the particle boards is the highest in Germany, Sweden and Finland however Austria and France produces significant amounts as well. The smallest production may be found in The Netherlands, Lithuania ad Belgium, which can be related to the countries' areas and the forestry resources. The highest production of particle board occurs in Germany which should be emphasized since the demand for particle board in the sector of building is growing constantly (see Table 7).

	Sawn wood	Wood-based panels	Veneer sheets	Plywood	Particle board
Belgium	1555	2552	42	20	2225
Denmark	-	-	-	-	-
Germany	25170	17791	392	229	10928
Spain	3332	5025	60	450	3295
France	10190	6709	80	378	4841
Italy	1700	5701	470	420	3600
Lithuania	1380	547	0	21	437
Netherlands	271	15	0	0	0
Austria	11262	3453	23	195	2500
Poland	4100	8299	80	390	5281
Finland	12477	1995	59	1410	400
Sweden	18600	928	55	92	627

Table 8 Production of particle board and materials for furniture industry, 2007 (thousand of tonnes) [8]

It is however important to notice the differences in the total forests areas and the areas available for wood supply. In some countries (e.g. Belgium, Denmark, Netherlands, Austria, Poland) the two areas are almost equal, while in some others the forest available for wood supply occupies a bit smaller areas than the total forest. This fact may be connected with the area of national parks and protected areas in each country as well as with the factor of location; some areas may not be available for removals since they are located e.g. high in the mountains.

Another important factor to mention is the difference in the advancement and development level. In some of the European countries the forests removal techniques are advanced and wood is being removed only with heavy machines while in some other parts of the continent wood in still removed from the forests manually. The disparity in the wood removal

techniques have a strong influence on the efficiency and can be seen in the data comparing the total forests areas with he total wood materials gaining.

The general trends in the forests products gaining is the sector's productivity increase. The roundwood production increase and the growing production of sawn wood are the most probably connected with the growth of the building sector demands. The fuel wood production increase can be a result of different international and national policies implementing rules concerning using wood as a renewable source of energy.
While the production of main forests products increases within the time the forest total area doesn't change significantly over the years.

Strong sawn wood and pulp markets in 2006 brought roundwood prices into record highs. Total removals in the UNECE region reached 1.3 billion m^3, only marginally below the exceptional level of 2005 that was influenced by significant volumes of storm-damaged timber, especially in Sweden. European removals were forecast to increased by 5.4% in 2007 as Swedish removals recover from the post-storm level of 2006. Looking at 2008, removals were forecasted to remain almost unchanged, in spite of the drastic reduction in housing starts in the US. Demand for processed fuels such as wood pellets is at record levels, resulting in shortages and higher prices in parts of Europe. Manufacturers, who until now have relied on sawdust as their main raw material, are having to look to other materials, such as wood chips and roundwood, to keep pace with the burgeoning demand.

European sawmillers increased production in 2007, by 4.3%, and another 0.4% in 2008, to a record 116.2 million m^3. European mills which had in 2006 experienced log supply problems and higher prices, to some extent driven by energy policies, suddenly found a reversal in January 2007 when two windstorms caused heavy damage to forests in Austria, Belgium, Czech Republic, France, Germany, Poland and southern Sweden. As roundwood supplies returned to normal levels over the year, prices rose, along with sawn wood prices.

Sawn hardwood markets are forecast to remain buoyant in the UNECE region. European markets are forecast to grow by about 2.4% in 2007 for both consumption and production, with little changes in trade. Europe, US and China are demanding European and American white oak, and sawn wood prices rose in 2007. Beech demand is up too, with a rise in prices.

European panel markets are forecast to continue growth in production and consumption, despite rising energy and wood raw material costs and global competition. Rising wood prices, in part driven by renewable energy policies, and resulting uncertainties with regard to wood availability, as well as difficulties to source supply from small forests owners are challenges confronting the European woodworking industries. Plywood production is expected to remain stable, facing difficulties because of severe competition from South American and Asian countries. The production of particleboard, by far the most important panel type in Europe, has been increasing steadily, though it lost market share due to the rapid expansion of other panel types. It is forecast to reach a record 47.5 million m 3 in 2008. Capacity expansions mainly in eastern Europe are projected, mostly to satisfy domestic demand.

The paper and paperboard sector in the UNECE region is marked by expansion in Russia, where consumption is forecast to increase by, contrasting with the situation for other regions where little change is expected in production or consumption. European consumption remained around 97 million m.t. from 2006 to 2008. Pulp consumption is expected to remain

stable in all three sub-regions, although European pulp production is forecast to increase by over 1 million m.t. and exports by 0.6 million m.t. The Confederation of European Paper Industries (CEPI) reported that in its member countries (most of western Europe) in 2006 consumption of recovered paper exceeded consumption of virgin pulp for the first time, despite exports of recovered paper to Asia of over 7 million m.t.

Agriculture

The highest agricultural production among the analyzed European countries occurs in France, Germany and Poland, however, Spain and Italy also produces significant amounts. The lowest production level can be found in the Netherlands and Belgium which is the most probably connected with the area of these countries, as it was similar with the production of forestry sector. The agricultural production of the analyzed countries in 2007 and 2008 is shown in the table below. Table 9 presents the total harvested production from all the cereals, including rice.

In Table 8 the total area covered by energy crops in EU 25 in 2005 is presented. This area is the largest in Germany, among other European countries and stands for more than the half of the total European area covered by energy crops. The majority of the area covered by energy crops in Germany is being grown without special regime, according to the data from 2005. According to the table presented below, among all the analyzed countries there are no energy plantations only in Lithuania. The smallest area under energy crops can be found in Belgium and in The Netherlands, however if comparing that area between Italy and Belgium concerning the total area of the country, the area covered by energy crops seems to be either small in Italy or significantly big in the Netherlands. Among the countries which are in the scope of this project also France provides Europe with wide areas dedicated to energy crops.

	Total	Energy crop scheme	Non-food on set aside regime	Without spec. regime
Austria	19,63	7,91	9,37	2,36
Belgium	7,56	2,59	4,07	0,91
Denmark	47,90	17,34	24,81	5,75
Finland	9,44	8,31	0,0	1,13
France	572,61	135,40	376,2	1,0
Germany	1356,61	235,60	341,0	780,0
Italy	9,80	0,29	8,34	1,18
Lithuania	-	-	-	-
Poland	60,2	3,67	0,0	56,53
Spain	39,45	25,61	9,11	4,73
Sweden	37,45	29,34	3,61	4,49
The Netherlands	1,29	0,05	1,09	0,15

Table 9 Area under energy crops in the EU , 2005 [6]

The strength, scope and timing of the policies influences the sectors in a different way. Concerning the longer period of time it is possible to notice the general trends in the sectors development. The pathway of sector progress is regulated by the policies applied in each sector and stimulated by the demand and trends in the requirement. The relationship of the sectors also may reflect the sectors productivity. Some of the important aspects concerning the material demanded and produced outcome is a result from the around Europe condition and market condition , which in general is reflected in the export and import balances.

Especially, it is possible to notice these relations in the agricultural sector which is strongly dependant on the export balances in Europe. It is also important to notice that the total amount of yield in the agricultural crops production is strongly influenced by the weather conditions.
In general it is not possible to assess if there are any strong changes in the past ten years in the sector concerning the total production, neither the overall trend can be shown on the base of this data (see Figure 4).
The important role in the agricultural sector productivity is played by the mechanization factor. On the base of data from last ten years it is also possible to assess that the amount of people employed in the sector of agriculture decreases while the productivity of the sector is stabilized at the same level or grows slowly.

Forestry

As mentioned before in this report, the most aforestrated areas in Europe can be found in Scandinavia and in some of the Alpine countries. If it comes to the total forest area in each country, among analyzed countries, Sweden has the widest area of forests, equal about 27 mln ha while Finland represents forest area smaller only for about 6 mln ha. Significantly large forests areas can be also found in France and Spain. Countries with the smallest total forests area are Netherlands, Denmark and Belgium what corresponds clearly with the total area of the country; those three countries are the smallest among all analyzed countries (Table 9).

	Forest land [1000 ha]
Belgium	646
Denmark	445
Germany	10740
Spain	13509
France	15156
Italy	9857
Lithuania	1978
Netherlands	339
Austria	3840
Poland	8942
Finland	21883
Sweden	27264

Table 10 Total area of forests in some of the European countries, 2000 [8]

The above data, the total area of forests corresponds with the amount of roundwood production. However, not all the countries that produce significant amount of roundwood are the leaders if it comes to the total forests area. The perfect example may be Germany, which is on the second position (just after Sweden) in the production of roundwood but not on the leading position if it comes to the total forests area (Table 10).

	Belgium	Denmark	Germany	Spain	France	Italy	Lithuania	Netherlands	Austria	Poland	Finland	Sweden
2006	4230	2358	62290	15716	61790	8618	5870	1107	19135	32384	50812	64600
2007	4100		76728	14528	62759	8125	6195	1022	21317	35653	56870	77200

Table 11 Total production of round wood (1000 m3)[8]

Waste Management Sector

The biggest producers of wastes are France and Germany among the analyzed countries while the smallest are Lithuania and Belgium. If it comes to energy recovery from the wastes the leaders are undoubtedly Sweden and Germany, while in Denmark, according to the available data, the energy recovery from the wastes is negligible (see Table 11).

On the Fig.11 the potential for energy production from different kinds of wastes is presented. It is predicted that solid agricultural residues will provide the widest field for energy production. Among other important for energy production groups of wastes municipal solid wastes, black liquor, wet manure and household waste wood are possible.

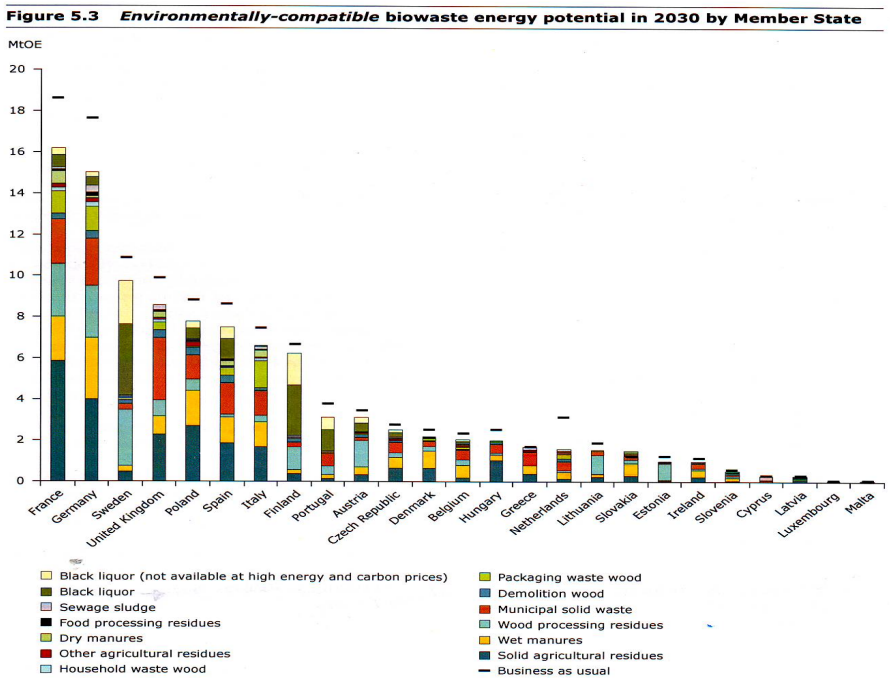

Figure 11 Biowaste energy potential in 2030 by member states [3]

	Total Wastes	Energy Recovery
Belgium	30025	1740
Denmark	21762	0
Germany	358364	17320
Spain	143885	3612
France	426605	10386
Italy	11960	2633
Lithuania	5869	169
Netherlands	100587	1737
Austria	47127	4377
Poland	169318	2381
Finland	65248	9088
Sweden	109692	18612

Table 12 Total amount of the wastes produced and the amount of waste from which the energy is being recovered, 2006 [8]

4. Policies analysis

4.1. Policies impact characteristics

The strength, scope and timing of the policies within a particular sector influence the sectors in a different way. In the longer period of time it is possible to notice the general trends in the sectors development caused by implemented policies and market characteristics. The market, demand and productivity relationship of the sectors also reflect the sectors' development.

The policies and their impact can be divided according to different features. Depending on the feature taken into consideration the policies, their scope and the strength of impact differ significantly among countries and sectors.

1. According to the area scope
e.g. local (Poland, 'Regional Strategies'), national (Austria 'The Austrian Forests Programme'), European (Directives), or Global (Kyoto protocol)

2. According to the time horizon
The long-term policies introduce plan or strategies for the timeline longer than ten years (e.g. 'Energy Policy of Poland till 2030') and define the target to be obtained. The level of the target achievement may be regulated in time or the deadline may be specified. The short term regulations concentrate more on the current needs of the sector and its development. They are assessed as more stable due to the long term contracts for farmers, transport companies and the end users of any raw material

3. According to the enforcement level
Compulsory, recommended, indicative

4. According to policy tools
e.g. The policies may be based on different tools such as incentives provided to stimulate the development, or additional payments/ tax allowances to enable the faster development. Some policies may include an obligatory target to be fulfilled under the risk of financial punishment. There are other kind of policies including the control policies aimed at introducing the reporting systems or others.

5. According to the topic
The regulation documents may be based on a particular topic or on a mix of few topics together. There are policies that consider only the financial background, or the ecological aspects etc. And others treat about one or more aspects on the background of another. The best example may be a policy which is aimed at increasing the bioenergy production but also includes the by-topic of green-house gasses emissions or biological diversity.

6. According to the scope
As well as multi-topic, policies may also be multi- sectoral. Some of the documents include only regulations concerning one sector, or even one industry branch within the sector and the others consider the aspects connected with more sectors.

7. According to production chain

The policies may regulate different segments of the production-end use chain. It is possible that only one section is being regulated e.g. The raw material production, the delivery scheme to the end user, the waste management within the industry etc. The complexity and coherence of the policy may, but does not have to, be ensured by covering all the production-delivery-end use chain.

8. According to actors
There are many groups of people influenced by a policy. The regulations may just influence the people directly connected with the financial aspects of the sector, the producers, suppliers, the end-users or sometimes the actors from different sectors. The impact in this group may be also divided into direct or indirect.

4.2. Policies tools

There are two most commonly used policy tools. The first type of tool is based on the bunch of incentives aimed at stimulating the development of the sectors e.g. subsidies, additional payments, different funds. They are usually focused on just one chain-level of the production/use biomass flow chain; the perfect examples of such policies are additional payments for the farmers growing energy crops, subsidies for the land afforestration, or the subsidies for producers, using the recycled materials (e.g. Poland, the Netherlands, Belgium). The other examples of incentive- based policy tools are funds dedicated to investments connected with the biomass use and the funds for research projects and innovative proposals.

Among all the policies listed in the analyzed countries an important role is played by the documents introducing different tax allowances. These kind of policies are the most common in the sectors of renewable energy production and waste management and offered for e.g. establishing energy plantations, producing 'green' energy, using recycled materials (e.g. Sweden, Finland).

Another tool used commonly in the policies is the obligations tool. There are many types of such instruments e.g. the mandatory uptake in the market which is common in most of the countries in case of renewable electricity. There is a high increase in the number of policies implementing the need for standardization and certification of products and processes, especially in the sectors: agriculture, forestry and RE production e.g. France, Austria.

Europe-wide trend of basing the national sectors development plans on the policies implementing obligations tools is observed. The incentive- based policies are complementary to the obligation-based policies and aimed at facilitating the production/use amounts target achievement.

All Member States have introduced support schemes to promote renewable electricity. These support schemes have triggered a significant increase in electricity generated from renewable energy sources over the last decade. The current level of support varies significantly among the Member States, due to country-specific cost-resources conditions as well as principal differences in the support instruments applied.

Overview of the main policies for renewable electricity in 12 analyzed countries (source: [26])

1. Austria

Feed-in tariffs combined with regional investment incentives.

Comments: Until December 2004 feed-in tariffs were guaranteed for 13 years. From 2006 onwards full feed-in tariffs for new renewable electricity generation are available for 10 years, 75% and 50% available for year 11 and 12 respectively. The new feed-in tariffs are announced annually and support is granted on a first-come, first-serve basis. From May 2006 there has been a smaller government budget for renewable electricity support.

2. Belgium

Quota obligation system / TGC combined with minimum prices for electricity from RES.

Comments: The Federal government has set minimum prices for electricity from RES. Flanders and Wallonia have introduced a quota obligation system (based on TGCs) with the obligation on electricity suppliers. In Brussels no support scheme has been implemented yet. Wind offshore is supported at federal level. The scheme is qualified as a public service obligation.

3. Denmark

Premium feed-in tariffs (environmental adder).Tender schemes for wind offshore.
Comments: Duration of support varies from 10-20 years depending on the technology and scheme applied. The tariff level is generally rather low compared to the previously high feed-in tariffs. A net metering approach is taken for photovoltaics

4. Finland

Energy tax exemption combined with investment incentives.

Comments: Tax refund and investment incentives of up to 40% for wind, and up to 30% for electricity generation from other RES.

5. France

Feed-in tariffs plus tenders for large projects.

Comments: For power plants < 12 MW feed-in tariffs are guaranteed for 15 years or 20 years (wind onshore, hydro and PV). From July 2005 feed-in tariff for wind is reserved for new installations within special wind energy development zones. For power plants > 12 MW (except wind) a tendering scheme is in place. The scheme is qualified as a public service obligation.

6. Germany

Feed-in tariffs.

Comments: Feed-in tariffs are guaranteed for 20 years (Renewable Energy Act). Furthermore soft loans are available.

7. Italy

Quota obligation system / TGC. Feed-in tariff system for photovoltaic (introduced in August 2005).

Comments: Obligation (based on TGCs) on electricity producers and importers. Certificates are only issued for renewable electricity capacity during the first 12 years of operation, except biomass which receives certificates for 100% of electricity production for first 8 years of operation and 60% for next 4 years. Separate fixed feed-in tariff for PV, differentiated by size and building integrated. Guaranteed for 20 years. Increases annually in line with retail price index.

8. Lithuania

Feed-in tariffs combined with a purchase obligation

Comments: Relatively high fixed feed-in tariffs for hydro (<10 MW), wind, biomass, guaranteed for 10 years. Closure of the Ignalina nuclear plant which currently supplies majority of electricity in Lithuania will strongly affect electricity prices and thus the competitive position of renewables as well as renewable support. Investment programs limited to companies registered in Lithuania.

9. Netherlands

Premiums payments (abruptly abolished in August 2006).

Comments: Premiums guaranteed for 10 years were in place from July 2003. For each MWh renewable electricity generated, producers received a green certificate [GO] from the issuing body, which was redeemed for the premium payment. Government put all premium renewable electricity support at zero for new installations from August 2006 as it was believed that the renewable electricity target would be achieved in advance of 2010. Premium for biogas (<2MWe) immediately reinstated. The Netherlands aims to introduce a new support scheme as early as possible in 2008. The preferred support policy option is currently improved premium payments. Fiscal incentives for investments in RES are available.

10. Poland

Quota obligation system. TGCs introduced from end 2005 plus renewables are exempted from the (small) excise tax

Comments: Obligation on electricity suppliers with targets specified from 2005 to 2010. Penalties for non-compliance were defined in 2004, but were not sufficiently enforced until end of 2005. It has been indicated that from 2006 on the penalty will be enforced.

11. Spain

Feed-in tariffs and premium

Comments: Electricity producers can choose a fixed feed-in tariff or a premium on top of the conventional electricity price. No time limit, but fixed tariffs are reduced after either 15, 20 or 25 years depending on technology. Transparent system. Soft loans, tax incentives and regional investment incentives are available.

12. Sweden

Quota obligation system with TGC.

Comments: Obligation (based on TGCs) on electricity consumers. For wind energy, investment incentives and a small environmental bonus are available.

Since biomass represents the cheapest sources for renewable electricity in several countries, it is not surprising that it attracts the largest share of investments in renewable electricity in countries with support schemes that are non technology specific, such as tax incentives and quota obligations with tradable green certificates. The tax measures in Finland, the Netherlands and Sweden (before 2002) and the present the Belgian and Swedish quota obligations have resulted in a concentration on current least cost technology. It should however also be mentioned that long standing traditions in the biomass sector and the importance of the forestry industry in countries like Finland and Sweden have played an important role in the development of solid biomass electricity.

Biomass electricity is considered cost-efficient in countries with reasonable quantities of exploitable wood waste. However, infrastructure constraints rather than economics is considered to be an important barrier to the development of this sector in many cases.

Despite the potential for solid biomass electricity in new Member States, there has been little development in this sector over the period.

4.3. Policies' trends

In this chapter the policies schemes are analyzed, taking into consideration many aspects like: time, geographical scope, supply and demand side. Policies may provide support not only for the biomass use but also for the biomass production. Concerning the supply side two main sectors are taken into consideration agriculture and forestry. The other branches such as wastes and co- products management are also significant concerning biomass supply and may influence the amounts of available biomass. Concerning demand side – renewable energy directive 2009/28/EC seems to be the most important.

The key policy tools in agriculture in Europe is the Common Agricultural Policy (CAP). 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). 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 the national law, programmes and strategies. Also the *Energy crop aid and set aside land under CAP,* which is a European document, implements obligatory changes on the base of which of all the Member Sates are to introduce the national policies. Apart from the International policies (e.g. Rural development policies, agricultural programmes) which regulate the sector the strongest, there are bunch of national regulations which are aimed at facilitating the achievement of the targets included in the international documents. The number of the policies being a result of International documents, together with the additional national policies provide a very wide and complex regulatory background for the sector.

Among the other regulated sectors similarly it is possible to list the Renewable heat and electricity sector. Here, the scheme for regulatory documents seems to be based on the same model. The International- European Policies introduce the obligation to achieve particular targets for all the Member States. The sector of renewable heat and electriciy production can be seen as the first, in which such a complex model has been implemented. In the past, all the member states were obliged to implement the assumptions of e.g. Green Paper, or Biomass Action Plan and nowadays, the newest policy – the Climate package – ensures the same regulations implementation in all the Member States. Most of the documents on the national level are based on the European regulations, however, the same as in the agriculture sector, there are many documents at national level independent of the general European regulations. There are also the decrees, plans and strategies partly based on the European renewable energy regulations, however e.g. assuming higher targets or being more specific about the target achievement methods.

Very similar situation can be detected in the sector of wastes and bio-based material management. The Directive on wastes set the background for the majority of national documents, however the same as in the two earlier mentioned sectors, there are documents on the national level implementing plans or strategies independently on the Directive.

The situation is completly different in other analyzed sectors: forestry, wood processing and pulp&paper production. These sectors have the European–level documents, which are however, not so tightly connected with the national documents. The Forestry Strategy, Forest Action Plan and FLEGT programmes are proposing general rules for the forestry management and only the Forest Action Plan is being updated every year to monitor the fullfilment of the document. On the national level the majority of the mentioned documents are general forests plans or acts. In some of the countries the special impact is put on the afforestation programmes (Poland, Lithuania). In most of the countries the forestry management predictions, i.e. the forecasted amounts of wood available in the forests, do not have the separate, dedicated documents, both are included in the regulatory policies also dedicated to cutting rules, protected forests areas or biodiversity. The multitopics character of the national policies and the indirect link among the national documents have the influence on the sectors development pathways. The regulatory situation in the wood-processing and pulp&paper production sectors is quite similar, however, in these sectors, there are no significant policies listed on the national level. The regulations concerning the sectors are mostly included in the forestry documents. Therefore, it is very difficult to find out the key features of the sectoral policies. The National documents are rather on the recommended enforcement level and provide plans and development strategies rather than introduce aims and particular obligations to be fulfilled. Especially the regional plans are aimed at stimulating the development of the sector, what may be assessed as the most important key feature. The sector's productivity is therefore, more regulated by the demand-supply market than by the established targets to be achieved.

5. Key features

5.1. Description of methodology

Many policy instruments need cooperation between policy-makers, consumers and producers to succeed. The criteria of sustainability are characterized by many features, among which the most important seem to be the balance development and criteria adjusted to set conditions as well as the interdisciplinary approach to the policy, what has already been mentioned before. Sustainable policy is the tool which allows the development of several branches but without harming branches connected, and provides possibilities for future ventures. Another important factor is the policy flexibility. If the conditions change significantly, the policy shall not introduce strict changes and difficult conditions.

There are many policies' features which may be assessed separately when analyzing particular law or document. Among them it is possible to list acceptability, feasibility, flexibility and many others. For this study it was assumed that within the framework of the project and to analyze policies from sectors within the scope, only three factors will be assessed: fairness, effectiveness and efficiency. These three factors were chosen among the others due to some reasons. First, assessing policies according to all the features is too complicated and requires a significant amount of experts input. Secondly, the three chosen factors also seem to cover most of the policy important characteristic features. It was possible

to asses if the policy is expected to bring the assumed results, if it is fair and the financial feasibility which is said to be one of the most important factors

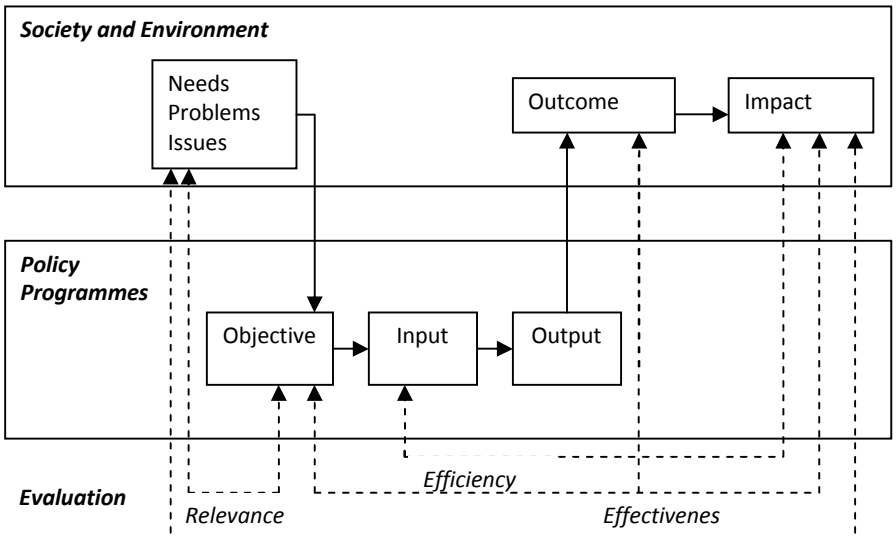

Figure 12 Schematic model of a policy process and evaluation.
The figures presents a simplified model of a public policy process (unbroken line) in which problems, needs and issues defined by the society are turned into public policy. Evaluations (broken line) can address various issues such as relevance, efficiency, effectiveness and sustainability [30].

Policy is fair if it balances costs and profits among all the involved actors by means of adequate distribution and share of costs and profits [9]. In general policy which is assumed to be fair, gives equal costs and profits to each actor or beneficiary of the policy. Among all the analyzed features, this is the first which takes into consideration the division of costs and benefits. If the aim of the policy is, for instance, to reduce the green-house gasses emission, the fair policy should divide the costs of policy implementation among involved actors, as well as provide fair division of the benefits from policy implementation among the actors.

Policy is effective if it provides the solution for the identified problem so, in other words, it has the ability to achieve the formulated target [9]. Policies that are effective lead to e.g. air clearance, restoration of the initial conditions of particular lake or river etc. when the effect is compatible to assumptions and is clean and visible. The question of effectiveness does not concern the costs of the policy nor take into consideration any other issues like social aspect. Policy Effectiveness is usually an essential feature to be evaluated when analyzing the policy.

Policy is efficient if the born costs are justified by achieved effects or if it maximizes the net effects. Policy efficiency does not consider the aspect of fairness so, in consequence, does not analyze who will incur in expenses and who will benefit [9]. The efficient policy should bring effects which are corresponding to the costs that had to be bared. These include complicated analysis of the cost and transforming the effects to countable units which can be late on transformed into particular amount of money.

Apart from the general analysis of the key features of policies in the analyzed sectors, in this paper all the policies were analyzed at national level by each partner and subcontractor. There were three features analyzed and the evaluation of the policies which are influencing the sector environment the most was done subjectively. All the partners were asked to assess each

listed policy in case of three factors: fairness, effectiveness and efficiency. Each policy factor was estimated by given points from 1 (not fair, effective, efficient) to 5 (fully fair, effective, efficient). The policy assessment – points allocation- was done on the basis of available information e.g. consultation with the representatives of the analyzed branches, scientific reports, articles, overall partners experience and knowledge about the policies and sectors. The points given by the partners to each national policy were added and the average amount was given to each document. All the policies were then divided into four groups:

1. Not assessed
2. Sustainable (average points 4-5)
3. Moderately sustainable (average points 2-3)
4. not sustainable (average points 1)

The Policies were sorted according to the number of average points given to assess the sustainability. The documents were also analyzed according to the countries and the countries profiles on the base of sustainable policies were shown. The policies requiring special interest – due to the not typical points given – were analyzed separately.

The majority of policies were listed for the sector of renewable heat and electricity production. However, the sectors of agriculture and forestry are also regulated by a significant amount of policies. The majority of sustainable policies were listed in the renewable heat and electricity sector, which was however expected due to the general number of the policies listed in this sector. Among the countries analyzed the most sustainable policies were found in Finland. Almost all the policies assessed as the most sustainable are the long-term policies and it is possible to assume that they are mainly regulatory policies, influencing the whole sectoral production on the national level. Some of the policies assessed as sustainable were based on the incentives e.g. tax allowances (Finland) or mandatory uptake in the market (Germany). There were only two policies assessed as not sustainable – in Poland (Strategy: Development Strategy for Rural Areas and Agriculture for years 2007-2013) and in Spain (Royal Decree: RD 661/2007) due to low effectiveness and efficiency assessment done by partners.

As mentioned before, the part of national policies analysis, containing the three factors assessment, was done by all the partners and subcontractors subjectively. The results and the scope of the analysis do not provide the background for identifying the key features, therefore, they will be discussed on the base of general analysis.

5.2. Key features identification and description

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 identification of key features enhancing biofuels but minimizing the impacts on other markets of biomass is very important issue. The policies analysis made in the report allows to identify features which seems to have the most important impact on biomass market.

Identified key features, which cover a broad spectrum like: sustainability, policies terms, infrastructure and R&D development, efficiency, promotion are presented below. It s important to mention that the sustainability key features were assessed not only in the positive

aspects but also as the feature being able to change and misbalance the sectors productivity and development.

Sustainability - is the key aspect of non disturbances market development. Sustainable policy is the tool which allows the development of several branches but without harming branches joined and provide possibilities for future ventures.

Timeframe – creating a long-term stable framework for farmers, foresters, industry sectors, is an important factor for a successful implementation of not disturbing policy. Long term policies allow to increase efficiency, include new geographical sources of supplies and develop research of new technologies.
This can best be met by setting long-term targets. There is recommended to regularly revise and forecasts to support long-term energy, industry and environmental strategies. Forecasts have thus been used to predict possible risks and avoid them by taking the right measures

Transparency and overall approach - the designated policy needs to be set in transparent way into context with other existing legislation and other policies aiming at similar objectives in order to achieve a consistent, cost-efficient complex approach.

R&D and technologies development and investment support for infrastructure– the development of R&D and infrastructure is the base for the market development and gives stable technical predictions. It should be made by improving investments eg. investment on support instruments such as investment subsidies or capital grants .

Promotion and information of public opinion – wide, transparent information about bioenergy and biofuels on all levels is very important. It allows to have the public acceptance for necessary changing especially when policy instruments need cooperation between policy-makers, consumers and producers to succeed.

Adjustment of used instruments to the stage of market development and resources potential - due to different resource potentials and differences in market development there is a strong need of developing spectrum of quantity-based instruments and price-based instruments that best adjust to the country conditions

Key features – Efficiency, effectiveness and fairness - the importance of the environment is more and more recognised, and so is the energy security. Due to the fact that environmental aspects and energy security are inextricably linked with the efficiency, it is expected that new and existing technologies will improve energy efficiency. The effectiveness of the policy is treated as one of the important sustainability factors, however it is important to underline that this factor is actually a basic factor comparing to the sustainability. The policy must be efficient to fulfil its purpose, only if this requirement is fulfilled, it is possible to decide f the policy is sustainable or not.

Area scope, national vs. international – The earlier mentioned international policies very often provide a background for national policies. Especially the European Directives must obligatory be implemented by means of national implementing plans. This system enables the unified implementation of assumptions for all the Member States which is a very important sustainability factor. The National policies are very important to facilitate the international targets implementation. The more each national policy is directly or indirectly connected with the international targets the more sustainable it is assessed to be.

6. Conclusions and Recommendations

- The sustainability of policies can be assessed within the sectors industries and on the basis of all the sectors analyzed. The results may be different for the sectoral and over-sectoral analysis.

- The strategies and plans included in the national policies are diverse and the estimation of the total demand of biomass products exclusively on the base of the presented policies would include a significant error.

- One of the most important sustainability factor is the area scope of the policies. The International policies implementing obligations for all the Member States and enforcing the national plans and strategies implementation are assessed to have the most significant impact on the sectors development.

- The sectors characterized by a strong correlation between the international and national policies will develop more rapidly and are expected to consume/produce more biomass material than the sectors in which the implemented policies on the International and national level stay in a loose correspondence.

- The productivity of the sectors which are weakly regulated is and will be based on the demand-supply balances and the raw materials prices and well as on the competitiveness among the sectors and the product prices changes.

- According to the International Documents – especially the Climate Package – the demand for biomass raw material will increase. In practice it will stimulate the agricultural sector and the sector of forestry production. Significant increase is also expected in the area covered by energy crops. The sector of renewable heat and electricity production will increase the productivity, while the other sectors using biomass as raw material may suffer from the increased competitiveness for the raw material.

- Especially the pulp and paper production sector' productivity may be endangered by the increased demand for raw material in the renewable heat and electricity production. Growing amount of policies being implemented in the renewable energy sector may in the future require more regulating and protecting documents in other sectors based on the biomass raw material.

- Due to the very strong policies being introduced in the renewable heat and electricity sector, the sector of waste management is expected to be more regulated especially regarding the bio-wastes. The utilization and recycling processes are expected to develop fast.

- The unification of the national policies on the base of international documents would increase the sustainability of the sectors regulations. Also the complexity of the documents and the wide scope concerning sectors would positively influence the sectors development and prevent the disturbances especially in the raw material availability.

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7. ANNEXES

ANNEX 1

country	sector	policy	Biomass use increase/ decrease	Biomass supply increase/de crease	comments
Finland	Renewable heat/renewable electricity	National Strategy to Implement Kyoto Protocol	increase		The total consumption of renewable energy would grow by at least one fourth by 2015 and at least by 40% by 2025. Renewable energy could then account for almost one third of primary energy.
Finland	Renewable heat/renewable electricity	Government Decree No 625/2002 on General Conditions in Granting the Energy A	increase		Support can be given to studies and investments and it is limited to 40% of total costs of the project. This regulation intents to promote projects, which (among others) contribute to production or development of renewable energies.
Finland	Renewable heat/renewable electricity	Updated Action Plan for Renewable Energy	increase		Increase of RES 30% by 2010 and 60% by 2025, compared to the 2001 level (all RES, both heat and electricity)
Poland	Renewable heat/renewable electricity	Strategy: Development strategy of renewable energy sources	increase		Strategic goal for RES in primary energy balance for 2010 - 7,5% (300 PJ), all kinds of biomass are considered except energy crops, the strategy assumes 3 scenarios of RES-E development (7,5%, 9,0% and 12,5% in gross electricity consumption) and includes a detailed RES structure prediction in 2010.
Poland	Renewable heat/renewable electricity	Policy: Energy Policy of Poland till 2030	increase		Policy assumes achieving 7,5% RES target (in primary energy consumption) and 7,5% RES electricity target (in national gross electricity consumption) in 2010. One of the main RES is to be biomass, which should come in future mainly from energy crops (no exact numbers). The policy mentions all kinds of biomass (from forestry, agriculture and industry).
Poland	Renewable heat/renewable electricity	Law: Energy law	increase		The Energy Law sets the main support mechanism for RES heat in the form of obligation to buy all the heat offered by the RES heat producer to the heat grid (under assumption, that RES heat production does not exceed the demand of interconnected consumers). This mechanism however does not work well in practice, since the regulator does not accept the costs of more expensive heat purchased by the heat grid company.
Spain	Renewable heat/renewable electricity	Plan: Spanish Renewable Energy Plan 2005-2010	increase		The objective of the Plan is to reach 1675 MW installed to produce electricity with biomass by 2010. 973 MW with residues and energy crops and 722 MW with co-firing. Type of biomass used is described in table I below. , Power generation with biomass in 2010 will be 6786,7 GWh and with co-firing 5036 GWh (Total=11822,7 GWh)
Spain	Renewable heat/renewable electricity	Law 54/1997 of the Power Sector			Regulates power supply activities such as production, transport, distribution, merchandising and exchanges.

Lithuania	Renewable heat/renewable electricity	Strategy: Lithuanian national energy strategy 2007	Increase		Strategic goal for RES in primary energy balance for 2010 - 12%, 2025 - 20%, biofuel - 2020 m. - 15%, 2025 m. – 20%; 2010 over 7% of electricity should be produced by RES, by 2010 should be build at least 200MW of wind power plants. Declarative support of all kinds of RES (biomass, biogas, wind, etc.)
Lithuania	Renewable heat/renewable electricity	Law: Lithuanian energy law	Increase		Declarative support of all RES
Belgium	Renewable heat/renewable electricity	Decree: Decree on qualitative CHP	Increase		Sets the legislative framework for the Flemish CHP certficate system among which biomass fueled CHP installations and sets CHP targets until 2012 and beyond. If a bio-energy production installation is a CHP, the installation can also make use of the system CHP-certificates. This system is similar to that of the renewable electricity certificates. Important difference is that a certificate can be produced for each MWh primary energy that is saved with the CHP installation in comparison with separated electricity and heat production. The penalty price is 45 €/MWh primary energy saving. The market price per certificate at the moment is about 40 €/MWh. Also a minimum value of the certificate is foreseen on 27 €/MWh primary energy saving. An important difference with renewable electricity is the degressive support of the system; The first 4 years 100% of the certificates are given to new installations, after 4 years the amount of certificates decreases following their primary energy saving ratio.
Belgium	Renewable heat/renewable electricity	Decree: Decree on rational energy use	Increase		Sets the legislative basis for the attribution of financial support for different target groups (private individuals, enterprises, non-commercial institutes, municipalities) using renewable energy sources
Belgium	Renewable heat/renewable electricity	Programme: Ecological investment support	Increase		Investment support for ecological investments. With this investment program part of the additional costs made by companies for technologies who are doing better for the environment than legally needed, can be funded by the Flemish government. Investment support for ecological investments is a call system: 3 times a year a call-system is opened by the Flemish Government where companies can apply for investment support for ecological investments. Investments in renewable energy (and more specific biomass technologies) are part of these ecological investments. SME's receive 40% of the extra cost in comparison to standard technology, large enterprises receive 20 % of the extra cost with a maximum of 1.75 million €. The extra cost in comparison to the standard technology is predefined and lays on 50% for biomass electricity or cogeneration and on 80% for biomass heat production.
Belgium	Renewable heat/renewable electricity	Programme: Increased fiscal deduction for enterprises	Increase		Enterprises investing in renewable energy (among which biomass) can deduct 14% of their investment of their enterprise taxes, this results in circa 5% of investment support.
Belgium	Renewable heat/renewable	Programme: Support for demonstration projects on	Increase		Each year the Flemish Energy Agency makes up a list with new innovative

	electricity	innovative renewable energy technologies			technologies. Companies who are willing to invest in these technologies can receive up to 50% of their costs with a maximum of 250.000 € per project. In return the authorities ask the permission for a detailed monitoring and follow-up of the project so that 'lessons-can-be-learned' from this project as the first of his kind. The list of innovative technologies is updated yearly. Biomass related technologies are very often part of the list f.e. CHP on biomass, ORC-technique and energetic valorization of road-side cuttings.
Belgium	Renewable heat/renewable electricity	Programme: Support for sustainable energy use	Increase		Reduction in property tax for enterprises who have an investement programme based on the increase of the use sustainable energy (among which energy from the biogenic part of waste)
Denmark	Renewable heat/renewable electricity	Agreement: RES-E	increase		
Denmark	Renewable heat/renewable electricity	Order: RES-E			
Denmark	Renewable heat/renewable electricity	Order: RES-E			
Lithuania	Renewable heat	Law: District heating sector law	Increase		Declarative support of RES-H (possibility to get higher tariffs).
Lithuania	Renewable heat	Programme: Support for biofuels for 2004-2010			Describe guidelines for bio resources utilization. Includes biofuel, biomass, biogas and waste combustion
Sweden	Renewable heat	The Carbon Dioxide Tax Act/The Recalculation of Energy and Carbon dioxide Tax Act (2008:853)	Increase		Emissions of CO2 is taxated through the carbon tax in order to reduce the amount of CO2 emissions. Biomass and peat are exempted from paying carbon tax (varying, see below). The carbon tax is set differently for different kinds of fuels. The carbon tax for fuel oil is 3007 SEK/m3, natural gas for heating 2252 SEK/m3 and coal 2617 SEK/1000 kg. The carbon dioxide tax should not be payed for: 1. methane produced from biomass, 2. Fuels with KN-no 4401 and 4402, with the exception of wood waste from household waste, 3. fuels with KN-no 2705, 4. fuels that come in special packaging of maximum 1 litre, 5. fuels that due to the fuels properties are lost during production, storing or transport. The electricity produced in CHP plants is completely exempted from the CO2 tax, the heat production is exempted by 19-79 % from the CO2 tax (79 % if the electricity production efficiency is larger than 15 %).
Sweden	Renewable heat	Law: The Energy Tax Act (1994:1776)/The Recalculation of Energy and Carbon dioxide Tax Act (2008:853)	Increase		The energy tax works the same way as the carbon tax, with the exeption that it is only a fiscal tax and does not primarily aim at reducing carbon emissions. However, biomass and peat are exempted from this tax as well. The energy tax for fuel oil is 797 SEK/m3, natural gas for heating 258 SEK/m3 and coal 339 SEK/ 1000 kg.
Finland	Renewable heat	Law: State support to energy investments of private persons	Increase		Support can be granted for households changing their oil heating systems to wood fuels, solar, heat pumps or district heating.
Finland	Renewable heat	Law: Taxation of fuels in heat production	Increase		Taxation of fuels in heat production does not apply to wood fuels, since 2005 also peat

Belgium	Renewable heat	Programme: Support for rational energy use			De installation of a biomass boiler heating system in a residential house with an automatic feeding system is eligible for subsidies in the Walloon Region..
Belgium	Renewable heat	Programme: Income tax allowance for energy saving investments in a residential dwelling	increase		Tax allowance system. Forty percent of the investment is eligible for tax allowance with a CAP of 2650 euro for wood boiler systems. For replacing an old boiler by a new wood boiler, the wood boiler has to fulfill the norm EN 12809, it has to be a boiler with automatic filling of the non-treated wood or pressurized wood dust. The nominal useable efficiency has to be minimum 60% following the norms 303-5.
Austria	Renewable heat	Federal Programmes	increase		A variety of federal programs exist for the support of RES-H consisting primarily of investment subsidies
Austria	Renewable heat	Strategy: Biomass Action Plan	increase		Theoretical targets of biomass energy in 2020 increasing to 256 PJ (comprising 130 PJ biomass heat, 54 biomass electricity, and 34 biomass fuels)
Austria	Renewable heat	Programme: EU 20% target	increase		Austria's target share is to achieve 34% RES in final energy consumption by 2020.
Italy	Renewable heat	Disposition for annual and multi-annual State budget (financial law 2009 art. 2 par.12			
Germany	Renewable heat	Act on the Promotion of Renewable Energies in the Heat Sector (Erneuerbare-Energien-Wärme-Gesetz, EEWärmeG)			
Germany	Renewable heat	Market Incentive Programme			provides financial support for the installation of renewable heat plants in new buildings
Lithuania	Renewable electricity	Law: Lithuanian electricity law	Increase		Declarative support of RES, put res under "public obligation", list institutions, responsible for fairness in RES support, listed supported electricity till 2009
Lithuania	Renewable electricity	Regulation: Procedures for promoting generation and purchasing of RES-E	Increase		Implement support mechanism for all biomass/biogas, wind and small hydro electricity. Support for green electricity will end in 2020. From 2021 will be introduced green certificate systems.
Lithuania	Renewable electricity	Regulation: Electricity market rules			Declarative support or all RES
Netherlands	Renewable electricity	Subsidieregeling Duurzame Energie (SDE), Variable Feed-in premium	increase		In this subsidy scheme, several categories of biomass to power are eligible for a feed-in premium, among which small-scal (<50 MWe) stand-alone power plants using woody biomass. The premium also depend on the price of fossil power: if ths goes up, the premium goes down, so that total income per kWh is constant
Netherlands	Renewable electricity	Regulation, Fixed Feed-in premium, Milieu-effecten elektriciteitsproductie (MEP)	increase		in this subsidy scheme, most coal-fed power plants have a subsidy arrangement for the co-firing of wood pellets. However, for this technology, these arrangements are valid for 4 years, implying that the subsidy will be abolished in 2009-2010. Negotiations on a new policy instrument for co-firing of biomass are ongoing.
Netherlands	Renewable electricity	Covenant, Coal Covenant	increase		Covenant in which the ministry and all power producers owning coal-fed power plants agreed on specific levels of biomass co-firing per power producer, provided

					the ministry would implement a sufficient support policy (in the MEP)
Poland	Renewable electricity	Law: Energy law – Regulation	increase		The Energy Law sets the main support mechanism for RES-E in the form of green certificates, for which the quantitative targets are set in the relevant ordinance. The ordinance sets also the rules for RES electricity production in co-firing process. The targets are set for each year till 2014, the target for 2010 and next years is 12,9% of electricity sold to final consumers, which corresponds to ca. 9,5% of national gross electricity consumption. The share of biomass coming from forestry and wood industry in big biomass fired installations (>10 MW) should decline and reach the value of about 0-10% in 2015.
Spain	Renewable electricity	Royal Decree: RD 661/2007	increase		Sets a methodology to update and systematize the legal and economic regime of the renewable electricity generation. Sets the feed-in tariffs for renewable electricity for 2008
Netherlands	Renewable electricity	Programme, Clean and Efficient	increase		This programme develops several policies and regulations necessary for the realisation of three ambitions for 2020 agreed upon in the most recent Coalition agreement: 20% renewables, 30% GHG emission reduction (compared to 1990) and a energy efficiency improvement of 2% per year
Sweden	Renewable electricity	Law: The Electricity Certificates Act 2003	increase		For each produced and measured 1 MWh of electricity from a renewable source or peat (CHP), an electricity certificate is allocated to the producer in question (*if its produced in a certified plant*). The consumers are then obligated to buy these certificates, generating an additional income to the producer. Electricity from the following sources are eligible to get an electricity certificate: Wind, solar, wave, geothermal power. Biofuels (*1. Trees, parts of trees, by-products from felling and other forestry related by-products. 2. Bark, return leaching solutions, slurry, liquid rosin, chip, splinter and other by-products from forestry processes. 3. Energy forest, energy crops, grain, olive seeds, nutshells, straw and reed. 4. Sorted wood waste. 5. Biogas formed when organic material such as manure, slurry from municipal and industrial treatment plants, domestic waste and waste from foodstuff production, restaurants, and commerce, is broken down by methane producing bacteria in an anoxic environment*), water power (*small scale that by the end of 2003 had an installed effect of max 1.5 MW, new facilities, resumed use of disused facilities, increased production capacity in existing facilities*) and peat in CHP plants.
Belgium	Renewable electricity	Decree: Flemish Decree on electricity	Increase		Sets the legislative framework for the Flemish green certificate system for renewable energy sources among which biomass resources and sets green electricity targets until 2020, the green electricity system is active since 2002. The producer of renewable electricity receives for the production of 1 MWh renewable electricity 1 certificate, this certificate can be sold to the energy suppliers who have the obligation of reaching a certain quota of renewable electricity out of there total amount of delivered electricity. If they do not reach their quota they are obliged to pay a penalty to the regulator for each missing certificate. The penalty is set on 125 €/MWh, the market price of a certificate at the moment is circa 110 €/MWh.

					The quota is increasing every year and have recently been set to 13% by 2020. To give the market players a minimum of financial security minimum levels of certificates are fixed. This means that if the prices of the certificates on the market drop, owners of installation can sell their certificates to the distribution companies who are obliged to buy them. For biomass energy this is 80 €/MWh until 2009 and from 2010 will be differentiated between dedicated biomass 90 €/MWh en co-combustion 60€/MWh en this guaranteed for a time span of 10 year. Important remark is that those certificates are only for installations under 70 kV grid because the regions are only responsible for this part of the grid.
Belgium	Renewable electricity	Decree: Walloon Decree on electricity	increase		The market value for a green certificate is above 90 €, during 2006 the average price was 91.58 euro. Compared to the physical electricity price of 30 €, this is a 300 % bonus for the clean producer. The Walloon certificate system is based upon avoided fossil CO2 emissions with respect to a reference being the combined cycle power plant firing natural gas with an efficiency of hE=55%. The regulatory body (Commission Wallonne pour l'Energie, CWaPE) has published a list of reference specific fossil CO2 emissions of the whole supply chain for all fossil fuels as well as the major biomass resources.
Austria	Renewable electricity	Law: Law for renewable energy	increase		main supporting measure is Feed-in Tariffs (FIT) for numerous RES electricity generation including biomass
Italy	Renewable electricity	Disposition for annual and multi-annual State budget (financial law 2008 art. 2 paragraphs from 134 to 176			
Italy	Renewable electricity	Ministerial Decree February 2007			
Germany	Renewable electricity	Act on granting priority to renewable energy sources (Renewable Energy Sources Act, EEG)			
Finland	Renewable electricity	Fiscal support for electricity produced from renewable energy sources	increase		The tax paid on electricity is refunded to the producer if the electricity has been produced with RES, the level of refund depends on the type of RES

ANNEX 2

country	sector	policy	Biomass use increase/ decrease	Biomass supply increase/decrease	comments
Poland	Pulp and paper	Strategy targets for the sector of pulp and paper industry until 2007	Increase		The Starategy focuses on the recycling chain of pulp and paper products and on increasing the competitiveness of polish products on the european market.
Poland	Pulp and paper	Law: Development strategy of paper industry in Poland till 2013	increase	Increase	This documment defines the development strategy of paper industry in Poland. Development in this sector depends mainly on the enonomy development and demand on paper poduct. The document brings up different aspects and topics within
Spain	Pulp and paper	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)	Increase		The objective is to reach the recoverying rate of 60% of paper and cardboard packaging wastes. In 2006, the recycling rate was 68.3% of total paper and cardboard consumption.
Sweden	Pulp and paper	Law: The Electricity Certificates Act	decrease	Increase	The same as for renewable electricity. This law affects the pulp and paper industry so that the amount of electricity produced from waste biomass from pulp and paper production is used in a higher degree for production of renewable electricity.
Sweden	Pulp and paper	Law: Producer Responsibility for Recycled Paper Ordinance 1994/Producer Responsibility for Recycled Packaging 1997	increase		Producers of e.g. paper and cartons packaging are responsible for the recycling of their products. The producers are responsible for constructing local recycling sites (in cooperation with concerned municipalities) where their products can be collected.
Germany	Pulp and paper	Act on granting priority to renewable energy sources and Act on the Promotion of Renewable Energies in the Heat Sector			
Belgium	Pulp and paper	Renewable energy and impact on the European paper industry			Indicates the coming lack of wood resources for the paper industry in combination with the use of wood for energy purposes. Indicates some actions to counter this problem.
Belgium	Pulp and paper	Bio-energy and the European Pulp and Paper Industry – An Impact Assessment MCKINSEY & COMPANY, INC. AND PÖYRY FOREST INDUSTRY CONSULTING FOR CEPI			Cobelpa (the paper industry sector) in Belgium has no specific strategic vision for Belgium. They do however refer to the McKinsey study to indicate that the sector will encounter problems due to a lack of resources which is enhanced by the use of biomass resources for energy production (study available at VITO)
Belgium	Pulp and paper	Wood resources availability and demands - implications of renewable energy policies - A first glance at 2005, 2010 and 2020 in European countries			Cobelpa (the paper industry sector) in Belgium has no specific strategic vision for Belgium. They do however refer to the UNECE study to indicate that the sector will encounter problems due to a lack of resources which is enhanced by the use of biomass resources for energy production. (Study available at VITO)
Finland	Particle Board and Furniture	Programme: National Forest Programme 2015	increase		Annual consumption of sawn wood at least 1.2 m3/inhabitant in 2015 (0.94 m3/inhabitant in 2006).
Finland	Particle Board and	Programme: Promotion Programme for Wood Construction	increase		The programme aims at increasing the use of wood as construction material.

Finland	Particle Board and Furniture	Programme: Programme for an industrial policy of wood products industry			Difficult to assess since the programme I aimed at increasing the value added from forestry and the exported amount not the production. The programme aims at increased value added in wood products industry, as well as increased export of wood products.
Poland	Particle Board and Furniture	Regional Strategies			Focus more on the managements issues not on the future sector's demand or supply
Poland	Particle Board and Furniture	Strategy: Timber industry strategy until 2006	increase		The strategy is no valid anymore but it is possible to assume that the sector industry will develop
Spain	Particle Board and Furniture	Law: Law 38/1999 of urban planning			Sets conditions for the new constructions that strongly affect the sector
Spain	Particle Board and Furniture	Royal Decree: RD 2004/2006 Technical building code			Announces rules on building quality and safety. Includes rules on energy efficiency.
Spain	Particle Board and Furniture	Strategy: Environmental strategy of the wood sector			Principles to improve the environmental quality of the sector, among them, energy recovery and waste management.
Spain	Particle Board and Furniture	Strategy: ROADMAP 2010 for the European woodworking industries(Aplicación en España)			Action Plan with 5 different activity areas. Deals with design, reliability, lifetime and sustainability aspects. In Spain, there have been developed 3 areas: building with wood, living with wood and transporting with wood.
Spain	Particle Board and Furniture	Plan: Spanish Renewable Energy Plan 2005-2010	decrease	increase	The objective of the Plan is to produce 12.1% of total energy consumption by renewable sources in 2010. In comparison with 2004 production levels, in 2010 the use of biomass for heat production should have increased its production in 582 Ths. Toe
Spain	Particle Board and Furniture	Royal Decree: RD 661/2007			Sets a methodology to update and systematize the legal and economic regime of the renewable electricity generation. Sets the feed-in tariffs for renewable electricity for 2008
Sweden	Particle Board and Furniture	Programme: National Wood Construction Strategy			The aim is to increase export, no data about the demand or supply given, The Swedish government has initialised a programme aimed at increasing the amount of buildings that are built with a wood core. The inititive was presented in the document "Mer trä i byggandet" (More wood in construction) in 2004. The document is the foundation for the "National Wood Construction Strategy" that is going to present its findings Dec 31 2008 on how to implement the strategy.
Germany	Particle Board and Furniture	Act on granting priority to renewable energy sources and Act on the Promotion of Renewable Energies in the Heat Sector			
Belgium	Particle Board and	White paper of the round table conference of the Flemish textile, wood and furniture industry			The white paper was a starting document of the wood- en furniture industry during a round table discussion with involvement of the Flemish Government concerning the sector. I assumes increasing competition for wood resources between the

	Furniture				wood-& furniture sector en the renewable energy sector. An amendment in the Flemish Decree on the promotion of green electricity from RES in April 2007 partially solved this problem. Electricity production installations licensed after June 2007 could only generate green certificates if they were using wood resources which did not qualify as an industrial wood resource. In other words; wood processing industry was given precedence regarding to wood resources. Only if wood resources were not usable in the wood processing industry they were eligible for green certificate electricity production. However green electricity installations granted a license before June 2007 are not subject to this amendment of Decree and are still in competition with the wood processing industry. The wood processing sector would also these earlier installations being subject to this amendment.
Belgium	Particle Board and Furniture	Synthesis note of the round table conference of the Flemish textile, wood and furniture industry			In this note an action plan for the wood processing industry is set up. Relevant actions are: 1)A work programme together with 'forestry' is suggested to improve monitoring of regional wood resources, sustainability management and economic management of forests. 2)Monitor the correct implementation of the amendment which gives priority of wood resources to the wood processing industry before going to electricity production.

ANNEX 3

country	sector	policy	Biomass use increase/ decrease	Biomass supply increase/decrease	comments
Finland	Agriculture	Law/Policy: CAP-based support for energy crops cultivation		Increase	CAP support for energy crops (reed canary grass) cultivation
Finland	Agriculture	Strategy: Development strategy for the Finnish countryside		Increase	Development of the production and use of wood energy and other renewable energies as a new sector in agriculture. Promotion of cultivation of energy crops on existing farmland. Increase of energy production from agricultural sources (excl. forestry) from 0 to 108 ktoe by 2013; cultivation area for energy crops from 9000 ha (2005) to ca. 200 000 ha by 2013, of this ca. 50 000 - 100 000 ha reed canary grass
Finland	Agriculture	Programme: Updated Action Plan for Renewable Energy		Increase	Target for agrobiomass 2.1 PJ by 2010 and 5 PJ by 2025
Poland	Agriculture	Strategy: Development Strategy for Rural Areas and Agriculture for years 2007-2013		Increase	Strategy takes into consideration the directions concerning the Development Strategy of Rural area Policy. This strategy place great emphasis on sustainable development of rural areas. Five of nine established Priorities within the frames of the Strategy concern rural areas
Poland	Agriculture	Policy: Energy Policy of Poland till 2025		Increase	Energy policy of Poland till 2025 is a document which includes the bunch of actions, that are aimed at providing energy safety, competitiveness of the economy, energy efficiency and environmental protections.
Poland	Agriculture	Announcement: Circumstantial conditions to obtain additional payments for permanent plantations in 2008		Increase	The objective of introducing this mechanism is to financially support the farmers who have invested in establishing the permanent plantation of energy crops. The amount of the help will be worked out on the base of costs of the establishing of 1 ha of the plantation of the energy plant.
Spain	Agriculture	Plan: Spanish Renewable Energy Plan 2005-2010		Increase	The objective of the Plan is to produce 12.1% of total energy consumption by renewable sources in 2010. In comparison with 2004 production levels, in 2010 the biomass from agriculture should have increased its production in: 1,908 Th Toe from agricultural crops; 670 Th Toe from agricultural woody wastes; 660 Th Toe from agricultural herbaceous wastes; 670 Th Toe from agricultural industry wastes.
Sweden	Agriculture	Programme: Agricultural Programme for Sweden 2007-2013		decrease	This programme is the national programme of an EU programme. There are goals set to increase the focus on sustainable development in the agricultural sector and funds allocated to increase the knowledge within the agricultural industry to learn about e.g. environmentally friendly agriculture. Funds also allocated to increasing the amount of plant residues left in the fields to increase natural fertilizing and reduce nitrogen leakage.
Sweden	Agriculture	Law: Directive for the EU support to farmers 2004		increase	This directive complements the EU directive 1782/2003 for support to the agricultural sector.
Lithuania	Agriculture	Sector Strategy: Development Strategy for Agriculture and rural areas			Strategy takes into consideration the directions concerning the Development

					development to agricultural education
Lithuania	Agriculture	Strategy: State long term development strategy			indicates main area of development of all major sectors in economy. Agriculture was part of competitive economy program.
Lithuania	Agriculture	Order: On direct payment for agricultural land, under crop and energy crops for year 2008		Increase	it declares the amount of support for different agricultural plants, including energy crops
Lithuania	Agriculture	Order: On support for biofuel production facilities development		Increase	Rules for gaining state support for development of biofuel production facilities
Lithuania	Agriculture	Programme: Lithuanian rural area expansion development 2007-2013		Increase	It declares just general support for RES
Lithuania	Agriculture	Strategy: National Strategy plan 2007-2013 for rural development		Increase	It declares just general support for RES
Belgium	Agriculture	Programme: Flemish Agricultural Investment Fund		Increase	Support for investments up to 30% made by farmers in technologies for renewable energy production (digestion, combustion,…). 30% of the biomass feedstock has to come from the own farm.
Belgium	Agriculture	Programme: Premium for energy crops		Increase	A support system for farmers of 45€/ha for the promotion of the production of energy crops
Austria	Agriculture	Law: Rural Development		increase	Allocated funds can be used for investment subsidies for energy from biomass
Denmark	Agriculture	Programme: Rural Development Programme 2007-2011			
Italy	Agriculture	Disposition for annual and multi-annual State budget (financial law 2008 art. 2 paragraphs from 134 to 176			
Germany	Agriculture	Act on granting priority to renewable energy sources and Act on the Promotion of Renewable Energies in the Heat Sector			
Germany	Agriculture	Biofuel Quota Act			Transport fuels must to a certain share contain biofuels. The act regulates these shares for both diesel fuel and gasoline
Finland	Forestry	Programme: National Forest Programme 2015		Increase	Energy use of forest chips increases to 8 - 12 million m3/a by 2015, production of wood pellets reaches 350 000 t/a, of which 20% is used in Finland.
Finland	Forestry	Law: Forest Act			Difficult to assess, Aims at promoting economically, ecologically and socially sustainable forest management.
Finland	Forestry	Regulation: Support for energy wood harvesting and chipping		Increase	Support for energy wood harvesting 7 €/m3 (min 20 m3), not for own use. Support for chipping energy wood from young forests 1.7 €/m3 (loose).
Poland	Forestry	Legal Act: General Forests Act		Increase	The act determines principle of preserving, protection and enlarging forest resources and the principle of the forest management in connection to different elements of the environment and concerning the national economy. Regulations of the act are being applied to forests, irrespective of the form of their property.
Poland	Forestry	Programme: National Program for increasing the forests areas		Increase	Afforestration, The program focuses on the possibilities of afforestrating mainly agricultural areas.

					The analysis of the program results for the previous year are shown as well as the model for future forests area. Hindering and promotion aspects, regional strategies and legal aspect are mentioned
Spain	Forestry	Law: Law 43/2003 of woodlands			Sets the regional governments competences, the central administration duties and the responsibility of the woodland owners
Spain	Forestry	Law: Regional forestry laws			Set the regional rules on forestry management
Spain	Forestry	Plan: Spanish forestry plan			Sets the national forestry policy, national objectives, national plans and national action programmes compatible with the regional planes.
Spain	Forestry	Plan: FLEGT Forest Law Enforcement, Governance and Trade			Establishment of a licensing scheme to ensure that only legal timber from producing countries ("Partner Countries") is allowed into the EU. Unlicensed consignments from Partner Countries would be denied access to the European market under the scheme.
Spain	Forestry	Plan: Regional forestry plannes			Set objectives and regional action plans
Belgium	Forestry	Forest inventory			The forest inventory is a set of statistical data (stock, growth, harvest) concerning the distribution and the status of Flemish forests. For all forests (public & private) each 5-10 years the inventory is updated based on spot-checks
Belgium	Forestry	Short rotation coppice on agricultural land			Due to a changing of the forestry decree, SRC was no longer seen as forestry but as an agricultural activity. This Made it possible for farmers to cultivate short rotation coppice on agricultural land, harvesting must be done at least each 8 years. As such SRC was removed from the forestry decree. The biomass flow will be: wood from SRC (willow or poplar harvested each 5-8 years). The changing of the decree made it possible for farmers to starting growing SRC on agricultural land. Before this would create the risk that the agricultural land would turn to forestry land when growing SRC on it. As a result, in the past, the success of SRC was low. The success of SRC in the Flemish region is still low, however the opportunity of growing SRC on agricultural land is now there.
Sweden	Forestry	Strategy: The Swedish Forest Industries Federation Climate Manifesto		Increase	There will be an increase in the sector's supply however it will be mainly used to increase the biofuel use The Swedish Forest Industries has stated five undertakings for reducing their impacts on the climate. 1. There should be a 20 % growth in the sector till 2020. 2. There will be an increase in the extraction of biofuel from the forest by 20 TWh annually. 3. Cease using fossil fuels in the manufacturing processes. 4. Reduce CO2 emissions from transport by 20 % by 2020. 5. Double resources for research by 2030.
Sweden	Forestry	Strategy: National Wood Construction Strategy		Increase	For the sector of building, The Swedish government has initialized a programme aimed at increasing the amount of buildings that are built with a wood core. The initiative was presented in the document "Mer trä i byggandet" (More wood in construction) in 2004. The document is the foundation for the "National Wood Construction Strategy" that is

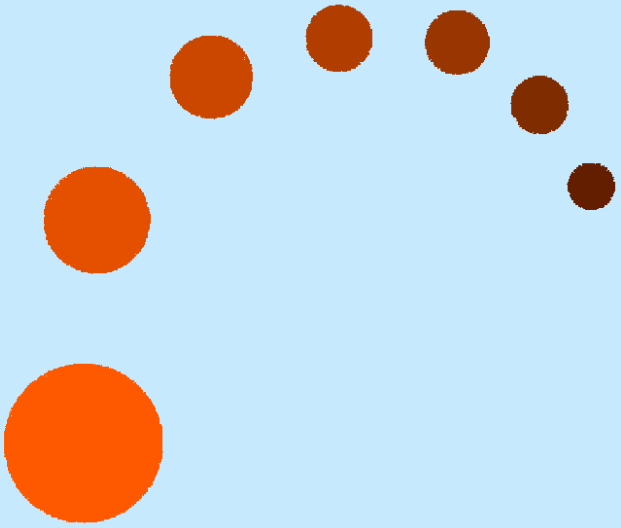
					going to present its findings Dec 31 2008 on how to implement the strategy.
Lithuania	Forestry	Law: LR forest Law			The act determines principle of preserving, protection and enlarging forest resources and the principle of the forest management in connection to different elements of the environment and concerning the national economy. Regulations of the act are being applied to forests, irrespective of the form of their property.
Lithuania	Forestry	Regulation: Forest cutting rules			Regulation on forest cutting rules.
Lithuania	Forestry	Strategy: Lithuanian forestry policy and strategy for it's implementation			Main priorities in development forest in Lithuania. Nothing directly related to biomass. Just mentioned goal to preserve and increase forests in Lithuania.
Belgium	Forestry	Decree: Short rotation coppice on agricultural land			Due to a changing of the forestry decree, SRC was no longer seen as forestry but as an agricultural activity. This Made it possible for farmers to cultivate short rotation coppice on agricultural land, harvesting must be done at least each 8 years. As such SRC was removed from the forestry decree. The biomass flow will be: wood from SRC (willow or poplar harvested each 5-8 years). The changing of the decree made it possible for farmers to starting growing SRC on agricultural land. Before this would create the risk that the agricultural land would turn to forestry land when growing SRC on it. As a result, in the past, the success of SRC was low. The success of SRC in the Flemish region is still low, however the opportunity of growing SRC on agricultural land is now there.
Austria	Forestry	Programme: The Austrian Forests Programme			Defines principles and goals for forest management - major stakeholder involvement
Italy	Forestry	Disposition for annual and multi-annual State budget (financial law 2008 art. 2 paragraphs from 134 to 176			
Italy	Forestry	Disposition for annual and multi-annual State budget (financial law 2009 art. 2 par.12			
Germany	Forestry	Act on granting priority to renewable energy sources and Act on the Promotion of Renewable Energies in the Heat Sector			

ANNEX 4

country	sector	policy	Biomass use increase/ decrease	Biomass supply increase/decrease	comments
Finland	Waste Management	Strategy: National Strategy of Biodegradable Waste		increase	Max 75% of biodegradable waste can be landfilled in 2006, max 50% in 2009 and max 35% in 2016. The aim is to reduce the amount of landfilled biodegradable waste to 190 kg per inhabitant (35% of total) in 2009 and to 130 kg (25%) in 2016.
Finland	Waste Management	Strategy: National Waste Plan		Increase	Target to recycle at least 50%, use as energy at least 30% and safely landfill at most 20% of MSW. Total amount of MSW should be freezed to the level of 2000 (2.3 - 2.5 Mt/a); required waste co-combustion and/or incineration capacity would be 700 000 - 750 000 t in 2016
Finland	Waste Management	Law: Waste Incineration Act 362/2003			Difficult to assess, Set requirements for waste combustion processes and emissions control
Finland	Waste Management	Government Decision on Construction Waste			Increase of use for energy purposes but decrease of the total amount of wastes , Target is to decrease the total amounts & to increase the recycling to 50% of construction waste (excl. soil and rocks) by 2000
Finland	Waste Management	Government Decision on Packaging Waste		increase	Sets targets for reuse rate (either as material or as energy) for different packaging materials and to decrease the total amount of packaging waste generated
Netherlands	Waste Management	Plan, National waste management plan		Increase	The national waste plan concerns all types of waste, and provides guidelines for prevention, recycling and processing of waste streams. Very influential in this context has been the 'ladder of Lansink' (named after a parliamentarian who proposed it), specifying priorities in the waste chain: prevention has highest priority, then comes recycling (preferably to the highest-value product), then comes incineration, and deposition is at the lowest end. The waste chain in the Netherlands is already quite efficient: more than 80% of waste is recycled, ca 12% is incinerated, and only 4% is deposited.
Netherlands	Waste Management	Law, Waste Tax Act			No data
Netherlands	Waste Management	Regulation, Regulation on management of paper and carton packaging			The regulation will not lead to any significant change in he available material, 75 weight % of all paper and carton packaging should be recycled; 25% of all wood packaging should be recycled
Poland	Waste Management	Law: Law concerning an obligation imposed on entrepreneurs in the field of waste management, product fee and deposit fee			Recycling duties, The Law focuses on the detailes concerning the obligatioons of entrepreneurs introducing packages and packages wastes on the market. It describes the recycling duties.
Poland	Waste Management	Law: Waste Law		Decrease	The act determines rules of conduct with waste in the way guaranteeing the protection of the people life, health and the environmental protection according to the sustainable development, particularly preventing forming of waste by principles or limiting the number of waste and of their negative influence on the environment, as well as recycling.

Poland	Waste Management	Plan: National Plan for Waste Management		Decrease	The plan includes the full scope of tasks necessary to provide the integrated waste economy in the country in the way providing environmental protection, taking into consideration present and future possibilities and economic conditions and the technological level of the existing infrastructure. The plan of the waste disposal includes waste produced in the country, particularly municipal waste, dangerous waste, the industrial waste and other kinds of waste. The plan is taking into consideration tendencies in the contemporary world economy, as well as domestic conditions of the economic development.
Spain	Waste Management	Law: Law 11/97 of containers (cans, bottles, …) and containers' residues.		Decrease	Sets the objectives and principles of performance of prevention, reutilization and recycling of containers and containers' residues.
Spain	Waste Management	Law: Law 10/98 of residues			Difficult to assess, Defines which residues are Municipal Wastes and regulates the competences on collection and processing
Spain	Waste Management	Plan: Wastes Integrated National Plan (PNIR)			Difficult to assess, To improve the waste management, to encourage the actors to reach ambitious ecological objectives and to support the achievement of all the legal regulations. It includes 13 specific wastes plans where specific measures and environmental objectives are set.
Spain	Waste Management	Royal Decree: RD 1481/2001			Difficult to assess, This RD regulates wastes' disposal in landfills
Spain	Waste Management	Strategy: Spanish strategy for the reduction of biodegradable wastes sent to landfill		Increase	The objective is to verify the fulfillment of the objectives set in the RD 1481/200. It concerns organic matter, paper/cardboard, wood and others (manure, wastes from agriculture, forestry and their related industries).
Sweden	Waste Management	Strategy: A Strategy for Sustainable Waste Management		Decrease	The Strategy for Sustainable Waste Management concern all kinds of waste. The strategy deals with and sets targets for different kinds of waste, i.e. how much material is allowed to be put into land fills and how much of a certain waste should be recycled. The types of biomass concerned in this policy are: household waste; food waste from households, restaurants, institutional catering and shops; food and similar waste from food manufacturing; sewage waste.
Sweden	Waste Management	Law: Waste Tax Act			No significant change since there are no changes for the biowaste, The Waste Tax Act imposes a tax on all waste that is deposited, except biomass waste used for e.g. composting or incineration. The waste tax act has shifted the Swedish waste management from depositing waste in land fills to increased use of incineration composting and anaerobic digestion of biological waste. As of now (Act 2005:962) the tax is 435 SEK per ton waste.
Lithuania	Waste Management	Plan: Lithuania National Energy strategy implementation plan for 2008-20018	Increase		Among other things it is planned to build 3 communal waste combustion CHP in biggest Lithuanian cities
Lithuania	Waste Management	Law: Waste management Law			The act determines rules of conduct with waste in the way guaranteeing the

					protection of the people life, health and the environmental protection according to the sustainable development, particularly preventing forming of waste by principles or limiting the number of waste and of their negative influence on the environment, as well as recycling.
Lithuania	Waste Management	Plan: National Plan for Waste Management		decrease	It is revision of national plan for waste management detailing actions for 2007-2013. Major shift in this plan is movement to waste composition prevention
Belgium	Waste Management	Plan: Strategic plan organic-biological waste		increase	Sets the framework for the management of organic-biologic waste from households and companies
Belgium		Biomass inventory			The biomass inventory is an action defined in the Action Plan Green Electricity of the Flemish government. De inventory indicates how much biomass is available in the Flemish Region and which biomass streams are eligible for energetic valorization. Not only waste streams are part of this inventory but also data from forestry and agriculture and import-export data.
Belgium		Strategic plan wood waste			Sets the framework concerning prevention, selective collection and useful applications of wood waste. The environmental friendly, the renewable en the CO2-neutral character of wood is a key topic within this framework. planning intakes preventie, selectieve inzamelling en nuttige toepassing van houtafval. The framework was prepared in close contact with relevant stakeholders, sectors, authorities & advice committees.
Belgium		Strategic plan high calorific waste			Sets the framework for high calorific waste (HCW) streams (minimal calorific value of 13 MJ/kg) and aims at a processing of these streams with the best available technique which means the highest energy valorisation with minimal costs and environmental impact. Wood is one of the most important HCW streams (next to animal, synthetic, carpet, paper, rubber,... waste streams). This is also way a specific framework has been made for HCW wood streams (see: Strategic plan wood streams).
Austria	Waste Management	Law: Waste angement Law			includes no requirements for biomass or energy use
Denmark	Waste Management	Agreement: RES-E			
Denmark	Waste Management	Order: RES-E			
Denmark	Waste Management	Order: RES-E			
Italy	Waste Management	Disposition for annual and multi-annual State budget (financial law 2008 art. 2 paragraphs from 134 to 176			
Germany	Waste Management	Act on granting priority to renewable energy sources and Act on the Promotion of Renewable Energies in the Heat Sector			



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Biofuel policies for dynamic markets