elobio

Biofuel policies for dynamic markets

Effective and low-disturbing biofuel policies

Estimated demand and supply for different kinds of biomass

Intelligent Energy Europe

Effective and low-disturbing biofuel policies

Demand and supply "translation" tables

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Translation Tables

Executive Summary

The aim of this report is to provide the translation tables with the amounts concerning the demand and supply of different kinds of biomass in 12 analyzed countries. The last report within work package WP3 is a result of the policy analysis done in the previous documents. The data for the tables, concerning the demand and supply, are provided by several Europe-wide reports estimating the biomass potential and the future development of energy sector. The studies used as a basic source are the European-wide studies, taking into consideration many political, social and environmental factors. As the information provided in the translation tables (Chapter 4) cover different types of material and is based on different assumptions the double counting had to be avoided. Therefore the values in the translation tables are to be treated separately with the consideration to various data sources and not summed together.

A probable wood shortage will create an explosive situation. Considering the policy pressure set by the European authorities and translated by the Member States in a range of incentive mechanisms, taking into account the technical potential of European forests and the estimated biomass needs to fulfill the targets, it seems that the situation on the raw material markets is very tight [8]. When looking for biomass sources, the energy business is procuring from easily accessible sources of feedstock, hence directly competing with the wood-based industries. Moreover, thanks to the various support mechanisms for renewable energy, the biomass-based power plants can afford to pay higher prices for the fuel they need.

In many parts of the world, significant expansion of plantations for bioenergy may be hampered by impediments to investment such as conflicting land claims, insecure land tenure, risk of expropriation and ineffective governance. Social issues that commonly occur when natural vegetation is replaced with commercially managed crops may also arise as a result of changes in property and land-use rights. Where agricultural crops are favoured over trees, the contribution of forestry may be confined to efficiency gains in current uses and increasing the use of wood residues from existing forestry operations. Under these circumstances, the availability of wood for bioenergy production is likely to be less controlled by energy markets than by trends in roundwood production, extent of forest resources and demands that compete for wood residues. Factors associated with climate change, energy efficiency and supply location will play a central role in wood energy production. In addition, an array of ecological, economic and social issues will come into play. In some areas and on some land types, trees may be more productive than agricultural crops and may not have as many negative environmental effects.

The part of the data referring to agricultural production is based on the predictions concerning the release of land which will be available for non-food agricultural crops [16]. The estimations take into consideration the sustainable model of agricultural management, environmental factors and the yields of the crops as well as the system of production.

Projections of the amount of biowaste depend of the development of the economy and society. In analysed source reports it was assumed that Europe will develop in a more sustainable way [2,4]. As well as a desire to promote biomass and other renewable energy sources, future scenarios assumed that society responds strongly to other environmental concerns, e.g. waste minimisation. Different models and assumptions were used to project the amounts of wastes available for the energy production in the future. Among them FAO

predictions and the European Topic Centre on Resource and Wastes management vision should be listed [2].

The forestry data were calculated by applying national and international targets concerning the forestry production and bioenergy production and consumption [5]. It is important to emphasize that the prices of the raw material and various costs connected with the production have not been included in the estimations. The changing prices of the traditional energy sources, which have a strong influence on the bioenergy production, have not been taken into consideration. Nor have the corresponding factors e.g. economic changes (global financial crisis observed in last years) and the food prices.

Statistics of RES consumption and production [6,7] indicates that the European targets for 2010 will not be met and only few countries will reach (in some cases even overcome) their national targets. Actions need to be taken at policy level. And to start with, there is an urgent need to bring coherence into policy, both at European and at national level [8]. Forest sinks-enhancing policies, as well as nature conservation policies are promoting reduced management and mobilization, when the climate change and the security of supply policies require more production and mobilization. The targets for the renewable energy share in Europe and the EU Member States (MS) are defined by Directive 2009/28/EC and National Renewable Energy Action Plans are under development within MS. They will set the scene for investors, industry and communities and will define the pathway towards national binding targets together with specific policy measures.

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 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 and co-products management.

The aim of this report is to provide the translation tables with the amounts concerning the demand and supply of different kinds of biomass in each partnering country. The last report within WP3 is a result of the policy analysis done in the previous documents. However, the numbers in translation tables are not directly the result of the qualitative analysis of international and national policies. The data for the tables, concerning the demand and supply, are provided by several Europe-wide reports estimating the biomass potential and the future development of energy sector. As there are many studies predicting the future productivity of

ligno-cellulose material, the data sources for this report were chosen carefully to fulfil the assumptions of the report. The studies used as a basic source are the European-wide studies, taking into consideration many political, social and environmental factors [3,4,5,15,16]. As the information provided in the translation tables at the end of this report cover different types of material and is based on different assumptions the double counting had to be avoided. Some of the analyzed materials are calculated separately in one of the used source-reports and included in the overall calculation in the other. Therefore the values in the translation tables are to be treated separately with the consideration to various data sources and not summed together.

The data provided in the translation tables were chosen as the most appropriate to be presented mainly due to the complexity of analysis and description of models used in source reports. Moreover these documents [EEA reports and RENEW reports] are used as a reference in several Commission working papers. On the other hand the assessment of the demand for lignocellulosic material in 2010 and 2020 in each partner country on the basis of policies/strategies and legal acts was not possible due to the fact the targets and strategies presented in the documents included a variety of factors impossible to be unified.

As the aim of this report was to provide the demand for different kind of wood and wastes products, the deep analysis and source searching was performed. In the majority of available studies the supply side rather is presented and calculated than the demand for different types of ligno-cellulose material. The demand values are presented only for the forestry products and with a respect to different industry branches, not the kind/size of the material. These changes in the data layout are mainly caused by the lack of data availability and the necessity of the use of European estimations not the national policy assessment model, which was explained above.

The output of this work package is aimed at providing the necessary data and background essential information for the further analysis of low-disturbing policies in WP 4 as well as providing part of the input data for the WP 5 which is working on interactions between biofuel policies and lignocelluloses markets with other markets using biomass material.

In this Deliverable the amounts of available land for energy crops, the demand for forestry products and the forestry products use, agricultural products and wastes available for energy production and wastes available for energy production are presented for each of the 12 analyzed countries in form of “translation” table and graphs presenting rough estimation of bioenergy demand and supply.

2. Products availability present vs. future

To begin with it is important to underline that there are many existing scenarios concerning the wood production and use for energy purposes. Table 1 presents the reported availability of biomass resources in 20 EU-countries. In the case of UK and Italy, data on forest residues and domestic firewood is derived from Finnish Forest Research Institute, whilst the data on industrial wood residues and by-products and wood wastes dates back to EC project called AFB-net V with focus on import and export possibilities and fuel of biomass in 20 European countries finalized in 2001. The total annual figure for reported biomass resources in 20 EU countries is around 5 974 PJ (143 Mtoe). Germany (1 300 PJ), France (1 200 PJ), Spain (793 PJ), Sweden (648 PJ) and Finland (426 PJ) are the richest EU countries in biomass resources.

Sweden, Finland, Germany and France have largest volumes of forest residues (excluding stump wood) [Table 1].

Resource type	EU-20 [i]	Biomass Action Plan EU-25 in 2010 (2020 in brackets)	EU-28[ii]
Forest residues	33.1	43 (39-45) Wood direct from forest (increment and harvest residues)	61
Domestic firewood (residential)	21.1		
Refined wood fuels	1.6	100 (100) organic waste, wood industry residues, agricultural and wood processing residues, manure	
Industrial by-products (solid)	19.1		
Industrial Waste Liquors	10.7		
Wood residues	8.2		
Other biomass resources (agro biomass, fruit biomass)	48.9	43-96 (76-94) Energy crops from agriculture	62-186
TOTAL	142.7	186-189 (215-238)	201-352

Table 1. Biomass resources in Europe, [Mtoe] [8]

1.1. Wood-based products

According to the Global Demand for Wood Products report projections suggest that the distribution of production and consumption of wood products among different regions will not change significantly before 2030, but that growth will increase at the global level. Production growth is expected to be highest in the Russian Federation, Eastern Europe and South America. High growth in consumption is expected in Africa and in Asia and in the Pacific region. These regions, together with Western and Central Asia, will remain dependent on imports to meet their demand. Consumption growth in developed countries is expected to be more moderate because of replacement by engineered (composite) wood products. The consumption predictions for Europe for years 2020 ad 2030 are presented in Table 2 [11]. Although production and consumption of wood-based panels – including plywood, veneer sheets, particleboard and fibreboard – are currently only half those of sawnwood, their higher growth rates will bring them almost to the levels of sawnwood by 2030 (see Table 2). Future growth in production and consumption will be slightly slower than in the past in most regions, which suggests that the substitution of wood-based panels for sawnwood may slower [11]. Similar to panel products, global production of paper and paperboard is also expanding rapidly, with an annual growth rate of 3.7 percent between 1965 and 1990 and 2.8 percent between 1990 and 2005.

Industrial roundwood demand is derived from growth in demand for end products – sawnwood, wood-based panels and paper and paperboard. Wood requirements for these products vary depending on the technology employed and the potential to use wood and fibre

[i] EU-20: Austria, Belgium, Czech Rep., Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Poland, Portugal, Slovak Rep., Spain, Sweden, UK

[ii] EU-28: EU+25 plus Romania, Bulgaria and Turkey

waste. Growth in sawnwood production requires more industrial roundwood, whereas a shift to reconstituted panel production (particleboard and fibreboard) increases the potential to use wood residues and fibre waste, reducing industrial roundwood requirements. Recycling policies have led to increased use of recovered paper and reduced pulpwood demand. Increased use of wood residues and recycled materials will reduce the share of industrial roundwood in total wood and fibre use from almost 70 % in 2005 to about 50% in 2030 [11]. Wood products demand, both actual and predicted are presented in Table 2.

	Actual			Projected	
	1965	1990	2005	2020	2030
Sawnwood	191	199	121	151	171
Wood based panels	16	53	70	99	122
Paper&paperboard	32	73	101	147	180
Industrial roundwood	519	650	494	647	749

Table 2. Wood products demand Europe, actual and projected, [mln m3], [11]

1.2. Woodfuel

Wood energy produced with efficient technology is already competitive with fossil energy in many countries and can offer some of the highest levels of energy and carbon efficiency among bioenergy feedstock, in particular when used for heat and power generation. Besides being economically attractive, wood energy is a strategic option for increased energy security, particularly in countries that have large forest areas and that depend on energy imports. Sources of wood for energy production may be derived from a range of existing production systems. Wood residues provide the greatest immediate opportunity for energy generation given their availability, relatively low-value and the proximity of production to existing forestry operations. Plantations established solely for the purpose of energy production are becoming more common in some countries and it is likely that plantations with multiple end uses will contribute energy logs as well as logs for other purposes as markets demand. Logged over forest areas and species not currently favoured by markets are additional potential sources of wood for energy.

According to estimations made on basis of 2007 wood products flow the sources of woody biomass for energy presents as shown in the Figure 1 [10]. The categories of wood supply are explained below the picture.

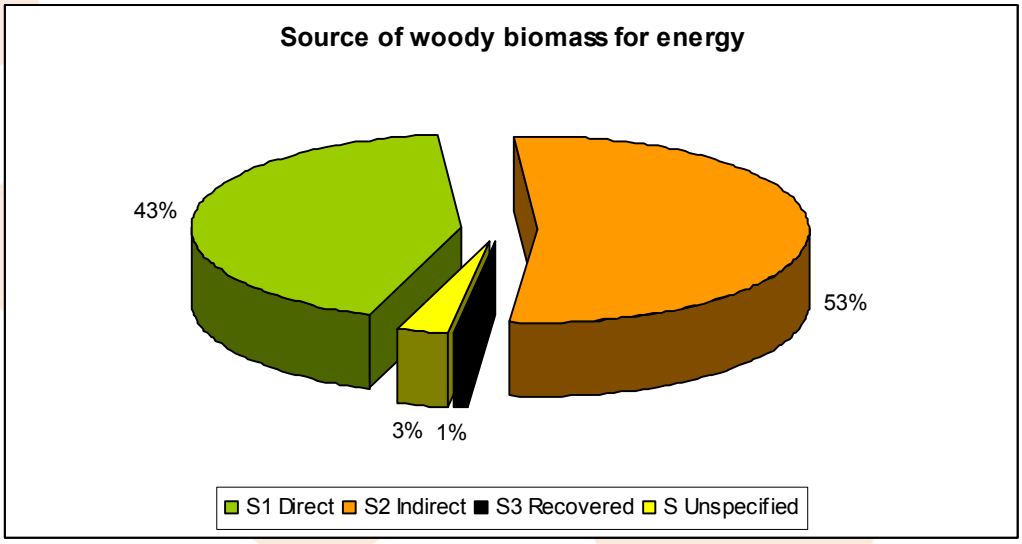


Figure 1. Sources of woody biomass for energy 2007 [10]

Where S1- Direct supply. The definition of this source comprises any wood fibre that enters the energy production without any further treatment or conversion. It comprises removals from forests and outside. This comprises also any wood defined by the FAO as coming from "Other Wooded Land" (OWL) and "Trees Outside Forests", but is wider than these two definitions. It comprises any woody biomass from any land use and covers amongst others infrastructure maintenance (roads, railway, power transmission lines, pipelines, etc.), hedgerows, agricultural residues from fruit tree orchards, wood from gardens and parks, etc. It comprises any form of woody biomass, such as green chips, roundwood or split, stacked or loose from any part of the trees such as roots, stemwood and branches, fruits and shells.
S2- Indirect supply. Processed and unprocessed co-products (residues) from the wood processing industries are considered as indirect supply. These co-products can be solid (sawdust, chips, slabs, etc.) or liquid from the pulp industry (black liquor or tall oil). Processed wood fuels with improved energy content per bulk volume (compressed), such as wood pellets, briquettes but also wood charcoal is also included under indirect supply.
S3- Recovered wood supply. The so-called post consumer recovered wood comprises any waste wood fibre after at least one life cycle. It comprises wood from construction, renovation and demolition, but also packaging as well as old furniture. Countries often apply different classifications to distinguish between different wood waste categories (contaminated with colours, glue, etc.).
S- Unspecified. A fourth introduced category in order to reflect the fact that many countries know something about the amount of wood used but not its source. These households' surveys are often conducted by the energy statistics and are hence not interested in detecting the different sources and origin of the wood fibres.

1.3. Future estimations

A probable wood shortage will create an explosive situation. Considering the policy pressure set by the European authorities and translated by the Member States in a range of incentive mechanisms, taking into account the technical potential of European forests and the estimated biomass needs to fulfill the targets, it seems that the situation on the raw material markets is very tight [8]. When looking for biomass sources, the energy business is procuring from easily accessible sources of feedstock, hence directly competing with the wood-based industries. Moreover, thanks to the various support mechanisms for renewable energy, the biomass-based power plants can afford to pay higher prices for the fuel they need. Looking at the current harvesting level in Europe's forests, adding what could additionally be mobilized, the McKinsey- Pöyry (See Figure 2) study calculated that the total wood supply by 2020 would be around 515 to 540 million cubic meters. This supply doesn't match the demand of some 720 to 800 million cubic meters in 2020 and might already be problematic in a couple of years [8].

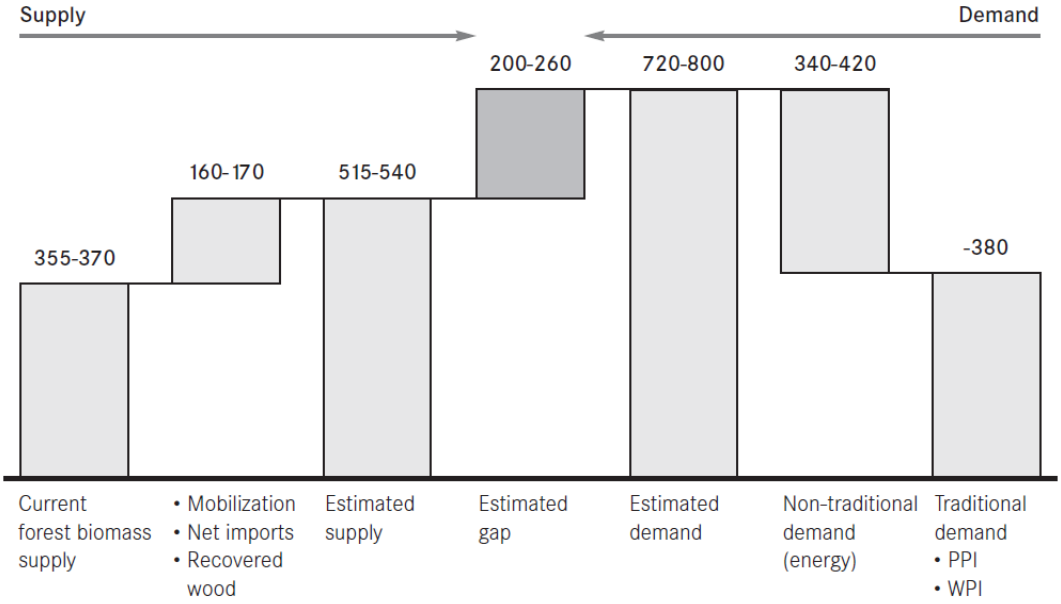


Figure 2. Supply to Demand comparison of wood products after McKinsey- Pöyry 'Bio-energy and the European pulp and paper study and impact assessment.'[8]

In many parts of the world, significant expansion of plantations for bioenergy may be hampered by impediments to investment such as conflicting land claims, insecure land tenure, risk of expropriation and ineffective governance. Social issues that commonly occur when natural vegetation is replaced with commercially managed crops may also arise as a result of changes in property and land-use rights. Where agricultural crops are favoured over trees, the contribution of forestry may be confined to efficiency gains in current uses and increasing the use of wood residues from existing forestry operations. Under these circumstances, the availability of wood for bioenergy production is likely to be less controlled by energy markets than by trends in roundwood production, extent of forest resources and demands that compete for wood residues. Factors associated with climate change, energy efficiency and supply location will play a central role in wood energy production. In addition, an array of ecological, economic and social issues will come into play. In some areas and on some land types, trees may be more productive than agricultural crops and may not have as many negative environmental effects. Low labour availability could also favour forest over agricultural crops. Other factors may reduce demand on forests for energy production, for example, technological problems with liquid cellulosic biofuel production and transportation-related constraints.
In general, the contribution of forestry to future energy production will be influenced by [9]:
• The competitiveness of wood-based energy in achieving the objectives of recent energy related policies;
• The costs and benefits of wood-energy-related systems in social, economic and environmental terms;
• Policies and institutions that provide the framework within which forestry acts.
The development of economically competitive technology for the production of liquid cellulosic biofuels will cause a major shift in the importance of wood energy. At that point, forest products will compete directly with agriculture for a share in the biofuels market. Forest products will also become a source for transport fuel, and where energy consumption is significantly affected by policy measures (e.g. EU, United States); large markets will open up to forest-derived energy from developing countries around the world.

Given that the value of wood for fuel has been low in comparison with other end uses, the future supply of wood for bioenergy production is likely to come from existing forestry operations. This may change if technology becomes available for the economically competitive production of energy from cellulosic materials [9]. Mabee and Saddler (2007) reviewed a number of regional and global outlook studies on forest fibre availability to determine the renewable global supply of forest biomass for wood energy production. They concluded that increased demand for wood energy in industrialized countries will have a significant impact on the amount of available excess forest biomass, taking between 10 and 25 % of the estimated global surplus. The global availability of fibre may not, however, cover demand in some regions and increased demand from wood processing industries may also compete for supply.

The technologies and systems used for creating wood energy are of great importance in analyzing the future availability of forest biomass for bioenergy purposes. Improvements in the efficiency of utilizing woodfuel could provide significant amounts of wood energy worldwide. By instituting a best practices approach to energy recovery (i.e. using CHP with flue gas recovery, or high efficiency wood pellet stoves), the amount of energy available through woodfuel increases dramatically and the resource may be extended significantly [9]. Increases in forest-based bioenergy use may have an impact on traditional processing industries. In some industrialized countries, removals of wood from the forest for bioenergy applications already account for at least half of industrial roundwood production [12, 13]. In

others, the amount of wood used for bioenergy purposes is still small compared with industrial roundwood harvest. When residue recovery and postconsumer waste are factored in, however, wood use for energy exceeds industrial roundwood production in several industrialized countries.

3. Scenarios assumptions

For the needs of this report three main data reports were used to present the future demand and supply of forestry, agricultural and wastes products. Estimations given in the translation tables are linked to the following data sources:

1. 'How much bioenergy can Europe produce without harming the environment?' [3], 'Estimating the environmentally compatible bioenergy potential from agriculture' [4]
2. 'Residue Biomass Potential Inventory Results' [15], 'Energy Crops Potential Inventory Results' [16]
3. 'Wood Resources availability and demands – implications of renewable energy policies, A first glance at 2005, 2010 and 2020 in European countries' [5]

Arguments to choose EEA study:

- The study is comprehensive, it covers different biomass in a consistent manner
- There is available methodological document
- The results are widely used in EU documents and the study is often cited

Summing up the results of estimates of potential biomass undoubtedly vary considerably, and the main criterion for selection this EEA study was its transparency and complexity.

Due to the fact that the data were presented in the translation tables on the basis of different reports, some of the materials are 'double counted'. For example the straw potential is presented separately on the basis of the the RENEW report and included in the biowaste supply potential estimation from the EEA Reports. Therefore, the translations tables include the separate estimations based on different sources but not the sum estimations concerning the demand and supply of various biomass products.
Within these reports for each of the sectors specific assumptions were formulated in order to estimate the potential in 2010 and 2020. They are presented in below sections.

Available land for energy crops cultivation

The available land for energy crops cultivation, agricultural biomass amount available for energy production and wastes available for energy production were based on calculation presented in two EEA reports: "How much bioenergy can Europe produce without harming the environment"[3] and "Estimating the environmentally compatible bioenergy potential from agriculture" [4].

Within the analysis of agricultural potential the competition between bioenergy needs and food production requirements was skipped. The available land for energy crops cultivation was calculated including set-aside land and land released from food production cultivation due to the technology and yields development. However, the competition between potential land for energy crops and land dedicated to agricultural production for export was included in the estimations. The land available for growing bioenergy crops will be largely determined by the utilized agricultural area, including set-aside, which can be released from food and fodder

production. The released and set-aside areas were modelled under the assumption of the further reform of the common agricultural policy CAP with total liberalization of the animal products market by 2025, following the trend of past CAP reforms and international trade negotiations. The liberalisation will lead to a decrease in production and thus a release of land, which could be used for dedicated bioenergy production.

As mentioned before the approach disregards competition between production of bioenergy and food for domestic use. However, competition was assumed on agricultural land that is used for export productions it is likely that increasing fossil fuel and carbon permit prices will stimulate bioenergy further at the expense of food and feed production.

Energy crops production potential

The data presented in this category are based on the RENEW report [16]. Within RENEW project both the energy crops potential and the potential of other residues (including straw) were calculated. A resource focusing approach has been applied, what resulted in the technical available potential of biomass after supplying food and fibre related needs. Pan-European databases were used as reliable and consistent data sources for the calculations, such as databases of EUROSTAT, FAO, FADN, TBFRA as well as spatial data of ESDB, Corine LC and TERRASTAT.
The model used for calculation in the RENEW project presents the potential assessment for the year 2020 for two different scenarios:

S1: represents intensive biomass production based on high level of inputs (maximal yield from land unit)
S2: represents a biomass production with minimal negative impact for the environment.

The energy species considered in the report were: willow, poplar, miscanthus, switch grass, reed canary grass and eucalypthus. The energy crop production potential is based on land allocation model and agro-climate suitability analysis. The potential was calculated by predicting and estimating the most suitable woody energy species and non-woody energy species field in each region. The model includes several assumptions and simplifications which can be found in details, in the report on the project website.

Straw

The straw potential assessment was taken from RENEW report [15]. The methodology was focused on assessing the surplus straw from cereal, oilseed and maize crops which can be used for other then agricultural uses. The available straw amounts were based on the total cereal production and the grain/straw mass ratio and the use of straw for animal production, for soil and for other agricultural purposes was taken into consideration to estimate the total amount of surplus straw. The timeframe and scenarios were similar as for energy crops potential assessment.

Basic assumptions for scenarios for year 2020:
S1: Higher rate of crop residue removal from the field. Less straw needed for animals rising.
S2: Lower rate of residues removal from the field. More straw is used for animal rising (less intensive animal production system).

Straw/grain weight ratio and the rate of straw left in the field have the strongest effect on the available straw potential. Other important factors are the future population and food consumption changes affecting cereal production.

Agriculture

The agricultural production which is and will be available for energy purposes named agricultural biomass consists of: conventional energy crops such as starch crops (e.g. cereals, sugar beets) or oil crops (e.g. rapeseed, sunflower) as well as perennial grasses or short rotation forests on agricultural land.
The environmentally- compatible bioenergy potential from agriculture was calculated for each Member State in EEA report "How much bioenergy an Europe produce without harming the environment?"[3] on the base of developing and applying a number of environmental criteria to minimise environmental pressures of bioenergy crop production while exploiting synergies between bioenergy and nature conservation. The amount of agricultural biomass that can be used to produce energy is primarily determined by the land area available, and by the yield of bioenergy crops cultivated on this land. The potential calculated in this report has been assessed using a four-step approach:

1. Formulate a number of environmental criteria.
2. Model based estimation of the future land availability for bioenergy production in each Member State, taking into account environmental criteria.
3. Determine an environmentally- compatible bioenergy crop mix in each environmental zone.
4. Calculate the bioenergy potential in each Member State based on the future land availability, the environmentally- compatible crop mix, crop yields and the net energy content of different crops.

Among the environmental criteria various factors were taken into consideration: soil erosion, soil compaction, leaching of nutrients, water use, crop diversity and farmland biodiversity.
It is important to mention that the study disregards the effect of competition between bioenergy and food production for domestic food supply. Crop mix which was used in calculations includes: rape seeds, sunflower seeds, sugar beets, maize corn, wheat corn, barley/triticale corn, maize whole plant, triticale whole plant wheat whole plant, sweet sorghum, SRC poplar, SRC willow, miscanthus, reed canary grass, and giant reed switchgrass.

Biowastes

Over 1.8 billion tonnes of waste are generated each year in Europe [3]. With generation of such vast quantities of waste, it is vitally important that waste is managed in ways that minimise harm to the environment and human health. A significant proportion of the waste generated is biowaste so the waste of biological origin. This can be used to generate energy thus helping to reduce climate change. Biowaste includes various by- products and wastes. For the need of the report the wastes potential estimations were derived from a report "How much bioenergy can Europe produce without harming the Environment"[3]. Since the results within the report were provided in a condensed form, the presentation of ligno-cellulosic wastes separately was not possible. In the EEA report the biowaste was specified as:

- Solid agricultural residues (straw, stalks, prunings)
- Other agricultural residues (greentops from different species)

- Wet and dry manure
- Municipal solid waste
- Black liquor
- Wood-processing waste wood
- Construction/demolition wood
- Packaging waste wood
- Household waste wood
- Sewage sludge
- Food processing wastes

It is important to mention that concerning the wood wastes and by-products within this study there exists kind of 'double counting'. According to the data from the reports used to perform the supply and demand for different biomass products wood wastes have already been calculated in the forestry products, residues and wood processing wastes. Some of the materials (e.g. black liquor, recovered wood from material and energy use, processed wood fuel) are therefore included both in the forestry product group of materials and the group of wastes. Since the data concerning wastes is assessed as reliable and presented in the way which is suitable for his report, the double counting of some materials will not be avoided but must be noted when processing the results. Even though different kinds of wastes are under different assumptions it is not possible to extract them from overall calculations concerning the potential of this material.

In the study 3 different approaches were used to estimate future biowaste potential:

1. For municipal solid waste and construction and demolition waste, forecast of waste generation were available by assuming the 25% waste reduction compared to a baseline.
2. For agriculture and food wastes the special scenario has been developed. The scenario included various information e.g. about the amount of biowaste generated per tonne of product and per animal, and the availability of this waste after other uses.
3. For other biowaste streams, estimates of current quantities were obtained and then projections of the main socio-economic driver for that waste production were used to generate forecasts of waste quantities.

The amounts of waste generated in each country are re-calculated from Mtoe to PJ on the base of conversion unit 41,868. All data necessary to provide information concerning the total amount of wastes generated in each country was taken from the EEA report: 'How much bioenergy can Europe produce without harming the Environment'[3].

Forestry

The **supply and the demand** for forestry products were based on the report 'Wood resources availability and demands- implications of renewable energy policies" [5].

The first part of the study assesses current wood supply and consumption in 2005 in 29 EU/ EFTA countries, using the "wood resource balance" developed by Mantau (2005). This methodology calculates independently the wood supply on the one hand (directly from the forest as well as indirect sources: wood residues, recovered wood, etc) and wood consumption on the other (by the wood-processing industries and energy generation). Multiple uses of wood (e.g. the use of wood residues, chips and particles etc) are accounted on both sides of the balance, thus it does not only consider the wood supply (and use) directly from the forest.

The second part collected and assessed national and EU policy targets for renewable energy, bioenergy and wood energy (if available) and translated them into wood volumes by applying a number of straightforward, transparent assumptions. Furthermore, the study calculated wood consumption from the wood-based industries2 for 2010 and 2020, based on the European Forest Sector Outlook Study (UNECE 2005).

This report was used as a basic for bioenergy demand –supply translation tables and graphs presented in next chapter for 12 analyzed countries. The report is not 'ideal' – situation within RES policy has changed within last years, there are already set national targets for RES for 2020, under elaboration are National Actions Plans defining pathways to reach these targets and showing also targets for bioenergy in different sectors. In the study, no econometric models were used to forecast the demand for wood energy, since EFSOS so far does not model the consumption of wood for energy generation, but it was assumed that the demand would be driven by policies. Prices are not included in the study, in order to keep the analysis simple and comprehensible. However, this implies certain assumptions and restrictions when looking at the results. Thus, no conclusions are made on the price of reaching the policy targets, but rather on the amounts of wood needed (also in comparison with other wood consumers), and this is leading to the question of possible impacts of the policies. The same methodology was used for both the scenario for 2010 and the scenario for 2020. For the year 2020 there was much less available data, missing national data have not been extrapolated from average data in other countries. Filling these gaps requires empirical research in the Member States. Moreover authors clearly stated that numbers in the report are not meant to be realistic forecasts of future wood demand for energy, but a picture of the consequences for wood demand of current energy policies and what this may imply for the forest sector. The numbers can and should be revised according to realistic national energy targets, taking the potential wood supply into account - inside and outside the forest, domestic and imports, and being aware of economic, environmental and social implications of these decisions.

But on the other hand a simple and transparent algorithm for translation of national and EU targets for renewable energy, bioenergy and wood energy into wood volumes is given:

1. Obtain credible official scenario for total primary energy supply (taking into account the forestry efficiency savings) if available. Otherwise assume the same energy supply as in 2005.
2. Apply official policy target for energy production from renewable sources to total energy supply. If no targets were found the overall EU targets were assumed (2010:12% and 2020:20%).
3. Apply national target for bioenergy if avaialable. Otherwise, estimate the share of energy production from biomass as percentage of energy production from biomass sources (e.g. by assuming the same share as in 2005).
4. Apply target for wood energy if available. Otherwise, estimate the share of energy production from wood as percentage of energy production from biomass sources (e.g. by assuming the same share as in 2005).

4. Translation tables

Translation tables are presenting the amounts concerning the demand and supply of different kinds of biomass in 12 analyzed countries. Estimations given in the translation tables are linked to the following data sources:

4. 'How much bioenergy can Europe produce without harming the environment?' [3], 'Estimating the environmentally compatible bioenergy potential from agriculture' [4]
5. 'Residue Biomass Potential Inventory Results' [15], 'Energy Crops Potential Inventory Results' [16]
6. 'Wood Resources availability and demands – implications of renewable energy policies, A first glance at 2005, 2010 and 2020 in European countries' [5]

The **supply and the demand** for forestry products were based on the report 'Wood resources availability and demands- implications of renewable energy policies" [5].

Potential from agriculture was taken for each Member State from EEA report "How much bioenergy an Europe produce without harming the environment?"[3]

The wastes potential estimations were derived from a report "How much bioenergy can Europe produce without harming the Environment"[3].

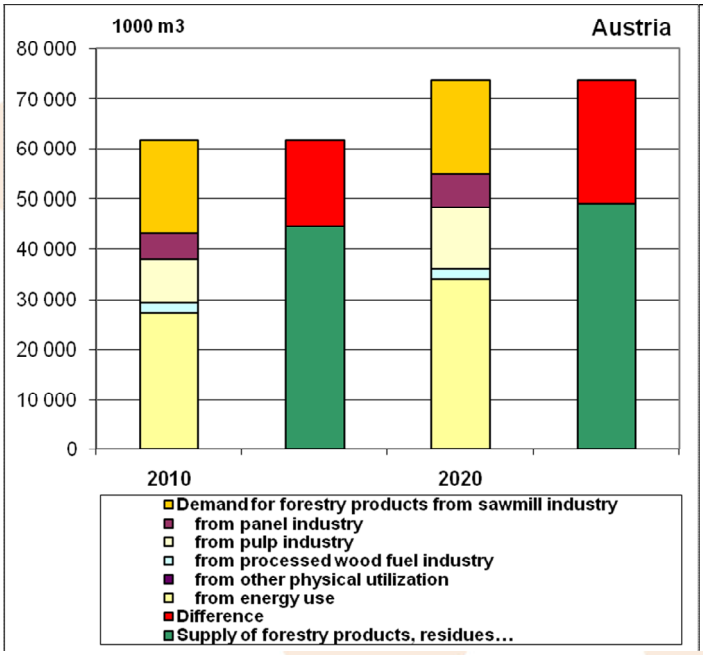
The straw potential assessment was taken from RENEW report [15].

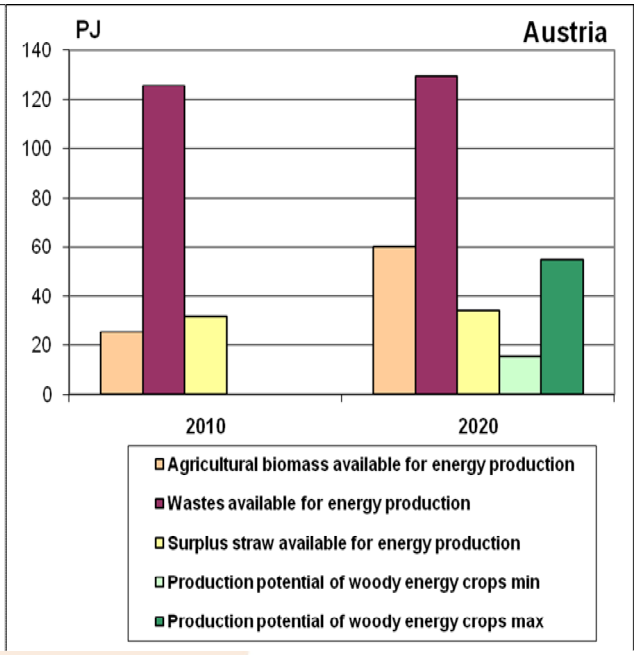
The energy crop production potential was taken from the RENEW report [16].

The charts illustrate the figures from translation tables for each country. The demand for forest biomass is presented for various sectors and the total biomass supply potential for years 2010 and 2020, the difference is highlighted in red. Biomass from agriculture is presented for years 2010 and 2020. The next graph presents biomass supplyy potentially available from agriculture and wastes.

AUSTRIA		
	2010	2020
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	204	266
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3) Including: - sawmill industry - panel industry - pulp industry - processed wood fuel industry - energy use	61699 18524 5240 8778 2021 27136	73613 18699 6731 12305 2021 33857
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3)	44551	48989
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	25.5	60.1
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	125.6	129.8
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		31.76-34.06
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 15.64-54.71

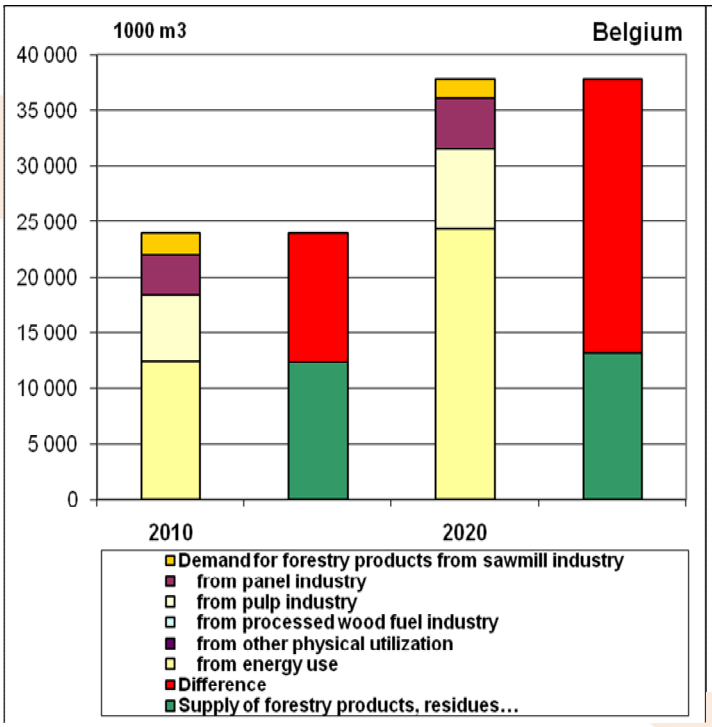
Table 3: Translation table for Austria

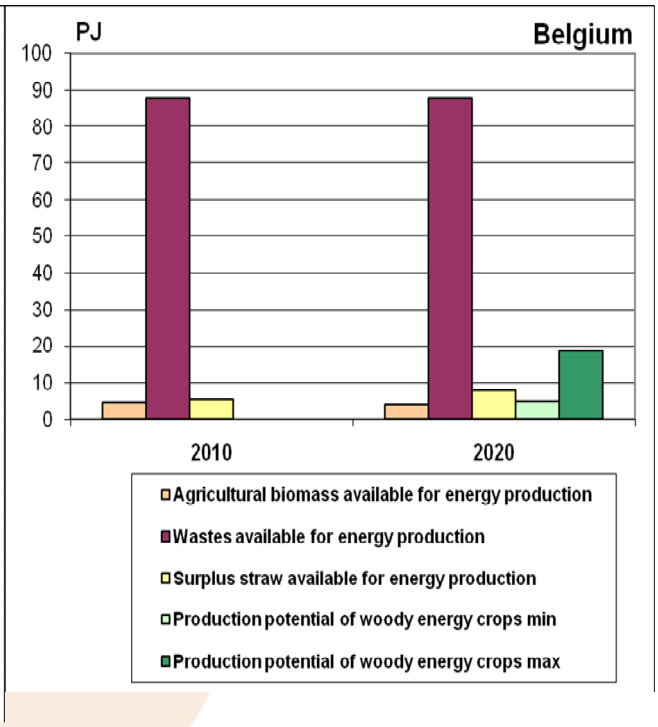




BELGIUM		
	2010	2020
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	0	0
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$) Including: - sawmill industry - panel industry - pulp industry - energy use	23939 1941 3659 5920 12420	37671 1628 4575 7130 24337
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$)	12253	13159
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	4.4	3.8
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	87.9	87.9
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		5.23-7.81
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 4.73-18.42

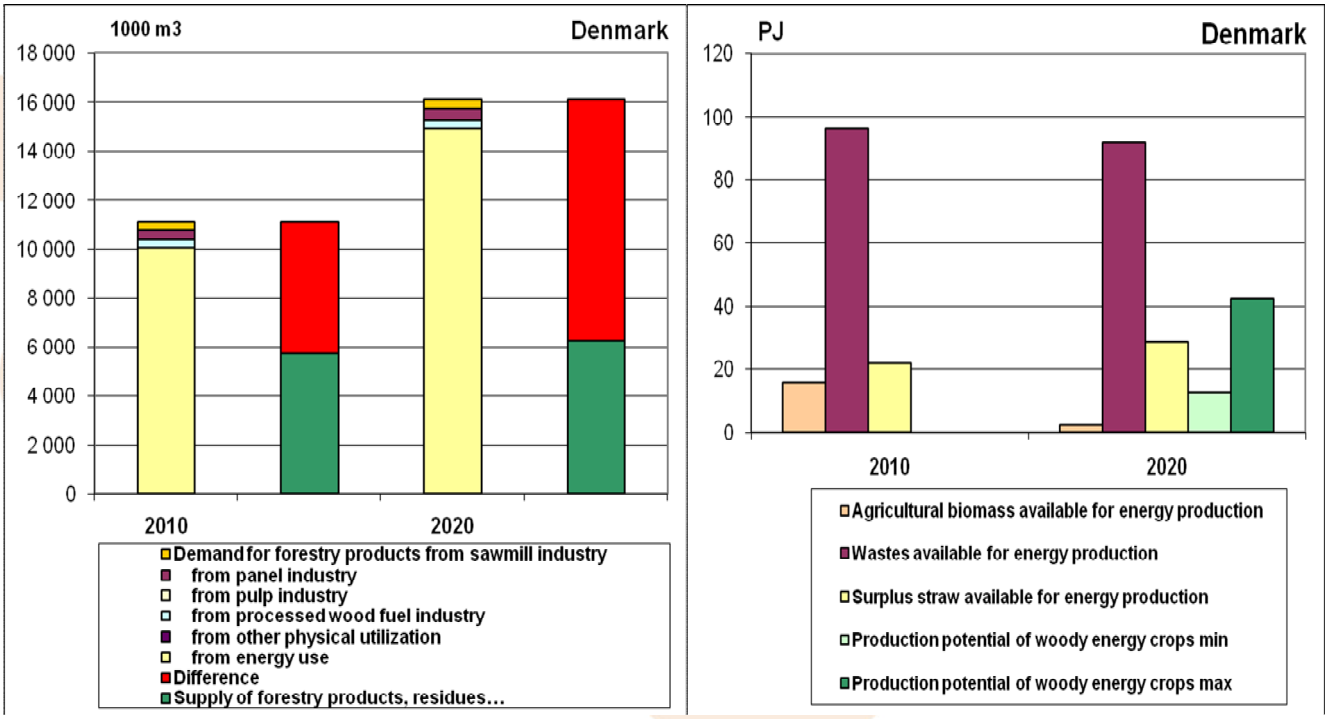
Table 4: Translation table for Belgium





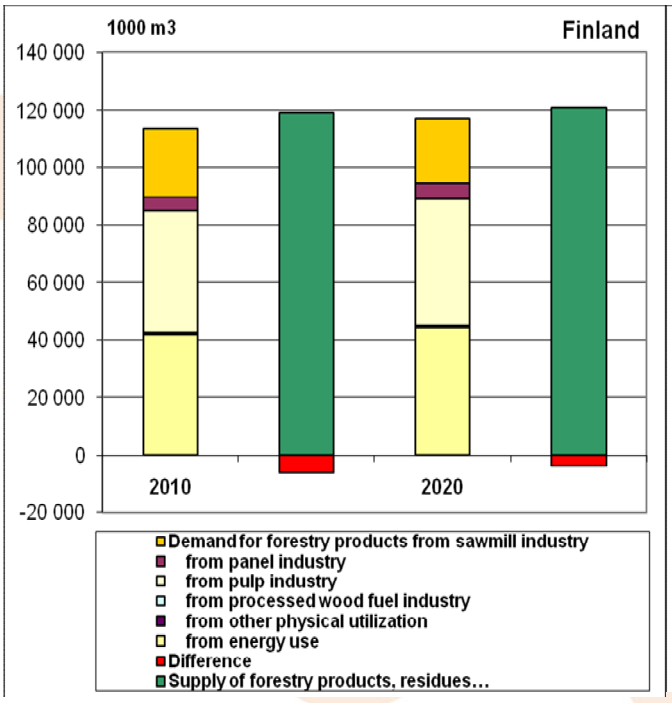
DENMARK		
	2010	2020
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	74	0
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3) Including: - sawmill industry - panel industry - processed wood fuel industry - energy use	11092 331 390 333 10037	16062 344 499 333 14906
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3)	5691	6215
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	15.7	2.5
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	96.3	92.1
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		21.8-28.71
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 12.76-42.35

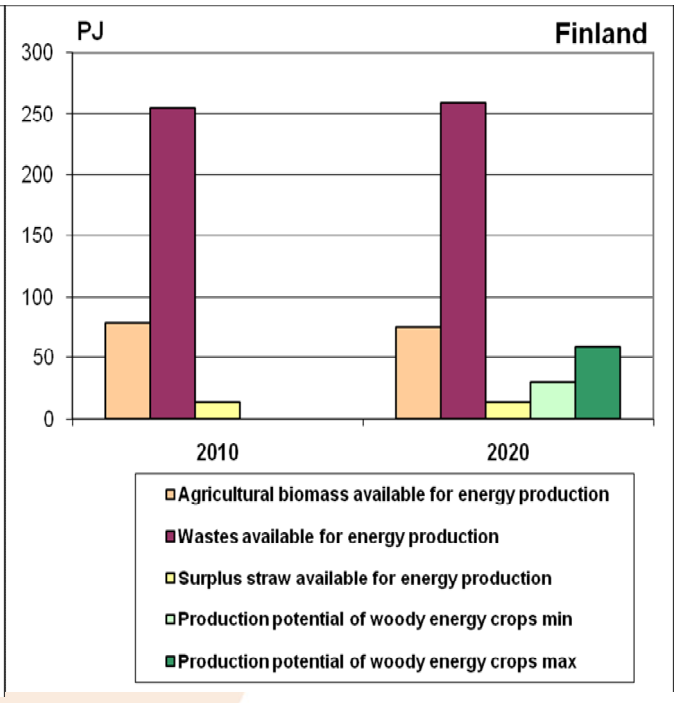
Table 5: Translation table for Denmark



FINLAND		
	2010	**2020**
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	486	299
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3) Including: - sawmill industry - panel industry - pulp industry - processed wood fuel industry - other physical utilization - energy use	113130 23499 4839 42229 392 321 41851	117097 22715 5386 44102 392 321 44182
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3)	119256	120900
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	78.4	75.4
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	255.4	259.6
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		13.04-13.77
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 29.97-58.79

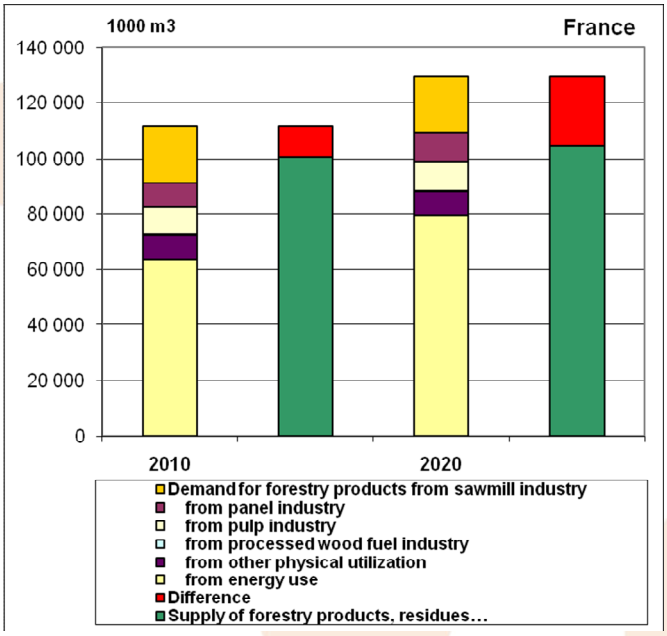
Table 6: Translation table for Finland

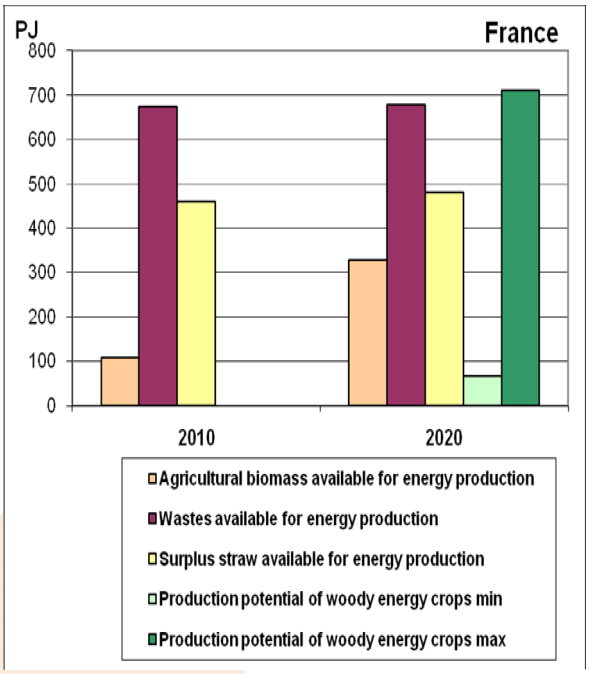




FRANCE		
	2010	**2020**
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	536	1000
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$) Including: - sawmill industry - panel industry - pulp industry - processed wood fuel industry - other physical utilization - energy use	111419 20141 9094 9680 250 8802 63453	129413 20142 10458 10549 250 8802 79212
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$)	100381	104210
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	106.8	327.9
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	674.1	678.3
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		461.65-480.43
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 64.66-711.46

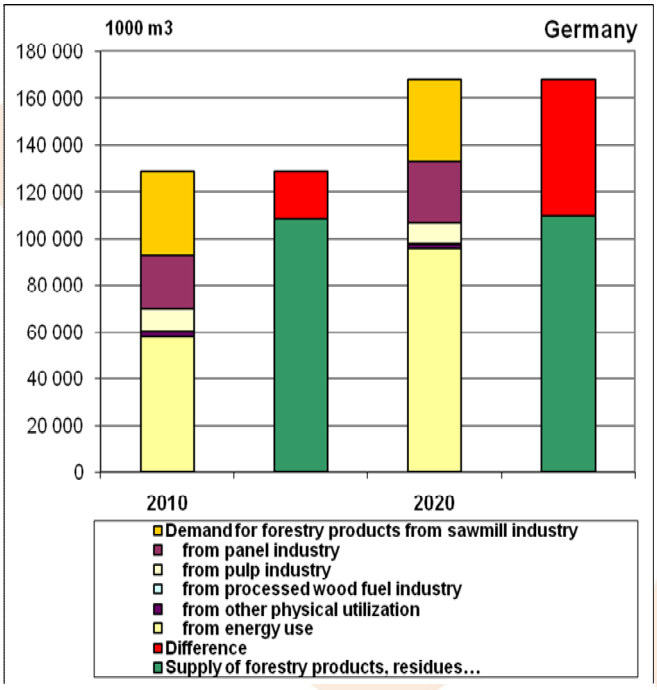
Table 7: Translation table for France

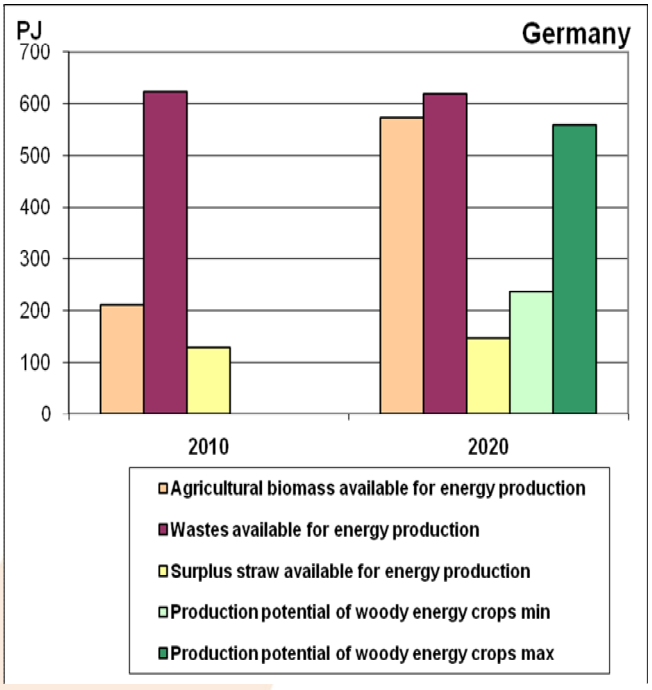




GERMANY		
	2010	**2020**
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	1000	2000
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$) Including: - sawmill industry - panel industry - pulp industry - processed wood fuel industry - other physical utilization - energy use	128356 36054 22349 9746 333 1889 57985	167915 4823 26565 8693 333 1889 95612
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$)	108293	109302
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	211.3	573.8
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	623.8	619.6
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		128.51-146.36
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 235.78-560.16

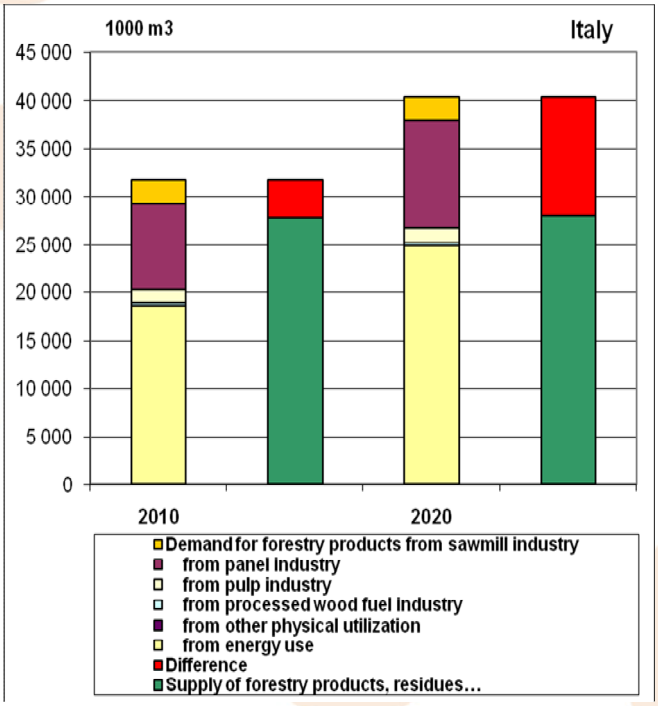
Table 8: Translation table for Germany

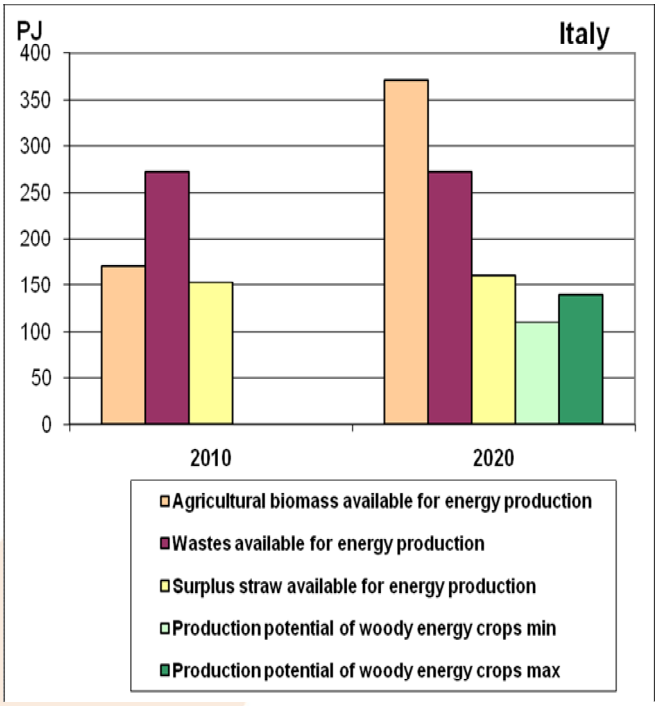




ITALY		
	2010	**2020**
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	1074	1786
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$) Including: - sawmill industry - panel industry - pulp industry - processed wood fuel industry - energy use	31721 2492 9013 1357 283 18575	40351 2349 11271 1588 283 24860
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$)	27737	27969
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	170.4	371.9
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	272.1	272.1
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		152.70-160.15
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 110.67-139.78

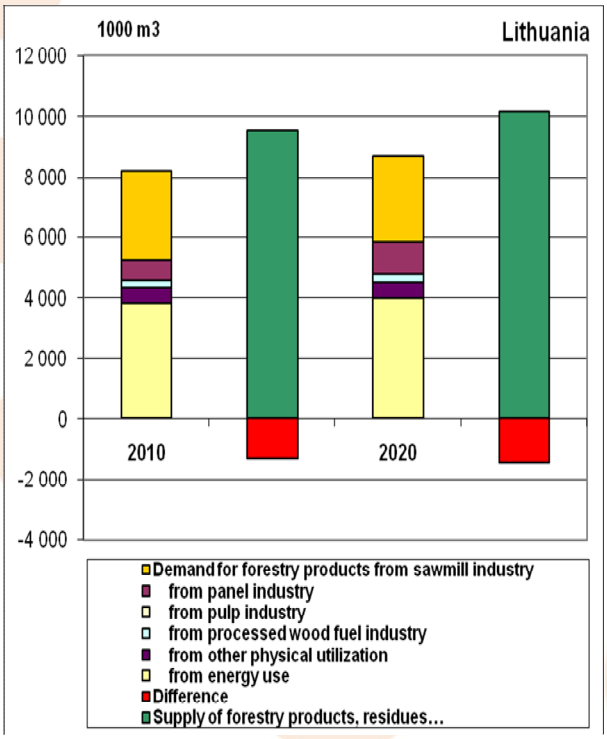
Table 9: Translation table for Italy

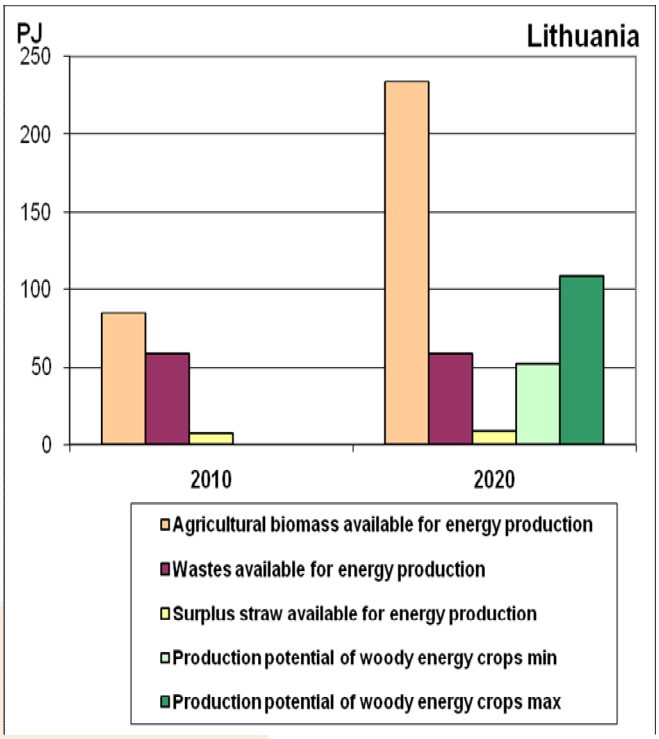




LITHUANIA		
	2010	**2020**
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	525	882
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$) Including: - sawmill industry - panel industry - processed wood fuel industry - other physical utilization - energy use	8212 2949 683 267 494 3820	8683 2850 1070 267 494 4003
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$)	9539	10140
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	84.8	233.8
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	58.6	58.6
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		7.34-8.65
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 52.24-107.86

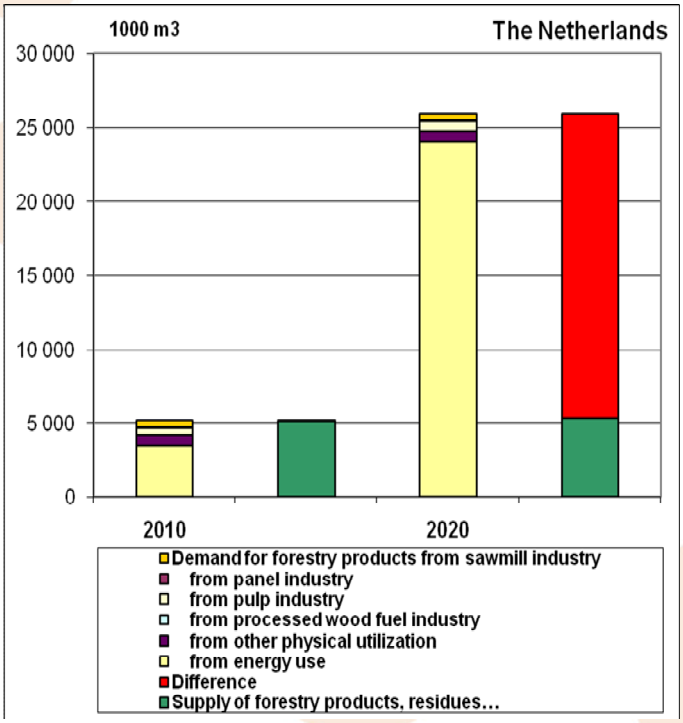
Table 10: Translation table for Lithuania

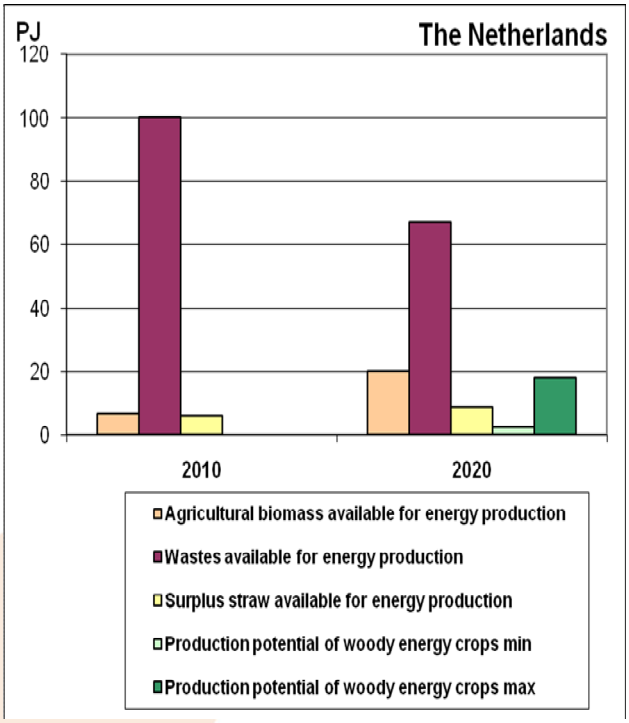




NETHERLANDS		
	2010	**2020**
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	0	0
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$) Including: - sawmill industry - panel industry - pulp industry - other physical utilization - energy use	5190 480 25 529 714 3441	25945 491 32 690 714 24018
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$)	5067	5301
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	6.9	20.3
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	100.5	67.0
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		5.99-8.87
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 2.2-18.29

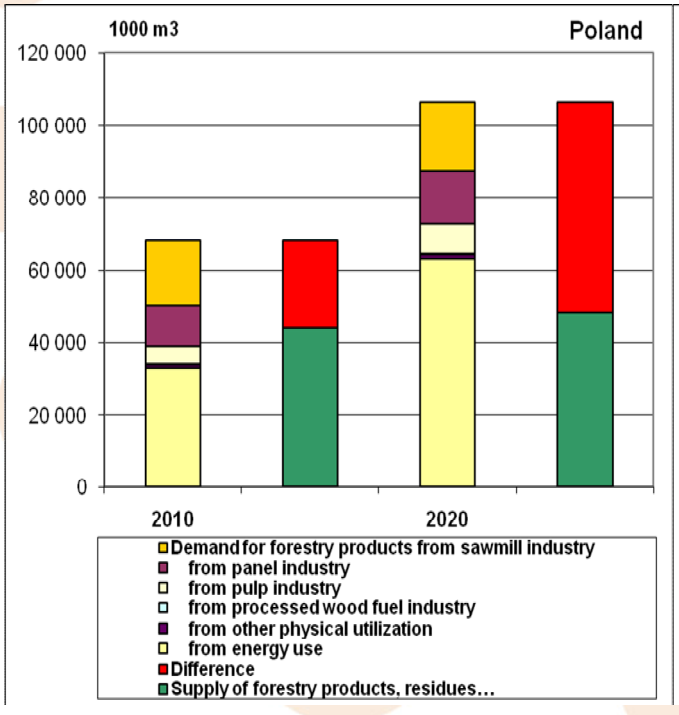
Table 11: Translation table for Netherlands

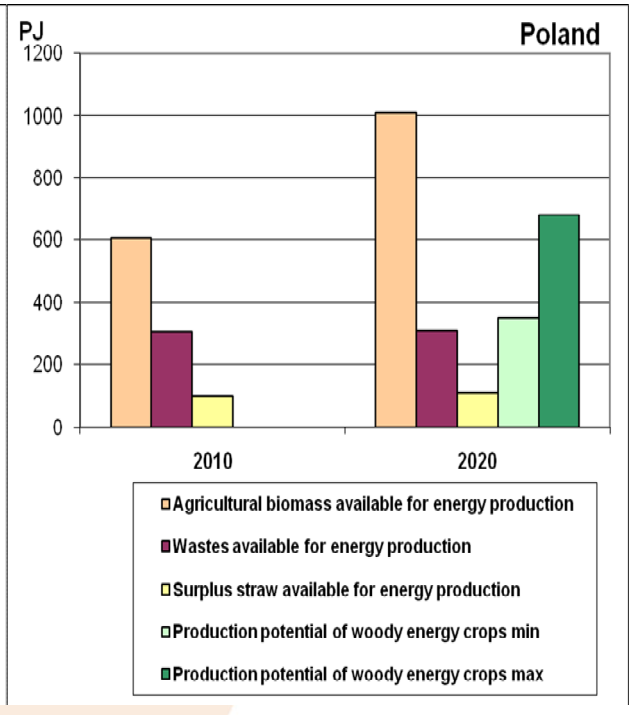




POLAND		
	2010	**2020**
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	3823	4321
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3) Including: - sawmill industry - panel industry - pulp industry - processed wood fuel industry - other physical utilization - energy use	68125 18019 11220 4944 333 987 32622	106289 19105 14596 8167 333 987 63101
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3)	43647	48247
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	608.2	1011.0
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	305.6	309.8
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		96.75-107.43
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 350.33-682

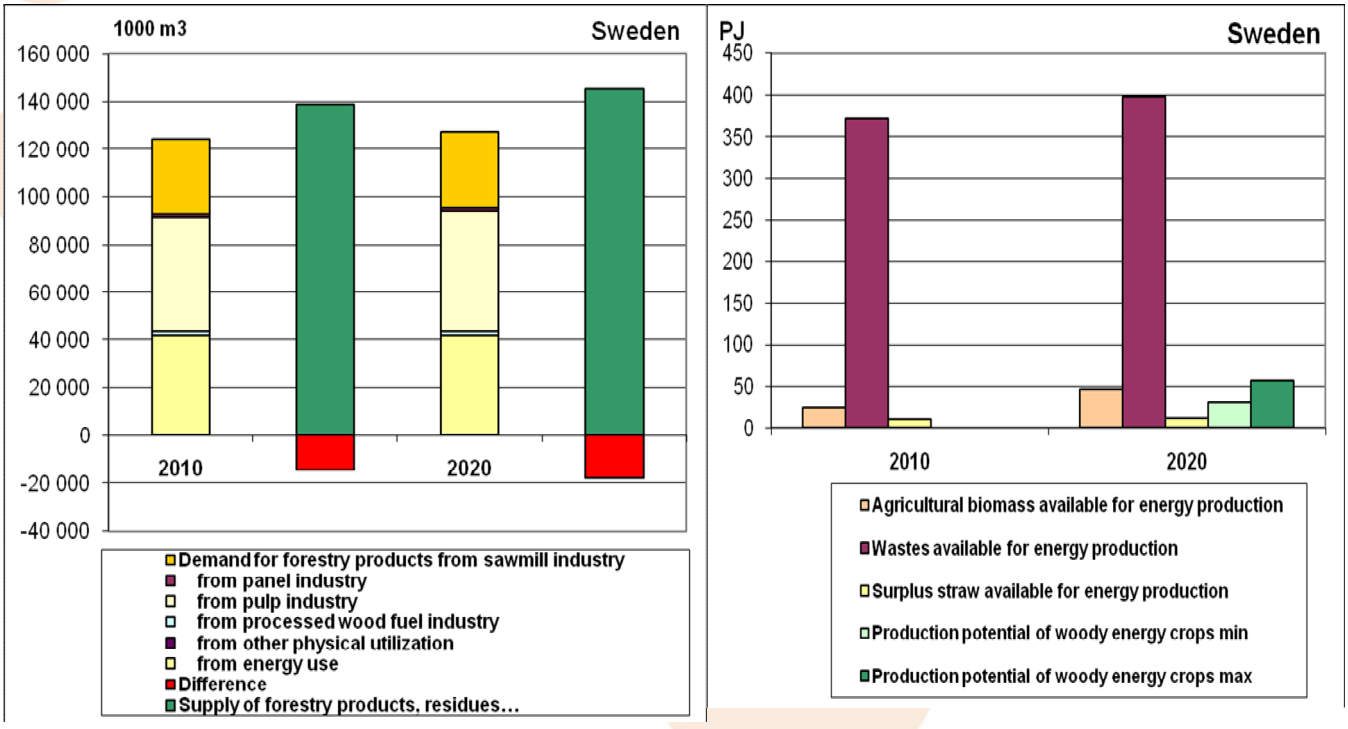
Table 12: Translation table for Poland





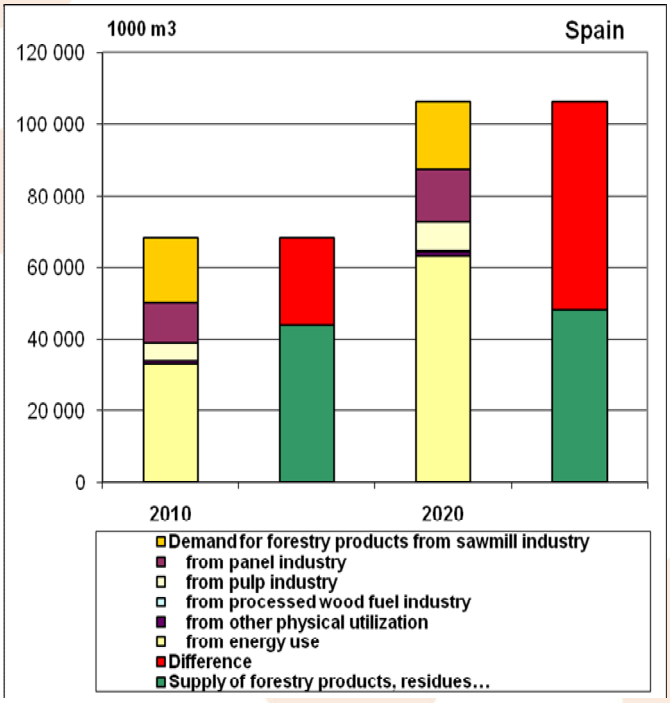
SWEDEN		
	2010	2020
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	135	168
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$) Including: - sawmill industry - panel industry - pulp industry - processed wood fuel industry - energy use	123919 31341 1177 48375 1608 41417	127114 31828 1230 51031 1608 41417
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES ($1000m^3$)	138786	145016
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	24.1	46.8
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	372.6	397.7
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		10.52-11.78
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 30.43-56.78

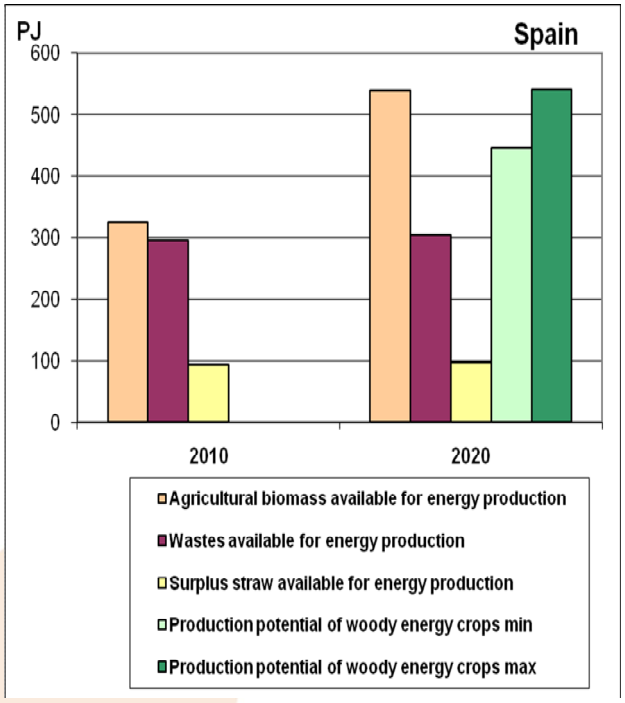
Table 13: Translation table for Sweden



SPAIN		
	2010	**2020**
[1)]AVAILABLE ARABLE LAND FOR DEDICATED ENERGY CROP CULTIVATION (1000 ha)	2706	2582
[3)]DEMAND FOR FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3) Including: - sawmill industry - panel industry - pulp industry - processed wood fuel industry - energy use	61068 7059 8228 6883 33 38865	132839 6946 10566 8752 33 106542
[3)]SUPPLY OF FORESTRY PRODUCTS, RESIDUES AND WOOD PROCESSING WASTES (1000m^3)	30998	33675
[1)]AGRICULTURAL BIOMASS AVAILABLE FOR ENERGY PRODUCTION (PJ)	324.7	539.6
[1)]WASTES AVAILABLE FOR ENERGY PRODUCTION (PJ)	297.3	305.6
[2)]SURPLUS STRAW AVAILABLE FOR ENERGY PURPOSES (PJ)		94.55-98.59
[2)]ENERGY CROPS PRODUCTION POTENTIAL (PJ) - woody energy crops S2-S1		 446.6-541.83

Table 14: Translation table for Spain





5. Summary

As shown in the tables above the amounts of different kinds of biomass are going to change in a different directions depending on the country. In some countries (e.g. Austria, Netherlands, Sweden) the area of land available to be used for dedicated energy crops will stay at the same level or will change but not significantly. In France and Germany the prediced area available for energy crops is expectd to grow twice between 2010 and 2020 while in Poland, Lithuania and Italy there is also expected growth but not as significant as in two mentioned countries. France and Germany are expected to release substantial areas due to the competition effect of bioenergy production versus food/feed production for export. There are some countries like denmark and Finland in which this area is expected to decrease in time.

The available arable land for energy crops is one of the 'ingredients' used for calculating the total potential of agrciultural products and wastes for bioenergy production. The area is shown as a diferent value since the data concerning the land available is usualy difficult to be derived from all the calculations and it is also interesting to mention how inportant part in the total agricultural potential is played by the raw materials from dedicated energy crops plantations. To avoid double-counting it must be noted that the estimated areas available for energy crops in 2010 and 2020 are not separate values but a part of total agricultural potential presented for each of the analyzed countries.

The supply by forestry products and by-products is expected to raise in all analyzed countries but the size of the raise will differ among the countries. The use so actually the demand for such products will raise as well in all the countries however, predicted use of forests material will be much higher in three countries. In the Netherands, Spain and Poland the use of wood products will raise significantly between 2010 and 2020. Especially in The Netherlands, where this use is going to raise five times. This fact may be explained by expected increase in demand for forestry products for the sector of bioenergy production which, in the Netherlands, has assumed very ambitious targets.
In general the use of wood material for energy production will increase in almost all the countries and is expected to stand for the greatest share in the total wood materials use structure.

The amount of agricultural products available for energy production will decrease between 2010 and 2020 only in Denmark. In most of the countries it is expected to grow, and in some cases significantly. In The Netherlands it is predicted that the potential from agriculture will be about three times higher in 2020 than in 2010. Also Austria, Denmark, Lithuania and Poland are characterized by a large difference in potential between 2010 and 2020. It is important to mention that Poland in 2020 is expected to have the potential equal one fourth of the whole EU-25 potential.

The amounts of wastes available for energy production are not expected to change much in any of the countries between 2010 and 2020. Only in Sweden the change is a bit bigger than in the other countries. The highest potential in the waste sector was found in France.

6. Discussion and outcome

The data in this report is based on the international data not the national assumptions resulting from the policies. The main reason for that are the data availability and the unification of the data. In each of the reports from which the data was gained, the assumptions for all the countries are similar and the data is unified for all the analyzed countries. This fact ensures relatively small error deviation and shows the national data presented on the same base, which enables the future analysis.

It is important to mention that the numbers presented for each country refer rather to the potential so to supply side than to demand side. Only the data for forestry products and by-products has been presented separately from the two different sides. To calculate the demand the deep analysis into various sectors using biomass is required. That kind of analysis would need detailed search and good contact with the representatives of all analyzed branches as well as producing the proper model to translate the results into demand.

Besides, the national documents and legal acts are different if it comes to the scope, enforcement level and other features so the demand resulting from the analysis of these documents would not be comparable among the countries.

The important factor seems to be the data availability and its confidentiality. The real demand for biomass is dependent on the plans for future production of different companies in many branches. It is obvious that the majority of the plans included in the companies' strategies are not available since information is kept in confidence.

The part of the data referring to agricultural production is mainly based on the predictions concerning the release of land which will be available for non-food agricultural crops. The estimations take into consideration the sustainable model of agricultural management, environmental factors and the yields of the crops as well as the system of production.
Projections of the amount of biowaste depend of the development of the economy and society. For the need of the source reports it was assumed that Europe will develop in a more sustainable way. As well as a desire to promote biomass and other renewable energy sources, the scenario assumes that society responds strongly to other environmental concerns, e.g. waste minimisation. Different models and assumptions were used to project the amounts of wastes available for the energy production in the future. Among them is it possible to list FAO predictions and the European Topic Centre on Resource and Wastes management vision.

The forestry data was calculated by applying national and international targets concerning the forestry production and bioenergy production and consumption.
It is important to emphasize that the prices of the raw material and various costs connected with the production have not been included in the estimations. The changing prices of the traditional energy sources, which have a strong influence on the bioenergy production, have not been taken into consideration. Nor have the corresponding factors e.g. economical changes and the food prices.

In most of the countries the demand for forestry products is expected to be on a higher level than the supply of such products. Also other estimations predict that the future supply of the

products will not fulfil the demand (See Table 15).

year	Total wood supply - EFSOS * [million m³]	Wood demand ** [million m³]	Difference
2010	783	923	140
2020	824	1,233	409
2020 75%	824	1,075	251

* direct from the forest and indirect (EFSOS forecast)
** required to fulfil EFSOS projections and RES policy objectives

Table 15:Demand versus supply [14]

The developments are necessary to keep supply and use in balance both now and also in the future. It is predicted that if wood supply is not increased, or not increased sufficiently [11]:
a. Targets for renewable energies will simply not be met.
b. Targets will be met, but with non-wood renewable and other renewables will be developed faster than wood-based energy.
c. Wood-processing industries will not develop as expected, but their production will increase less (or even decrease).

But actions also need to be taken at policy level. And to start with, there is an urgent need to bring coherence into policy, both at European and at national level [8]. No need to say that the absence of a European framework policy on forests is a weakness in that context. But, on top of this, forest sinks-enhancing policies, as well as nature conservation policies are promoting reduced management and mobilization, when the climate change and the security of supply policies require more production and mobilization.

Policies to prevent and fight against major natural or human-induced disasters are also needed to avoid inefficient depletion of the existing resources. Over the last five years, forest fires in Portugal, Spain and Greece have created the irremediable loss of millions of cubic meters of wood. Land-use will also require further thoughts. Therefore attention have to be paid to sustainability and the dedicated allocation of land to short-rotation forestry and forest plantations, which will certainly contribute to ease the situation. Moreover, currently unused land might be needed in the future to achieve the objectives.

Statistics of RES consumption and production [6, 7] indicates that the European targets for 2010 will not be met and only few countries will reach (in some cases even overcome) their national targets. Actions need to be taken at policy level. And to start with, there is an urgent need to bring coherence into policy, both at European and at national level [8]. Forest sinks-enhancing policies, as well as nature conservation policies are promoting reduced management and mobilization, when the climate change and the security of supply policies require more production and mobilization. The targets for the renewable energy share in Europe and the EU Member States (MS) are defined by Directive 2009/28/EC and National Renewable Energy Action Plans are under development within MS. They will set the scene for investors, industry and communities and will define the pathway towards national binding targets together with specific policy measures.

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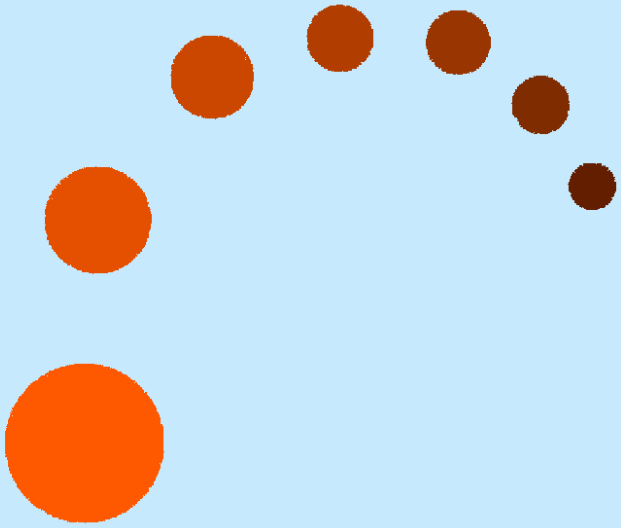

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