



**Deliverable 7.4 + Deliverable 7.6**

**Projections on Future development of  
European pellet market  
&  
Policy recommendation**

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Intelligent Energy  Europe

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## 1. Introduction

This present deliverable is the merging of two foreseen output of pellets@las Project.

It must be noticed that this report will merge the tasks:

- **Task 7.4 Future European pellet market developments (task leader: ETA)**
- **Task 7.6 Policy recommendation paper (task leader: ETA)**

It seems reasonable to work on a single report as the arguments treated are very similar and can be explained in a better way.

Starting from the analysis made in previous deliverables, it seems reasonable to continue with the classification of countries in relation to pellet market. The following table in the following page is extracted from the Deliverable 7.2, already available on web and summarised the data collected for European countries.

The projections will be made for next 15 years, as longer projection are not likely and accurate.

For the development of the policy, main task of this report, some Directive of European Parliament have been studied, as their targets are very close to our scopes.

The following Directives are mentioned several times during this report:

- Directive 2009/28/EC of The European Parliament and of the council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC
- Directive 2009/29/EC of The European Parliament and of The Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community
- Directive 2004/8/EC on the promotion of cogeneration,
- Directive 2002/91/EC, Directive on the energy performance of buildings,
- Directive 2005/32/EC on the eco-design requirements),
- Biomass action plan 2005;
- KYOTO PROTOCOL to the United Nations framework convention on climate change, 1997.

These mentioned documents will be used as primary form of inputs for green market development.

The use of wood pellets (replacing fossil fuels) also leads to the reduction of greenhouse gas emission and therefore also contributes to the second objective of the directive. The largest reduction was shown for pellets substituting coal for power production (about 1900 kg CO<sub>2</sub> eq per tonne pellet), followed by substitution of heating oil for district heating (about 1500 kg) and natural gas for residential heating (about 900 kg). Consequently, an estimated 10 million tonnes of CO<sub>2</sub> eq emissions were avoided in 2006 in the 27 EU countries plus Norway and Switzerland (based on a consumption of 6 million tonnes of wood pellets and substitution of coal and heating oil). As expressed in previous deliverables, it must be noticed that pellets trading volume are reported with a different value between importers and

exporters, due to a misapplication of the rules and delays due to recent implementation of a pellet code within Eurostat statistics. Most common, the export is firstly being registered, followed by a registration of the import. [Richard Sikkema, Monika Steiner, Martin Junginger, Wolfgang Hiegl, Deliverables 4.1 / 4.2 / 4.3].

## 2. Objective of the task

After the identification of a common methodology for market analysis in every country of the European pellet Market, an official classification of the present of future situations in every country is made on the basis of reasonable assumption. This following table is the starting point of this Deliverable 7.4+7.6 , and is extracted from Deliverable **7.2 Analysis of new, emerging and developed European pellet markets.**

Countries	Num. producers	Production 2008	Consumption 2008	Export/ Import	Historical data available	Production capacity	National Standard
<i>Austria</i>	<i>25</i>	626.000	509.000	117.000	yes	1.006.000	yes
<i>Belgium</i>	<i>10</i>	325.000	920.000	-595.000	no	450.000	no
<i>Bulgaria</i>	<i>17</i>	27.200	3.000	27.000	no	62.300	no
<i>Cyprus</i>	<i>0</i>	0	0	0	no	0	no
<i>Czech Republic</i>	<i>12</i>	27.000	3.000	24.000	no	78.000	no
<i>Denmark</i>	<i>12</i>	134.000	1.060.00	-926.000	yes	313.000	no
<i>Estonia</i>	<i>6</i>	338.000	-	338.000	no	485.000	no
<i>Finland</i>	<i>19</i>	373.000	149.200	224.000	yes	680.000	no
<i>France</i>	<i>60</i>	240.000	200.000	40.000	no	1.391.800	no
<i>Germany</i>	<i>50</i>	1.460.000	900.000	450.000	yes	2.400.000	yes
<i>Greece</i>	<i>5</i>	27.800	11.100	0	no	87.000	no
<i>Hungary</i>	<i>7</i>	5.000	10.000	4.000	no	5.000	no
<i>Ireland</i>	<i>2</i>	17.000	30.000	-13.000	no	77.500	no
<i>Italy</i>	<i>75</i>	650.000	850.000	-200.000	yes	750.000	yes
<i>Latvia</i>	<i>15</i>	379.000	39.000	330.000	no	743.600	no
<i>Lithuania</i>	<i>6</i>	120.000	20.000	100.000	no	152.600	no
<i>Luxemburg</i>	<i>0</i>	0	5.000	5.000	no	0	no
<i>Malta</i>	<i>0</i>	0	-	-	no	0	no
<i>Netherlands</i>	<i>2</i>	120.000	913.500	-795.000	yes	130.000	no
<i>Norway</i>	<i>8</i>	35.100	39.800	-4.000	yes	164.000	no
<i>Poland</i>	<i>21</i>	340.200	120.000	220.000	yes	674.200	no
<i>Portugal</i>	<i>6</i>	100.000	10.000	90.000	no	397.000	no
<i>Romania</i>	<i>21</i>	114.000	25.000	89.000	no	260.000	no
<i>Slovakia</i>	<i>14</i>	117.000	17.550	99.450	no	142.000	no
<i>Slovenia</i>	<i>4</i>	154.000	112.000	42.000	no	185.000	no
<i>Spain</i>	<i>17</i>	100.000	10.000	95.000	yes	250.000	no
<i>Switzerland</i>	<i>14</i>	70.000	90.000	-20.000	yes	171.000	no
<i>Sweden</i>	<i>94</i>	1.405.000	1.850.000	-445.000	yes	2.200.000	no
<i>UK</i>	<i>15</i>	125.000	176.000	-51.000	yes	218.000	no

(-) :represents a value between zero and 3.000 tons per year

Table1: European Pellet market.

So following to this collection of data, to the latest inputs received from the market actors and on specific goals defined from the Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources, here below are highlighted some objectives planned from the Commission.

*(3) The opportunities for establishing economic growth through innovation and a sustainable competitive energy policy have been recognised. Production of energy from renewable sources often depends on local or regional small and medium-sized enterprises (SMEs). The opportunities for growth and employment that investment in regional and local production of energy from renewable sources bring about in the Member States and their regions are important. The Commission and the Member States should therefore support national and regional development measures in those areas, encourage the exchange of best practices in production of energy from renewable sources between local and regional development initiatives and promote the use of structural funding in this area.*

*(4) When favouring the development of the market for renewable energy sources, it is necessary to take into account the positive impact on regional and local development opportunities, export prospects, social cohesion and employment opportunities, in particular as concerns SMEs and independent energy producers.*

*(24) In order to exploit the full potential of biomass, the Community and the Member States should promote greater mobilisation of existing timber reserves and the development of new forestry systems.*

So, following to this and work already done, projects on future utilization of wood pellet, industrial pellets, will be made. From what we understand,

This Directive clearly suggested to Member States to have a **“Bottom-up”** approach in development of biomass sector. The regional initiatives are normally easier to start, to be implemented at operational level, as the actors and policy makers are deeply involved in the project. Moreover also the economy scale and professionalism related to this project with a regional dimension, are higher than in national projects.

Also considerations derived from high level participants to last workshop of the Project (18th November 2009, Renewable Energy House, Brussels, Belgium, organized from EUBIA) will be used in a minor way.

### 3. Projections for International trading and markets of pellets

This Deliverable will treat the European market (pellet production and use), although the European trade of pellets does also include trade flows from non-European countries. Total EU exports are estimated at about 2.7 million tonnes, of which 98% is trade within EU.

The EU import is about 3.4 million tonnes, of which about 47% is covered by intra-trade. The biggest trade volumes are recorded by the Netherlands, Belgium and Sweden. In this case, the countries involved in the analysis are the ones that showed a very relevant production capacity and also a relevant influence in Pellet trading, by diffuse logistic facilities. The key player of next years will be:

#### A. Canada and USA

#### B. Balkan countries

#### C. North-west Russia

The future of pellet production largely depends on export opportunities given from these countries. Following to this identification of exporter countries, here below some information on these pellet markets are given:

**A. Canada and USA** Canada and the USA both have a well developed production of pellet. Following to the Wood Pellet Association of Canada (WPAC) the actual production, of pellet in the two country is the following:

- **Canada**, around 2,5 M tons
- **USA**, around 2 M tons

The actual production should be pretty stable for both countries This situation would however change quite rapidly if Canada were to implement their commitment under the Kyoto Protocol. All pellet producers in British Columbia are using mountain pine beetle (MPB) wood in their pellets, as this wood is being harvested and processed by related industries at the moment. There is an effort being made to collect the MPB affected material while it still has a merchant value.

However, to utilize MPB directly and solely for wood pellet production would require higher pellet prices, as the feedstock supply of MBP, in this case, is more expensive than sawdust (Verkerk, 2008).

However, as more recent data shows, the increase in wood pellet exports from Canada to Europe in 2007 has been far more moderate than initially expected. This is probably due to the fact that 2007 was a very bad year for the European pellet market with very low prices, coupled with a very strong Canadian dollar and skyrocketing freight costs, in 2007 vs. 2006. Also, growth projections to 2010 will largely depend on the market development in Europe. The success of the Canadian wood pellet industry in particular is largely linked to the growing demand for wood pellets in Europe, initially in Sweden, later also in other European countries such as the Netherlands and Belgium.

Regarding the USA, up until the end of 2007, the USA have been mainly producing and importing wood pellets for domestic consumption. However, several projects are under way in Southeastern USA, amongst which is the largest pellet production plant in the world (B.I., 2008).

Lately, it looks like the USA is taking giant steps to become a second large exporter of wood pellets to Europe, moreover the pellet price in Europe and the increasing supply from other regions, such as Eastern Europe and Latin America., The market development in next years will be related to several factors, as new positive trend in



green policy exist in USA after election of President Obama and their translation into the stimulation of biomass fuels for domestic purposes. [Richard Sikkema, Monika Steiner, Martin Junginger, Wolfgang Hiegl, Deliverables 4.1 / 4.2 / 4.3].

**The actual production of pellet is around 4.5 Million tons in North America and Canada.**

**B. Balkan countries:**

- **Serbia** there are 5 pellet plants located ranging between 10-35 ktonnes capacity per year, using hardwoods such as beech for pelletizing. The domestic market is not well developed, with only a few supermarkets in Novi Sad and Belgrade offering wood pellets.
- **Montenegro**, there is currently a single pellet plant, with a capacity of 25 ktonnes/year. Sawdust from the adjacent sawmill is used for the production of wood pellets. The wood pellets are used both for sale to households and for the needs of the company itself.
- **Bosnia-Herzegovina** there are several pellet plants, ranging between 3-45 ktonnes/year. There is no significant domestic market yet, as a rough estimate 10-15% of the pellets produced are sold on the domestic market. Most of the export goes to Italy and Slovenia. The entire capacity is 120 ktonnes/year. The largest production capacity in the western Balkan is situated in *Croatia*; in mid-2008, a total of 7 pellet plants had a combined capacity of 194.5 ktonnes/year, ranging from 7.5-40 ktonnes/year. Feedstocks for pellet production consist (amongst others) of sawdust from oak, beech and ash, and spruce and fir wood. The total potential of the forest biomass for the production of briquettes or pellets is estimated to be about 1 million cubic meters, so there are reasonable possibility for further expansion. As there is again a small domestic market, the large majority of wood pellets are exported.

**The actual production of pellet is around 200.000 ton per year in Balkan countries**

**C. North-west Russia:** The three pellet markets in Russia, Ukraine and Belarus are similar on one hand and different on the other hand. The Russian wood pellet market is the most developed. Russian pellet companies are concentrated mostly in the North-West and the central part of Russia, in regions with developed forests or woodworking industry. In general, pellet production started in the North-West of Russia in the presence of both forest industry and required export logistics (harbours). Consequently, it spread to central Russia and the Ural region. In addition to wood pellet production plants, some sunflower husk and peat pellet producers are also present in Russia but so far their numbers are limited. Similarly, in Belarus, producers also prefer woody material as feedstock for pellets. In the Ukraine, the situation differs. As agriculture is more developed here than the wood industry, sunflower husk pellet producers have approximately the same share in pellet production as wood pellet producers. The major export flows from Eastern Europe originate from Russia and the Baltic States. Most Russian pellets are delivered to Europe through St. Petersburg harbour (at least 60-70% of produced pellets). The prices of pellets exported from North West Russia to Scandinavia and Western European countries are at a level between 100 and 120 €/tonne FOB (excluding VAT) according to Rakitova and Ovsyyanko (2009). These pellets are used for medium scale district heating in Scandinavia and, to a lesser extent, for large scale heating in the Netherlands, Belgium and UK. Furthermore, 15% of Russian pellets were exported through the Baltic harbours in the period 2008-2009.

Ukraine and Belarus pellets are first distributed per train to Baltic ports and than being shipped to the European Union. Truck transport is less common: about 15% of Russian pellets and also Ukrain pellets are transported by truck to the European Union, i.e. Poland and Germany (Rakitova and Ovsyanko 2009).

**The actual production of pellet is around 650.000 ton per year in Russia, Ukraine, Belarus**

In the following table the flow of pellet of 2009 is reported.

Figure X: Data about imported volume of Pellet [Eurostat 2009].

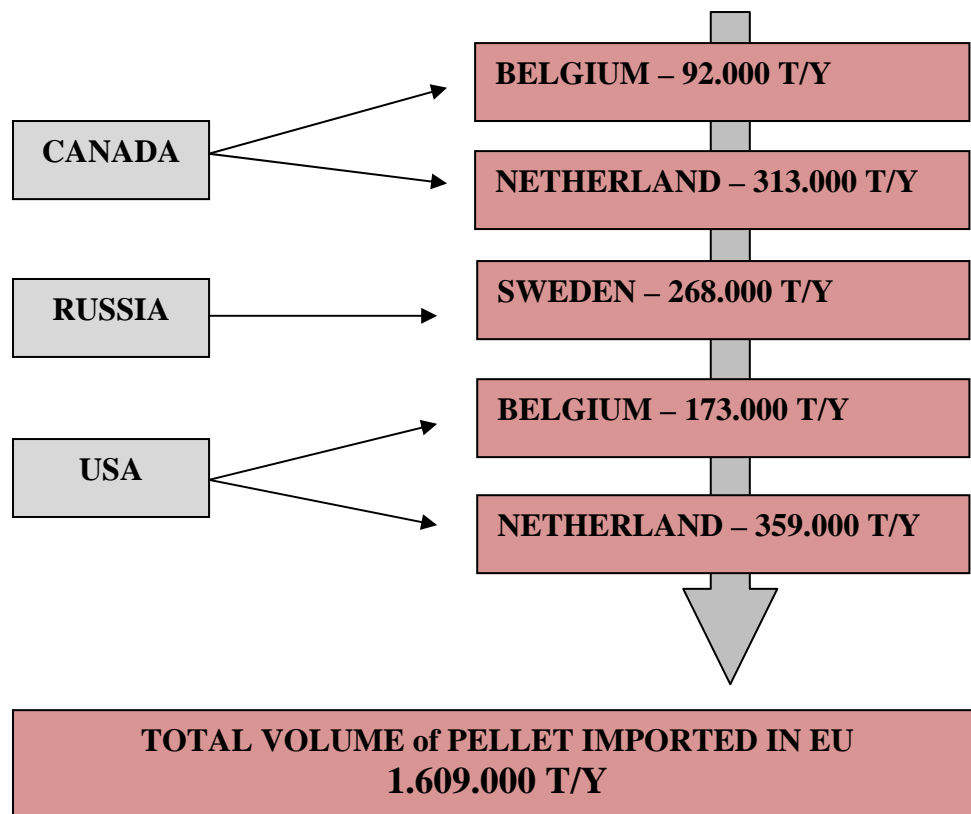


Figure 1: Flow of importation of pellets in 2009

Main trade routes of European pellet volumes are from North America to the Netherlands & Belgium, having average overseas shipments of 20,000 to 30,000 tonnes per freight, and from Baltic States and Russia to Scandinavia by coasters, having average loads from 4,000 to 6,000 tonnes (Selkimaki and Roser 2009). Another important route is by truck from Austria to Italy, having average loads of 24 tonnes.

Remarkably, total EU intra export is not equal to total EU intra import volumes - they differ from each other by about 800,000 tonnes (out of a total of 2.7 million tonnes).

**This fact is due to a discrepancy between exporter classification and European importer classification.**

## 4. Projections up to 2020. Descriptions of market studies.

In the following pages projections about the development of demand and offer of pellet at EU level will be made. The projections will be about:

**Case 1.** Projection of wood pellets (demand and offer up to 2020) with a market simulation: stabilization of the market, some years with a positive trend, some years of negative trend, then positive growth. The Yearly increase rate (%) can vary from 28% in 2009, to 6% in 2020.

**Case 2.** Projection of wood pellets (only the offer up to 2020) with a market simulation: Utilization of the classification of EU market used in Deliverable 7.2 (New, Emerging and Developed markets) for type of class of markets, with the following value, 5% for Developed Market; 7% for Emerging market; 10% for New markets. The simulation is based on gathered results of the year 2009.

**Case 3:** This projection considers the possible scenario of MBP utilization up to 2020 with a market simulation: after some years of big growth (Yearly increase rate of 25%) there will be a stabilization, then a negative trend for couple years, then positive trend in last years of the projection (with Yearly increase rate of 15-20 %).

Once again it is good to underline that these assumption are merely projections of personal analysis in the trend of European Pellet Market. The historical data used as starting point for this calculation, are extracted from the data collection of EU market.

### Technical specification about historical data of EU Pellets Market:

The main data used are the level of production and consumption of pellet at EU level for the years 2006, 2007, 2008.

<i>year</i>	<b>Production (t/y)</b>	<b>Consumption (t/y)</b>
<b>2006</b>	<b>4.615.340</b>	<b>4.749.000</b>
<b>2007</b>	<b>5.942.827</b>	<b>5.866.800</b>
<b>2008</b>	<b>7.429.440</b>	<b>8.060.650</b>

Table 2: Gathered results of European Pellet market (2006 – 2008)

When data were not available, assumption has been made, considering also the data collected during WP4, WP5. Moreover, analyzing the data of European pellet market it was noticed that the gathered results could be useful than the analysis among the single market. In fact:

1. The production has a more balanced trend, in fact the production normally follows specific investigation on annual demand related to the availability of raw material and its cost.
2. The consumption is a free value that can be influenced from various matters, first of all the fossil fuel prices, the availability of pellet product in the bordered area, the average temperature of a season, the sector to which is destined the pellet.

3. Many new actors in production industries appeared in this last two years. The positive trend of EU market' yearly increase, is surely influenced by this data.
4. From previous task and the data collected there are some new plants in start up phases (Norway, Portugal, Eastern countries) that will ensure a very positive trend for next 3-4 years.
5. After this positive period a normalization phase will follow and the market will have a stabilization, with reduced percentage of development compared to previous years.

This analysis considers also the social economic conditions of EU in these last years. For example it is reasonable to mention the “peculiarity of European social condition”.

The ECB is the central bank for Europe's single currency, the euro. Its last data mentioned that:

- The PIL decreased of 5% in last two years;
- The cost of money is stable at 1% (lower value in the EU history);
- A general reduction of the economic social indexes was noticed in EU area.

Following to this considerations, some questions emerge:

- **Why the wooden sector has such a positive period? What can be extracted from this analysis?**

Even though this situation the wooden sector had a positive period. The reason of this pick in pellet market could be found in the raw material supply chain. The main material of pellets sector is still residues from timber wood, and semi products from other primary process and products. The question that is interesting all the actors in Europe is:

- **When the wood supply chain will be saturated, how the raw material for wood pellets will be collected?**

The fact that wooden residues, treated only in a mechanical way, could become a primary form of energy for people seemed a sensational input for entrepreneurs.

The lack of unique normative facilitated speculations in past years, and is facilitating the trading nowadays. Here below the graphic represent the projection of EU market in next fifteen years.

As previously mentioned, to provide reasonable data projection of EU market, two different scenarios for wood pellets are made:

- **Case 1:** consumption and production are compared up to 2020.
- **Case 2:** following to our classification made in deliverable 7.2 Analysis of new, emerging and developed European pellet markets, a growing scenario up to 2020 is made.

The most recent study have been analyzed, for example AEBIOM, in its last Road Map for Pellets, mentioned that:

*-“The European Directive on Renewables sets the target of a 20 % share of renewable energy by 2020. In 2005 bioenergy contributed to 66 % of all renewables and it will still contribute very significantly in 2020. Biomass for heat and derived heat from biomass (heat from district heating and cogeneration plants) is by far the main renewable energy source in Europe with 57.5 Mtoe in 2005. To reach the 2020 target AEBIOM estimates that 147.5 Mtoe biomass should be used in the heat sector (including derived heat). Pellets are still playing a minor role but taking into account the*

*experience of a few leading countries and provided a biomass heat policy is implemented, pellets use is growing much faster than traditional technologies.*

*Therefore it can be estimated that the use of pellets for heating purposes in the residential, services and industrial sectors might reach 50 Mt in 2020, corresponding to 22 Mtoe. Demand will also increase for power production and the future development in this sector depends on political decisions. It might reach additional 20 to 30 Mt pellets or more if current policies stay in place, what corresponds to 10 Mtoe biomass and about 1/3 bioelectricity if converted in a coal fired power plant”.*

**In this scenario, the utilization of pellets for large scale application is considered.**

Nowadays there are only 4 European Countries that are using pellets for co-firing, and following to our calculation, the development of this sector will be strongly suggested, but not easy to reach. In fact many Eu countries are still far from an efficient /massive utilization of pellets for co-firing. Italy is an example of this trend, in fact, even if supplier of pellets or chips are available, the incentives are confirmed, but the large scale users are still missing. For this reason we used lower yearly increase rate, compared to scenario mentioned above (Aebiom): 5%, 7%, 10% in best cases.

## 4.1 Projection of utilization of European forest

Forests cover more than one third of the European land surface. The forest area of Europe amounts to about 10 million km<sup>2</sup>, of which nearly 80% represent the vast forest areas in the Russian Federation. Recent estimates indicate that the forest area has been expanding in many European countries.

**1 The average annual increase of forest amounts to approximately 0.5 million hectares per year.**

Our assumption for the available forestry surface to be harvested for pellet sector, will use the above numbers. The total volume of timber in Europe's forests is slightly above 100 billion m<sup>3</sup>. More than three quarters of that volume is located in the Russian Federation. For the past decades the timber volume has been increasing due to the fact that the extraction of timber from forests has amounted less than the annual increment. This fact is surely good for wooden sector.

Forest ownership varies widely across Europe, the pattern often reflecting political histories. About two thirds of the forest is in private hands in the north-western and centrally located countries of the European Union. In the new EU Member States the case is just the opposite. High levels of public ownership are common in Southeastern Europe and Eastern Europe ranging up to 90-100%. Countries with the highest levels of forest in private ownership are Portugal (~90%), Austria and Sweden (80%). [Schuck, A., Van Brusselen, J., Päivinen, R., Häme, T., Kennedy, P. and Folving, S. 2002. Compilation of a calibrated European forest map derived from NOAA-AVHRR data. European Forest Institute. EFI Internal Report 13, 44p. plus Annexes]

It must be mentioned that to find an appropriate yield for forestry cultivation is hard. For the residues of forest, an average of 1,5 dt/ha is assumed (<http://www.bio-south.com/>) while for cutting / harvesting of specific area the productivity can reach very high level, as 25dt/ha. Due to this wide range it is difficult to define good scenarios.

**All the assumptions defined in this report are using very prudent numbers, so this approach will be used also in this case.**

In this case, the yield average of forest is considered as follows

**2 The average annual production of wood in the forest is: 18,5 dt/ha**

**3 The potential yearly available wood in EU will be around 9.250.000 dt/year**

Considering that the sustainability of the supply chain is a priority, prudent availability will be considered. So, the following parameters are assumed:

- 20% of available wood will be left on the fields;
- 15% of available wood is not convenient to be collected (technical difficulties of too expensive)

**4 The yearly available wood for pellet sector will be around  
6.012.500 dt/year**

**This data will be used as available amount of raw ,material for this Pellet market  
projection.**

### 4.2 Case 1: European pellet markets, a growing scenario up to 2020.

This scenario considers both demand and offer of Eu pellet Market. This scenario considers a very heterogeneous future for pellet market. Our assumption are the followings:

1. During the next few years a strong yearly development in the market is still considered possible (up to 2011)
2. After this positive period there will be a normalization of the market (up to 2013).
3. Then a wrong period has been assumed. Difficulties for years 2013-2014-2015 are assumed.
4. A stabilization of the market is assumed (up to 2020).

This data are confirmed from our assumed rate (see table below “Yearly increase rate %”).

year	Yearly increase rate %	Production	Yearly increase rate %	Consumption
2006	0.28	4.615.340	0.23	4.749.000
2007	0.25	5.942.827	0.37	5.866.800
2008	0.20	7.429.440	0.25	8.060.650
2009	0,20	8.915.328	0,25	10.075.813
2010	0,15	10.252.627	0,2	12.090.975
2011	0,10	11.277.890	0,15	13.904.621
2012	0,09	12.292.900	0,13	15.712.222
2013	0,08	13.276.332	0,12	17.597.689
2014	0,03	13.674.622	0,07	18.829.527
2015	0,05	14.358.353	0,05	19.771.003
2016	0,05	15.076.271	0,05	20.759.553
2017	0,06	15.980.847	0,06	22.005.127
2018	0,06	16.939.698	0,06	23.325.434
2019	0,06	17.956.080	0,06	24.724.960
2020	0,06	19.033.444	0,06	26.208.458

Table 3: Data used for Case 1 – wood pellets projection

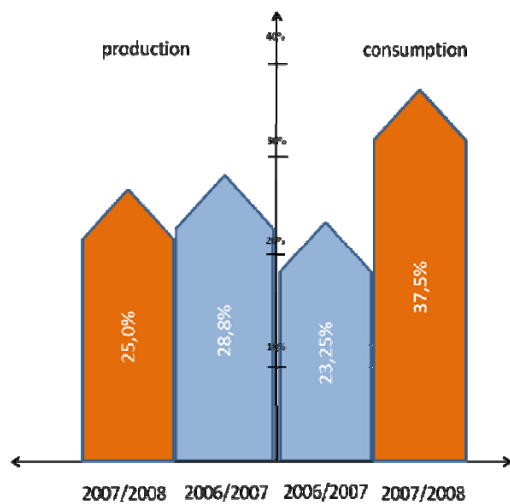
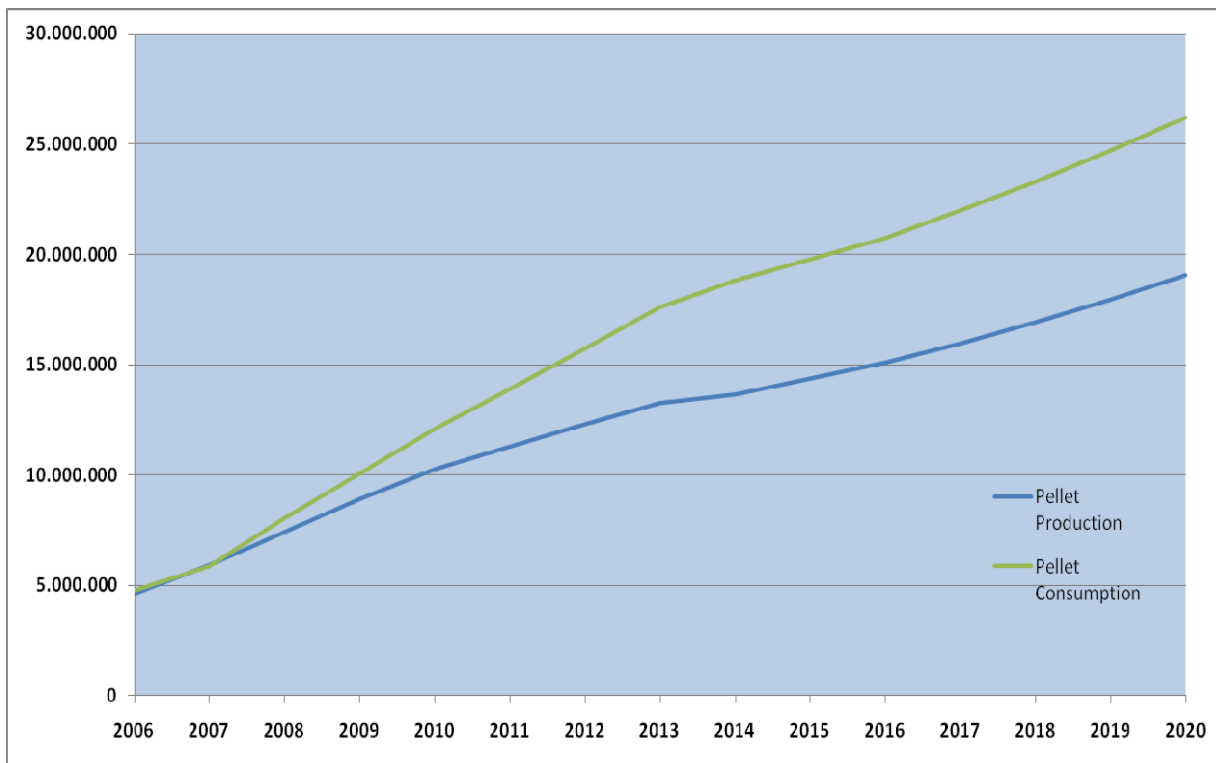


Figure 1: Historical data of EU pellet market used for the calculation of the projection.





Graphic 1: Case 1 European Pellet Market – scenario up to 2020.

Considering the data of 2008, the demand of pellets in European countries in 2020 will be triplicated in terms of volume. The corresponding utilization of pellets will be around:

**25.000.000 tons/year pellets**

### 4.3 Case 2: European pellet Offer, a growing scenario up to 2020.

This scenario considers only the offer of Eu pellet Market. Starting from the definition of class of countries made in previous Deliverables 7.2, this scenario is based on a more stable parameters:

- 1) Utilization of historical data (up to 2009)
- 2) Constant growth of the market (up to 2020).

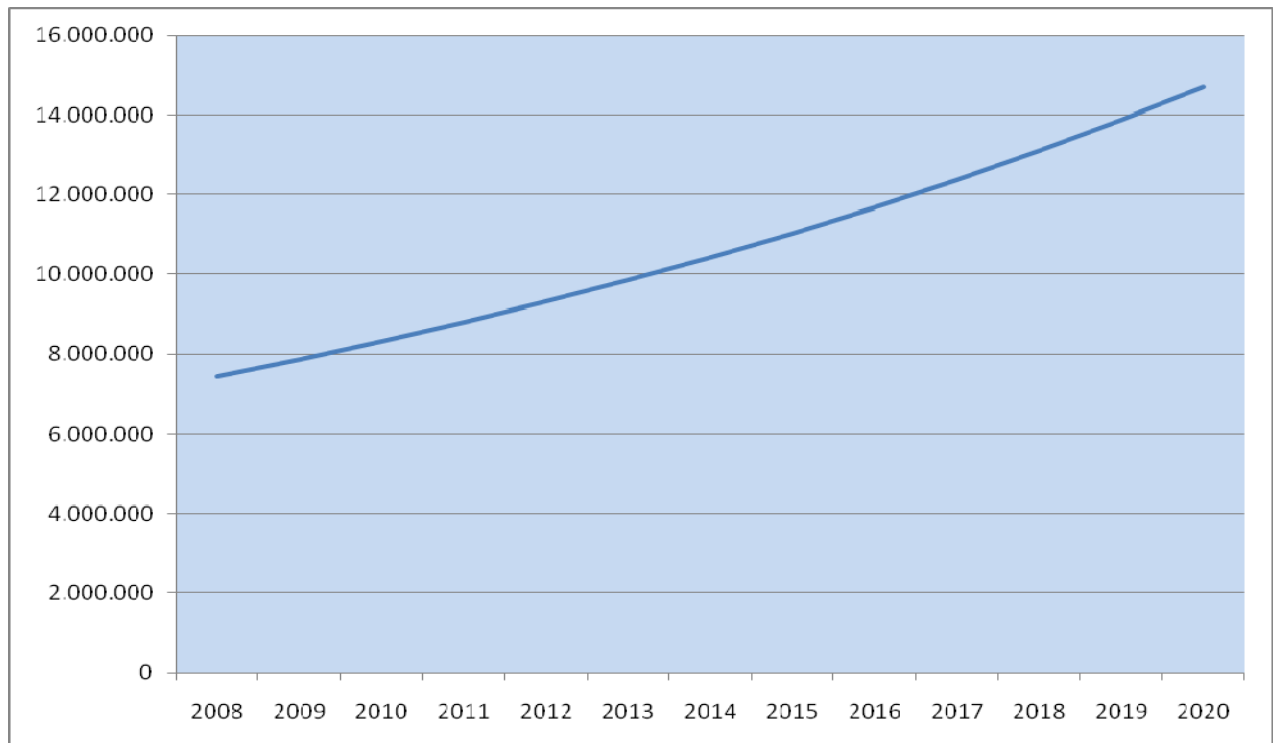
This data are confirmed from our assumed rate (see table below “Constant Yearly increase rate %” in orange color).

Developed Pellet Market	Emerging Pellet Market	New Pellet Market
Austria	Estonia	Bulgaria
Belgium	France	Cyprus
Denmark	Norway	Czech republic
Finland	Poland	Greece
Germany	Romania	Hungary
Italy	Slovakia	Ireland
Netherlands	Spain	Lithuania
Sweden	Slovenia	Luxemburg
8 countries	Switzerland	Malta
	Latvia	Portugal
	UK	10 countries
	11 countries	

A	B	C
Total production Developed Countries	Total production Emerging Countries	Total production New Countries
5.093.000	2.012.300	324.000
68,6% of EU Markets	27,09% of EU Markets	4,36% of EU Markets

Constant yearly increase rate %	0,05	0,07	0,1	
Year	A	B	C	$\Sigma (A+B+C)$
2008	5.093.000	2.012.300	324.000	7.429.300
2009	5.347.650	2.153.161	356.400	7.857.211
2010	5.615.033	2.303.882	392.040	8.310.955
2011	5.895.784	2.465.154	431.244	8.792.182
2012	6.190.573	2.637.715	474.368	9.302.657
2013	6.500.102	2.822.355	521.805	9.844.262
2014	6.825.107	3.019.920	573.986	10.419.013
2015	7.166.362	3.231.314	631.384	11.029.061
2016	7.524.681	3.457.506	694.523	11.676.709
2017	7.900.915	3.699.531	763.975	12.364.421
2018	8.295.960	3.958.499	840.373	13.094.832
2019	8.710.758	4.235.594	924.410	13.870.762
2020	9.146.296	4.532.085	1.016.851	14.695.232

Table 4: Data used for Case 2 – wood pellets projection



Graphic 2: Case 2 European Pellet Market – scenario up to 2020.

Considering the data of 2008 of classified countries, the European offer of pellet up to 2020 could reach the level of :

**15.000.000 tons/year of pellets**

The discrepancy between European offer and demand would be satisfied by the importation.

In our opinion it is not useful to overpass this edge in our projection as this amount of wood today is an ambitious target for green energy sectors. Without relevant investments in the supply chain, in the distribution chain and also in the final users profile (large scale users will increase in next years in Europe) this amount of pellets will be difficult to be produced. Only a well planned program in conversion of arable lands at Eu level could make this target reasonable.

Moreover the pure wood pellets will be very expensive when this volume of biomass will be required from the market in a stable way, year after year. The partial utilization of various kind of biomass will be a necessary parameters for the economical sustainability of this product in future years.

So, defining a scenario for pellet utilization in next years, it can be mentioned that :

- the residential heating sector will be based on pure wood pellet as it is nowadays,
- but the large scale users will surely use an industrial pellets with a lower quality in term of physical/ chemical properties (MBP).

## 5. Projection of future trends of low quality pellet (MBP)

The WP5 of Pellets@las project was a specific task related to MBP – Mixed Biomass Pellets. This class of product is very heterogeneous, as many different materials are used by producers among Europe.

Wood pellets are getting scarce as they are being appreciated as a modern and convenient fuel by both domestic users (first) and now also by very large users, like industry and even power plants.

The risk is that a rising price of wood resources will eradicate the statement of the promoters that the pellet price is expected to remain more stable than the fossil fuels. It will decrease the competitiveness of pellets and the propensity of people to pellets utilization..

The reason behind this development is the scarcity of prime material, which for pellets has been pure wood residues. This is indeed the most “easy” fuel, giving fewer problems in the combustion technologies.

However, besides the material, the main advantage of the pellet is not its (present) composition of pure wood, but its **form**. The prime material can be taken also from less pure, but widely available resources, like agri-forestal residues. If these residues are pelletised, the following advantages will be attained:

- *High density and low humidity.*

This means that it will be convenient to transport (also bigger distances, if necessary) and easy to store (not only because of its low volume, but also because it will not decay like other forms of biomass). In other words, it can be a commodity on a wide market, just like gas or oil.

- *Easy and standard format for users.*

This means that it is technically easy to feed it **automatically** into the burner, so it requires less investments and the market will accept it as a replacement for fossil fuels. Normal biomass resources need specific handling and burning equipment, this creates dependency of those users on the supply of that type of biomass.

- *Mixing is possible.*

Therefore, the pellet fuel can be fine-tuned into a given range of characteristics. So it is easier to create a global market with a few quality standards, just like with fossil fuels.

It can be noted that all these advantages are also the success factors of the present well known fossil fuels. Therefore it is expected that if all biomass resources (residues from agriculture, forest maintenance and energy crops) passes through this process of pelletisation, the same success will be achieved with biomass.

At the same time, the norm **CEN/TC 335 standards for solid biofuels**, is working in a different direction. The main national actors are not easy to find a common approach for the definition of physical/chemical parameters. For example, the ash content of pellets, is a parameters that could influence in a relevant way the utilization of pellet.

Depending on the ash level, the scenario of suitable raw materials change totally. Surely big plants can digest in a better way a wider range of pellets fuels, but little stoves are surely made to be fuelled with pellet of pure wood.

## 5.1 State of the art of MBP

Nowadays, wood pellets are used for the domestic market and – with a sharp increase – for the industrial sector, especially the power plants. Industries are very large consumers and cause scarcity. In the same time, they could use pellets of much lower quality, because of their different combustion equipment and flue gas cleaning. They would also benefit with a lower price for pellets, an advantage that is not compatible with the scarcity for wood pellets, but only with the employment of agricultural residues as base material for pellets.

At the same time, domestic users face an increasing price for the wood pellets and the expectation that pellets are much more stable in price than fossil fuel is not coming true. Domestic users really depend on the quality of this type of bio-fuel: they can not (easily) switch to lower quality pellets. So, the supply of pellets should be split into domestic and industrial users. Both sectors will benefit: domestic users will have their high quality fuel at a stable price, industrial users will be able to fulfill Kyoto constraints at a lower price and with abundant resources (as agricultural residues are indeed).

Standards of pellets are today focused on wood pellets, but also industrial users have strict requirements on fuels, especially if these are from biomass. Therefore, they need a fuel that is easy to control and has constant quality. Pellets can make this true, but standards must be developed.

## 5.2 Long term goal

A new market will be created that will raise pellets from the rather little high quality market (suitable to small users), to the large users, which are typically constrained by the Kyoto emission caps. It is expected that this action will create a significant relief on these large users (less fuel costs, Kyoto compliance), and that it will lead to huge reductions of fossil fuel consumption. Moreover, it will lead to a stronger agricultural sector.

## 5.3 Potential impacts on the market

- A new market is expected to form itself, with a few pellet quality classes. This market can be supplied by local producers (agriculture sector);
- Agriculture will better valorize its residues (low cost pelletising process) and also have better reasons to enter in the business of energy crops. As a result, agriculture will need less support of the Community;
- Pellets can become sooner an energy commodity, competitive with fossil fuels.
- A few large power plants and industries that switched to agri-pellets will show the way to others in EU.
- The average efficiency of biomass conversion into energy will rise, because they will typically be burned in large power plants (efficiency about 40%) while typical biomass plants have efficiency of max 30%. But large plants need a modern and convenient

fuel because of the huge logistic problems. Therefore the biomass must be in the form of pellets.

- The net result of the fuel switch is very significant because huge quantities of agricultural residues are still unused and their transformation into a competitive (to fossil fuels) energy resource will:
  - Replace fossil fuels;
  - Avoid their combustion in the open field (if not forbidden) or decomposition in still stronger greenhouse gases than CO<sub>2</sub> (methane);

Adding the possible contribution of future dedicated energy-crops, cultivated in marginal lands or lands taken out of food production, this scenario could become very interesting and realistic.

In the following paragraph a projection of the possible offer of agricultural residues in Europe is made.

## 5.5 Projection on utilization of European Arable land

Please note: the following table summarize the estimated share of intensive farmland in arable land use category in 2010 for agricultural residues. The data refers to the analysis made in EEA Report No 7/2006. The arable land included in this assumption refers to plantation as cereals, oilseed and other arable crops. The possible utilization of arable land is always lower than 70% of available land. The land that is currently used for crop production is assumed to remain available for bioenergy production.

Available arable land for dedicated bioenergy crop		
Countries	year 2010 (1000ha)	year 2020 (1000ha)
Austria	204	266
Belgium	0	0
Czech Republic	303	314
Denmark	74	0
Estonia	88	154
Finland	486	299
France	536	1000
Germany	1000	2000
Greece	356	298
Hungary	413	512
Ireland		
Italy	1074	1786
Latvia	83	144
Lithuania	525	882
Netherlands	0	0
Norway		
Poland	3823	4321
Portugal	250	169
Romania		
Slovakia	81	140
Slovenia	3	16
Spain	2706	2582
Switzerland		
Sweden	135	168
UK	824	1118
	<b>year 2010</b>	<b>year 2020</b>
<b>TOTAL EU</b>	<b>12.964.000</b>	<b>16.169.000</b>

Considering that the agricultural residues have a too wide range of productivity, it is difficult to define a general parameter of dry ton per ha.

For example:

- Cereal Straw: 6dt/ha
- Fibres sorghum: 25dt/ha
- Miscanthus: 25 dt/ha
- Arundo Donax: 27dt/ha

In 2020, at least **16 Milion ha** of land will be dedicated to bioenergy crop.

Table 5: Available arable land for dedicated bioenergy crop

Sources: No Data for Cyprus, Luxemburg and Malta, land for Germany and France based on Hektor calculation and rounded, other countries based on Capsim calculation.

1) The average annual yield of agricultural residues is: **15 dt/ha**

2) In 2020, at least **16 Milion ha of land** will be dedicated to bioenergy crop.

**3) The potential yearly available agricultural residues in EU will be around : 240.000.000 dt/year**

Considering that the sustainability of the supply chain is a priority, a prudent availability will be considered. So, the following parameters are assumed:

- **20% of available residues will be left on the fields;**
- **30% of available residues are not useful for energy scopes** (physical parameters are inappropriate, wrong chemical composition; difficulties in storage or processing, wrong climate condition, pests, etc)

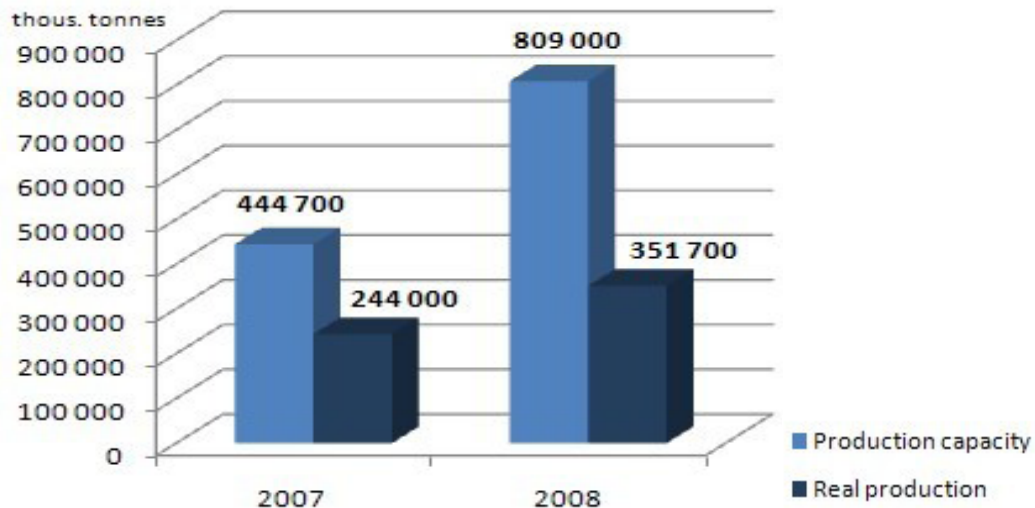
**4) The yearly available agricultural residues for MBP sector will be around 132.000.000 dt/year**

**This data will be used as available amount of raw material for this Pellet market projection.**



### 5.6 Case 3: European MBP markets, a growing scenario up to 2020.

Here below the graphic represents the level of production of MBP in Europe in 2007, 2008. This data are used as starting point in our scenario.



Graphic 3 MBP European Market.  
Source: MBP report, pellets@las project.

The average growth of the market between 2007 and 2008 is around 44%. This data confirm that market of MBP in Europe is increasing in a positive way. The reasons can be various:

- Scarcity or relatively high cost of wood residues;
- Availability of agricultural residues is diffuse;
- Good results achieved from some MBP producers (mixture of 80% wood, 20% herbaceous crop;). The ash content in MBP is normally very high, this last test give an ash value after combustion lower than 2%. It is a reasonable parameters for a massive utilization. [Sources: Pellets@las Workshop, 18<sup>th</sup> November, Bruxelles]

In order to give a clear understanding of this projection, here below are listed the data used for this analysis. As in previous scenarios for wood pellets, it seemed reasonable to consider a general trend with:

- some positive years for MBP market (up to 2012)
- Then a wrong period has been assumed. Difficulties for years 2013-2014 are assumed, as in Case 1. This reduction in positive trend is highlighted by the red line.
- Then a normalization phase will follow with percentage of yearly increase that are lower compared top these years, but still interesting.

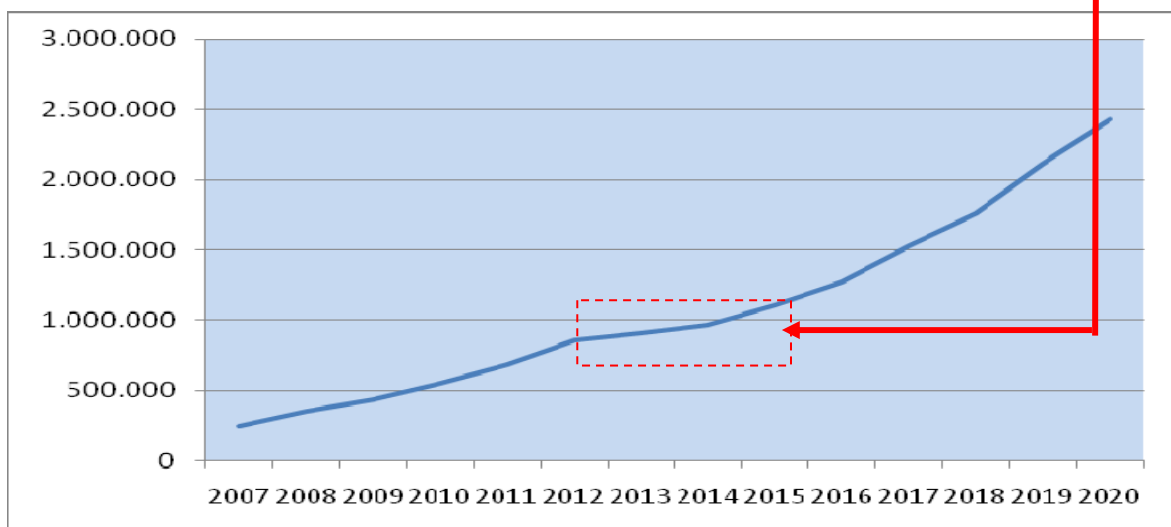
This assumption reflects a personal analysis, market data are considered but in a very prudent way, if compared to the “high rate” found by the available data. This fact is confirmed from our assumed rate (see table below “**Yearly increase rate %**” in orange color). The opportunity to create distinct MBP quality classes for pellets could be a direct answer to the problem of the present scarcity of pellets:

- Small users (domestic market) have the least advanced technology (at least in terms of acceptable types of biomass). They have also less control over flue gases. So, the present high quality pellets should be reserved to them;
- Large users (industry and power generation). For them, a few additional pellet quality classes can be created. This opens the door to a huge quantity of biomass (in a medium term [year 2020] around **130 million dry ton/year in EU-25** of available agricultural residues). These resources can now be converted into a competitive and classified energy product.
- Trading mechanisms and logistics of the new industrial fuel must be formed. Politicians have to be convinced of the great benefit that can be achieved by the agricultural sector, local (mechanical) industry and services.

For large users, this solution comes right in time. This leads to the conclusion that MBP should be available in much larger quantities. Logistic schemes for supplying raw material to local pelletisers have to be designed and promoted and the knowledge must be disseminated to potential users. Help must be provided to let this work in the Kyoto context.

In the following pages the data about potential utilization of MBP are listed. The data used are realistic, but they represent only an assumption.

<i>year</i>	<b>Yearly increase rate %</b>	<b>Production</b>
2007		244.000
2008	0,4	351.700
2009	0,25	439.625
2010	0,25	549.531
2011	0,25	686.914
2012	0,25	858.643
2013	0,06	910.161
2014	0,06	964.771
2015	0,15	1.109.486
2016	0,15	1.275.909
2017	0,2	1.531.091
2018	0,15	1.760.755
2019	0,2	2.112.906
2020	0,15	2.429.842



Graphic 4: Case 3 European MBPellet Market – scenario up to 2020.

Considering the few historical data available (2006-2007) a detailed assumption is not possible. Anyway following to our calculation, the European offer of MBpellet up to 2020 could reach around:

**2.5 Million tons of pellets per year.**

This data is surely underestimated, but it is not reasonable to make scenario on uncertain data. This results comes from the calculation based on real percentage of growth during years 2006, 2007, 2008.

## 6. Trade options

Trading options are well explained in the Report Logistic management of wood pellets: Data collection on transportation, storage and delivery management made from Eubia. Two facts are evident:

1. Trading and storage facilities are a key point in development of a market, in fact logistical issues of inter-continental pellet trade should not be underestimated.
2. The richness related to international trading is relevant as recent study showed that shipping is the cheaper way for trading pellets.

It became evident that the wood pellet market is growing strongly (especially in North-America and Russia), but that is also still an immature market, influenced by factors such as subsidy schemes, resource availability/scarcity, fossil fuel prices and seasonal influences. On the demand side, further growth can be expected, mainly due to rising (heating) oil prices – the potential market for substituting heating oil is 150 Mtonne/yr.

Certification of wood pellets is not (yet) a hot topic, but may become so in future years as increasingly over Europe, sustainability requirements for biomass are being formulated.

### Delivery for short and medium distances:

- **Trucks:** The transport by truck is in Europe one of the most developed way of goods transportation, in fact considering only inland transport, it appears that the considerable growth in transport has been almost entirely realized by road transport. However, due to the environmental interest of pellets and its commitment in energy and CO<sub>2</sub> emission saving, transportation by truck seems not the better way to make the energy and CO<sub>2</sub> emission balance very efficient. Economically, the maximum profitable driving distance for truck transportation of forest fuels is evaluated at approximately 60-100 km, depending on the material transported and the logistics system.
- **Train:** The railway goods transport increased during the last years, but not at all in the same pace as road transport. The conclusion is that the number of km by road is much greater than the km performed by rail. An example is given from the world's largest Pellet manufacturing plant located in Cottdale (Florida, USA) that use trains for transportation of pellets directly from the plant to the ports (100km in the South) and where they are delivered by bottom unloaded wagons and stored in large hall of 35000 tons capacity.
- **Waterway** (river boat/barges): there are promising opportunities to transport the alternative biomass materials like pellets in many part of northern and central Europe via inland, ship canal, river or sea waterways. The study mainly based on woodchips shows that waterway transport of forest fuels by barges and vessels could complete round wood logistics and be particularly suitable in the largest inland waterway area of Europe. In case of pellets, its characteristic gives the possibility to get pumped by means of a fuel hose.

### Delivery for long distances:

- **Shipping:** At present, most of pellets transported for long distance are coming from the North American and are shipped to Europe for use in power generation. Much of

the Scandinavian and Baltic product is also shipped to Europe (see Figure 7). With the pellet market still being relatively new, it has experienced some imbalances of undersupply and oversupply, but stability is now being achieved. Bulk pellets are shipped in large ocean tankers. It is important to cover the goods in order to protect it against water, it must be loaded to minimize fines, and procedures are changing to minimize dangers of off-gassing and fire. Task 40 reports of IEA Bioenergy consider that more than 150 new Handysize tankers will be required for exportation of biofuels into 2014. In 2007, around 2.4 million tonnes of wood pellets were shipped by ocean freighter primarily from Canada, the US and the Baltic countries to western and northern Europe;

## 7. Contribution to EU targets

### 7.1 Sustainability of the supply chain

The analysis of the utilization of pellets at European level is an important criteria to be considered. The sustainability of a fuels is very relevant for some stakeholders (50%), it is useless for some other (50%). Normally the most interesting actors are developed countries and importers. This fact sounds strange, as the producers should pay more attention to this fact, but today ( also following to world’s financial situation of the year 2009) the economic growth has an higher relevance, then sustainability’s growth.

Anyway, international scientific working group (Task 39 ; Task 40) are still working on this direction trying to increase the transparency and the traceability of the energy products.

Following to this, it is reasonable to list the latest inputs arrived from international committee on Biofuels. These data are summarized from the presentations showed during the Workshop on Sustainability criteria of Task 40, held in Bruxelles, the day 29<sup>th</sup> January 2009.

One of the hot topic in this workshop, was the “Certification Standards for wood residue”. The most common certification themes, are the followings

- Conserve biological diversity
- Maintain wildlife habitat and species diversity
- Protect special sites
- Maintain soil & water resources
- Ensure harvest levels sustainable
- Protect forests from deforestation
- No wood from illegal sources
- Aboriginal rights &/or involvement
- Public disclosure

These parameters can be considered as “directly connected” with the supply chain of biofuels and for this reason they are crucial. Following to this, and to the inputs received from Task 40 representatives, here below are listed some criteria defined from the Roundtable on Sustainability Biofuels [Source: *rsb@epfl.ch*, web: *EnergyCenter.epfl.ch/Biofuels*]:

Inputs from Roundtable on Sustainable Biofuels	Priority
<b>National Law</b> (especially land, labor, water rights)	++
<b>Community Consultation</b> (especially to determine land rights, social & environmental impact, idle land, resolve grievances)	+
<b>Social</b> – biofuels should benefit rural communities and workers should not contribute to food insecurity	++
<b>GHG</b> - significantly better over lifecycle than fossil fuel	++
<b>Environmental</b> – conserve and protect soil, water, air conserve and protect high conservation values	++
<b>Technology</b> – (esp. biotech) should be used responsibly and transparently, contribute to income or sustainability	+
<b>Economic Efficiency</b> - economically viable, continuous improvement	+

Many certifications already exist or are under development for biofuel crops (palm, sugar, soy).

- Most standards were created for the food industry, so they focus on farm sustainable agriculture, and not climate change or ‘macro’ effects (e.g. land use change and food security).
- To minimize verification burden, aim is to recognize other certifications as covering most elements of the RSB meta-standard, then add on information about GHG emissions and macro effects.

## 7.2 GHG calculation method

Another topic that needs to be mentioned is the “analysis of the greenhouse gas calculation methods”. Here below there is a summary of the state of art of agreements and differences between the various international interpretation of GHG emission. *[Sources: Workshop Sustainability certification for biofuels and bio-energy, Brussels, January 29, 2009, Jinke va.n Dam, Copernicus Institute - Utrecht University]*

However, there is a nuance and variability of GHG balances due to the complexity of biomass energy systems (crop, region, energy carrier) and the sensitivity of a wide range of parameters. An accurate GHG methodology is needed as the GHG balances have to be calculated for various purposes as:

- CDM (Kyoto Protocol)
- Joint Implementation (Kyoto Protocol)
- Recently: requirements on GHG performance biofuels (e.g. EU: 35% reduction compared to reference fuel)
- Results GHG reduction performance – and reduction costs – are interesting for various stakeholder groups (investors, policy makers, certifying bodies)

Here below some reference about GHG methodology by International Organizations:

### IPCC

- IPCC Guidelines for National Greenhouse Gas Inventories for estimating national GHG inventories; and IPCC guidelines for LULUCF;

### UNFCCC

- Specific methodologies developed for CDM projects. The same principles apply to JI methodologies;

### Global Bioenergy Partnership (GBEP)

- Task Force on the harmonization of methodologies for measuring GHG emission reductions from the use of biofuels.
- Development of a template + good practice guidance

### International Organization for Standardization (ISO)

- ISO 14040 describes principles and framework for LCA.
- Member bodies (Brazil, Germany) propose new ISO work on “Sustainability criteria for biofuels”.

### **European Committee for Standardization (CEN)**

- Technical committee (CEN TC 383) on ‘Sustainably produced biomass for energy applications’ is established to promote standardization;
- One of the working groups focuses on the standardization of GHG methodologies > provide clarification on issues

### **UNEP**

- Two main review studies of LCA / GHG emissions of biofuels
- Identification research gaps and future recommendations

### **IEA Task 38**

- Aims to demonstrate and promote the use of a standard GHG methodology;
- Published a number of reports, articles, case studies

### **Roundtable on Sustainable Biofuels (RSB)**

- Draft standard on principles and criteria for sustainable biofuels: Principle 3 on GHG balances;
- Aim: to establish an acceptable standard methodology for comparing GHG benefits of biofuels;

Here below some reference about GHG methodology by National Governments:

#### **United Kingdom:**

- Carbon reporting expected from obligated companies under the RTFO (Renewable Transport Fuels Obligation);
- Carbon methodology forms the foundation;
- Monthly reporting (administrative batch) of the net GHG savings of the biofuels;

#### **Netherlands:**

- GHG methodology is developed and implemented in two calculation tools (for biofuels and for bio-electricity and heat)
- Two reports on technical specifications tools are published (can be downloaded);
- GHG calculation tools online, available for interested stakeholders;

#### **Germany:**

- Biomass Sustainability Ordinance (BSO) requests a minimum CO<sub>2</sub> saving for biofuels;
- GHG methodology for biofuels developed;
- Methodology biofuels forms basis for development methodology for biomass for energy in 2009;

#### **Belgium:**

- Renewable obligation of 6% renewable electricity by 2010 in the frame of targeted green certificate systems
- Based upon avoided fossil CO<sub>2</sub> emissions in Wallonia and Brussels region;



- Calculated with defined formula. Reference: Combined cycle power plant firing natural gas;

**Switzerland:**

- Tax exemption biofuels with 40% GWP reduction and <125% of overall environmental impacts (UBP) than the fossil reference system;
- Full LCA required
- Based on Ecoinvent methodology and tool;

**USA:**

State Massachusetts:

- Tax exemption renewable fuels;
- Qualifying biofuels must show 50% GHG reduction compared to petroleum;
- Full LCA is required for biofuels including indirect emissions and land-use changes

State California:

- Low-Carbon Fuel Standard
- Protocols to measure carbon-intensity of fuels which includes full LCAs

Here below some reference about GHG methodology by **the European Commission:**

- 35% GHG emission reduction biofuels and other bioliquids compared to reference fuel;
- 35% reduction will increase to 50-60% by 2010;
- Ongoing: Fixed GHG methodology for liquid biofuels and methane (see also CEN initiative);
- Currently focus is on biofuels. Biomass for energy and heat will follow later in 2010;
- Approach must be followed by all individual EC countries;

**What can be extracted from these list of methodologies or approaches is a general transparency of the actions, in fact the data about emissions, energy consumption level and other parameters are public and transparent.**

**The benefits for these markets can be relevant, also other EU countries should follows the approaches used from developed energy market.**

## 8. Identification of instruments for the implementation of policies and strategies

After the analysis of the possible European scenario, an accurate analysis of the goal to be achieved must be done. The MBP market will probably become very positive its development will serve to provide valuable information to European Governments with respect to the implementation of effective policies and strategies. Following directives were analyzed:

- Analysis of main European Directives (Directive 2004/8/EC on the promotion of cogeneration, Directive 2002/91/EC, Directive on the energy performance of buildings, Directive 2005/32/EC on the eco-design requirements);
- Best practices related to the policy, transparency and implementation of the market will be collected, evaluated and highlighted. The emerging and developed countries will be the main actors in this part.

### 8.1 Contribution to Energy-Related Policies

MBP are practical than other formats and needs much less retrofitting than other forms of biomass, because of its standard format. It is able to emancipate in the fossil dominated market and much cheaper than usual wood pellets, especially if the avoided Kyoto-penalties are considered.

This is interesting for all industries that are (large) consumers of heat. Pellet boilers are more suitable for them than other biomass boilers: they offer automatic and constant operation, and cost less. Moreover, quality of pellets can be more constant (standards). Finally, pellets are easy to store and to transport, much like fossil fuels. That is all that industry asks for.

**RES Electricity and Heat :** Agri-pellets can be made from huge biomass resources that are otherwise inconvenient to use. The very large quantities make it useful for industrial heat, also for cogeneration and power plants. Therefore agri-pellets are expected to have a large quantitative effect on market. Co-firing in high efficiency power plants is also more efficient than use in typical biomass state-of-the-art plants (10% better).

The following issues are related to the EU policies (other than for renewable energy).

- **This policy paper supports the agricultural policy** by giving much more economic potential to the sector: residues will be valorized; setting up energy cultures will be encouraged. Therefore, the farmers will be given a competitive alternative to many products that nowadays are supported economically, even without demand.
- **Many SMEs in the agricultural sector will create local jobs:** pelletising, logistics, trade.
- **Competitive EU industry.** Besides the agriculture, also the industrial sector is threatened by rising energy prices, which have a rising influence on the costs for production. The final result of this trend is unknown but will negatively affect the entrepreneurial mood for the future. A stable price for a modern, national / EU fuel will surely make EU industry more competitive.
- **ETS (Emission Trading Scheme, Kyoto targets)** will be facilitated by the very significant quantities that this scenario could bring into the fuel market.

- **Biomass Action Plan:** this project will give to this plan a very significant quantitative and qualitative impulse.
- **Cohesion Policy:** many of the poorer regions and countries (for example CEEC) depend on agriculture and will benefit from production of a modern biofuel.
- **Security of Supply:** most countries will be able to find national demand for the own agri-forestral residues and therefore fully enjoy strategic benefits. This will also encourage local use of resources and avoid too much transport (as with fossil fuels).
- **Open market:** agri-pellets are suitable, just like fossil fuels, for the international fuel market (easy storage, low transport costs). Therefore, overproduction can be exported and contribute to the open EU market. Standards are necessary for this objective (these are included in the project).
- **Growth of electricity demand and risk of black out:** new large power plants need a lot of planning and a view, far into the future, of the best fuel to choose. Moreover, agri-pellets will make this new trend towards coal plants be more acceptable for the population and the politicians.

Quantities are not yet a problem. Available biomass in the EU-25 per year is (on medium term, from only residues, without energy cultures) appr. 130 million dry ton/year. Total coal power in EU-25 is about 200 GWe. The potential of biomass will be triple if also energy cultures will be used by the co-firing.

Another social problem may be solved by the proposed solution. Large users are now buying large quantities of wood pellets. Some power plants are known, which consume per year more than 100.000 ton of wood pellets, enough for 30-50.000 homes. This is causing scarcity on the domestic market and thousands of new pellet boiler/stove owners are faced up to rising prices of the fuel, which definitely has a negative impact on the perception of biomass (the message was always: pellet costs will not follow the oil prices).

The price difference between agri-pellets and wood pellets should do the rest.

## 9. Policy recommendation paper

A recommendation paper on promising national and international policies and strategies aims at the promotion and transparency of pellet markets.

This recommendation paper includes the identification of instruments for the successful implementation of policies and strategies. Directive 2004/8/EC on the promotion of cogeneration, of the Directive 2002/91/EC on the energy performance of buildings and of the Directive 2005/32/EC on the eco-design requirements.

Before to define any possible utilization of pellets, it is reasonable to start from the analysis and definition of the product. The following paragraphs want to provide general information about the product “Pellets” and its general characteristics. After this, also specific recommendation on “How” to stimulate the national market of each Member States, will be given.

This Recommendation Paper is one of the final task of Pellets@las Project, all the other information are available at the project website: <http://www.pelletsatlas.info/cms/site.aspx?p=9107>.

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### What Is Biomass Energy?

Biomass refers to living matter. Agricultural crops are biomass and have a value as both food and energy. The non-edible portions of crops, such as corn stover, can be used for animal feed or for energy. Energy crops, such as switchgrass, could provide a biomass resource, but switchgrass hasn't been established in sufficient volume to be a reliable energy source. Forest residue and other wood wastes are biomass that is suitable for energy production and not for food or feed. Wood wastes from sawmills, paper mills and other wood industries are readily available biomass.

Given proper forest management, biomass is an indefinitely sustainable, plentiful source of clean and renewable energy from the forests.

### What Are Wood Pellets?

Wood pellets are a refined and densified biomass fuel. They can be made from material rejected by wood product manufacturers. By pelletizing residual forest waste, sawdust, and used wood pallets, millions of tons of waste can be put to work for the bioenergy economy while enhancing the environment at the same time. Agricultural by-products such as cornstalks and straw, straw, cereals, herbaceous plantations can also be pelletized.

### Where Can Wood Pellets be used?

Wood pellets can be burned in residential stoves or can be co-fired in industrial, institutional or electric generation boilers that currently burn coal. Wood pellets are readily transportable from forested areas to anywhere in the state.

### Wood Pellets can be co-fired with Coal?

Electric utilities burn coal to make electricity. Wood chips are not as efficient a fuel as coal. Coal can be processed, usually by grinding, to improve its efficiency. Wood pellets improve

the combustion characteristics and the friability of the wood so that they can be ground and co-fired with coal.

Wood pellets have several desirable features for co-firing with coal. By removing most of the moisture from the wood, wood pellets burn much like coal. The pellets are a consistent product, of a specific diameter and a range of lengths. They have a hard outer surface which makes handling them similar to coal. They are also friable like coal, that is, they break into small particles when processed. That means that they can be mixed with the coal without the need for a separate system.

Depending upon the type of coal boiler, wood pellets can be fed into it in a couple of ways. In some cases, such as a fluidized bed boiler, the wood pellets can be fed with the coal through the same feeder system. In other cases, such as for some stoker coal boilers, a separate storage and injection system is required. The calorific value of Pellets (average value) is 4.500 kwh/ton.

**European Commission supports the development of solid biofuels market for heating purposes?** Here below some inputs about pellets utilization and state of art of Policy in Europe.

#### **Recomendations for policies at EU level**

Directive 2004/8/EC: The RES directive is a key step forward for renewable heat in Europe. For the first time renewable heat is considered within the European targets as well as in the national targets.

National renewable actions plans have to be developed and it is certain that member states will realize the importance to address the huge heat market covering roughly 50 % of the final energy consumption. Introducing minimum shares of renewable in new houses and certification of heat installers are “key features” in this directive. The following topics are highlighted here below:

- Interim targets should be mandatory to ensure full commitment of the member states from the beginning.
- Guidelines for national actions plans should be as precise as possible to ensure that the heat market is not neglected.
- When planning heat installations in industrial and residential areas, the use of renewable energy for heat should be mandatory.

#### **Quality of national action plans**

In order to enhance the quality of national action plans with respect to developing the heat sector and the use of pellets as fuel in particular the Commission could initiate a road show addressing national policy makers and supply them with examples of good and successful policies.

A very important instrument is also the briefing of policy makers about the direct impacts of policy measures and the costs/benefits of different policy measures. It is of great interest to offer this kind of information in an understandable way.

#### **Labeling schemes for heating devices**

The labeling of household devices has been a great success in terms of transforming markets towards more efficient appliances. It should be implemented in a similar way for biomass heating devices. It is fundamental, that the labelling scheme is specific for the different types of heating devices such as pellet stoves, pellet boilers, etc. Both efficiency and emission levels of appliances should be considered in labelling schemes.

### **EU certified professional education schemes**

Similar to the European Computing Drivers License ECDL that has become a widely accepted standard it should be considered to establish a “EU biomass heating drivers licence” for installers, that makes sure that all key issues for the efficient installation and operation of biomass heating systems are known. [See, Directive 2009/28/Ec ff The European Parliament and of the Council Of 23 April 2009 on the Promotion Of The Use of energy from renewable sources - Annex IV certification of installers]

### **Cooperation programs with countries with high biomass potential**

In the medium term European biomass resources may need to be complemented with biomass resources from countries with high production potential in terms of climate and available land. In view of already visible trends towards resource nationalism access to such sources can only be secured by long term policies of cooperation that establish mutual benefits.

Important will be the assurance that imported biomass is produced in a sustainable way. Therefore there is a need of certification schemes which are easy to use, effective and affordable in order to guarantee an environmentally sound production chain of pellets, whatever its origin (imported or locally produced).

Experiences have been gained in the last years by power producers on certification of pellets. It includes traceability of the pellets along the production and transport chain. Several sustainability criteria have been taken into account like forest management, local environmental impacts of the pellets production plants, and even energy and CO<sub>2</sub> balances (for which the Belgian and Dutch system is particularly advanced). [Source: Pellet Road Map, 2009, Aebiom]

### **Target Groups and Key Actors**

The first action will consist in the involvement of appropriate stakeholders.

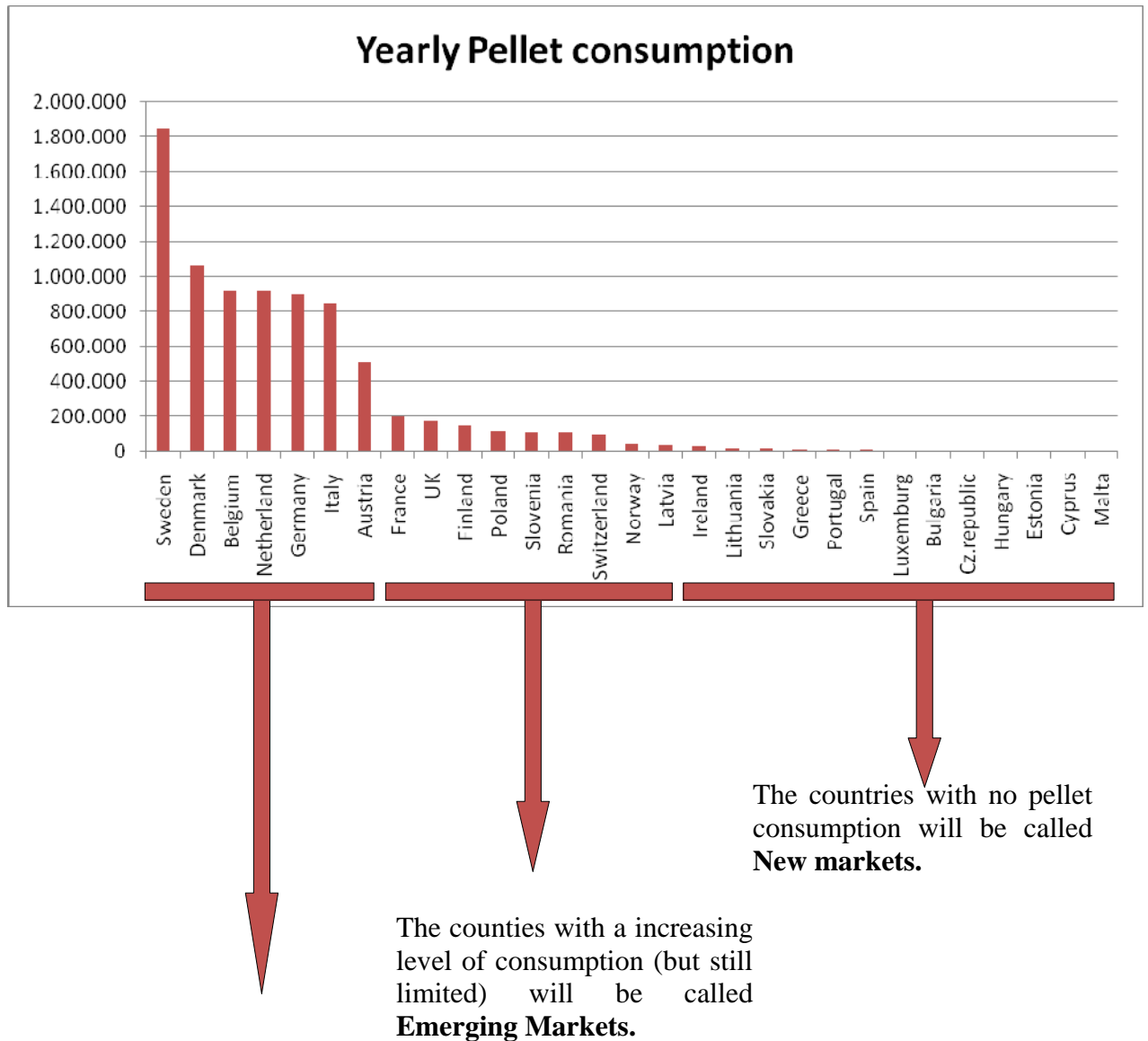
- Industries, especially those that are covered by the EU ETS and so constrained by the National Allocation Plan, with a cap on their greenhouse gas emissions;
- Power plants, especially with coal (always Kyoto-constrained), where co-firing of biomass (especially with pellets) is relatively easy and cheap;
- Farmers and their organisations; convincing, matching with technology providers and enterprises that can collect and chip/pelletize the biomass locally,
- Technology providers and financial institutes that will co-operate in the assistance to the core and secondary target group. It is expected that commercial interest will be their driver.
- News media and Scientific organisations (for standards),
- Policy makers; voluntary agreements, explaining the benefit of local job creation, compliance to the EU targets and energy independency.

The core group can influence the following stakeholder in several ways. The driver for the core group to contribute is the large scale that they want to reach together; without this it will be difficult for the single actor to reach success.

Here below the graphic represents the 2009 situation in Europe concerning the yearly utilization of pellets for the heating purposes. Specific recommendation for the development

of the European market are given, starting from the countries with an inexistent market until the definition of recommendations for developed countries.

A provisional classification of EU markets of pellets has already been done in previous Deliverable 7.2. Anyway the scenario is well represented from these classes and specific recommendation can be given to investigated markets.



The counties with a relevant level of pellets consumption will be called **Developed markets**

Graphic 5: Yearly pellets consumption in Europe



## 1 - To promote biofuels and the benefits related to its utilization.

To explain to population the environmental benefits related to pellets and the differences with the utilization of traditional wood logs, emphasizing the high efficiency of modern stoves. The strongest benefits related to pellets utilization can be found where natural gas piping is still missing, where traditional fuels are not available. For example Balkan and Eastern countries have a strong tradition of utilization of log wood, but not pellets. To start the conversion of old inefficient fireplaces, with high efficiency boilers, could be a reasonable solution. Also the supply chain related to pellet sector could benefit from these initiatives.

Sensible areas where no gas connection is available could be the more useful target for a first start up of pellet heating applications. These initiatives could be positively accepted from habitants, but also for municipal authorities.

Following to this it is reasonable to highlight some European Projects related to promotion of biofuels, where general information on pellets can be fund:

- [www.bio-south.com](http://www.bio-south.com) – analysis of biofuel production, production costs, availability of biomass.
- <http://www.escansa.com/propellets/propellets.htm> - stimulation of the market by installation of heating systems fuelled with pellets
- [www.pelletcentre.info](http://www.pelletcentre.info) – market analysis at EU level, to increase trading and transparency of pellets market
- [www.biohousing.eu.com/](http://www.biohousing.eu.com/) - specific technical solutions for an easy installation of pellets heating systems, trading opportunity, technology solutions
- [www.phydades.info](http://www.phydades.info) – standardization of chemical analysis methods, public database about properties of biofuels
- <http://www.eubionet.net/> - Solutions for biomass fuel market barriers and raw material availability

## 2 - To encourage governmental authorities to establish/develop the National Association of Biofuels.

New Markets rarely have a National Association of Pellets. An Association has, as natural scope, the promotion of its sector. The benefits and outputs in term of visibility and information can be diffuse. National Pellets Association are slowly becoming a reality also in New Markets. Data that could be provided from the Associations are relevant and could focus on:

- Historical data of a market: useful inputs for new investments as the trend of a pellets can be better defined;
- Quality of the product following to standards: in order to facilitate the trading of the product;
- Costs of biofuels and comparison with traditional fuels: profitability is the main benefits for the final users;
- Availability of pellet during all the year;
- Secure information about producers (number, contacts, production capacity, etc).



**3 - To use and develop the richness related to the supply chain of raw material for local workers, and, to increase the infrastructural optimization of the supply chain in order to establish secure supply by private companies.**

The supply chain connected with pellets, foreseen various phases:

- Collection of residues (local forestry operators, owners, managers)
- Transportation to pellet plants (technical operators, forwarders, etc)
- Transformation of residues into pellets (pellettizers equipment supplier, technicians, OM workers);
- Delivery of the product to traders or retailers.

Each of these phases creates richness among local populations and private companies be economy scales. These positive results are not related to the method of supply of raw material, in fact any country make the most profitable choice, depending on natural availability, prices, market values of the specific raw material), but to the open range of interest related to this business.

**4 - Financial support is a relevant parameters in order to increase the utilization of the biofuels.**

Biofuels utilization is a good objective to achieve, but their utilization is strongly related to the high investment cost of the stoves and boilers. A financial support can facilitate in a relevant way the diffusion of biofuels and related machineries.

The governmental authorities are the main decision maker in this contest and their effort (financial facilitations and other initiatives) is needed and recommended. Normally financial support permit a domino effect in term of number of stoves sold, in the following years.

The governmental authorities should maintain a financial support for capital investment, but also the feed in tariff for green electricity production. Some positive example of national strategy are listed here below. For example:

- **Germany:** support measures included reduced VAT rates on wood fuels (7 % instead of 19 %) and several information portals on renewables in general. The legal framework for wood heating is provided by the German Law for the protection against harmful effects on the environment (BImSchG). According to this law, small-scale heating installations do not need special approval. If units are operated with regular fuels, including wood pellets, approval is not necessary for units up to 1000 kW. In case other fuels (e.g. straw) are used, units need approval above the size of 100 kW.
- **Belgium:** Federal tax reductions and a grant system in Wallonia promote the development of this sector which was insignificant in 2006 and grew strongly, especially in 2008. Further growth can be expected especially in the pellet stove sector.
- **Finland:** The competitiveness of pellets is significantly dependent on taxation. The Finnish energy taxation system favors wood fuels since 1998. Contrary to the combustion of fossil fuels and peat, no energy tax is levied on the combustion of wood. About 78 % (in 2006) of the raw wood import to Finland is coming from Russia. But the trend is changing. Russia is planning to develop more its own wood

industry and is using a special program for export duties for round wood in 2007-2011 to finance the process and consequently, the price will rise by 80 %.

- **Italy:** until 2011 will be possible to deduct the 55% of investment cost of heating plant fuelled with pellets - for the following 5 years the nominal share of 11% can be deduct from the national taxation called IRPEF. This initiative is included in the Energy Efficiency measure foreseen from the government.

## **5 - To support the market share that these countries have reached and to increase the production capacity of pellet sector.**

This can be done analyzing the propensity of these countries to the utilization of renewable energies and biofuels. Normally the trend of biofuels is indirectly related to the availability of traditional fuels. Moreover with few exception, the new markets show that their production level is very close to their maximum production capacity (the only exceptions are Latvia, Czeck Republic and Portugal). New investments in this sector are required in order to increase the national market especially for country like Greece and Lithuania. Another parameter that need to be considered is the appropriate storage capacity of a production plant, avoiding to stop the production for technical reasons.

## **6 - To create a common platform of acknowledgement between operators in biofuels sector for New Markets.**

The production of solid biofuels increased a lot in all European countries, in the past ten years. New European Members are becoming big exporter/trader of biomass fuels and they will also become big users, soon. Even if production, technology and Market seem well developed everywhere in Europe, there are still some substantial deficiencies in many countries.

Available and precise information on biomass fuels and ashes is a necessary condition for a rapid penetration of biomass as sustainable fuels in all the European Countries.

The scope of the European Projects named Phydades ([www.phydades.info](http://www.phydades.info)) is to strengthen the knowledge about analysis methods for solid biofuels “standardised by CEN” in European countries, especially new member states.

Initiatives of high profile, as the ones we just mentioned, are very positive for the development of these countries which, in few years, could become relevant actors in European pellet market.

Since January 2010, the “Training material for laboratory technicians related to characterization of biofuels” is available on the Phydades webpage in various languages.

## **7 – The renewal of district heating (Biomass Action Plan)**

The Commission urges the Council to agree to its proposal to add the supply of district heating to the list of goods and services to which Member States may apply a reduced rate of VAT. It would then recommend Member States to extend to district heating any reduced VAT rate already applied to natural gas or electricity. In combined heat and power plants, biomass can provide heat and electricity at the same time. The Commission encourages Member States to take this double dividend into account in their support systems. DH are a primarily goal for New markets.

The optimum results reached from Developed markets, showed that the pellet sector is well managed from private and public stakeholders. DH in these countries are diffuse and it is reasonable to see a strong relation between these two aspects.

Many projects focused their effort on DH during these years, today many useful instruments for DH installation are available. On behalf on European Project named Biohousing, a Guide for connecting several houses to a micro heating network, is available on the project website: [www.biohousing.eu.com](http://www.biohousing.eu.com). The guide provide information on technology, economic environmental benefits, barriers, crucial aspect related to installation of DH.

## 8 - The production should follow a specific standard for the quality of pellets.

All these countries have already developed a national standard or at least a certification concerning the quality of pellet. Many Countries still need to increase their qualitative production, even if quality and certification is becoming an hot topic among the world, as the big trading is still connected to these parameters. Here below the figure show the Din Plus certification map.

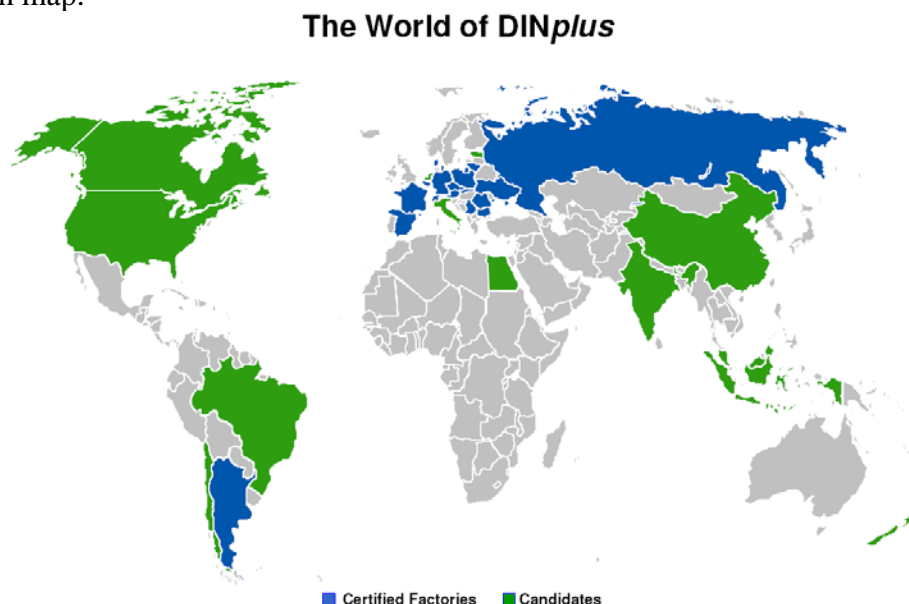


Figure 2: map of DIN Plus certification among the world

## 9 - Large scale Utilities.

A common characteristic of Developed Markets (with the exception of Italy) is that they have some large scale consumer in their markets. This fact is positive for pellet sector as a constant demand of pellets facilitate the work of pellets producers. Moreover DH and co-firing in big plants fuelled with pellets are a good promotion for the bioenergy sector as the good energetic property of this fuels are clear for all the population. Some positive example of national strategy are listed here below. For example here below some details of large scale utilities:

- Belgium:** The Green Certificate Scheme in Belgium contributed to stimulating the demand for solid biofuels, including pellets, for electricity generation in (co)combustion in Belgium which is largely satisfied by pellet imports (*Sources: Barel C., ADEME, France, Pellets@las country report Belgium, August 2009*). Electrabel (GDF Suez) is the major consumer of industrial wood pellets in Belgium with a large demand in Les Awirs (80 MW, 100 % biomass), 4 co-firing facilities and a number of smaller units (*Sources: [www.electrabel.be](http://www.electrabel.be) - August 2009*).

- **Denmark:** In Denmark more than half of the residential heat demand is supplied via district heating. The utilizations of wood pellets started in the district heating sector in the late 1980'es when coal fired heating plants were converted to use wood pellets. The Danish wood pellet market is one of the world largest and especially in relation to the number of inhabitants the consumption of wood pellets is significant. Strong drivers provide for wood pellets use in all sizes of combustion plants from small boilers in single family houses and small block heating centrals over medium sized district heating plants up to large power plants producing power and heat for large district heating systems.
- **Netherlands:** A large demand for wood pellets for co-firing in coal fired power plants is nowadays present in Netherland. This demand is almost exclusively caused by the so called MEP feed-in premium, which was in place between 2003-2006, and provided a subsidy of between 6-7 €t per kWh electricity produced from clean woody biomass.
- **Sweden:** In Sweden district heating is very common and is used in most cities and towns. The Swedish wood pellet market is one of the world largest and especially in relation to the number of inhabitants the consumption of wood pellets is significant. Strong drivers provide for wood pellets being used in all sizes of combustion plants from small boilers in single family houses and small heating centrals for residential houses, public service buildings and industry over medium sized district heating plants up to large power plants producing power and heat for large district heating systems. Large scale consumption of pellets takes place in large district heating plants and CHP plants. These plants reduced their consumption of fossil fuels due to energy taxes on fossil fuels. DH plants switched from combustion of oil to coal, then to pellets. The 40% of pellets demand is used by large scale users.
- **Slovenia:** Pellet consumption is relatively small in Slovenia except for one case. Two power plants are purchasing pellets to substitute charcoal. The power plants are in Trbovlje and in Sostanj and use low quality pellets for combustion. Slovenia has a great potential regarding woody biomass resulting from the abundance of forestland and the cut for woods for energetic purpose increased continuously during the last years.
- **UK:** In the UK it is estimated that the majority of pellets manufactured and imported are historically at least have been co-fired for the production of electricity. This fact is also confirmed from the high level of consumption of biomass.

Pellets manufactured in the UK are generally made from sawdust, clean waste wood (diverted from landfill) and energy crops (such as willow grown on short rotation coppice) and forest thinning.

Two different market (residential and large users) exist in UK. The first type of pellets market – high quality is used for residential sector, while the second type – industrial pellets is destined to co-firing.

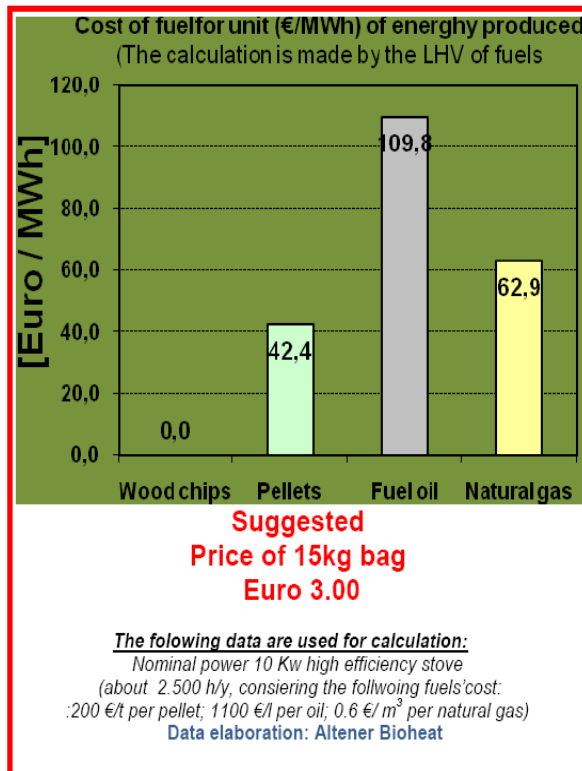
- **Italy:** the pellet market in this country is mainly formed by little stoves and by residential user. schools, hotels and some other utilities are starting to use pellet as well, but large scales utilities using pellets are still missing.

## 10 - Transparency of the market.

As last input, we believe that the transparency in the market related to information on quality and final prices for users is a crucial parameters for the final users of pellets. To force

producers to highlight the clear identification of the final cost of pellet could be an important initiative. Pellet is a biofuel and the main data to show to final users should be the profitability. The parameters of “€/kWh” should be clearly listed on the label of every pellet bag (25 kg), in order to present the economic benefits of using biofuels.

The stabilization of the market in general (quality of the product and final cost), could



facilitate a governmental support to this sector and also increase the trust of final users. This label, that is only an example of how it could be, represent a graphic. The graphic compares the costs of various fuels with a suggested prices. Practically it offers to users a clear data about what they are buying. The label could be printed client by client in any shop depending on purchase prices.

The main consideration is that energy products are a primary goods and an high level of acknowledgement is requested to any users. This label could facilitate this scope, at least in markets that requires an increase in trading and management of energy products.

Figure 3: Suggested informative label for 15 kg Bag of pellets.

## 11 - Balancing domestic production and imports (Biomass Action Plan)

Biofuels and their raw materials are traded on world markets. However, the Union has some discretion about how far to encourage domestic production or imports. The Commission prefers the balanced approach. Therefore, it will:

- 1) address the issue of amending the biofuels directive so that only biofuels whose cultivation complies with minimum sustainability standards count towards its targets;
- 2) support developing countries that wish to produce biofuels and develop their domestic markets.

Practically, to built a market on internal resources is the more adapt solution for a balanced market. If massive importation of biofuels is demonstrated, a progressive reduction of import must be foreseen. At the same time biofuels are well accepted from all the national Legislation and increase of biofuel market is still the main goal of EC. Stricter sustainability criteria will surely arrive in next years among EU countries.

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