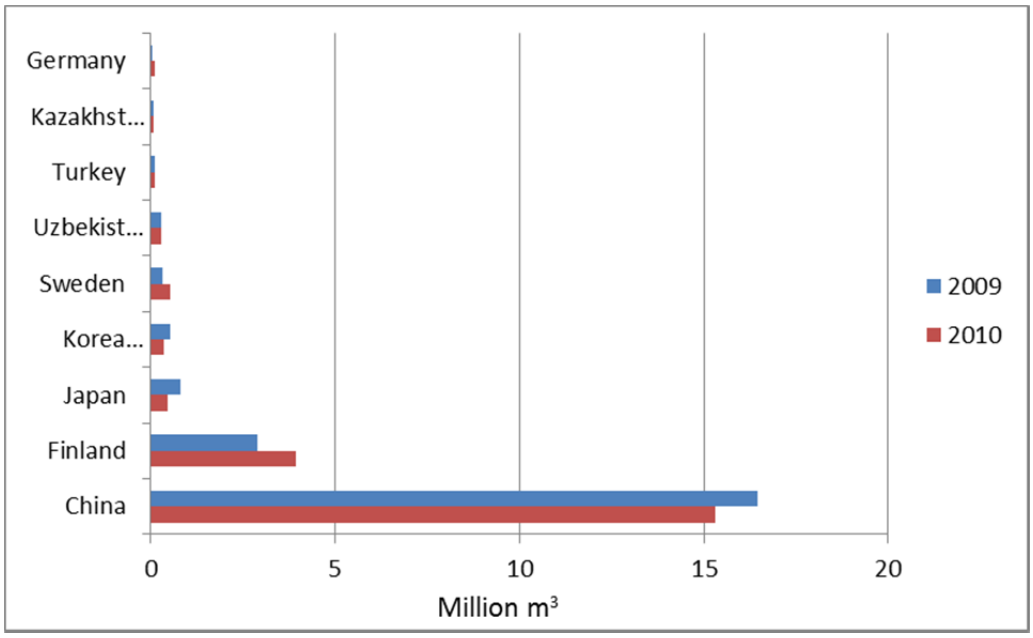
4. GLOBAL (NON-EU) REGIONS

4.1 Russia

4.1.1 Roundwood

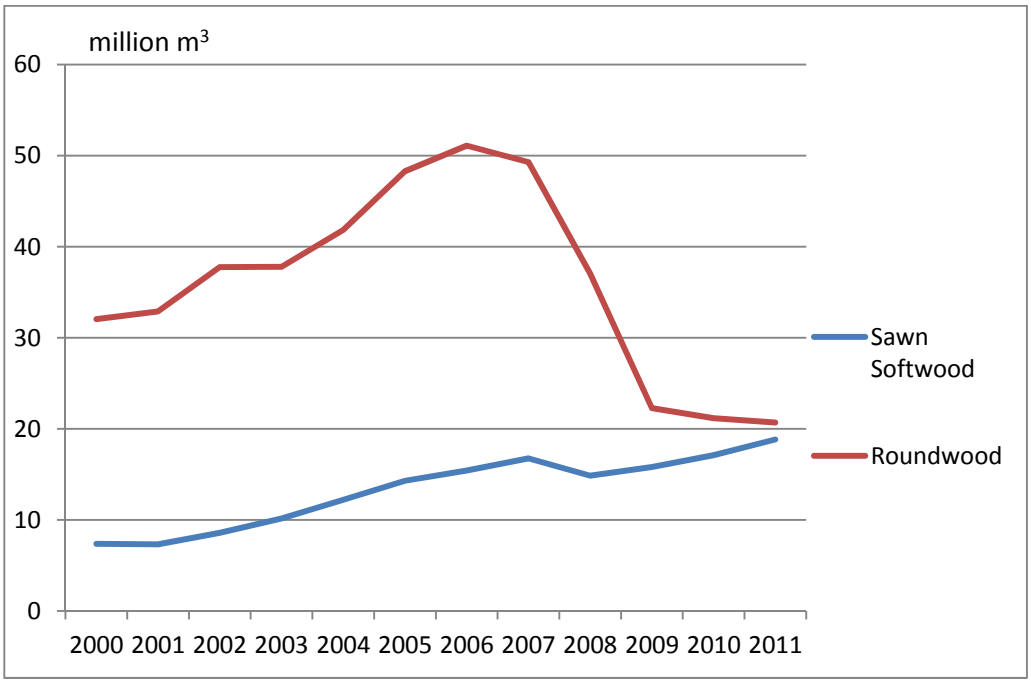
Russia has traditionally been the biggest exporter of roundwood in the world. Russia exports roundwood to Asia as well as to the EU. China is by far the biggest importer of Russian roundwood followed by Finland and Japan. Also South Korea, Sweden and Estonia have been major importers. Russian roundwood exports volume totalled to 21 million m^3 in 2011, showing a decrease of about 2% from 2009.

Figure 4.1 Russian roundwood exports by the main countries



Russia announced a log export tax in 2007. At the beginning the tax was 25% but the intention was to increase it substantially during the following years. The reason for the Russian export duties was that the Russians wanted to create their own forest industries and not be an exporter of natural resources. The idea was that foreign companies who wanted to use Russian wood should invest in Russia. However, the export duties did not result in investments in Russia, but especially European companies tried to diminish their dependence on wood import from Russia. As a result, global roundwood exports from Russia have been in sharp decline from 2006 to 2011, falling from about 51 million m^3 to 21 million m^3 during the five-year period.

Figure 4.2 Russian exports of roundwood and softwood sawnwood, 2000-2011



Russia has for 18 years negotiated to join the WTO. Between Russia and the EU one of the most difficult issues has been the export duties on wood. In 2004, they signed a bilateral agreement for certain wood categories. The partners agreed on additional categories in an exchange of letters in November 2010. Russia became a new member in the WTO in August 2012, whereupon its existing bilateral commitments with the EU became enshrined in the accession protocol.

The Russian membership will not result in a complete abolishment of the duties, but will fix the rates which the EU has previously negotiated bilaterally with Russia and the duties will at least not rise in the future. There will be an export quota (tariff reduction quota – TRQ) for pine and one for spruce. For the EU countries these quotas (3.6 million m^3 and 5.9 million m^3 respectively) will be sufficient, although it seems that the decision has changed the trend and that companies again are importing more roundwood from Russia than before. In 2011, the total export from Russia was around 24 million m^3. However, it is apparent that the import, especially to the EU, is unlikely to reach the same level as 5-10 years ago, since EU companies try to avoid being too dependent on the imported wood.

4.1.2 Recovered paper

The Russian paper and paperboard production and consumption have grown fast during the period 2000-2010. Production has grown by 3.2% and consumption by 6.2% per annum. The paper and board production was 7.3 million tonnes and consumption 6.2 million tonnes in 2010.

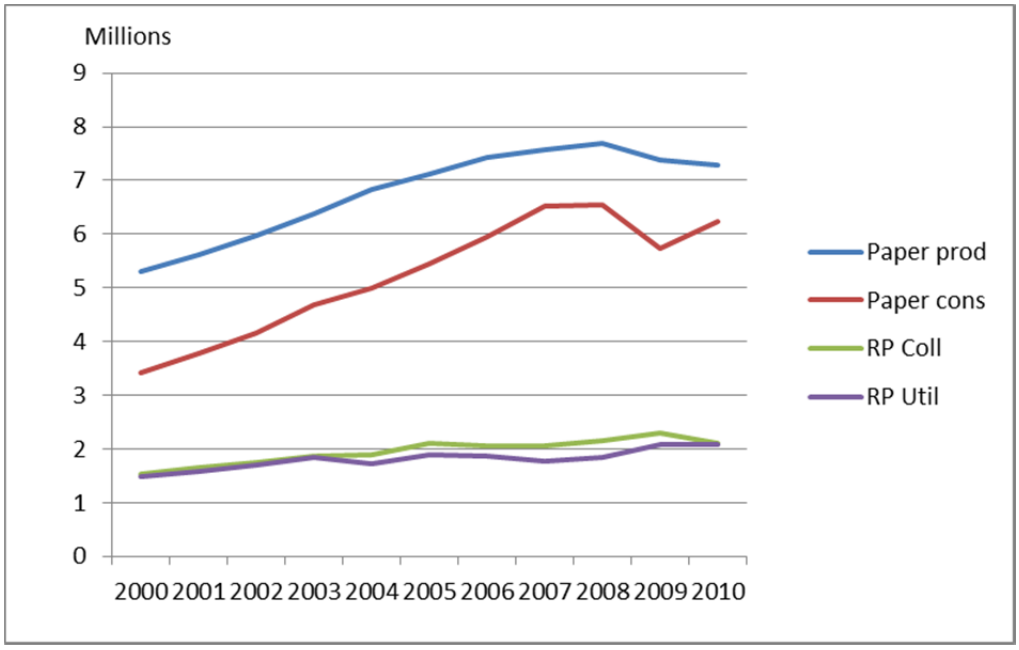
Both recovered paper collection and utilisation have grown firmly. Both recovered paper collection and utilisation were about 2.1 million tonnes in 2010. During the last

decade, the recovered paper collection volume has grown by 3.2% per annum from 1.5 million tonnes in 2000, and utilisation by 3.5% per annum.

The Russian recovered paper collection rate was 33.7% and utilisation rate 28.5% in 2010.

The recession affected paper consumption in Russia but that started to recover already the next year. The recession had no significant impact on the collection of recovered paper.

Figure 4.3 Paper and paperboard production and consumption and recovered paper collection and utilisation development in Russia 2000-2010



4.1.3 Sawnwood

Russia is in volume terms one of the top three softwood sawnwood producers in the world. According to FAO, 2011 output exceeded 29 million m^3 but this volume came mainly from the sawmills that are involved exclusively in export business. Consequently, the real production level is estimated to somewhere in a range of 35-40 million m^3.

The structure of the Russian sawmilling industry has remained rather unchanged during the last years. There has not been any massive investment to change the ranking of the largest mills. However, in June 2010, Ilim Timber successfully acquired two of Klausner Group's sawmills in Germany, as well as the brand-new Linck sawing line to be installed within the frame of modernisation of the company's plant in Ust-Ilimsk. Furthermore, the company acquired Tolleson Lumber with two sawmills in the south east U.S. in March 2011. These acquisitions can be considered as the first serious attempt by a Russian sawmilling company to expand outside the mother country's borders.

Despite the increasing domestic consumption, Russia's softwood sawnwood business is strongly export-driven. However, there has been significant change in the structure of exports. Europe used to be the dominant market but China, the Middle East, North Africa and Central Asian countries have increased their combined share to approximately two thirds of the total export volume. Furthermore, the forthcoming EU TR might have an impact on future trade flows from Russia, because of the EU requirements for verifiably legal wood and supply-chain traceability. The impact is however not expected to be significant because much of the wood is imported by big enterprises. These enterprises can be assumed to have the resources, as well as adequate network of local suppliers, to maintain credible due diligence systems. However, the EU TR is likely to make it more difficult for the SMEs to compete against the large enterprises. This disadvantage may change the composition of the actors in the market at least temporarily.

The Russian sawmill industry has for a long time been viewed to have enormous growth potential. However, there are considerable challenges in making this potential a reality. The industry continues to lag behind in product sales values relative to its competitors in several markets. This has been due to perceived product quality issues resulting mainly from outdated technology as well as differences in service levels, such as timeliness, ease of payments, and claim handling.

Furthermore, cost inflation in Russia is quite rapid relatively to the overall product sales value outlook. Softwood sawnwood prices have remained relatively flat on a the long term especially in the large well established markets. The combination of flat long-term price outlook and increasing costs eats away some of the profit margin potential of the Russian industry.

4.1.4 Wood-based panels

Plywood was the main export product, 1.4 million m^3 or 45% of the total production in 2011, by the Russia wood-based panel industry. However, as the country's economy has developed the domestic market has also gained strength. Important international events (Olympic Games, World Cup football, and the Youth Sports Games) are expected to trigger major construction works. It is therefore expected that less plywood will be exported thanks to the improvements on the domestic market. Birch is the predominant raw material, but also some spruce, pine and larch are used. In 2010 plywood production totalled to about 2.6 million m³. No new greenfield mills are known to being built up at the moment but some companies are upgrading their production facilities.

According to the Research Institute NIPIEllesprom, Russian **particleboard** production has increased by about 5% to almost 5.8 million m^3 in 2011. A great majority of the output occurs in Central and North-West regions of the country. Imports and exports have been rather equal in volume, approximately half a million m^3, during the last years. The latter is absorbed mainly by central Asian countries such as Kazakhstan and Uzbekistan, as well as Belarus. In 2011, Russian particleboard production capacity reached over seven million $m^{3,,}$ following the replacement of old production lines by five new and modern production facilities.

The majority of Russian **MDF** production occurs in the Central federal region of the country. In 2010, two new MDF mills in Siberia and Far-Eastern regions were completed, raising the total annual output to exceed one million m^3. Imports of particleboard have decreased gradually following the growth of domestic MDF-production capacity.

Russia has still no OSB production as projects in North-Western region were frozen due to the financial crisis. However, they are expected to become operational during 2012 or 2013 resulting in a production capacity of approximately 450 000 m^3 per annum.

4.1.5 Pulp and paper

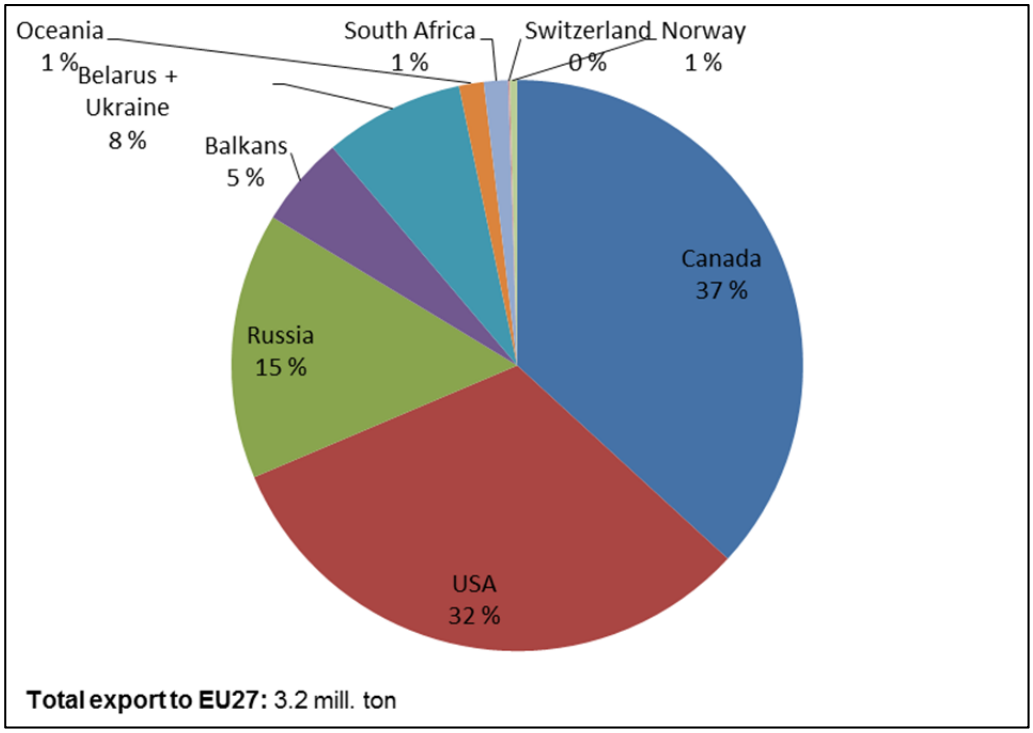
The total paper consumption grows in Russia with an average annual pace of 6.2%. The total consumption in 2010 as about 6.2 million tonnes, of which the share of newsprint was 0.6 million MT, that of printing and writing was 0.7 million MT, packaging papers and paperboards accounted for 3.6 million tonnes and tissue provided 0.2 million tonnes. The rest, 1.1 million tonnes, belonged to other paper grades.

The production clearly exceeds the consumption, being about 7.3 million tonnes and grows more slowly, by 3.2% in average. The consumption of the packaging grades grows fastest, by 7.2% per year. The total paper exports are 2.5 million tonnes, the biggest share being newsprint, with 1.4 million tonnes. Russia also exports chemical wood pulp, about half of the 4 million tonnes produced annually. The main export destinations for Russian pulp and paper products are: China (market pulp, kraft linerboard), Ireland (market pulp, kraft-linerboard), India (newsprint) and Turkey (newsprint).

4.1.6 Bio-energy

Industrial wood pellets are traded from Russia to Sweden, Denmark, the Netherlands, Belgium and UK and are mainly intended for large scale industrial utilisation such as co-combustion with other biofuels in medium to large-scale CHP plants. Russia is a very important source of pellets for the EU area (Figure 4.4).

Figure 4.4 Shares of wood pellet exports to EU-27 from outside EU in 2011



4.2 South America, especially Brazil

4.2.1 Roundwood

Brazil is a vast country and there are regional differences as regards its forests. Natural, tropical forests are mainly in the northern parts of the country. Relatively small amounts of wood are harvested commercially, mainly involving family businesses for domestic wood supply. The increasing emphasis is, however, on plantations for pulpwood in the south and east of the country and Brazil has become the leading plantation country in the world. Related technology is very advanced and the country has large areas where plantations can expand, particularly onto abandoned agricultural land. However, the non-completion of the forestry code has slowed down the development. Foreign ownership of forests has also been limited.

Hardwood species accounted for almost three quarters of the total industrial roundwood harvest volume (about 140 million m^3) in 2011. Industrial harvest of softwood species (38.3 million m^3 in 2011) has decreased by approximately one million m^3 since 2000, whereas industrial harvest of hardwood species has increased by almost 30 million m^3 during the same time period.

Plantation wood is mainly targeted at the growing pulp industry, with eucalyptus being the main species grown, followed by pine. Teak plantations are gaining attraction among solid wood industries but overall are still a niche sector. However, future growing regimes are expected to include components other than pure pulp regimes.

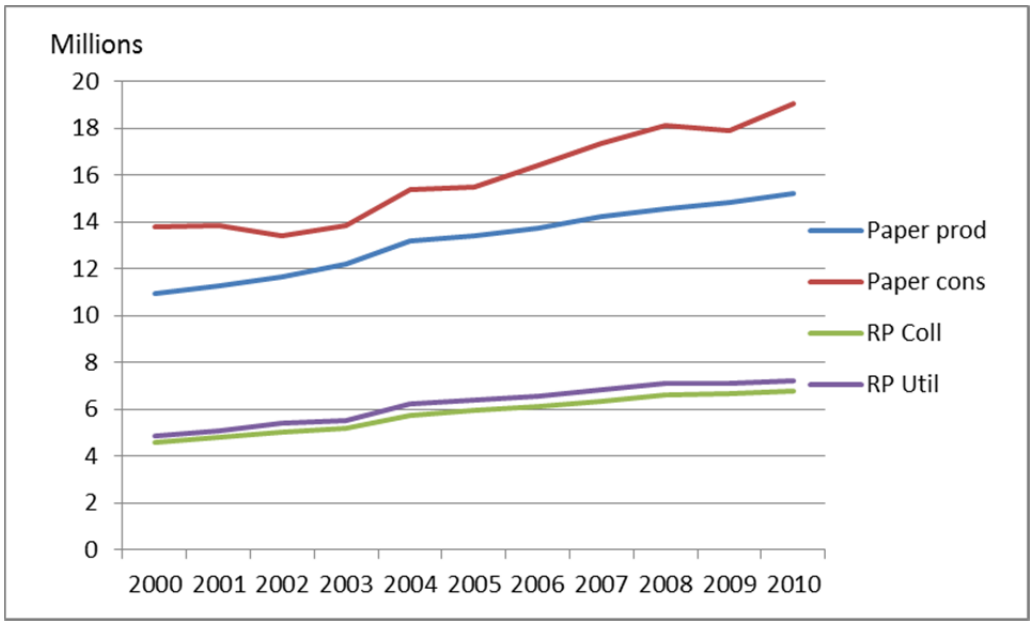
4.2.2 Recovered paper

In South America the paper and paperboard production and consumption have grown firmly during the last decade. During the period 2000–2010 both paper and paperboard production and consumption have grown by 3.3% per annum, on average. The paper and paperboard production was 15.2 million tonnes and paper and board consumption 19.0 million tonnes in 2010.

This growth in paper and board has supported positive development in recovered paper collection and utilisation. The South American recovered paper collection was 6.8 million tonnes and utilisation 7.2 million tonnes in 2010. The collection rate was 35.5% in 2010 which is only 2.5 percentage units higher than in 2000. During the last decade, 2000-2010 the recovered paper utilisation rate has grown only slightly from 44.5% to 47.7% by the end of the period. Due to fast growing paper and paperboard production and consumption growth, also recovered paper collection and utilisation volumes have grown considerably during the last decade; collection and utilisation have grown by about 4% per annum, in average. The South American region is more or less self-sufficient in recovered paper; the regional net imports of recovered paper was some 0.5 million tonnes in 2010.

The South American paper and paperboard production and consumption as well as recovered paper collection and utilisation development during the period 2000-2010 are shown in Figure 4.5. The figure shows development in the whole Latin American region excluding Mexico.

Figure 4.5 Paper and paperboard production and consumption and recovered paper collection and utilisation development in South America 2000-2010

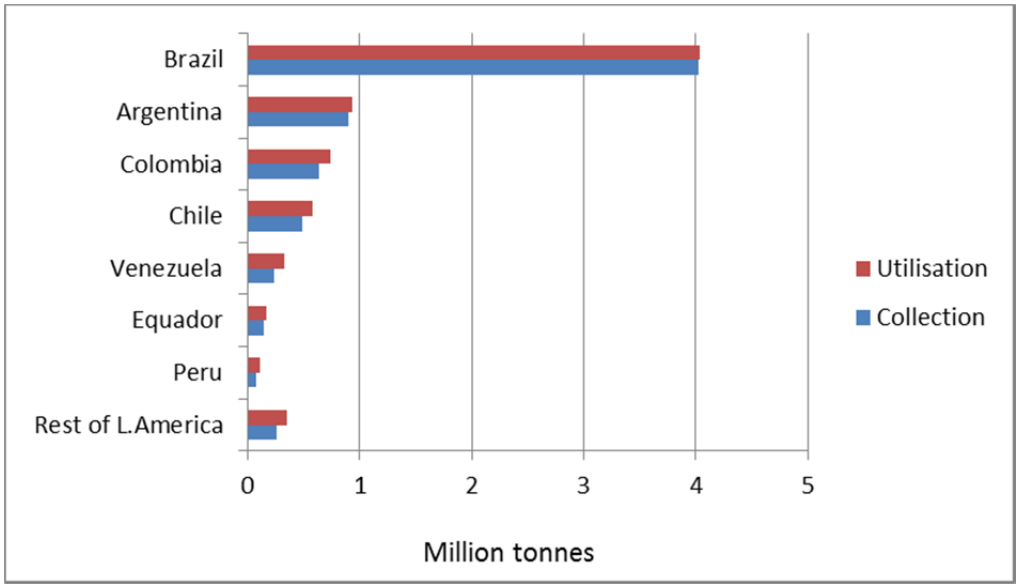


The three leading South American countries, namely Brazil, Argentina and Colombia dominate the South American recovered paper market. These three countries

represent about 85% of recovered paper collection and 83% of the recovered paper utilisation volume in South America in 2010.

Brazil is, by far the most important recovered paper collector and user in South America with about 4 million tonnes in 2010. Brazil alone represents about 60% of the total South American recovered paper collection. The country is self-sufficient in recovered paper. Both recovered paper collection and utilisation volumes have grown by about 4.4% per annum, in average, during the last decade.

Figure 4.6 Recovered paper utilisation and collection in selected South American countries 2010



4.2.3 Sawnwood

Brazil

Hardwood products dominate Brazilian sawn softwood output. It is by far the largest tropical sawn hardwood producer in South America and also globally. However, its role in the global hardwood business is relatively much more limited as exports have decreased to less than half a million m^3. Brazil's major export markets have increasingly been in China but also in the Netherlands, France and the USA. Brazil is the largest sawn softwood producer in South America, with approximately nine million m^3 per annum. The domestic market has always played an important role and its share of the total output has even increased during the last years.

Chile

Chile is the other significant sawn softwood producer in South America. Unlike in Brazil, exports which accounted for approximately 25% in 2011 have an important role. Chilean Radiata pine exporters have especially targeted the U.S. market and following the downturn in the US housing market overall sawn softwood exports from Chile have decreased from about 3.4 to 2.7 million m^3between 2005 and 2011.

4.2.4 Wood-based panels

Brazil

The Brazilian plywood industry is strongly export driven as approximately half of annual output is exported (about 1.2 million m^3 in 2011) mainly to the EU area (Germany, Belgium and the UK). Softwood plywood dominates (about 80% in 2011) total production with tropical species making the balance. The total production level has stabilised at around 2.5 million m^3 in 2011 after peaking at almost 4 million m^3 in 2004.

The Brazilian Wood Panel Industry Association (ABIPA) reports that the production and consumption (both about 3.1 million m^3) of **particleboard** rose by more than 20% in 2010. International trade is almost non-existent. Roundwood (about 80%) continues to be the main wood raw material type ahead of industrial residues (about 20%). No recovered wood is used in Brazilian particleboard production.

To meet the increasing demand, Brazilian **MDF** production progressed by almost 27% in 2010, followed by minor growth in 2011. Imports (180 00 m^3) increased (+ 12%), but they play a minor role in the overall consumption (almost 3.2 million m^3 in 2011). As for particleboard production, roundwood was the principal (80%) wood raw material and chips accounted for the balance.

Competition between wood product industries as well as land use for the production of biofuels has led to a significant increase in prices. For example, in 2010 roundwood prices were up by +29%. Moreover, the cost of resin adhesives also exploded by +45%.

Chile

Chile is also a significant player in the global **plywood** business. The annual production has almost doubled since 2005 and softwood plywood exporters are targeting both European and especially the east coast U.S. markets. A wide spread forest fire destroyed Arauco's, the leading manufacturer in the country, largest plywood mill in early 2012 but the company has already decided to rebuild a new state-of-the-art mill, with 350 000 m^3 annual output of high quality Radiate pine plywood. This investment should further improve that company's competitiveness in the global market.

4.2.5 Pulp and paper

The consumption of paper and board grows in South America almost at the same pace as the production, about 3% per year. Paper exports are growing but so are the paper imports.

Otherwise, South America has become the pulp fibre basket of the world, especially with its extremely competitive Eucalyptus fibre. The exports of chemical pulp were in 2011 2.5 times those of the year 2000. The production has doubled from 10 million tonnes to 19 million tonnes. New Eucalyptus-based pulp mills are under construction and still more of them are under development. Each of them will add some 1.5 million tonnes chemical pulp capacity to the market. Production of other pulps is minor. The big producer countries are Brazil and Chile, but Uruguay has also joined the club, including via EU companies.

Brazil

Paper and board consumption grows in Brazil 2.7% per year and the annual exports are about two million tonnes, doubling from 2000 to 2011. All exports are printing and writing grades.

Brazil produces 70% of South American pulp. The production has grown by 7.3% a year and pulp exports by 11% annually. The exports in 2010 were 8.4 million tonnes.

4.2.6 Bio-energy

South America has so far not been very important as a source of bio-energy feed stocks for Europe. The EU import has relied much on imports from North America. The situation might change in the future if Asian countries like Japan and possibly China increasingly use more biomass for energy. The distance from the west coast of Canada and the US is much shorter to Asia which might direct the flow of biomass for energy to that region instead of Europe. In that case the huge potential of South America and namely Brazil will be the likely way to balance the situation.

4.3 Asia, especially China and Malaysia

4.3.1 Roundwood

China

China is one of the few countries in the world to restrict tree harvest by means of a strict logging quota system. Thus, the harvest of both softwood and hardwood industrial roundwood have remained at almost the same levels, 60-66 and 34-38 million m^3 per annum respectively, between 2000 and 2011. There are big differences as regards the existence of existing forest resources and future demand in China. This has caused plantation to expand to challenging topographies increasing also the associated costs.

Harvesting restrictions have led to increasing roundwood imports, especially of softwood species. Softwood roundwood imports increased from about 6.5 to about 34.8 million m^3 between 2000 and 2011. Russia is by far the largest roundwood supplier with approximately 14 million m^3 volume followed by New Zealand as well as exports from North America. However, the current level is well below the peak volume reached in 2007 when exports exceeded 25 million m^3. Imports of hardwood roundwood have remained at around 10 million m^3 during the last decade. This volume is mainly supplied by the other Asian countries, such as Papua New Guinea, Solomon Islands and Malaysia. In 2010, China was the main destination of both softwood and hardwood roundwood exports from the EU-27 area. The total export of roundwood to China was 1.3 million m^3.

The pending changes of Russia's roundwood export taxes following its WTO membership might cause some serious implications for the non-EU countries, mainly China, Japan and Korea, due to the quota volumes proposed. For spruce, the non-EU quota volume of 300 000 m^3 is dramatically lower in comparison to the estimated exports (around 3.5 million m^3) during the last years. The reverse is true for pine; the quota of 12.4 million m^3 is 50% higher than recent trade volumes. This might create an issue for China, as the 13% duty on the Russian spruce log export quota could be exhausted in less than a month pushing duties on the excess back to the current 25% for the rest of the year.

Malaysia

Hardwood species dominate Malaysia's roundwood business. Malaysian tropical log production has continued to decline, dropping to 19.3 million m^3 in 2009 and 18.4 million m^3 in 2010 further to 17.2 million m^3 in 2011, and this is still less than half of the levels of the early 1990s. In 2011, approximately 20% of the industrial hardwood roundwood harvest volume was exported. Export volumes of hardwood roundwood have decreased by about 2.2 million since 2000 while the harvest has fallen by about 4.9 million m^3 during the same time period. Import volumes are insignificant.

Malaysia continued to dominate the trade in tropical logs, with 3.7 million m^3 exported in 2011, although tropical log exports had declined 14% from 2008 levels and 24% from 2007 levels. Malaysia's major log customers are all in Asia, with India accounting for over half of Malaysia's exports while China, Taiwan, Japan and the Republic of Korea accounting for about one third of the reported log-export volume.

Resource availability in natural forests has become increasingly constrained by Government policy on implementing sustainable forest management. Although the Government of Malaysia aims at doubling the plantation forest area to 500 000 ha to relieve harvesting pressures on natural forests, there has been slow progress to date towards achieving this target.

Malaysia was one of the first countries to start negotiating a VPA with the EU in 2006 but negotiations are still going on.

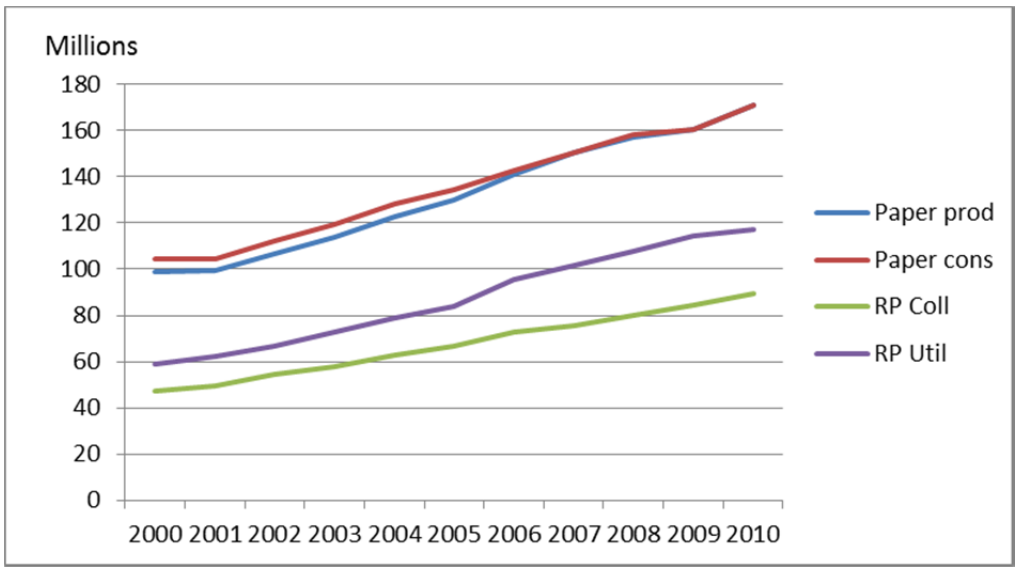
4.3.2 Recovered paper

The Asian market is growing fast. The total Asian paper and board production was 175 and consumption 181 million tonnes. During the period 2000-2010 the paper and board production has grown by 5.7% and consumption by 5.2% per annum, on average.

The recovered paper collection and utilisation have grown even faster than paper and board production. The recovered paper collection was 92 million tonnes and utilisation 120 million tonnes in 2010. Recovered paper collection has grown by 6.5% per annum and utilisation by 7.1% per annum, on average, during the period 2000-2010. The average Asian recovered paper collection rate was 51% and utilisation rate 69% in 2010.

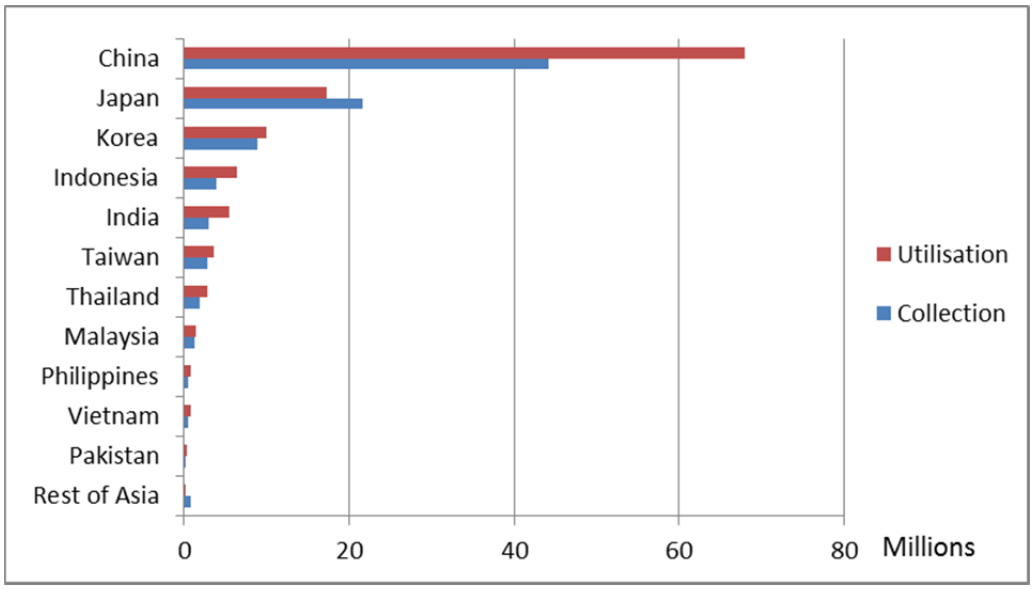
Asia imports considerable volumes of recovered paper from outside the region. About one quarter, or 23% of regionally consumed recovered paper is being imported. The Asian recovered paper net import was close to 28 million tonnes in 2010. The main sources of imported recovered paper are the USA and Europe. In fact, the Asian paper and paperboard industry would suffer severe fibre raw material shortage without imported recovered paper.

Figure 4.7 Paper and paperboard production and consumption and recovered paper collection and utilisation development in Asia and Far-East in 2000-2010



There are great differences between countries in recovered paper collection and utilisation volumes and activity.

Figure 4.8 Recovered paper utilisation and collection in selected Asia and Far East countries in 2010



China is the most important Asian country collecting and utilizing recovered paper. The recovered paper collection was 44.1 million tonnes and utilisation 67.9 million tonnes in 2010. The corresponding collection rate was 46.1% and utilisation rate 70.4%. Recovered paper is the most important paper and paperboard industry raw

material in the country. The recovered paper collection and utilisation have grown fast in the country. During the period 2000-2010 the collection volume has grown by 11% per annum and utilisation volume by 13.5% per annum, on average. The recovered paper net imports was about 25 million tonnes in 2010 corresponding 35% of the total recovered paper demand in the country.

China is the most important recovered paper using country in the world. In 2010 the Chinese recovered paper consumption was 68 million tonnes. This is about one third of the global recovered paper consumption. In 2000 China consumed 18 million tonnes of recovered paper and the share of total global consumption was about 13%.

During the same time China's recovered paper imports has grown from 5 million tonnes in 2000 to the above mentioned 25 million tonnes in 2010.

In 2000 China collected 14 million tonnes of recovered paper, which covered about 80% of the total local recovered paper demand. In 2010 China collected about 44 million tonnes of recovered paper and its self-sufficiency has reduced to 64%. During the same period China's recovered paper collection rate has grown moderately from 37% in 2000 to 46% in 2010. One reason for the low collection activity relates to low per capita paper and board consumption, other uses outside paper industry, as well as on the fact that great volume of local paper consumption (especially packaging grades) are being exported to outside the country together with traded products. In fact, these volumes cannot be collected in China.

In fact, China with its ever increasing recovered paper demand and its difficulties to increase collection volumes in short term as well as its actions in recovered paper import markets has great effect on global recovered paper trade and prices. It can be assumed that China will continue to be dependent on global recovered paper purchases also in the future.

The main recovered paper sources are the US, Europe and Japan. The great number of empty paperboard packaging containers, waiting for back hauling to China in Europe and the US, offers a good means of recovered paper transport.

China's paper companies secure supplies with an active buying policy, as well as launching collection companies in sourcing countries. A good example of this development is Nine Dragons in the US with its own collection organisation in North America.

China is a very quality and price-sensitive buyer. This fact together with large recovered paper storage facilities to cover even several months' need also has in turn an effect on market prices. The Chinese buyers tend to fill their storages during periods of low market prices. Many European recovered paper buyers who rely on "just on time" systems have to buy recovered paper also during the peak periods of price fluctuation.

Japan is the second biggest Asian country in recovered paper collection and utilisation, in volume. The recovered paper collection was 21.6 million tonnes and utilisation 17.3 million tonnes in 2010. Globally, Japan is the leading country in collection activity with a collection rate of 78% in 2010. During the same year the recovered paper utilisation rate was 63%. Japan is a net exporter of recovered paper. In 2010 the recovered paper net exports were 4.4 million tonnes and about 80% of this volume was delivered to China.

Due to already high recovered paper collection and utilisation activity as well as stagnated paper and paperboard production and consumption growth, the Japanese collection and utilisation volumes have not changed considerably during the last decade. During the period 2000-2010 the recovered paper collection volumes have grown by 1.7% per annum and utilisation volumes have decreased by 0.5% per annum, on average.

Malaysian paper and board production was 1.6 million tonnes and consumption 3.6 million tonnes in 2010. Both the production and consumption have grown fast during the last decade; production by 3.1% per annum and consumption by about 5.0% per annum, in average. The utilisation of recovered paper in paper and paperboard production was 1.4 million with high utilisation rate of 86% in 2010. During the same year the recovered paper collection was 1.2 million tonnes with a collection rate of 33%. The Malaysian net imports of recovered paper was 0.2 million tonnes in 2010.

4.3.3 Sawnwood

China

The two most significant sawnwood business countries in Asia have witnessed different development paths during the last decade. Strongly emerging China has surpassed mature Japan as the leading country in Asia. According to FAO, hardwood species still dominate (about 60%) the Chinese sawnwood production, which totalled almost 45 million m^3 in 2011. Both industries are very fragmented with small labour intensive companies scattered around the country. Sawnwood exports do not have significant role in the business.

Softwood sawnwood imports dominate the overall sawnwood imports in China. They have grown from about 2.6 million m^3 in 2005 to over 16 million m^3 in 2011. In 2009 China's import volume exceeded the one of Japan's for the very first time. Russia and Canada are by far the largest suppliers with pine products accounting for approximately three quarters of the total softwood import volume.

2011 imports of hardwood sawnwood (about 7.4 million m^3 according to FAO) exceeded the pre-economic downturn levels (about 5.1 million m^3 in 2005). The US is the largest supplier with oak being the main exported species. Russia is the second largest supplier with approximately half a million m^3 volume. Germany (100 000 m^3) and Romania (70 000 m^3) were the leading European exporters focusing on beech products.

Japan

Like domestic output, that suffers from the outdated and uncompetitive sawmill industry, sawn softwood imports to Japan have decreased gradually during the last decade. However, 2011 imports (6.8 million m^3) showed an increase in comparison to the previous year. Japan is a traditional high-end market and important export destination for Nordic suppliers and Russians, as well as West-coast North Americans.

Malaysia

Malaysia, previously the largest tropical sawnwood exporter, recorded exports of 1.9 million m^3 in 2009, down by 23% from the previous year. Malaysia has rather diverse market destinations but a number of those markets are in the EU (the Netherlands, Italy, and France) and the US, all of which have experienced significant

market downturns. Exports to all major export destinations in 2011 declined 22% compared to 2010 and totalled to approximately 2.2 million m^3 and almost reaching pre-crisis levels.

4.3.4 Wood-based panels

Most of the plywood manufactured in the Asia-Pacific area is used within the area. Plywood is also exported e.g. to the Middle East, the US and Europe. The Asian plywood production is based on the use of tropical wood species, such as Meranti and Keruing, as raw materials. The use of small-diameter plantation trees, such as Acacia and Albizzia, is increasing. Various pine and Eucalyptus species are used for plywood in the Pacific area. Plantation forests play an increasingly important role also in China and South-East Asia.

China

The Chinese **plywood** production continues to be on a strong upwards path. Despite the global crisis and lower construction activity, the Chinese plywood industry continued to grow in 2010 and 2011. A majority (about 60%) of the Chinese plywood is poplar plywood, while Eucalyptus plywood has a share of about 20%, softwood plywood for 10% and tropical plywood accounts for another 10 per cent. There are about 6 000 plywood companies and approximately 5 500 of those companies produce less than 10 000 m^3 annually.

Chinese exports of plywood peaked in 2007 but decreased sharply in 2008 (-18%) and again in 2009 (-22%). The Chinese authorities increased again the export rebate from 5% to 9% from 1 December 2008 onwards in order to prevent exports from deteriorating further. Most of the plywood has been exported to North America and the European Union, accounting for 20% and 18% of the overall Chinese exports, respectively. In 2011, the exports increased with 27%. It is expected that the export will increase a further 21% in 2012.

There continued to be concerns about Chinese tropical plywood quality although some improvements in core composition have been evident. The EU had decided to retain anti-dumping duties on Chinese Okoumé-faced plywood, even as production of Okoumé plywood has become uncertain following the decision by Gabon to limit Okoumé log exports.

Chinese **MDF** business has witnessed a dramatic growth over the last decade – the 2011 output approached 44.6 million m^3, while it was only about 18.5 million m^3 (FAO STATS) in 2005. The expansion occurred at a time when China already faced an MDF overcapacity as investors rushed to enter the MDF industry sensing quick profitability. Competition has grown fierce among the 400 or so small MDF producers that originally dominated the MDF industry. This has resulted in a takeover and merger trend as MDF producers try to increase in size to gain greater market share. Continuous presses are replacing older multi open-faced machinery.

China's furniture industry, including furniture exports, remains the major consumer of MDF, using an estimated 50% of all locally produced MDF. Flooring is the second largest consumer of MDF, using an estimated 30%. Imports of MDF are basically non-existent.

The materials supply situation as regards China's MDF industry differs in various parts of the country. While the southwest and western regions have sufficient commercial

roundwood resources, the situation along the developed east coast region where Shanghai and other major cities are located is different, as there is less forest land. MDF mills in eastern China must have their own plantation to install a MDF line. More and more companies are doing this. Eucalyptus is planted in the south and poplar trees in the north and are cut down after about five years' growth. The use of bamboo is rather limited and this trend is not expected to change in the near future.

In 2011 the Chinese **particleboard** production level stayed on the similar level as in 2010, reaching almost 13 million m^3. The significant growth in capacity (19.7 million m^3 per annum in 2011 vs. 11.5 million m^3 per annum in 2008) is driven by the domestic furniture industry which consumes basically all annual output. Imports have been steady at around half a million m^3 per annum.

Chips and sawdust were the main (about 90%) wood raw material source for both MDF and particleboard industries but according to the EPF Annual Report 2010-2011, China experienced a sharp cost increase; chips- & sawdust +40-45%, resin +30-33% and also energy about +25%.

Malaysia

Malaysia, previously the largest tropical plywood producer, has a heavily export-oriented plywood industry and plywood production follows the growth trends in its major export markets. Consequently, exports dropped by 38% between 2008 and 2009 to 2.2 million m^3, less than half the level in 2006. Nearly half of Malaysia's exports were destined for Japan and the remainder to Taiwan, the Republic of Korea, the UK and the US. The EU, particularly the UK, is an important market, and Malaysia was able to supply significant volumes of certified plywood to the EU, with small price premiums evident in the UK market. In late 2010, The Republic of Korea imposed anti-dumping duties ranging from 5% to 38% on plywood imports from Malaysia for a period up to three years. This is the first time that anti-dumping duties have been imposed on Malaysian plywood in international markets.

Malaysia's plywood mills have also been impacted by a steady reduction in log supply due to policies to achieve sustainable forest management, prolonged bad weather conditions in 2010 and robust log demand in China and India, all of which have restricted log supply to domestic plywood mills.

Plywood mills in Sarawak were reported to be operating at 70-80% capacity due to log shortages. Malaysian, as well as Indonesian, plywood producers have begun to use fast growing tropical plantation species such as *Acacia mangium* and *A. falcata*, in addition to the use of softwood core material (such *Pinus radiata*), for tropical plywood production.

MDF is the main reconstituted wood-based panel type manufactured in Malaysia. Like elsewhere in Asia, production has grown strongly during the last decade but is still at a clearly lower level than for example in China. 2010 output totalled to approximately 1.5 million m^3 of which about half was exported.

4.3.5 Pulp and paper

The paper and board demand in China has grown from the level of 41 million tonnes per year in 2000 to more than 100 million tonnes per year in 2011. China has replied to this demand by constructing scores of new paper and board machines. The

production has very closely followed the Chinese consumption: the clear policy of the Chinese government is to produce the paper in the country.

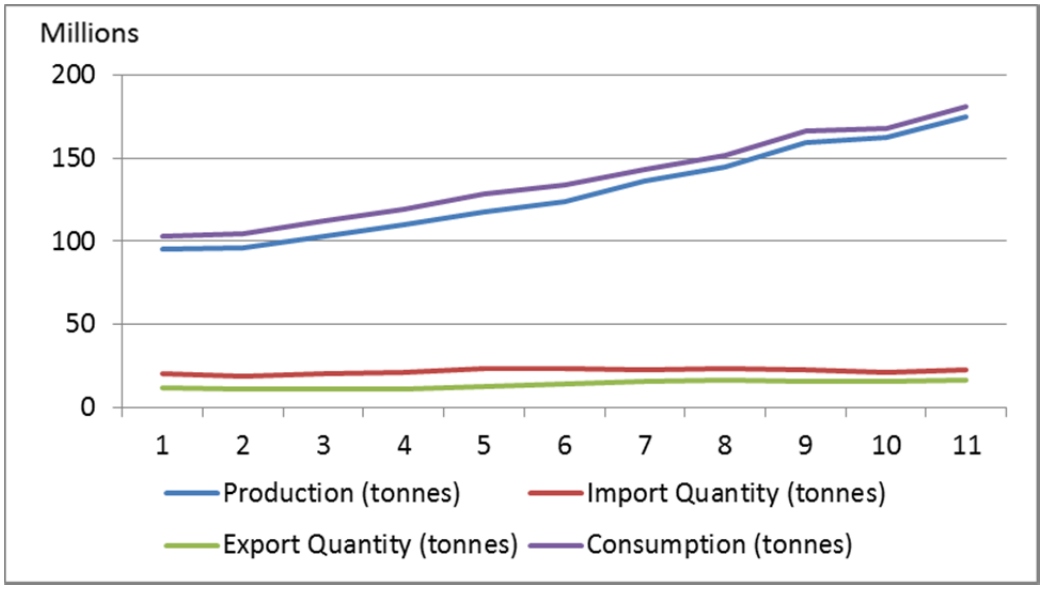
The change in China is largely responsible to the change visible in the following graph of the demand-supply of paper and board in all Asia. However, some 25 million tonnes of new paper and board capacity has been started up elsewhere in Asia, too.

The paper production has grown also in India (by 6.5 million tonnes), Indonesia (+4.5 million tonnes), Turkey (+3.8 million tonnes) and even in Thailand by 1.9 million tonnes. Converesely, the production in Japan follows the same route as other mature market like North America and Europe: its paper and board production has decreased by 4.5 million tonnes.

The total imports and exports look quite small in the graph. In reality the numbers are not that small: Asia is still a net importer with 22 million tonnes imported and 16 million tonnes exported paper and paperboard in 2010.

The change in China is largely responsible to the change visible in the following graph of the demand-supply of paper and paperboard in all Asia. However, some 25 million tonnes of new paper and paperboard capacity has been started up elsewhere in Asia, too.

Figure 4.9 Paper and Paperboard Products in Asia



Source: Faostat

China

The paper and paperboard demand has grown strongly and in all main grades in China. The share of newsprint is quite small, and its consumption turned down in 2009. The annual paper and board import volumes in 2000 were 10 million tonnes, declining to 4 million tonnes in 2010, transforming China to a net exporter.

Paper making requires fibre, and that is where imports come in picture. The imports of chemical wood pulp have increased from three million tonnes in 2000 to almost ten million tonnes in 2010.

Only one million tonnes of mechanical pulp is consumed and produced in China. However, the consumption of semi-chemical pulp has tripled during the decade and about one third of it is imported for the use in the paperboard machines.

No dissolving pulp is produced in China. Its consumption, i.e. imports, has grown fast but the consumption was still only about one million tonnes in 2010.

Malaysia

Paper consumption is growing in Malaysia with an annual rate of 6.8%. In 2010 the consumption was 3.3 million tonnes, about half of which is produced in Malaysia.

Some 150 000 tonnes of chemical pulp was produced in Malaysia in 2010, the consumption being about double that figure. An upgraded pulp mill started just in May 2012, increasing the chemical pulp production by 120 000 tonnes annually. All trade in all other pulp grades is minimal.

4.3.6 Bio-energy

China

China is rapidly gaining importance in the global wood-pellet markets. In China the pellet markets are still in an immature state. During 2010 the pellet consumption in China was about 600 000 tonnes. The most of Chinese pellets, about 85%, are based on non-wood raw materials such as agricultural residues like rice husks and bamboo sawdust. Thus the growth of the Chinese pellet industry can be expected to have small influence on the international trade flows of wood residues. There are 19 wood pellet mills in China, located close to the Eastern coast with total capacity of about 750 000 tonnes/year. In the future the Chinese consumption of pellets is estimated to reach 10 million tonnes by 2020 making China to account about 20% of the global demand. However, most of the demand will be satisfied through domestic sources, so China cannot be expected to have high interaction in intercontinental trade of wood pellets.

Other countries

In 2010 there were over 100 wood pellet mills in Japan with total production capacity of over 200 thousand tonnes annually. However, the annual production in 2009 was only about 34 000 tonnes. Two main markets for the domestic wood pellet production in Japan are residential wood stoves and small scale boilers. The use of pellets for residential stoves has almost quadrupled during 2006-2009 to around 12 000 tonnes per year, but this is still marginal in comparison to the utilisation of wood pellets for co-firing which constitutes of about 65% of the Japanese pellet consumption. Imports of wood pellets to Japan have strongly increased in recent years. Most of the wood pellets are imported from British Columbia, Canada with minor amounts from China, Vietnam and New Zealand.

There are over 20 pellet plants in South Korea; all are very small and connected to woodworking industries, using their residues. Consumption of wood pellets in South Korea is increasing. The annual amount of installed boilers has risen from 600 pcs in 2006 to about 6000 pcs in 2011. The domestic consumption in 2010 was estimated at

27 000 tonnes of which 15 000 tonnes was produced in South Korea. The imports amounted to 12 000 tonnes of the consumption. In 2010 about 20 000 tonnes of wood pellets were imported to South Korea, mainly from China, Vietnam and Malaysia. The future market of wood pellets is expected to grow due to a renewable portfolio standard introduced by the Korean government.

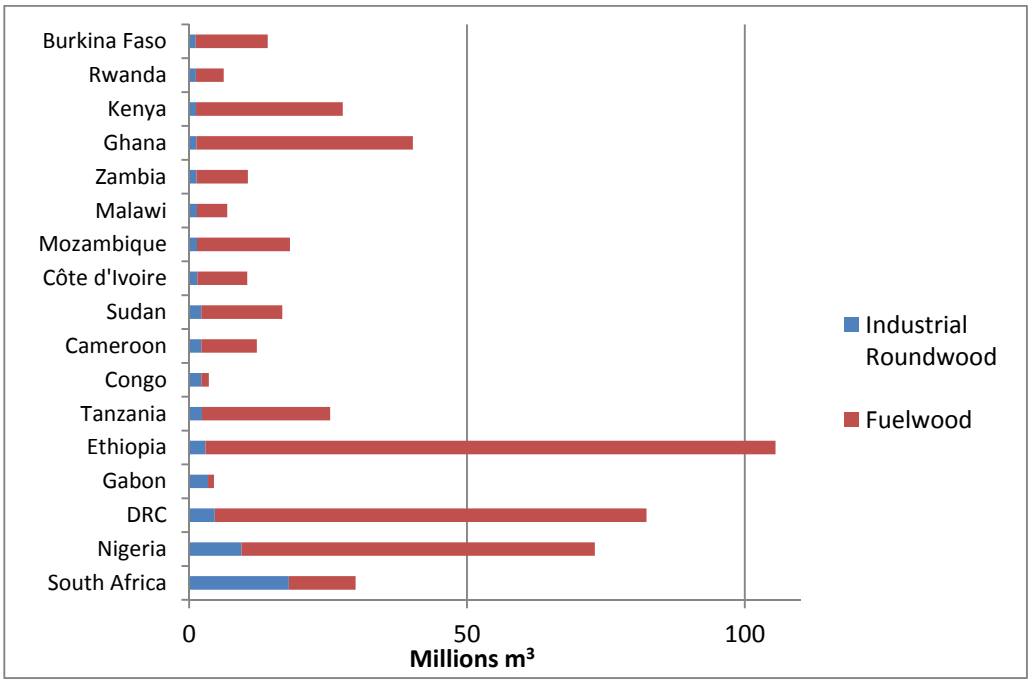
The increasing domestic consumption of pellets in China, Japan and South Korea will draw increasing amount of imports of wood pellets from Canada, namely British Columbia. In a longer time span it casts an effect on the pellet imports of EU-27. In 2011 about 2.1 million tonnes of wood pellets were shipped from Canada to EU but the share cannot be expected to grow much as increasing amount is exported to Asia.

4.4 Africa

4.4.1 Roundwood

Fuel wood harvests dominate the overall roundwood harvest activity in Africa. Only in a few countries such as South Africa, Gabon and Congo DCR the annual volume of industrial harvest exceeds the one of for fuel wood purposes.

Figure 4.10 Industrial roundwood vs. fuel wood harvest in Africa in 2011 (million m^3)



Source: FAO Statistics Division, 2012

In 2010, many African countries re-imposed log export restrictions to assist the sawmilling and other wood-processing industries to recover from the continuing downturn, assisted by some improvements in prices and demand in the EU, and some diversion of sawnwood exports to the growing markets in India and China. The implementation of the log-export ban in Gabon in 2010 was reported to have led to a decrease in availability of specialty African species such as Padouk, Ovangkol, and

Bubinga in the European market, with significant volumes of these species being processed from Gabonese logs in European sawmills.

Ghana

According to the FAO, Ghana is one of the biggest (about 42 million m^3 in 2011) roundwood harvesters in Africa. However, only a few per cent of the total annual harvest volume is for industrial use, the rest being fuel wood. Despite the considerable current harvest volumes, a significant share of the natural tropical hardwood forests has been harvested and the land converted for agricultural purposes during earlier decades.

The government started forest plantation operations but the effort was not successful. There are some teak and rubberwood plantations at the moment and the country is increasingly gaining attention from international investors. Ghana was the first country to conclude a FLEGT VPA with the EU. Negotiations on the agreement concluded in September 2008, the VPA was formally signed on 20 November 2009 and it was ratified on 19 March 2010. This and the relatively well operating general business environment, as well as recent oil and gas discoveries, have made Ghana one of the hottest interest countries in the whole of Africa.

Mozambique

The total annual roundwood harvest volume amounts to approximately 18 million m^3 in Mozambique but only less than ten per cent of the volume is for industrial purposes, the remainder going for fuel wood. Despite the poor overall national infrastructure, the country is one of the global hot spots as regards fast growing plantations. The current plantation area is still rather limited, estimated to be less than 50 000 ha, characterised by old and small plots but could reach around half a million ha in the future. The development is driven by the increasing interest by international forest funds as well as forest industry companies. One of the country's competitive factors is its good strategic location in relation to the Asian markets.

The old plantations are mostly pine whereas Eucalyptus and teak are also gaining a foothold in the new plantations. Pine and teak plantations apply mostly sawlog regime, whereas Eucalyptus plantations apply mostly pulp regimes. Forest certification is not yet wide spread but is gaining more and more attention in the face of export requirements for the EU, USA and other developed markets.

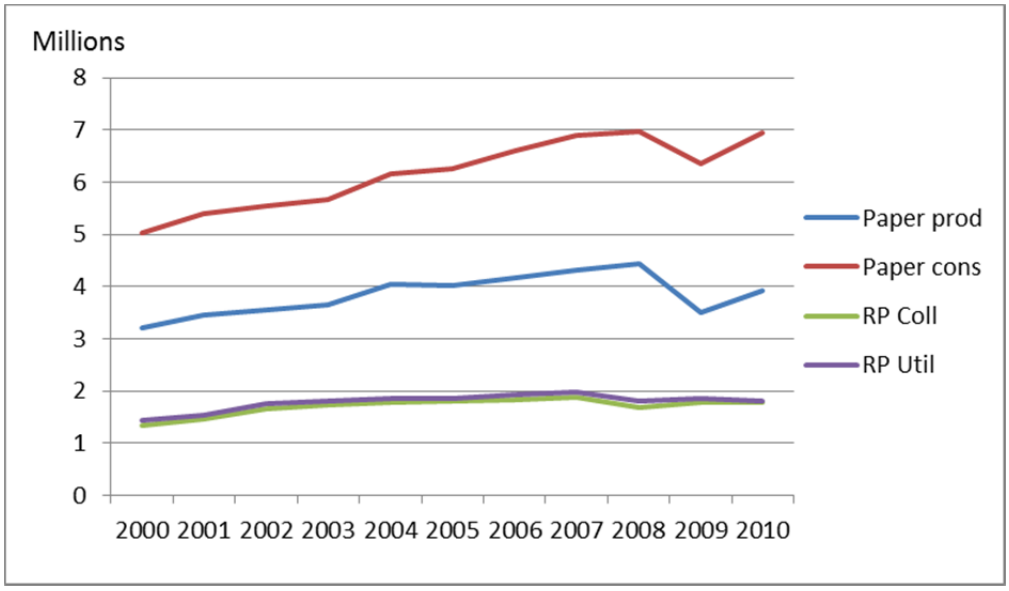
4.4.2 Recovered paper

The African paper and paperboard production was 3.9 million tonnes and consumption 6.9 million tonnes in 2010. During the last decade, during the period 2000-2010 the production has grown by 2.1% and consumption by 3.3% per annum, on average.

Both the African recovered paper collection and utilisation were about 1.8 million tonnes in 2010. The average regional collection rate was 25.5% and utilisation rate 46.1% in 2010. During the period 2000-2010 the collection volume has grown by 2.9% per annum and utilisation volume by 2.4% per annum, on average. The African development for paper and paperboard production and consumption as well as recovered paper collection and utilisation during the period 2000-2010 is shown in Figure 4.11. The following countries are included in the total for Africa: Algeria, Angola, Burundi, Cameroon, Chad, Comoros, Congo Rep. Congo Dem. Rep., Egypt, Ethiopia, Gabon, Gambia, Ghana, Kenya, Lesotho, Liberia, Libya, Mali, Mauritania,

Morocco, Mozambique, Namibia, Nigeria, Niger, Guinea-Bissau, Rwanda, Senegal, Seychelles, South-Africa, Sierra Leone, Sudan, Swaziland, Tanzania, Togo, Tunis, Tunisia, Uganda, Zaire, and Zambia

Figure 4.11 Paper and paperboard production and consumption and recovered paper collection and utilisation development in Africa 2000-2010



Source: Faostat

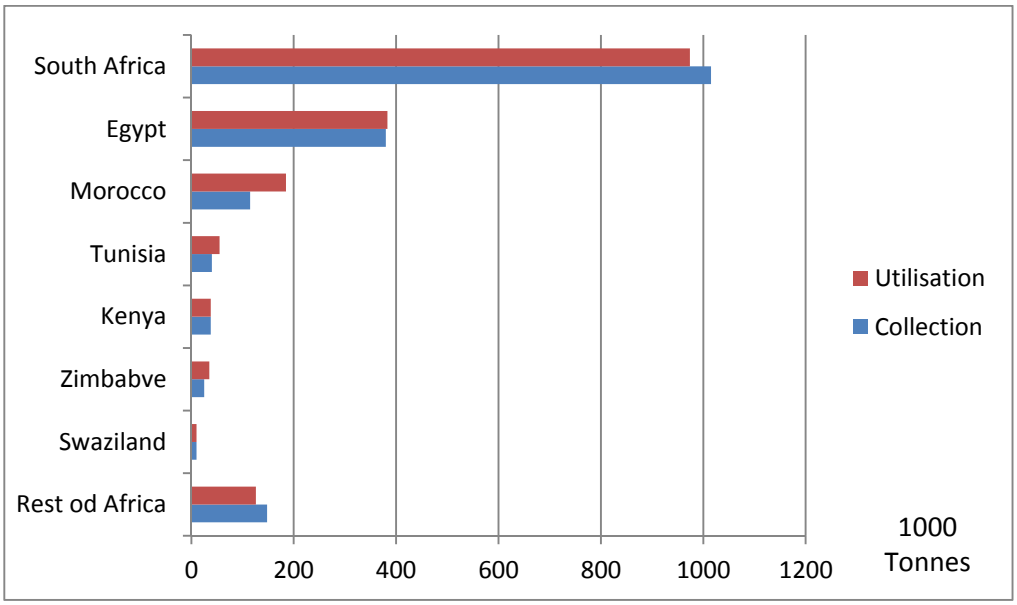
South Africa is by far the most important paper producer and consumer in Africa with 2.5 million tonnes in 2010. This corresponds to 64% of the total African paper and board production. The South African paper consumption represents about 36% of the total African consumption.

The three biggest African countries, namely South Africa, Egypt and Morocco, represent about 85% of the total African recovered paper collection. Though some African countries have large populations, the paper and recovered paper related volumes are low. E.g. Nigeria has a large population, but its paper and board consumption is estimated at only 425 000 tonnes per year and recovered paper collection at 80 000 tonnes in 2010.

Ghana has no paper and board production, except some minor tissue and egg tray production and converting utilizing domestically collected and imported recovered paper, with maximum volumes of some thousand tonnes. Total paper and board consumption is estimated at 65 000 tonnes in 2010. Recovered paper imports are about 3 000 tonnes and domestic collection of recovered paper, mainly from printing and trade sources below 1000 tonnes.

The paper and paperboard consumption in Mozambique was below 20 000 tonnes in 2010. The main share of consumed paper and board, of about 17 000 tonnes, is imported and local production and converting are only about 2 000 tonnes. The volume of annually collected recovered paper is estimated at 5 000 tonnes.

Figure 4.12 Recovered paper utilisation and collection in selected African countries in 2010



Source: Faostat

4.4.3 Sawnwood

Hardwood species dominate, making up approximately two thirds of the total, African sawnwood production. Exports of tropical hardwood products by the largest supply countries such as Nigeria (about 2 million m^3 in 2011), Cameroon (about 800 000 m^3) and Ghana (about 500 000 m^3) have the most relevant African supply role in the global sawnwood business. On the other hand, Northern African countries (Morocco, Algeria, Tunisia and Egypt) form an important outlet for global softwood sawnwood exporters. The importance of this region has increased significantly during the last couple of years as demand has weakened in many of the other major markets. South Africa is the only African country that has significant and advanced softwood sawnwood production, led by two major producers, Merensky and York Timber. Despite this fact, South Africa has increasingly been analysed as a future export market by the main global softwood sawnwood suppliers, given rising population and relative wealth.

According to the ITTO, Ghana exported approximately 170 000 m^3 of tropical sawn hardwood in 2011. The volumes have remained almost unchanged during the last decade. According to FAO, over 95% of sawnwood produced in Mozambique is sawn softwood which is mostly consumed locally.

The EU Timber Regulation is likely to impact the composition of traders importing wood-based products from Africa to Europe. Large international traders have the capacity and resources to support their suppliers in achieving reasonable due diligence (through third-party-verified mechanisms) and therefore have an advantage over smaller traders who lack the funds to construct adequate due diligence systems. This situation is likely to prevail in the absence of FLEGT licensed timber or unless the small traders manage to develop cheap and reliable due diligence systems. As a result, there is a threat of declining imports from Africa to Europe, assuming that many SME traders may find it economically unviable to comply with the EU TR, or the

African suppliers may direct their sales to less demanding consumer markets. If they export to the processing "hubs", such as China and Vietnam, which ultimately export to Europe, EU TR traceability will still be necessary. On the other hand, the EU TR provides an incentive for African countries to hurry their VPA processes (or to initiate new VPAs), and therefore in the long run, has the potential to increase wood flows to Europe. Nevertheless, in the short-term, the effect of the EU TR is likely to remain economically minor, especially considering that the imports from Africa have been relatively small in the recent past.

4.4.4 Wood-based panels

Veneer, and partly also plywood, from the main wood-based panel business in Africa. They are also the globally traded wood-based panel types. Tropical veneer exports from the African region were nearly a third of exports from all ITTO countries, with Côte d'Ivoire, Gabon and Ghana rated in the top five global exporting countries. In contrast to Malaysia, whose exports are predominantly to Asia, most of the African tropical veneer exports went to EU destinations. Therefore, the EU Timber Regulation will have an impact on future trade flows of African veneer and plywood.

Ghana's veneer and plywood production exceeded 440 000 m^3 in 2011 of which less than half was exported. The volumes have remained unchanged between 2000 and 2011.

South Africa is the only African country with a significant reconstituted panel production. 2011 output exceeded 620 000 m^3.

4.4.5 Pulp and paper

The demand of paper and paperboard in Africa was about seven million tonnes in 2010, with growth in all paper grades and by a combined 4.2% as an annual average. The annual paper consumption in Africa was 7 kg/capita in 2010, compared to the global average of 55 kg/capita. 140 million internet users have been reported in Africa, which gives a hint that advertisers might turn to e-media, even though the demand also for the publishing grades is growing at the moment. Instead, there is space for further demand growth for packaging and tissue grades.

About four million tonnes of paper and board are produced in Africa, of which 60% in South Africa. The imports in Africa have grown from two to four million tonnes from 2000 to 2010. Most of the imports are of packaging (1.8 million MT) and printing and writing grades (1.4 million MT) in 2010.

The supply and demand of chemical wood pulp match in Africa (1.5 million MT in 2010) and no major amounts of pulps need to be imported or can be exported. There is one exception: practically all 800 000 tonnes of dissolving pulp produced is exported.

Ghana

Ghana imports about 65 000 tonnes of papers and paperboard and 250 tonnes of chemical pulp. There is no production or imports of dissolving, mechanical or semi-chemical pulps.

Mozambique

There is no major demand for or production of wood pulps or papers in Mozambique yet. The local consumption of papers and paperboard is some 20 tonnes in total. As mentioned before there is an increasing interest in the potential Mozambique has regarding forestry and forest industry. But as regards pulp and paper, this would be export-oriented, at least initially.

4.4.6 Bio-energy

Whilst more than half of Africa's domestic consumption of wood is for bio-energy (cooking and heating), little wood is exported outside the continent for fuel. There may be some potential for this in the future, particularly from purpose-grown plantations. However, as any wood fuel production is likely to be a co-product of pulpwood and/or sawlog production, it is difficult to estimate potential volumes which might be available. Even then, wood fuel may be used locally or traded within Africa.

4.5 North America (Canada and the US)

4.5.1 Roundwood

Canada

Canada has faced a dramatic drop in the harvest of industrial softwood roundwood as annual volumes have decreased from 163 million m^3 in 2000 to 121 million m^3 in 2011. International trade levels has remained relatively unchanged and below 5 million m^3 per annum. The annual harvest of industrial hardwoods was around 35 million m^3 between 2000 and 2005 but has been halved since that. There are two main reasons for the lower volumes – lower domestic sawnwood production following the downturn in the US housing market and the consequences of the massive and prolonged mountain pine beetle infestation in western Canada, mainly British Columbia.

It has been ten years since the BC government released its first mountain pine beetle action plan. The epidemic has now infected and/or killed over 17.5 million ha of British Columbia's lodgepole pine forest, an area roughly double the size of Austria. BC government reports indicate that almost 60% will be killed by 2016 where after the epidemic is expected to taper off. Some wood-supply management areas have begun to see MPB-related reductions in the annual allowable cut. From the current Interior AAC of about 60 million m^3 (both public and private land), the AAC is expected to decline to about 40 million m^3 showing a massive reduction of approximately 20 million m^3.

USA

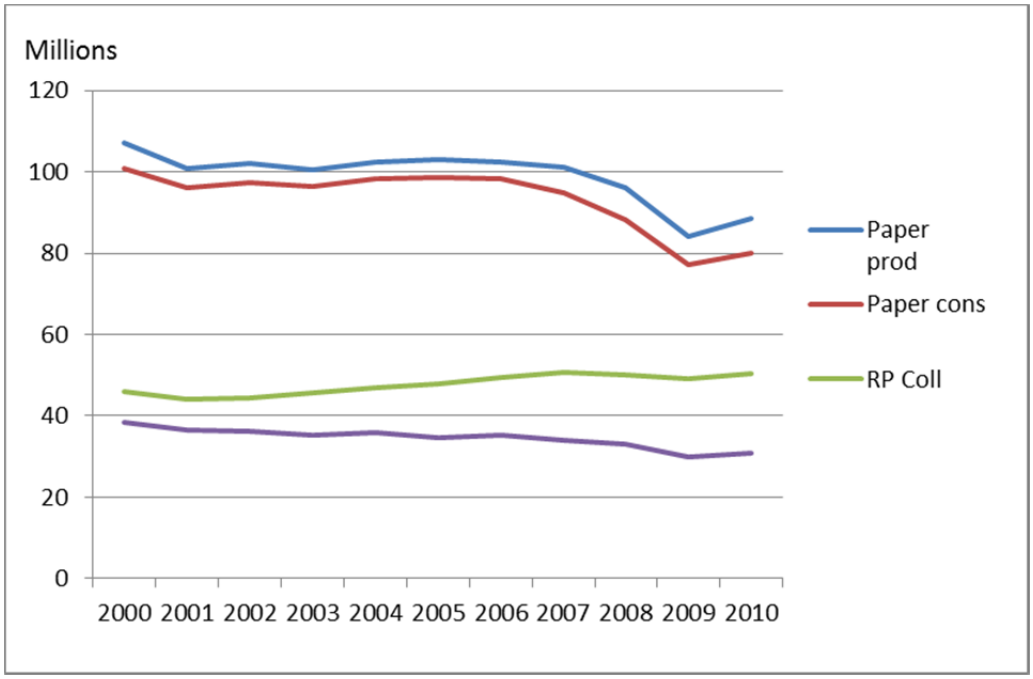
Like Canada and for the same main reason (construction slump), the annual harvest of industrial roundwood has been hit hard in the US. Harvest of industrial softwood roundwood has decreased by over 80 million m^3 between 2000 and 2011 and the harvest of industrial hardwood roundwood by almost 40 million m^3. The country is a net exporter of both softwood and hardwood roundwood, approximately 8 and 3 million m^3/a respectively, with 2000 and 2011 volumes being rather unchanged.

4.5.2 Recovered paper

North America (the US and Canada) is the leading paper and paperboard producing and consuming region. The paper and board production was 88.5 million tonnes and consumption 80 million tonnes in 2010. Both paper and board production and consumption has been declining during the period 2000-2010. The paper and paperboard production has declined in average by 1.9% per annum and consumption by 2.3% per annum during the period.

During the same period recovered paper collection has grown by 0.9% per annum from 46 million tonnes in 2000 to 50.3 million tonnes in 2010. The collection rate has grown from 45.5% in 2000 to 62.9% in 2010.
Due to the fact that recovered paper utilisation has decreased during the same period from 38.5 million tonnes in 2000 to 31 million tonnes by 2010, the North American region has increased its net exports of recovered paper from 7.5 million tonnes in 2000 to 19.4 million tonnes in 2010.

Figure 4.13 Paper and paperboard production and consumption and recovered paper collection and utilisation development in North America in 2000-2010



Source: Faostat

The US dominates the North American recovered paper collection, utilisation and net exports. The USA represents about 93% of total North America's recovered paper collection, utilisation and net exports.

4.5.3 Sawnwood

Softwood sawnwood production totalled to about 80 million m^3 in 2011. This is approximately 30 and a staggering 48 million m^3 less than in 2000 and 2005,

respectively. The U.S. housing slump is the main reason for the decline. Mill closures, reduced production and shift reductions have continued to be frequent occurrences in all major producing areas of North America. Between the peak of the housing boom in 2005 and early 2012, eighteen sawmills have closed in the interior of British Columbia alone. These closures, together with local veneer mill closures, have resulted in a reduction of approximately 12 million m^3 of annual log demand.

The imported share of the US sawn softwood consumption was about 27% in 2011 with Canada accounting for the most of this volume. Non-Canadian imports experienced further contraction – and particularly hard hit was Europe. Despite the pullback, Germany remained the largest European supplier of softwood sawnwood products followed by Sweden and the Czech Republic. Similarly, Southern Hemisphere producers reduced deliveries of appearance and industrial grade products redirecting their exports instead to other markets such as China, Southeast Asia and the Middle East.

From 1990 to 2005, exports of Canadian sawn softwood declined steadily as the consumption in North America grew towards the peak in 2005. By 2011, Canadian exports had recovered the volume of offshore exports lost over the previous 15 years. At the moment, the main offshore export markets are China, Japan, the Middle East and Taiwan.

In 2010, the production of hardwood sawnwood continued to decline in North America and totalled approximately 17 million m^3, of which about 94% occurred in the USA. However, the slide in North American sawn hardwood production set in well before the recent economic downturn. The production of sawn hardwood, having reached a peak of around 31 million m^3 in 2000, has been falling for a good decade now because of the recession and the fact that the building activities has been very low. The 25% drop in the production over the last decade, recorded for example in the UNECE/FAO statistics, may understate the true extent of the decline. Market reports published by Hardwood Review Express drawing on wide ranging interviews with sawn hardwood manufacturers both in the USA and Canada suggest that between 2006 and 2009 as much as 50% of productive capacity was temporarily or permanently idled.

4.5.4 Wood-based panels

After six years of contraction, Canadian **particleboard** production (1.7 million m^3) improved by 10% and exports (about 680 000 m^3) by 26% in 2010 although both remained at low levels. According to the Composite Panel Association, over one third of Canadian exports have traditionally gone to the US being thus highly dependent on the US housing market. CPA states that the industry continued and will continue to face significant cost increases for resin and wood.

Following several years of production decline, Canadian **MDF** production remained under the one million m^3 threshold. Exports (350 000 m^3) dropped again (-35%) and were in 2010 almost 900 000 m^3 less than in 2006. Almost half of the total export volume went to the US.

The **OSB** industry in Canada is the second largest in the world after the US. Canada traditionally exports (2.9 million m^3 in 2010) more than half of its annual production (4.4 million m^3 in 2010) and the US has accounted for approximately 90% of the exported volume.

North America is the world's biggest producer of softwood **plywood**. The region also has a considerable veneer and plywood industry utilising hardwood, hardwood, especially birch but also aspen. The market area is wide and production is strongly concentrated within major forestry industry corporations. 65% of the plywood is produced by the five largest companies. Demand for plywood is primarily driven by the US economy, particularly housing construction.

Canada's plywood production is purely softwood and totalled to around 1.5 million m^3 in 2010 which is significantly less than pre-crisis (about 2.1 million m^3 in 2007). Canada was a net importer of approximately 300 000 m^3 in 2010. The US was the main supplier accounting for two thirds of the total import volume.

As in Canada, plywood production in the US is also softwood plywood. The domestic industry has faced a dramatic drop in annual output – from about 16 million m^3 in 2005 to about 8 million m^3 in 2010.

According to the Composite Panel Association, the particleboard production in the US increased slightly in 2010 attaining about 3.9 million m^3. The production level was nevertheless well below the mid-2000s levels of over 7 million m^3. Installed particleboard capacity exceeds 8 million m^3 in the country.

MDF production contracted (-16%) third year in a row totalling to about 2.5 million m^3. Despite MDF imports declined by -30% in 2010 the US is still a net importer of approximately half a million m^3. According to EPF 2010-2011 Annual Report, the local MDF industry continues to deal with raw material shortages while pellet and other biomass production for energy are subsidised.

The total collapse of the housing market in the US in 2008 cut the demand for **OSB** by two in three years. The current production is about 9 million m^3 with installed capacity at around 15 million m^3. Imports have dropped to about 2.6 million m^3 from about 9 million m^3 in 2006. Exports increased by 70% in 2010 amounting to about 230 000 m^3, and progressed relatively better towards overseas markets in comparison to Canada and Mexico.

4.5.5 Pulp and paper

Total **paper and paper consumption** decreases in North America with a pace of 2.4% per year. The total production has decreased from 107 million tonnes in 2010 to 89 million tonnes in 2010. The demand for newsprint decreases fastest, almost 10% per year, as both the consumers and the advertisers switch from newspapers to the electronic media. Only television can compete with the internet on the advertisement dollars. Consumption of printing and writing grades decreases by 3.1% per year.

Not even the packaging grades can hold up: their consumption decreases by 1.2% as verage. Less packaging is preferred and plastic packaging competes fiercely. Only the tissue grades present some growth, by 0.7% annually, along with the ageing population.

As the paper machines are stopped, pulp production goes down simultaneously: chemical pulp by 2.2% per year, mechanical pulp by 3.1% and semi-chemical pulps by 6.5%. Only dissolving pulp demand grows, by 3.1%, but the volumes are very low: below 1 million tonnes in 2010, and don't let the pulp mills continue running.

The US

What was written about North America above also applies for the USA: 93% of the paper in North America is consumed and 85% is produced in the US.

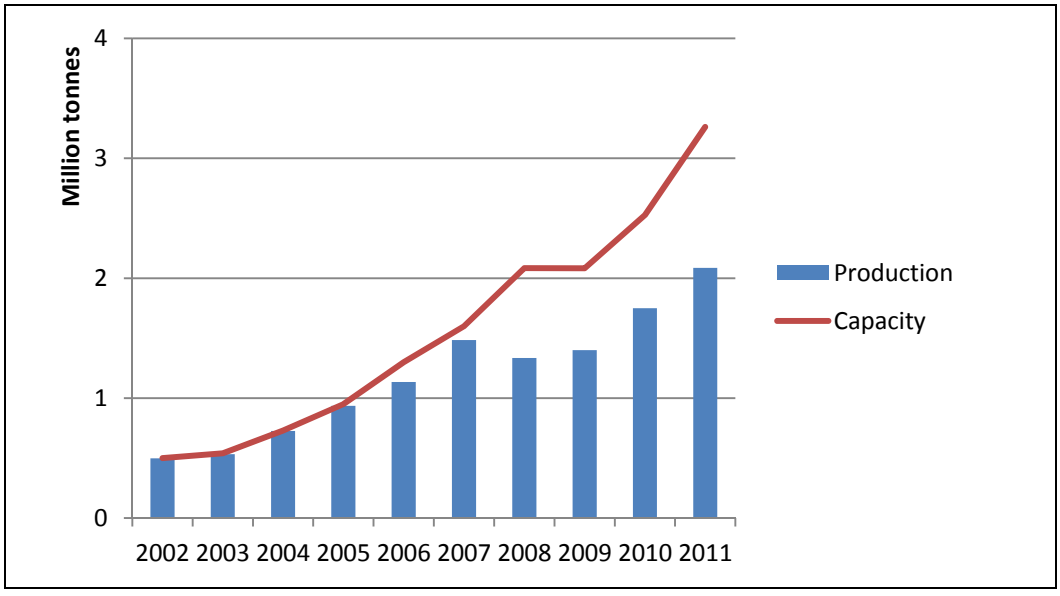
Canada

Canada's "home" market is in the US. As a consequence, turmoil in the US means turmoil in Canada. Nevertheless, paper consumption decreases also in Canada itself, by 4.6% per year. To say it in numbers, the annual paper demand in Canada has decreased from 9 million to 5.7 million tonnes. At the same time the exports have decreased by 6 million tonnes. The end result is 40% decrease in total paper and paperboard production.
Some blame the mountain pine beetle for the closing of mills and consecutive unemployment, even though its extent is limited to BC. The latest mountain pine beetle outbreak did start to develop in 1990s, but there are divergent views on whether the pine beetle or the decreasing demand of paper products in the US is the main driver of the closures.

4.5.6 Bio-energy

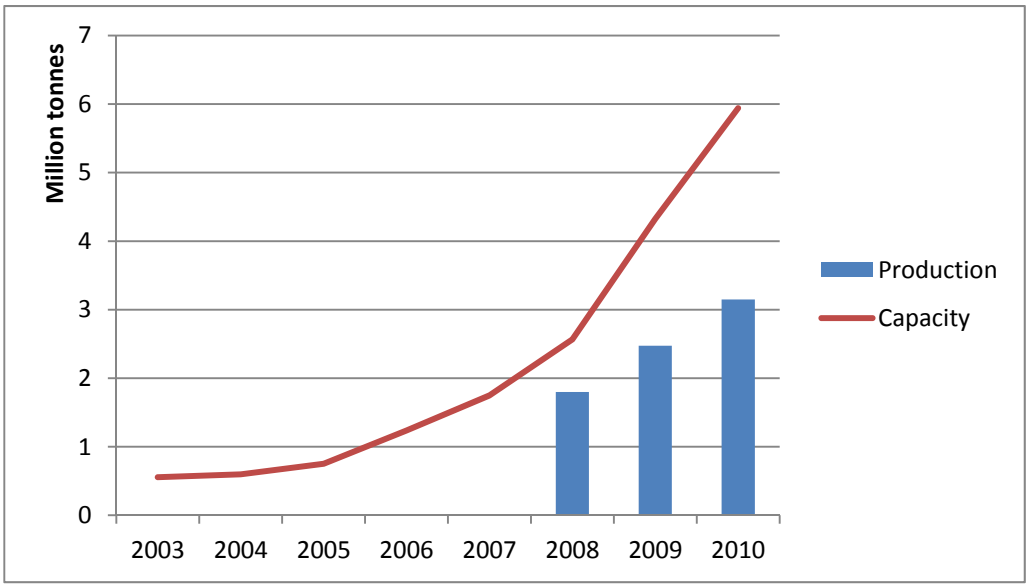
North America is by far the most important source for import of pellets to the EU. Globally imported pellets mainly from Canada and the US arrive in Belgium and the Netherlands by ship. Once there, these pellets are transported further to large-scale industrial co-combustion plants all over Europe. Capacity has been built in North America and is planned to fill the increased need for biomass in Europe.

Figure 4.14 Production and Capacity of Pellet Production in Canada



Source: IEA Bio-energy – Task 40: Sustainable International Bio-energy Trade: Global Wood Pellet Industry Market and Trade Study

Figure 4.15 Production and Capacity of Pellet Production in the US



Source: IEA Bio-energy – Task 40: Sustainable International Bio-energy Trade: Global Wood Pellet Industry Market and Trade Study; Spelter and Toth 2009, North America's Wood Pellet Sector.

During recent years there has been a huge unprecedented epidemic of Mountain Pine Beetle in British Columbia and parts of Alberta. This has increased expectations in many countries and by many stakeholders in the EU to get substantial amounts of wood for bio-energy purpose imported from Northern America. However, it is likely that little of the dead forest will be harvestable, due to logistical and cost reasons.

4.6 Main issues arising on global regions

- Russia has traditionally been the biggest exporter of roundwood in the world. Among the EU countries, imports from Russia have been extremely important especially for Finland, but also Sweden, Germany and the Baltic States have imported significant amounts of Russian roundwood. However, China is by far the biggest importer of Russian roundwood. The amount is so significant that without the Russian-Chinese trade the global roundwood trade would have been very different, and it is likely that China would have imported a lot of roundwood from Asian countries instead.

- There has been a significant decline in the Russian roundwood export volume during the last years. The Russian membership in the WTO has bound the export duties to the EU to the level previously negotiated between the EU and Russia. However, these remain significant and so the volume is not expected to increase to the same level as earlier. There will be a tariff-reduces quota (TRQ) for the imports from Russia. For the EU, this quota is big enough, but for China it might be so low that it will affect China's roundwood trade with Russia.

- The Russian softwood sawmilling and plywood industries are heavily export-oriented, but the domestic demand is expected to grow which will somewhat affect the import into the EU.

- Brazil is the leading forest plantation country in the world. Plantation wood is mainly used in the growing global pulp industry. South America has become the pulp basket of the world. The export of chemical pulp has increased 2.5 times during the last decade. Brazil produces 70% of the South American pulp.

- Brazilian sawnwood is mainly used domestically, but plywood is strongly export-driven and half of the annual output is exported, mainly to the EU area (Germany, Belgium and the UK).

- China has harvesting restrictions, including a logging quota system. This has led to increasing roundwood imports, especially of softwood species. The domestic restrictions combined with the economic growth have increased the softwood roundwood imports from 6.5 to about 24.5 million m^3 in a decade (2001-2011).

- The Asian countries import considerable volumes of recovered paper from outside the region. About one quarter of regionally consumed recovered paper is being imported from the other parts of the world especially from the EU. The Asian recovered paper net import was close to 28 million tonnes in 2010. The main sources of imported recovered paper are the USA and Europe. In fact, the Asian paper and paperboard industry would suffer severe fibre raw material shortage without imported recovered paper.

- Malaysia has a heavily export-oriented plywood industry and therefore plywood production follows the growth trends in its major export markets. The export dropped by 36% between 2006 and 2011. In the EU, Malaysian plywood is imported to the UK. In contrast to Malaysia, whose exports are predominantly to Asia, most of the African tropical veneer went to EU destinations.

- Africa is rapidly growing as an important continent for the wood-using industry. This applies both to sourcing of wood as well as to investments in forest resources and in processing industries. Most of the African tropical veneer went to EU destinations.

- Ghana was the first country to conclude a FLEGT VPA with the EU. This and the relatively well operating general business environment have made Ghana one of the hottest interest countries in the whole of Africa. Ghana currently exports roughly half of the annual veneer and plywood production of 400 000 m^3.

- Mozambique is another global hot spot with regard to fast-growing plantations, despite its overall poor national infrastructures. The current plantation area is still rather limited, estimated to be less than 50 000 ha, but could reach about half a million ha in the near future. Development there is driven by the increasing interest by international forest funds as well as forest industry companies. One of the country's competitive factors is its strategic location in relation to the Asian markets. The importance of these markets is likely to be highlighted in the future as the EU TR will make it more demanding to export wood-based products to Europe. However, the EU TR can also be expected

to catalyse the adoption of VPAs in new candidate countries and to speed up the currently on-going attempts to provide the markets with FLEGT-licenced timber. Therefore, in the long-term, Africa possesses the ingredients for an increased market share including in the European market.

5. ASSESSMENT OF REGULATORY FRAMEWORKS AND INSTITUTIONS

This chapter reviews a selection of regulatory frameworks and institutions that have potential influence on wood raw material supply and demand in Europe. The chapter starts with the global scope by assessing the importance of World Trade Organisation (WTO), Organisation for Economic Cooperation and Development (OECD) and various multilateral environmental agreements (MEAs). This is followed by general EU-level discussion on relevant regulations, policies and institutions. Finally, some sector-specific EU-policies are reviewed.

5.1 Global framework and regional framework

5.1.1 World Trade Organization

Trade in forestry products under WTO

The WTO does not have an agreement specifically regulating trade in forestry products or any other natural resources[22]. However, there are a number of WTO rules covering goods and services that are relevant. In principle, forestry products fall under the industrial products that are dealt with as a part of Non-Agricultural Market Access (NAMA) negotiations.

According to the study[23] made for the EC on the Sustainable Impact Assessment of proposed WTO negotiations, published in 2005, further reduction of tariffs in the forest sector as the result of Doha negotiations would result in overall economic gains while environmental and social impacts would be ambiguous. The study concludes that trade liberalisation is not likely to influence forest product consumption and production much, but it would result in increased trade by improving market access notably for lower-cost producers. Furthermore, the already low import tariffs and relatively small share of forest products traded internationally explain the expected small aggregate impacts of full liberalisation on forest product consumption levels. In addition, the majority of trade in forest products takes place within EU, NAFTA, APEC, and under other various regional trade agreements, which may already apply zero or close to zero tariffs.

In terms of developing countries, the study expects that trade liberalisation would lead to negative impacts on equity. Most of the benefits would be likely to accrue to large companies often located close to urban centres, given their capacity for economies of scale. Small and Medium Enterprises (SMEs) in developing countries would not find it as easy to benefit from new trade opportunities as larger companies. In fact, in many developing countries (e.g. in Eastern Africa, India, Vietnam) one can expect many small companies to succumb to increased competition due to imports. Furthermore, an increasing range of non-tariff measures (NTMs) aimed at meeting environmental and safety objectives makes it more difficult (or costly) for many developing country producers, especially SMEs to enter the international market. However, legitimate NTMs do not yet appear to be major constraints to trade. Sometimes they offer opportunities based on environmentally sound practices to access new markets or maintain existing ones, as is demonstrated by forest certification.

[22] WTO (2010). World Trade Report 2010: Trade in natural resources.

[23] Savcor Indufor Oy, IARC and IDPM (2005). Sustainable Impact Assessment of Proposed WTO Negotiations: Final Report for the Forest Sector Study.

NAMA forest products sectorial initiative

A sectoral initiative is a voluntary agreement among a group of countries with a principal goal of fully eliminating or harmonising tariffs in a specific product sector or sub-sector; particularly on products of export interest. Timetables, stages and percentages of tariff reduction are all under negotiation. Discussions of specific proposals are taking place in informal WTO member-driven processes, based on a "critical mass" approach. This means that any proposal must attract a critical mass (no less than 90% representation of world trade in a specific sector) of Member support before being implemented.

In October 2005, Canada, Hong Kong, New Zealand, Thailand and the US presented a proposal to initiate sectoral negotiations for enhanced liberalisation of the forest products[24]. It proposed to cover products in six forest product categories including: sawnwood, plywood, wood pulp, paper and paperboard, books and newspapers, and wooden furniture. According to the submission, developed countries signing up could reduce their tariffs to zero, whereas developing countries could settle for an as-yet-to-be determined "x" tariff rate. In terms of realistically achieving the critical mass, the EU, Japan and China, all of whom are major importers and exporters of forest products, would have to join the initiative. However, Japan has indicated in the past that it is not interested in getting involved due to concerns of the effects of trade liberalisation in forest products on sustainable use of forests[25]. In addition, EU has remained in line with its general NAMA approach to give priority to across-the-board tariff reductions, and therefore has not supported such initiatives and will remain particularly prudent with regard to them[26].

In the absence of an overall Doha or a sectorial agreement, WTO partners have engaged in several regional or bilateral trade agreement deals and negotiations. These agreements do not replace the WTO system and negotiation process, but rather complement it. In many cases, forest products are included. Some important free-trade negotiations, in terms of forest industry, have been or are being carried out between the EU and South Korea (FTA since July 2011),, India, ASEAN countries, Mercosur countries, as well as Ukraine, not to forget Canada (FTA due in 2014) and the USA. In addition, Russia's WTO recent membership should reduce tariffs and dismantle other barriers to trade as well as make the business environment in Russia more predictable.

WTO and MEAs

At the 2001 Doha Ministerial Conference, WTO members agreed to negotiate on the relationship between WTO rules and the MEAs, particularly those that contain "specific trade obligations" (STOs). These negotiations take place in special sessions of the WTO's Trade and Environment Committee. Members have agreed that the scope of these negotiations would be limited to applicability of WTO rules to WTO members that have signed the MEA under consideration. So far, no measure affecting trade taken under any MEA has been challenged in the WTO system.

In addition to looking at the relationship between the STOs in MEAs and the WTO rules, the negotiations have covered procedures for MEA secretariats and relevant WTO committees to exchange information regularly. Currently, the Trade and

[24] WTO (18 October 2005), TN/MA/W/64
[25] WTO (6 January 2003), TN/MA/W/15/Add.1
[26] Trade Sustainability Impact Assessment of the Forest Sector under DDA negotiations. European Commission Position Paper, 26 June 2006.

Environment Committee hold an information session with different secretariats of the MEAs once or twice a year to discuss the trade-related provisions in these environmental agreements and also their dispute-settlement mechanisms

Closer cooperation between MEA Secretariats and WTO Committees is essential to ensure that the trade and environment regimes develop coherently. This objective has been recognised in various international environmental arenas, such as:

- Rio Declaration (Principle 12)
- Agenda 21 (Chapter 2, paragraph 2.9)
- The United Nations Framework Convention on Climate Change (UNFCCC) (Article 3, paragraph 5)
- The Kyoto Protocol (Article 2, paragraph 3)
- Plan of Implementation of the 2002 World Summit on Sustainable Development (paragraph 47)

5.1.2 Organisation for Economic Cooperation and Development

The role of forestry products

The OECD is often regarded as a source of reliable information and therefore its publications have the potential to influence future policies. There was formerly a Pulp & Paper Working Group. However, forest products have not been separately discussed under the Organisation in recent years and they are not included as a separate item in the 2011-2012 working programme. On the other hand, OECD has been analysing many issues that are linked to forestry, such as sustainable development, sustainable consumption, value-added products, green growth and green economy. In addition, the OECD Environmental Outlook to 2030[27] ranks in its key messages issues related to biodiversity and renewable natural resources according to their management status. It concludes that forested area in OECD countries seems satisfactory. Globally alarming issues are species loss, ecosystem quality, invasive alien species, state of tropical forests, illegal logging and ecosystem fragmentation. Forest management and protected areas are valued as issues that remain a challenge but are globally improving.

Through its daughter organisation, the **International Energy Agency (IEA)**, the OECD also tracks and forecasts energy sources and consumption, including bio-energy. Several IEA initiatives in the field of bio-energy are significant.

5.1.3 The United Nations Framework Convention on Climate Change and its Kyoto Protocol

Both the UNFCCC[28] and the Kyoto Protocol[29] recognise that combating climate change should not lead to uninformed or unjustifiable restrictions on international trade. In addition, the implementation of these agreements should be carried out in a way that minimises adverse effects on other Parties in terms of international trade, and social, environmental and economic impacts.

[27] OECD (2008). OECD Environmental Outlook to 2030.
[28] United Nations Framework Convention on Climate Change (UNFCCC). 1992. United Nations Framework Convention on Climate Change: Article 3, paragraph 5.
[29] United Nations Framework Convention on Climate Change (UNFCCC). 1997. Kyoto Protocol to the United Nations Framework Convention on Climate Change: Article 2, paragraph 3.

Forest issues in the climate negotiations

In the climate negotiations, forestry issues belong under the larger Land Use, Land-Use Changes and Forestry (LULUCF) theme. Forests act as sinks, capturing greenhouse gases from the atmosphere. According to the Kyoto Protocol, industrialised countries can count carbon stored in vegetation and soil as credit. The effect of reforestation and forest management on sinks can be taken into account with certain restrictions, whereas emissions generated by deforestation are added to other emissions. However, difficulties in finding a consensus on calculation methods related to the LULUCF sectors has hindered the achievements on forestry related climate programmes such as REDD+ (reducing emissions generated by deforestation and forest degradation in developing countries through conservation, sustainable management of forests and enhancement of forest carbon stocks).

European Union's position on LULUCF accounting rules

Until now, the efforts of farmers and forest owners, and their good practice aimed at securing carbon stored in forests and soils, have not been properly recognised. The reason for this has been the challenges that come with collecting robust carbon data from forests and soils and the lack of common rules on how to account for emissions and removals. Recently, following the decision of the UNFCCC on revised accounting rules from soils and forests adopted in December 2011, the EU has been determined to close the gap in common accounting in its climate policy. Therefore, in March 2012, the European Commission took a first step towards incorporating removals and emissions from forests and agriculture into the EU climate policy by adopting a proposal[30] "on accounting rules and action plans on greenhouse gas emissions and removals resulting from activities related to land use, land use change and forestry".

The proposal establishes accounting rules for greenhouse gas emissions and removals in the forest-based and agriculture sectors – the last major sectors without common EU-wide rules. This provides new opportunities, for instance, to reward farmers and forest owners for their contribution in the fight against climate change in the context of the common agricultural policy. All in all, the proposal assigns a very important role to LULUCF in tackling climate change. However, since it is not considered appropriate to require the sector immediately to comply annually with the emissions reduction targets that apply for other sectors, Member States are not allowed to count LULUCF towards their individual reduction commitment target, whereas this is allowed in the international framework. In a second step, consideration could be given to formally include the sector in the EU's climate commitment. This is well aligned with other policies already in force in the region, such as the 20% reduction of GHG emissions by 2020. Nevertheless, the full mitigation potential can only be achieved once LULUCF is part of an emissions reduction target.

Harvested wood products (HWPs)

IPCC good practice guidance (2003) defines HWPs as wood and paper products[31]. It does not include carbon in harvested trees that are left at harvest sites. How wood products will be treated depends largely on the results of the LULUCF negotiations on the global level. CO_2 is released during harvesting and manufacture of wood products and by the use and disposal of wood. In the recommended default approach of the Intergovernmental Panel on Climate Change (IPCC), all CO_2 emissions and removals associated with forest harvesting and the oxidation of wood products are accounted

[30] COM(2012) 93 final
[31] IPCC good practice guidance (2003)

for by the country in the year of harvesting (removal)[32]. The proposed method recommends that storage of carbon in forest products be included in a national inventory only in the case where a country can document that existing stocks of long term forest products are in fact increasing. It is relatively safe to assume that no significant boosts to promote the use of HWPs are to be expected in a short term. However, if a country is able to clearly demonstrate that the existing HWP stocks are increasing, this may create incentives to use wood over other materials especially in public procurement. Nevertheless, these trends can be expected to vary between nations and are likely to be derived from a set of green incentives; not just the climate policy. In any case, the significance of forests and wood products in preventing climate change has been recognised in the negotiation process[33].

5.1.4 The Convention on Biological Diversity

The Convention on Biological Diversity (CBD) addresses forests directly through the expanded programme of work on forest biological diversity[34], adopted in 2002 in the Council of the Partners (COP) 6. The forest work programme constitutes a broad set of goals, objectives and activities aimed at the conservation of forest biodiversity, the sustainable use of its components and the fair and equitable use of the benefits arising from the utilisation of forest genetic resources. The programme of work on forest biodiversity consists of three elements: (i) conservation, sustainable use, and benefit-sharing, (ii) institutional and socio-economic enabling environment, (iii) knowledge, assessment, and monitoring.

The three elements are divided into 12 goals, 27 objectives and 130 activities. The expanded programme is directly linked to several other programmatic areas and cross-cutting issues, such as agriculture, biofuels and biodiversity, protected areas, Ecosystem approach, Indicators, Climate change and forest biological diversity, Invasive Species, and Sustainable Use of Biodiversity.

The strategic plan for biodiversity 2011-2020

A revised and updated Strategic Plan for Biodiversity was adopted in 2010 to serve as a ten-year framework for action by all countries and stakeholders to save biodiversity and enhance its benefits for people. The Strategic Plan includes 20 headline targets for 2015 or 2020 (the “Aichi Biodiversity Targets”), organised under five strategic goals[35]. The goals and targets comprise both: (i) aspirations for achievement at the global level; and (ii) a flexible framework for the establishment of national or regional targets. Parties are invited to set their own targets within this flexible framework, taking into account national needs and priorities, while also bearing in mind national contributions to the achievement of the global targets. This new plan will be the overarching framework on biodiversity, not only for the biodiversity-related conventions, but for the entire United Nations system.

Many of the 20 Aichi Biodiversity Targets are relevant to forestry. Target 3 calls on Parties to eliminate, phase out or remove, incentives that are harmful to biodiversity, such as subsidies that support unsustainable farming, forestry or fishery. Target 5 states that the rate of loss of all natural habitats, including forests, should be at least

[32] Revised 1996 IPCC Guidelines
[33] Ministry for Foreign Affairs of Finland (2010). The international promotion of wood construction as a part of climate policy. Working Group Report.
[34] COP 6 Decision VI/22: Forest biological diversity.
[35] COP 10 Decision X/2: Strategic Plan for Biodiversity 2011-2020.

halved and where feasible brought close to zero, and degradation and fragmentation should be significantly reduced. In addition, target 7 requests that areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity. However, the current gloomy global economy may have a hindering effect for meeting the Aichi Targets in the short term due to the allowed flexibility according to national needs and priorities that are likely to be more economically oriented in the coming years.

CBD and trade

In Article 11 of the Convention, the international community acknowledged the importance of incentive measures in achieving the conservation and sustainable use of biological diversity. The Article states that "*Each Contracting Party shall, as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity."*

In the spirit of Article 11, the collection, production, transformation, and commercialisation of biodiversity-based goods and services that meet specific sustainability criteria may generate incentives for the conservation and sustainable use of biodiversity. Consequently, a number of thematic programmes of work under the Convention call for the increased marketing of products derived from sustainable use.

The trade-related work under the CBD captures the different aspects of the complex relationship between international trade and the objectives and provisions of the Convention. Biodiversity generates and helps to maintain the supply of many ecosystem services that are essential for human well-being and economic development. Many biodiversity-based ecosystem services are not traded on markets, and their value is not properly reflected in market prices. The economic work under the Convention seeks to promote the valuation of these services, and to introduce measures that correct the incentives of individuals, governments and companies towards more effective conservation and sustainable use of biodiversity, such as promoting the trade of biodiversity-based goods that are produced in a sustainable manner. It also seeks to ensure the mutual supportiveness of international trade rules and the objectives of the Convention.

5.1.5 The Convention on international trade in endangered species of wild fauna and flora[36]

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments that aims to limit international trade in specimens of wild animals and plants in order to enhance the chances of their survival. Annually, international wildlife trade is estimated to be worth billions of USD and to include hundreds of millions of plant and animal specimens; including e.g. timber and wooden musical instruments. CITES entered into force in 1975 and has currently 175 signatory Parties. Adhering to the agreement is voluntary. Although CITES is legally binding to its Parties, it does not take the place of national laws. However, it provides a framework according to which the Parties are expected to adopt their domestic legislation.

[36] http://www.cites.org/

CITES has three different levels of protection for species, known as Appendices.

1. Appendix I represent species that are in the most danger and are considered to be threatened with extinction.
2. Appendix II contains species that are at risk in the wild, but not necessarily threatened with extinction.
3. Appendix III contains species that a certain country (called a Party within CITES), has voluntarily requested to be regulated in order to help preserve the species in question.

All import, export and re-export of a CITES-species have to be authorised according to a licensing system. CITES requirements are not necessarily uniform in all the countries and may in some cases be less strict than the national laws. In these cases, the national law should be followed.

Although there are literally thousands of plant species protected under CITES, only a small minority of them are trees. Furthermore, just a fraction of these included tree species are actually used for wood processing (Table 5.1). European wood-processing industries, in general, are based on legally available sources. Although CITES has been criticised, it is fairly safe to assume that the companies relying on a supply of heavily regulated timber species have already long been adjusted to the CITES requirements. Thus, the significance of CITES to European wood raw material supply can be seen as minimal.

Table 5.1 List of species of trees typically used or harvested for lumber under the CITES Appendices

Common name	Scientific name	CITES status
Afrormosia	*Pericopsis elata*	Appendix II
Ajo	*Caryocar costaricense*	Appendix II *
Almendro	*Dipteryx panamensis*	Appendix III (wood from Costa Rica, and Nicaragua only) *
Bois de Rose	*Dalbergia louvelii*	Appendix III (Wood from Madagascar only)
Brazilwood	*Caesalpinia echinata*	Appendix II
Cedar, Spanish	*Cedrela odorata*	Appendix III (wood from Columbia, Guatemala, and Peru only)
Cocobolo	*Dalbergia retusa*	Appendix III (wood from Guatemala only)
Ebony, Madagascar	*Diospyros spp.*	Appendix III (wood from Madagascar only)
Lignum Vitae	*Guaiacum spp.*	Appendix II *
Mahogany, Cuban	*Swietenia mahagoni*	Appendix II
Mahogany, Honduran	*Swietenia macrophylla*	Appendix II (wood from Neotropics only)
Mahogany, Mexican	*Swietenia humilis*	Appendix II *
Monkey Puzzle	*Araucaria araucana*	Appendix I *
Podocarp, Black Pine	*Podocarpus neriifolius*	Appendix III (wood from Nepal only) *
Ramin	*Gonystylus spp.*	Appendix II *
Rosewood, Brazilian	*Dalbergia nigra*	Appendix I *
Rosewood, Honduran	*Dalbergia stevensonii*	Appendix III (wood from Guatemala only)
Rosewood, Madagascar	*Dalbergia madagascariensis*	Appendix III (wood from Madagascar only)
Sandalwood, Red	*Pterocarpus santalinus*	Appendix II
Stinkwood, Red	*Prunus africana*	Appendix II *
Verawood	*Bulnesia sarmientoi*	Appendix II

* including finished wood products. Note! This list is a condensed and simplified version.
Source: *www.wood-database.com/wood-articles/restricted-and-endangered-wood-species*

5.1.6 United Nations Forum on Forests

The issue of forests has been, more or less, a priority on the international environmental policy and political agendas for the past 20 years. At the 1992 Earth Summit, intense negotiations among governments resulted in the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests, also known as the "Forest Principles", as well as Chapter 11 of Agenda 21: Combating Deforestation.

The United Nations Forum on Forests (UNFF) has been established as a follow-up on this discussion. UNFF has four Global Objectives:

- Reverse the loss of forest cover worldwide through sustainable forest management, including protection, restoration, afforestation and reforestation, and increase efforts to prevent forest degradation
- Enhance forest-based economic, social and environmental benefits, including by improving the livelihoods of forest-dependent people
- Increase significantly the area of protected forests and other sustainably managed forests, and increase the proportion of forest products derived from sustainably managed forests
- Reverse the decline in official development assistance for sustainable forest management and mobilise significantly increased new and additional financial resources from all sources for the implementation of sustainable forest management

After intense negotiations at UNFF7, the Non-Legally Binding Instrument on All Types of Forests (NLBI) was adopted in 2007. The instrument is considered a milestone since it was the first time that Member States agreed to an international instrument for sustainable forest management. NLBI has been endorsed by the General Assembly of the United Nations and aims:

a) To strengthen political commitment and action at all levels to implement effectively sustainable management of all types of forests and to achieve the shared global objectives on forests;
b) To enhance the contribution of forests to the achievement of the internationally agreed development goals, including the Millennium Development Goals, in particular with respect to poverty eradication and environmental sustainability; and
c) To provide a framework for national action and international cooperation.

The instrument is expected to have an impact on the discussion regarding international cooperation and on national action to reduce deforestation, prevent forest degradation, promote sustainable livelihoods and reduce poverty for forest-dependent communities. Consequently, NLBI (and UNFF in general) have much more to offer in the developing world where forest operations are still largely unregulated and/or unsustainable in many locations. Hence the true impact on European raw material supply and demand is limited.

5.1.7 The International Tropical Timber Organization

The International Tropical Timber Organization (ITTO) is an intergovernmental organisation that promotes conservation of tropical forest resources and their sustainable management, use and trade. It was established under the International Tropical Timber Agreement (ITTA) which was ratified in 1985 and negotiated under

the auspices of the United Nations Conference on Trade and Development (UNCTAD). Members of ITTO are the world's major producing and consuming countries of tropical timber. The Member States manage about 80% of the world's tropical forests and are responsible for 90% of the global tropical timber trade. The governing body of the ITTO is the International Tropical Timber Council (ITTC), which is composed of all the Organisation's members. Half the votes on the ITTC are assigned to producing countries and half to consumers. Within each block, votes are assigned based on market share.

ITTO is a unique organisation. Like all commodity organisations it is concerned with trade and industry but like an environmental agreement it also pays considerable attention to the sustainable management of natural resources. ITTO's mandate has been renewed by the ITTA 1994 and again by the ITTA 2006. The main aim is to promote the expansion and diversification of international trade in tropical timber from sustainably managed and legally harvested forests, and the sustainable management of tropical timber-producing forests. In order to reach its aim, ITTO works internationally on policies, guidelines, and demonstrations to promote sustainable forest management and forest conservation through various ways, such as:

- Collection, analysis, and dissemination of data on the production and trade of tropical timber
- Improvement of the competitiveness of wood products relative to other materials
- Boosting the marketing of tropical timber from sustainably managed and legally harvested sources
- Sharing of information on certification and specific aspects of the international timber market
- Carrying out specific studies
- Co-operating with other international organisations, including the EU's FLEGT Action Plan
- Helping countries to improve forest law enforcement and governance, to address illegal logging and related trade in tropical timber, and to undertake sustainable forest management and forest restoration
- Strengthening the capacity of countries to gather and report data on the tropical timber trade and on forest management

Managing its own programme of projects and activities allows ITTO to quickly test and operationalise its policy work. In addition, through its structure and thematic programmes, the Organisation has the capacity to assist countries by funding practical activities to support implementation of the global policy framework. ITTO's efforts to improve the competitiveness of wood products relative to other materials have the potential to enhance the demand for wood also in the EU market. Furthermore, its work with tropical timber markets helps to maintain the supply of sustainable and legal timber which is increasingly important considering the new EU Timber Regulation.

5.1.1 The United Nations Environment Programme

The United Nations Environment Programme (UNEP), established in 1972, hosts several environmental convention secretariats such as CITES and CBD. UNEP works with a wide range of partners (including UN entities, international organisations, national governments, non-governmental organisations, the private sector and civil society) to promote the wise use and sustainable development of the global environment. Its work encompasses:

- Assessing global, regional and national environmental conditions and trends
- Developing international and national environmental instruments
- Strengthening institutions for the wise management of the environment
- Facilitating the transfer of knowledge and technology for sustainable development
- Encouraging new partnerships and mind-sets within civil society and the private sector.

Green economy

The UNEP-led Green Economy Initiative was launched in late 2008. It consists of several components whose collective overall objective is to provide the analysis and policy support for investing in green sectors and in greening environmentally unfriendly sectors. The Green Economy is characterised by substantially increased investments in economic sectors that build on and enhance the Earth's natural capital or reduce ecological scarcities and environmental risks[37]. These sectors include renewable energy, low-carbon transport, energy-efficient buildings, clean technologies, improved waste management, improved freshwater provision, sustainable agriculture and forest management, and sustainable fisheries. The investments are driven or supported by national policy reforms and the development of international policy and market infrastructure. UNECE is currently writing a paper on the contribution of the forest-based sector to the green economy.

5.1.2 Forest Europe (The Ministerial Conference on the Protection of Forests in Europe)

FOREST EUROPE (The Ministerial Conference on the Protection of Forests in Europe, MCPFE) is the pan-European policy process for the continent's sustainable forest management. FOREST EUROPE develops common strategies for its 46 member countries and the EU on how to protect and sustainably manage forests. It was founded in 1990 and has led to achievements such as the guidelines and criteria for sustainable forest management.

The collaboration of the ministers responsible for forests in Europe has been of great economic, environmental and social importance on the national and international level. Several high-priority topics have been formulated to strengthen the role of forests. These include, for example, climate change, water protection, biodiversity, as well as bio-energy and wood production. Other major tasks are to develop a framework for future forest cooperation and to explore the opportunities for a legally binding agreement on forests in Europe. In addition to several countries outside Europe, also various international, non-governmental and private-sector organisations participate as observers.

[37] UNEP (2010). Driving a Green Economy through Public Finance and Fiscal Policy Reform.

FOREST EUROPE countries pursue sustainable forest management through creating new policy instruments and adjusting existing ones. This is done:

- By integrating sustainable forest management into legal and regulatory frameworks;
- Through financial support measures addressing the different dimensions of sustainable forest management;
- Through efforts to strengthen the forest-related information base; and
- By improving communication with the public.

At the MCPFE-meeting in June 2011 in Oslo, the Ministers responsible for forests in Europe made a historical decision. They signed a mandate for negotiating a Legally Binding Agreement on Forests in Europe[38]. According to the provisions of the Oslo Mandate, the Committee should have completed its tasks not later than 30 June 2013. A consensus document was agreed though not the modalities for implementation.

5.1.3 Key messages

WTO implications

To date, the NAMA Forest Products Sectorial Initiative has not attracted sufficient support to pass the critical mass requirement to be discussed, agreed and implemented. This situation is likely to persist in the near future as EU and Japan, among others, do not seem to be keen on supporting such initiative. However, since the EU's wood raw material demand is largely satisfied by European sources, increased market liberalisation should not have a major effect on Europe's wood supply. Also, most of the developing countries already face low or no tariffs at all for their exports to developed countries[39]. In addition, as the Russian Federation recently joined the WTO, the supply situation should improve within the limits of tariff reductions to be implemented. Thus, sector-wide market liberalisation of forestry products is more relevant to European businesses exporting majority of their products to non-EU countries with whom the EU has no existing regional or bilateral trade agreements.

Certification for sustainable forest management may play a more significant role as a market-based tool tracing the supply of forestry products into the EU market. This is heavily linked in the "greening of trade" due to increased environmental and public awareness. Those who adapt greener practices are provided with larger market access due to growing demand in sustainable forestry products. This trend can be expected to strengthen in the future. Consequently wood, as a renewable material, is likely to have an increased demand in some sectors such as construction and energy production, at least in its demand share when compared to other competing and more polluting materials.

OECD implications

OECD's role in the policy arena is mostly advisory as it produces scientific data to help direct the development of future policies. Due to its internationally acknowledged status, the organisation has influence in the global scale. OECD's promotion of green

[38] FOREST EUROPE, Conference Proceedings: Ministerial Conference on the Protection of Forests in Europe, Oslo 14–16 June 2011

[39] Savcor Indufor Oy, IARC and IDPM (2005). Sustainable Impact Assessment of Proposed WTO Negotiations: Final Report for the Forest Sector Study.

growth is a catalyst for introducing new policies and legislation that aim to expand the markets in environmentally friendly ways. This influence can be seen, for example, in the "greening" of public procurement, as well as some nations taking additional environmental commitments to those that are required by commonly established agreements. The implications of such development to forestry and wood raw material supply should continue to be beneficial as long as the wood procurement is based on sustainable forest management and does not compete significantly with the establishment and maintenance of protected, as well as recreational forest areas. The IEA has a number of sectorally relevant initiatives.

MEA implications

In terms of forestry, relevant MEAs stress the importance of sustainable forest management, taking into account social, economic, cultural as well as environmental dimensions. However, most MEAs introduce principles and goals that are not legally binding. The ones that are, do not currently seem to pose significant limitations to European forestry. For example, the trade of CITES-controlled species is very low and usually related to highly specialised industries, such as the production of certain musical instruments. Furthermore, the forestry related issues under the UNFCCC and its Kyoto Protocol are still largely debated in terms of technicalities and have not yet translated into solid measures globally. Therefore, the role of MEAs can be seen largely as qualitative steering of policy issues and public awareness with very few direct trade related implications.

Regardless of the above, the EU has often been one of the leading proponents of environmentally friendly principles and has been driving more ambitious goals than the ones usually agreed in the MEA negotiations. One such example is the previously discussed EU proposal for rules and action plans on greenhouse gas emissions and removals from LULUCF[40] that has gone further than what was agreed in Durban without compromising the principles and rules laid down internationally. The document assigns a very important role to LULUCF on tackling climate change, aligned with other policies already in force in the region, such as the 20% reduction of GHG emissions by 2020. In general, the United Nations Climate Change Conference, Durban 2011, delivered a breakthrough on the international community's response to climate change.

The intention with UNEP's Green Economy Initiative is that the policy makers need to realise that increased investments are required to create the enabling conditions in a transition to a green economy. Consequently, governments will need to take an active role to fully realise the benefits of forests in a green economy.

The International Tropical Timber Organization (ITTO) is a commodity organisation concerned with the conditions of trade but it has also similarities with an environmental agreement. Its main aim is to promote the expansion and diversification of international trade in tropical timber from sustainably managed and legally harvested forests. However, the biggest implications of ITTO do not largely affect the EU wood-processing industries.

In developing countries, where forest management practices are often lagging the European standards, MEAs provide mechanisms to transfer knowledge and technology that are likely to increase the flows of legal timber to European market. However, these flows are currently minor when compared to the flows procured within Europe.

[40] COM(2012) 93 final

Forest Europe (MCPFE)

The collaboration of the ministers responsible for forests in Europe has been of some importance at both national and international levels since the very beginning of the FOREST EUROPE process. The negotiations for a Legally Binding Agreement on Forests in Europe demonstrate a mutual effort to work on ensuring the vitality of the forests for the future generations. In general, the work of MCPFE shows clear commitment to keep forests as an important part of European livelihoods by creating a positive high-level political atmosphere that, in one respect, aims to maintain the supply and demand of European forest products at a sustainable level.

5.2 General EU policy framework

5.2.1 EU Trade Policy

The EU is the world's largest single market with transparent rules and regulations and hence an attractive trading partner for other countries. It has a secure legal investment framework that is amongst the most open in the world, as well as 500 million consumers looking for quality goods. Furthermore, the EU is the most open market to developing countries in the world[41]. In order to manage trade relations with countries outside the EU a functional trading policy is required. Governing trade is an exclusive power of the EU which means that only the EU, and not individual Member States, can legislate on trade matters and conclude international trade agreements. Nonetheless, the Member States have to agree on trade policy and are consulted on individual implementation measures through a specific committee. Important objectives of the EU trade policy are:

- To lower barriers to EU exports and EU investment through negotiations and, where necessary, dispute settlement; and
- To improve conditions for third-country operators importing into the EU (especially developing countries).

In addition, the EU uses its trade policy to reinforce other important international goals:

- Supporting the fight to protect our environment and reverse global warming;
- Striving to improve working conditions for workers in developing countries;
- Ensuring the highest standards of health and safety for the products we buy and sell.

EU in the global arena

The development of trade, if properly managed, is an opportunity for economic growth. Hence, the EU Trade Policy seeks to create growth and jobs by increasing the opportunities for trade and investment with the rest of the world. The EU engages actively in bilateral trade agreements with trading partners such as South Korea (since July 2011), ASEAN, India, Canada(due in 2014), Central America, Andean Community, Ukraine, Euromed, Mercosur and the Gulf States, as well as the USA and Canada. High on the agenda are also aims to enforce EU rights, tackle trade barriers, as well as deepening the relations with important strategic partners (namely the US, China, Russia, Japan, India and Brazil). The success of the EU is inseparably bound

[41] COM(2012) 366 final

up with the success of its trading partners, both in the developed and developing world. For this reason, sustainable development is central to trade policy.

In the WTO, the European Commission negotiates on behalf of the 28 Member States of the EU and pursues an active negotiation agenda in the Doha Development Round. Through the WTO, the EU seeks to:

- Ensure new markets for European companies,
- Observe the rules and make sure others also play by the rules,
- Promote sustainable development in trade.

Market access

Existence of free trade depends fully on businesses being able to access their markets. As a promoter of open trade, the EU aims to guarantee free market access for all. In addition to import tariffs or quotas, European exporters face numerous trade problems due to discriminatory or disproportionate regulations or standards. Removing these barriers is one of the goals of the EU's strategy to boost exports and promote growth in jobs in Europe. *Market Access Strategy*[42] defines the two main instruments to address the trade barriers: Market Access Partnership[43] and the Market Access Database. The Market Access Strategy is a key pillar of the EU's Trade Policy.

According to European Commission (2008), **the Trade Barriers Regulation (TBR)** is designed to ensure that the rights of the EU under international trade agreements can be enforced in cases where non-Member States maintain or impose barriers to trade. The TBR is a legal instrument that gives the right to EU businesses, industries or their trade associations to log a complaint with the European Commission if such barriers or obstacles are detected. Under the TBR, the Commission is able to investigate complaints about violations of international trade rules and propose solutions to eliminate them.

The Market Access Partnership (MAP) is a combined effort from European Commission, national governments and businesses to work together to identify and tackle trade barriers restricting European exporters and investors on markets outside Europe. This requires an analysis of concrete exporting problems and definition of priorities. Furthermore, the MAP enforces global and bilateral trade rules through technical dialogues, political interventions and, where necessary, through the EU's *Trade Barriers Regulation*[44] and dispute settlement. Service to businesses is based on efficiency and transparency including systematic registration and follow-up of market access cases.

The Market Access Database (MADB) supports a continuous three-way exchange of information between the EU institutions, Member States and European business. It is free, interactive and practical service that provides:

- Information about Market Access conditions in non-Member States;

[42] COM(96) 53 final
[43] COM(2007) 183 final
[44] COUNCIL REGULATION (EC) No 3286/94 of 22 December 1994 laying down Community procedures in the field of the common commercial policy in order to ensure the exercise of the Community's rights under international trade rules, in particular those established under the auspices of the World Trade Organization (amended by 1995 and 2008)

- A systematic way for the European Commission to follow up complaints from businesses about barriers to trade in non- Member States;
- A means of ensuring that Europe's trading partners are abiding by their international commitments;
- Better input for defining the EU's trade policy objectives on further trade liberalisation in the framework of the WTO and new free trade agreements between the EU and preferential trade partners.

The MADB can be used to check the export situation by product, sector or country, and to identify the possible significance of trade barriers. In 2013, there are three listed barriers in the "Wood, Paper and Pulp" sector; two of which are linked to tariff levels[45] and one linked to a registration, documentation and customs procedures[46]. The MADB includes a new "complaints register" which serves as a single online entry point which enables companies to report the nature of a barrier they encounter directly to the Commission and to work directly with the Commission towards the removal of that barrier – including being able to follow the progress of a complaint more easily. Currently there are no complaints registered under "Wood, Paper and Pulp" -sector.

5.2.2 EU Forest Law Enforcement, Governance and Trade

The EU Forest Law Enforcement, Governance and Trade (FLEGT) initiative is EU's response to the issues of poor forest governance and illegal logging. It includes actions aimed at both production and consumption of forest products.

The FLEGT Action Plan[47] was published in 2003. It recognises that the EU is an important export market for countries where levels of illegality and poor governance in the forest sector are most serious. The FLEGT Action Plan introduces various tools; such as development aid for producing countries, public and private sector procurement and investment policies in the bank sector; as mechanisms to improve sustainable forest management.

Under the Action Plan, the Commission was given a mandate by the Council to negotiate trade agreements, so called Voluntary Partnership Agreements (VPAs), between producer countries and the EU. VPAs aim to improve forest governance within a partner country by providing technical and financial means to enforce forest law and, if appropriate to strengthen it. In relation to wood and wood-based products exported to the EU, VPAs also seek to ensure that the wood exported to the EU is from legal sources within the partner countries. Subsequently, in 2005, a Regulation[48] on the establishment of a FLEGT licensing scheme for imports of timber from VPA countries into the EU was adopted. In 2008, this Regulation was complemented with the adoption of a further Regulation[49] laying down detailed implementing measures.

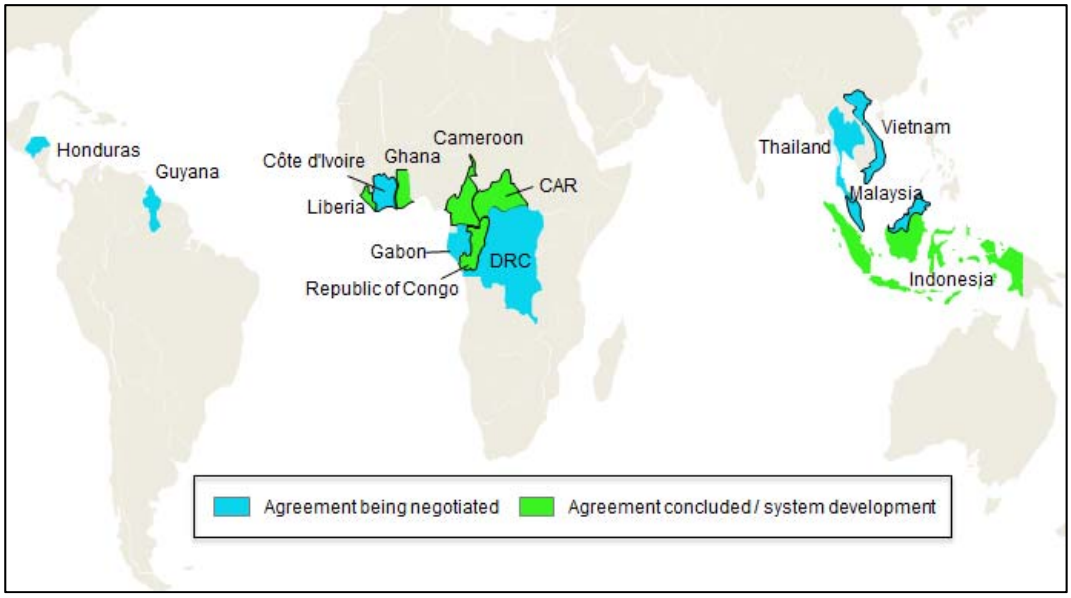
There are currently six countries developing the systems agreed under a VPA (Cameroon, Central African Republic, Ghana, Liberia, Republic of Congo

[45] MADB: Parquet Tariffs, USA (barrier id: 060100); Increased tariffs on uncoated paper, Malaysia (barrier id: 060136)
[46] MADB: Reclassification of paper products, South Korea (barrier id: 060074)
[47] COM (2003) 251 final, 21 May 2003. FLEGT proposal for an Action Plan.
[48] Council Regulation (EC) No 2173/2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community, 20 Dec 2005.
[49] Commission Regulation (EC) No 1024/2008 laying down detailed measures for the implementation of Council Regulation (EC) No 2173/2005 on the establishment of a FLEGT licensing scheme for imports of timber into the European Community, 17 Oct 2008

(Brazzaville), and Indonesia,) and eight more negotiating with the EU (Guyana, Honduras, Democratic Republic of Congo, Gabon, Côte d'Ivoire, Malaysia, Vietnam, and Thailand). (Figure 5.1) Furthermore, FLEGT information missions have been carried out in following regions[50]:

- Central and South America: Bolivia, Colombia, Ecuador, Guatemala, Peru;
- Asia Pacific: Cambodia, Laos, Myanmar/Burma, Papua New Guinea, the Solomon Islands ;
- Africa: Sierra Leone

Figure 5.1 VPA partner countries



Source: Reproduced from EFI FLEGT web page, 28 August 2013.

5.2.3 EU Timber Regulation

On the consumption side, the EU Timber Regulation (EU TR) was adopted in 2010 and introduces (from March 2013) new obligations for EU operators who place timber on the EU market. It was triggered by point 6 of the annex of the FLEGT AP. It specifically addresses illegally harvested timber on the EU market. In the contrast to previous regulations under the FLEGT Action Plan that were directed towards producer countries, the EU TR complements the big picture by introducing restrictions on the operators and traders in the EU. The three main requirements of the EU TR are the following:

1. Placing on the EU market of illegally harvested timber and products derived from such timber is prohibited;
2. EU operators who place timber products on the EU market for the first time must exercise “due diligence” through a due diligence system (DDS).

Once on the market, the timber and timber products may be sold on and/or transformed before they reach the final consumer. To guarantee the traceability of

[50] Situation as presented in the EFI FLEGT-webpage in 28 August 2013.

timber products, economic traders in this part of the supply chain have an obligation to:

3. Keep records of their suppliers and customers.

In order to carry out due diligence, operators may make use of their own DDS or use that of a monitoring organisation to assist them. When exercising due diligence, as laid out in the second requirement for a DDS, the following three key elements need to be accounted for:

1. **Information**: The operator must have access to information describing the timber and timber products, country of harvest (also region or concession if relevant), quantity, details of the supplier and information on compliance with relevant national legislation.
2. **Risk assessment:** The operator should assess the risk of illegal timber in his supply chain, based on the information identified above and taking into account criteria set out in the regulation.
3. **Risk mitigation:** When the assessment shows that there is a more than negligible risk of illegal timber entering the supply chain that risk should be mitigated. Potential ways are for example (i) requiring additional information from the supplier, (ii) stopping the sourcing from a questionable supplier, (iii) obtaining third-party verified or certified wood products as part of the requirements for the DDS.
   However, it should be noted that the correct execution of a DDS, even if under the supervision of a monitoring organisation and/or including verified certification, does not exonerate an operator from responsibility if he/she does indeed – even inadvertently – place illegal wood on the EU market.

The EU TR covers a broad range of wood-based products, including solid wood products, flooring, plywood, pulp and paper as well as packing cases and boxes (see Annex of the EU TR for compete list). Not included are e.g. recycled products, rattan, and printed papers such as books, magazines and newspapers. In case the product scope is deemed unsatisfactory it can be amended when necessary, following the EU TR's first review due in the 2015. The EU TR applies to both imported and domestically produced timber and timber products. However, FLEGT or CITES licensed timber or timber products are considered to comply with the requirements of the Regulation. Therefore, operators purchasing such timber are deemed to have carried out proper due diligence.

In 2012, the Commission adopted two regulations of secondary legislation to complement the EU TR.

1. In February: a delegated regulation[51] on the procedural rules for the recognition and withdrawal of recognition of monitoring organisations as provided for in the EU TR, and
2. In July: an implementing regulation[52] on the risk assessment and risk mitigation measures as well as on the frequency and nature of checks which

[51] Commission delegated Regulation (EU) No 363/2012 of 23 February 2012 on the procedural rules for the recognition and withdrawal of recognition of monitoring organisations as provided for in Regulation (EU) No 995/2010 of the European Parliament and of the Council laying down the obligations of operators who place timber and timber products on the market.

[52] Commission implementing Regulation (EU) No 607/2012 of 6 July 2012 on the detailed rules concerning the due diligence system and the frequency and nature of the checks on monitoring organisations as provided for in Regulation (EU) No 995/2010 of the European Parliament and

Member States' competent authorities will conduct on the monitoring organisations to ensure they comply with the requirements of the EU TR.

The purpose of the latter is to ensure the uniform implementation of the EU TR across the Member States. The regulations are accompanied by an informal guidance document.

5.2.4 EU Green Public Procurement and Ecodesign

The EU actively supports Green Public Procurement (GPP) in the context of its policy on Sustainable Consumption and Production[53]. In 2008 the communication *Public procurement for a better environment*[54] defined GPP as "*a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured*." The communication established a range of support measures to be implemented by the European Commission. More recently, the Europe 2020 strategy has identified public procurement as one of the key means of attaining smart, sustainable and inclusive growth.

GPP is a voluntary instrument, which means that Member States and public authorities can determine the extent to which they implement it. Public spending in EU equals approximately 2 trillion euros annually (around 19% of the EU's GDP). This makes public authorities major consumers in the European market and gives them the power to significantly influence the sustainable consumption and production patterns by deciding to choose goods and services that are more environmentally friendly. Such "green purchasing" will provide industry with real incentives to aim for green technologies and products. The strength of the incentive will depend largely on the share of public purchases in any given sector, thus making some sectors (such as construction, public transport, health sector and education) more disposed to public pressure than others.

The legal framework

From an international perspective, the EU is bound by the conditions of the General Procurement Agreement (GPA) of the WTO. The internal legal framework for public procurement is defined by the provisions of the Treaty on the Functioning of the European Union (TFEU) and by the EU Procurement Directives[55]. Up to now, these directives explicitly allow for the inclusion of environmental considerations in procurement. Furthermore, case law from the European Court of Justice has already underlined the issue with key cases[56], thus establishing the scope for inclusion of environmental criteria in competitive tenders in a fair and transparent manner. In addition, sector-specific EU legislation creates certain mandatory obligations for the

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of the Council laying down the obligations of operators who place timber and timber products on the market.

[53] COM (2008) 397 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan.

[54] COM (2008) 400 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Public procurement for a better environment.

[55] Directives 2004/17/EC and 2004/18/EC as referred to in "Buying Green! A Handbook on Green Public Procurement, 2nd edition (European Commission, 2011)."

[56] Concordia Bus (2002) and EVN Wienstrom (2003)

procurement of specific goods and services, for example by setting minimum energy-efficiency standards which must be applied[57]. Moreover, some Member States have specific rules which create mandatory GPP standards for particular sectors or types of contracts.

EU GPP criteria

Environmental procurement criteria have been developed for 21 product and service groups[58] to assist contracting authorities in identifying and procuring greener products, services and works. The GPP criteria are periodically reviewed and updated to take into account the latest scientific product data, new technologies, market developments and changes in legislation. In addition, new product and service groups can be added once environmental procurement criteria for them have been established. Most of the criteria sets rely upon life-cycle assessment (LCA) data where these are available, together with eco-labels and the scientific evidence which these are based upon[59]. Naturally, only some of the criteria have implications for the use of wood. The identified criteria-specific impacts to be alleviated include for example: forest destruction, potential loss of biodiversity, emissions from production, consumption of natural resources, soil erosion, and illegal logging.

[57] For example: DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 May 2010 on the energy performance of buildings (recast)

[58] As of 28 August 2013 (http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm)

[59] Evans, Ewing, Mouat and Nuttall (2010). Report to the European Commission: *Assessment and Comparison of National Green and Sustainable Public Procurement Criteria and Underlying Schemes.*

Figure 5.2 presents some of the GPP approaches to tackle these impacts.

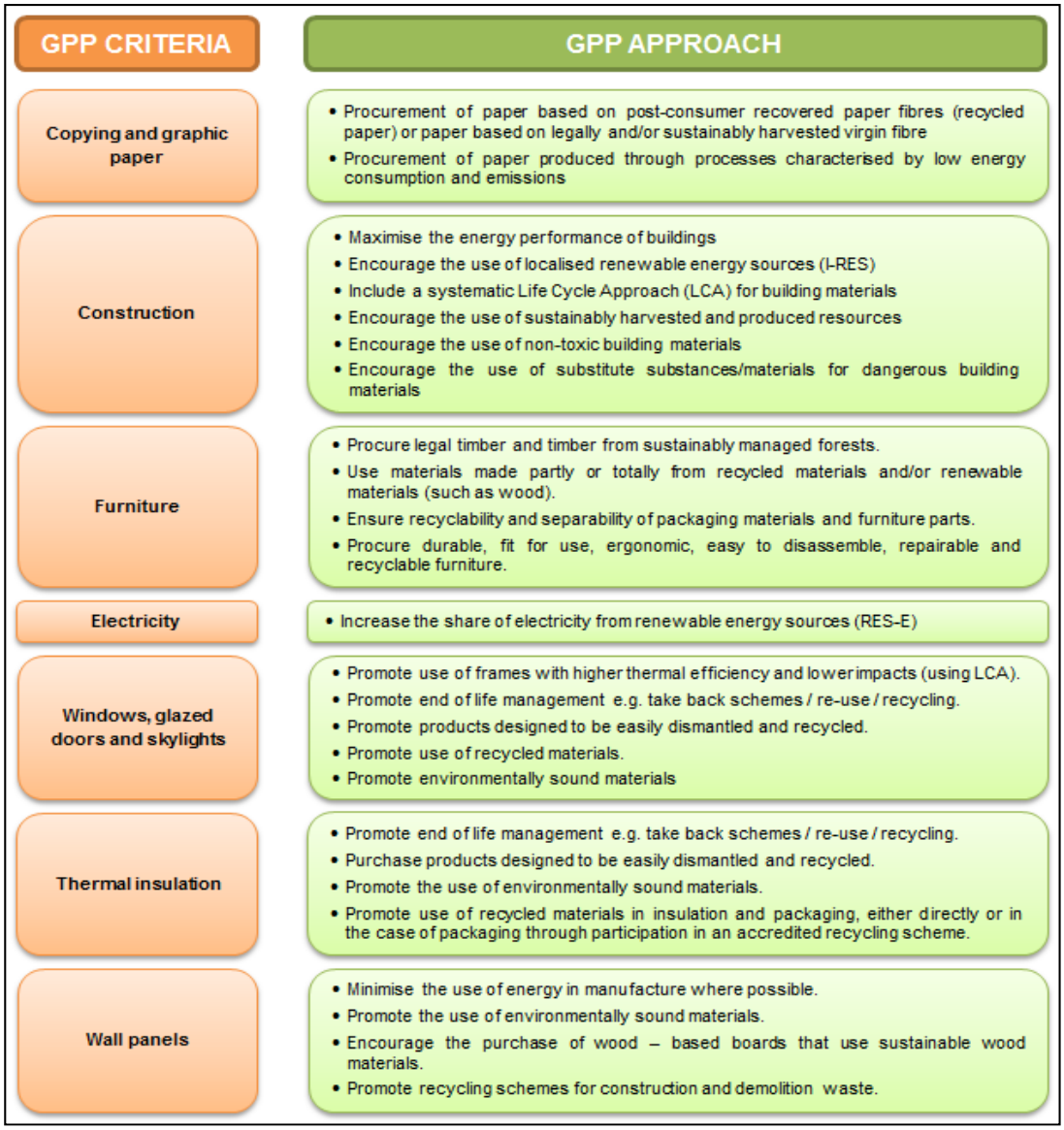
At the national level, most Member States have now published GPP or Sustainable Public Procurement (SPP) National Action Plans (NAPs) which outline a variety of actions and support measures for green (or sustainable) public procurement. Most have set targets for GPP or SPP, either in terms of overall procurement, or for individual product and service groups. A complication which arises from this is that individual Member States and the EU as a whole have progressed their current GPP schemes to different points of maturity, with some forging ahead. Varying criteria have been developed for the same product groups, or Member States have developed a number of different approaches to GPP/SPP criteria setting. Having a number of differing schemes and criteria has a potentially negative effect on the European market for green products, as each has to comply with different standards in a number of Member States. Therefore working towards common GPP/SPP criteria would considerably reduce the administrative burden for both operators and those implementing GPP/SPP, as well as for the business community supplying the products and services.

Ecodesign

Ecodesign is an approach to product design that takes special consideration for the environmental impacts. Just as under the GPP criteria, impacts are reviewed in terms of the whole lifecycle of the product. The EU's Ecodesign Directive[60] provides a framework to set obligatory ecological requirements for energy-using and energy-related products sold in all 27 Member States. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Roadmap to a resource efficient Europe*[61] strengthens the Commission's commitment to "*boost the material resource efficiency of products (e.g. reusability/recoverability/recyclability, recycled content, durability)*", and to expand the scope of the Ecodesign directive to non-energy related products. Ecodesign has clear synergies with other EU-level "green" policy instruments, such as GPP, EU Ecolabel and Energy label. Together they will favour the use of wood in situations where wood has a lesser impact in environment in terms of LCA.

[60] Ecodesign Directive (2009/125/EC) which is a recast of the Ecodesign Directive 2005/32/EC and introduces an extension to energy related products.
[61] COM(2011) 571 final

Figure 5.2 GPP approach to various wood-related GPP criteria



GPP CRITERIA	GPP APPROACH
Copying and graphic paper	• Procurement of paper based on post-consumer recovered paper fibres (recycled paper) or paper based on legally and/or sustainably harvested virgin fibre • Procurement of paper produced through processes characterised by low energy consumption and emissions
Construction	• Maximise the energy performance of buildings • Encourage the use of localised renewable energy sources (I-RES) • Include a systematic Life Cycle Approach (LCA) for building materials • Encourage the use of sustainably harvested and produced resources • Encourage the use of non-toxic building materials • Encourage the use of substitute substances/materials for dangerous building materials
Furniture	• Procure legal timber and timber from sustainably managed forests. • Use materials made partly or totally from recycled materials and/or renewable materials (such as wood). • Ensure recyclability and separability of packaging materials and furniture parts. • Procure durable, fit for use, ergonomic, easy to disassemble, repairable and recyclable furniture.
Electricity	• Increase the share of electricity from renewable energy sources (RES-E)
Windows, glazed doors and skylights	• Promote use of frames with higher thermal efficiency and lower impacts (using LCA). • Promote end of life management e.g. take back schemes / re-use / recycling. • Promote products designed to be easily dismantled and recycled. • Promote use of recycled materials. • Promote environmentally sound materials
Thermal insulation	• Promote end of life management e.g. take back schemes / re-use / recycling. • Purchase products designed to be easily dismantled and recycled. • Promote the use of environmentally sound materials. • Promote use of recycled materials in insulation and packaging, either directly or in the case of packaging through participation in an accredited recycling scheme.
Wall panels	• Minimise the use of energy in manufacture where possible. • Promote the use of environmentally sound materials. • Encourage the purchase of wood – based boards that use sustainable wood materials. • Promote recycling schemes for construction and demolition waste.

Source: Data collected from EU GPP product sheets.

5.2.5 The EU Construction Products Regulation

The Construction Products Regulation (EU) No 305/2011 (CPR) which repealed the Construction Products Directive (EU) No 89/106/EEC (CPD), was adopted on 9th March 2011. The Construction Products Regulation (CPR) is focused on the performance of building products. Under the CPR, various groups of defined building products are defined and assessed, based on their functional performance, considered from the life-cycle viewpoint, according to specific European standards or norms. A number of these norms relate to wood-based building products.

In July 2012, The Commission adopted new policy document on construction: Communication on "Strategy for the sustainable competitiveness of the construction

sector and its enterprises"(COM (2012) 433 final). This Communication proposes an action plan to promote construction as a driving force for the creation of jobs and sustainable growth in Europe in the short to the mid-term, focusing on five key objectives:

- stimulating favourable investment conditions;
- improving the human-capital;
- improving resource efficiency;
- strengthening the internal market and
- fostering the global competitiveness of EU companies.

A further communication on sustainable buildings is being prepared. Preparation for this includes a stakeholder consultation and a study exploring different policy options for the impact assessment, e.g.:

- an assessment framework for the environmental performance of buildings, i.e. an EU scheme established either on a voluntary or a mandatory basis, supported by EU standards, or guidance to schemes used in Member States;
- assessment and reporting scheme on the environmental performance of construction products and the establishment of a database, i.e. incentives or mandatory requirements to provide Environmental Product Declarations for products placed on the market;
- Measures to stimulate the supply and the demand of resource efficient buildings, i.e. Green Public Procurement, financial incentives, information.

5.2.6 European Environment Agency

The regulation establishing the European Environment Agency (EEA) and its European environment information and observation network (Eionet) was adopted by the EU in 1990[62]. The EEA became operational in 1994 and has currently 32 member countries. The EEA's mandate is:

- To help the European Community and member countries make informed decisions about improving the environment, integrating environmental considerations into economic policies and moving towards sustainability;
- To coordinate the European environment information and observation network.

The EEA's main clients are the EU institutions including the European Commission, the European Parliament and the Council, as well as its member countries. The EEA also serves other EU institutions such as the Economic and Social Committee and the Committee of the Regions. In addition, the business community, academia, non-governmental organisations and other parts of civil society are important users of EEA's information.

Eionet

The information provided by the EEA comes from a wide range of sources. Therefore Eionet, which involves more than 300 institutions, was set up to work with the EEA. The EEA is responsible for developing the network and coordinating its activities. Hence, it works closely with national focal points (NFPs) that are responsible for

[62] COUNCIL REGULATION (EEC) No 1210/90 of 7 May 1990 on the establishment of the European Environment Agency and the European environment information and observation network; later amendments include EEC Regulation 1210/1990 and EC Regulation 401/2009

coordinating the activities of Eionet at national level. They are typically national environment agencies or environment ministries in member countries. NFP's main tasks are to develop and maintain the national network, identify national information sources, capture and channel data and information from monitoring and other activities, help the EEA analyse the information collected and assist in communicating EEA information to end-users in member countries.

At the EU level, the EEA has established and manages European topic centres (ETCs) to support data collection, management and analysis. ETCs cover the major environmental and operational areas of the EEA's work programme and are distributed across the EEA member countries. Other important partners and sources of information for the EEA are European and international organisations, such as the Statistical Office (Eurostat) and the Joint Research Centre of the European Commission, the OECD, the UNEP, and the Food and Agriculture Organisation (FAO).

European Shared Environmental Information System (SEIS)

In February 2008, the European Commission released a Communication[63] entitled "Towards a Shared Environmental Information System (SEIS)". The concept aims to improve the collection, exchange and use of environmental data and information across Europe. SEIS intends to create an integrated web-enabled, EU-wide environmental information system, by simplifying and modernising existing information systems and processes. Consequently, it will bring together existing data flows and information related to EU environmental policies and legislation and make it easily accessible to both policy-makers and citizens. The EEA is a leading proponent of SEIS, plays a crucial role in collecting and providing environmental information, and manages or participates in many on-going European initiatives contributing to the implementation of SEIS principles. Over the coming years, the EEA will work together with Eionet, the European Commission and other stakeholders to implement SEIS. In 2010, the Commission published its Green Paper on Forests and Climate Change. So far, the only follow-up action has been to try to strengthen forest information, such as through work on harmonising the results of national forest inventories (NFIs).

EEA and forestry related reporting

Large parts of Europe are densely populated, a fact which poses vast pressures on the management of natural resources, such as forests. EEA Technical Report (9/2006)[64] summarises some major impacts of human influence on European forests. These are:

- Forest area loss and fragmentation;
- Harvesting of trees before their physiological maturity and potential age, resulting in a decrease deadwood habitats and of associated species;
- Modification of forest stands by silviculture, in term of tree species composition, standing volume of forest growing stock, distribution of age classes and rotation periods, regeneration measures, suppression of disturbances like fires or pests;
- Establishment of forest structures that do not occur naturally often leading to the development of associated biodiversity linked to continued human interference in natural succession processes;

[63] COM(2008) 46 final

[64] EEA Technical Report (9/2006) European forest types: Categories and types for sustainable forest management reporting and policy.

- Establishment of forest plantations with native or non-site-native species.

As a result, European forests are dominated by relatively young even-aged stands of few tree species and the largest forest areas are found in age classes 20-40 and 40-60 years. Consequently, the conservation and enhancement of biological diversity has become a critical issue of forest management. This is well demonstrated by the reported, nearly 40%, increase in the protected forest areas from 2000 to 2005 in the EEA member and associated countries[65]. Evidently, the Natura 2000 programme has been one of the major drivers of this development. The trend of enhancing protection is likely to continue in the coming years, but at a more moderate pace. Therefore, the current wood procurement (in the short term) should not be significantly affected by the establishment of new protected areas in the European level.

In some cases, there is a significant trade-off between protecting biodiversity and enhancing carbon sequestration versus increasing the wood supply[66]. Furthermore, demands on forests for biomass or bio-energy will keep growing in the future thus increasing the pressure on biodiversity. However, according to EEA Report (7/2006)[67], significant amounts of biomass can be technically available to support ambitious renewable energy targets, even if strict environmental constraints are applied. Nevertheless, environmental considerations still often restrict the availability of biomass from waste, agriculture and forestry. On the other hand, co-benefits between biomass production and nature conservation can exist for example in the form of crop diversification, reduction of pesticide use and increased soil protection. In order to ensure that wood procurement for the EU wood-processing industries develops in an environmentally-compatible way, as well as to further explore co-benefits with nature conservation; environmental guidelines need to become an integral part of planning processes at the local, national and European levels.

5.2.7 Key Messages

EU trade policy

Being a major player in the global market, the EU has the leverage to advance an open global trading system based on fair rules. The TBR is designed to ensure that those rules are respected, whereas the MAP and MADB function as the main instruments to help ensure a fluid market access. The fact that there are currently no new complaints registered, and that there are only three listed barriers under the "Wood, Paper and Pulp" –sector in the MADB, indicates that no significant obstacles are hindering the access of EU businesses to global forestry products' markets. This also means that, overall, the EU has been successful in initiating regional and bilateral trade negotiations and carrying them through with satisfactory results.

Considering that the current Doha Negotiations Round of the WTO have been effectively stalled for many years, and that the EU is not interested in advancing the NAMA forest products sectoral initiative, it can be safe to assume that no large advances in the EU trade policy are being taken in the multilateral arena in terms of forest products.

[65] EEA Report (3/2008). European forests — ecosystem conditions and sustainable use.
[66] EEA (2010). 10 messages for 2010 – Forest ecosystems (Short assessment of the status of the European forest ecosystems).
[67] EEA Report (7/2006) How much bio-energy can Europe produce without harming the environment?

FLEGT AP and VPAs

FLEGT partnership processes and EU TR are designed to reinforce each other. The EU TR bans illegally harvested wood from the EU market and requires due diligence for legal wood placed on it. Under FLEGT VPAs, forest governance in the partner country is addressed. For wood exported to the EU from a FLEGT partner, the legal source and production of wood is verified by the VPA partner country's LAS (Legality Assurance System), which will award a FLEGT licence to each consignment that is verified as legal. By purchasing FLEGT-licensed timber, EU operators will also be able to meet the obligations set by the EU TR. Therefore, the demand for FLEGT-licenced wood is likely to increase in the near future as the EU TR takes effect. However, the on-going VPA-negotiations have been slow and currently there is no FLEGT-licenced timber available in the market. So far only six countries have managed to proceed into VPA implementation and development of their LAS. It is a common conception that these few producer countries are not able to satisfy the European demand for FLEGT-timber in the short term. However, it should be recognised that partner countries have to undertake significant reforms in practice, and sometimes to their legislation, to achieve a VPA. Subsequently, more work is also required for implementation. The whole process takes years to complete but is for the long term. This long-term work is well aligned with the EU GPP as the FLEGT Action Plan recommends that Member States consider using public procurement policies to offer market incentives for legal and sustainable timber.

EU TR

Several EU TR-related concerns were expressed in the stakeholder consultations of the external Support Study[68], commissioned by the European Commission, for development of the non-legislative acts provided for in the EU TR:

- Possibility of rerouting of import routes vectors to "soft" member states due to milder penalties and less frequent monitoring in some EU countries
- Strict implementing measures endanger the competitiveness of (especially) SME importers and retailers
- There is generally poor awareness on the EU TR
- There is a fear of wood losing market share to other competing materials
- There is not enough FLEGT-licensed wood available (none at the moment)

According to these concerns, the application of the EU TR may have a short-term impact on the structure of wood-based imports to the EU. Larger operators are likely to handle their business as usual, since they generally have the resources and know-how to deal with the new due diligence requirements. In addition, they have often been working on their due diligence systems prior to the regulation's entry into effect, as a marketing measure for "greener" and more sustainable image.

On the other hand, SMEs face a more serious threat to their business-as-usual activities. They do not necessarily have the resources to implement highly reliable due diligence systems and hence may require longer adaptation times. Consequently, the demand for "safer" timber from the EU domestic market, or from other regions generally deemed as low risk, is likely to increase, at least amongst the SMEs. Some of the SMEs relying on the exotic, imported timber species may be pressured to start purchasing from EU-based suppliers rather than source the wood themselves.

[68] EFI, Indufor and University of Padua (2011). Support study for development of the non-legislative acts provided for in the Regulation of the European Parliament and of the Council laying down the obligations of operators who place timber and timber products on the market.

Therefore, the import market of exotic tree species depends on the capacity of these suppliers to import legal wood products; at least until the FLEGT--icenced timber reaches the market. However, as most of the timber is procured from the EU domestic market, the effect of the EU TR should be more visible within those industries dealing with timber imports, and even in this case, mostly in the short term.

EU GPP and Eco-design

Considering that the EU public sector spends approximately 2 trillion Euros annually, the EU GPP provides a huge incentive for various businesses to aim for greener products in order to maximise their share of this spending pool. Wood, as a renewable resource, has already gained a boost in public demand on various sectors such as construction. This trend is likely to continue as the GPP criteria, in synergy with ecolabels and ecodesign, are being enhanced and reviewed. In addition, many countries have taken their GPP measures even further than required. Even though this is beneficial in terms of the increased demand of sustainable forestry products, it also makes things more difficult for businesses operating in several countries as they have to adapt to the variety of differing regulations. Furthermore, because GPP often favours eco-labels and certified products, these NTMs are likely to be strengthened in the future.

Messages from EEA research

Urbanisation, immigration, technological development, change of life-style, as well as other on-going changes in European society will modify the cultural role of forests and will impact the general awareness of nature, including forests. Consequently, demands on forests will become stronger and spatially more diversified in the future. Production of wood and other traditional forest resources will have to be balanced against other kinds of goods and services from the forest ecosystems. In addition, demands on forests as a resource for bio-energy will continue to grow. However, any use of forests for bio-energy should not damage biological diversity and ecosystem conditions. Regardless of the current technological advances in the collection and handling of data, forests still remain a mystery in many respects. Therefore, there is a strong call for a systematic and harmonised Europe-wide monitoring and assessment of forests. EEA's SEIS is aiming to provide such a data tool in terms of the environmental issues.
The Commission's main follow-up to its Green Paper on Forests and Climate Change (2010) has been trying to harmonise the results of national forest inventories (NFIs).

5.3 Sector-specific EU Policies

5.3.1 Regulations impacting the use of bio-energy

Heads of States and Governments of the 27 Member States adopted a binding target of 20% final energy consumption from renewable energy by 2020. Based on this, the EU institutions adopted the Directive 2009/28/EC on the promotion of the use of energy from Renewable Energy Sources (RES Directive) which contains a series of elements to create the necessary legislative framework for concretising the 20% renewable energy targets. The RES Directive entered into force in June 2009.

The RES Directive is probably the most important driver of the renewable energy sector development in the near future.[69] The directive sets at EU level: a legally binding target of 20% of renewable energy in EU total energy consumption in 2020, as

[69] Directive 2009/28/EC

well as a common obligation for a 10% share of renewable energy in the transport sector (bio-fuels) by 2020. However, the overall targets of the former are modulated between Member States, so as to share the burden, with national targets indicated in Annex 1 of the Directive, whereas all must reach the bio-fuel obligation. Apart from the 10% transport energy obligation, an individual MS is free to decide how its target is to be reached, using one or more renewable energy source (RES) to provide one or more type of renewable energy (heating & cooling; electricity; CHP). Directive 2009/28/EC also requires EU Member States to adopt a national renewable energy action plan (NREAP). These have to indicate in detail how the national targets will be reached, including energy sources and uses, as well as their trajectories up to 2020.

The directive defines three options for any MS to reach its national target as a share of the EU goal of 20% renewable energy in 2020:

- The generation and use of renewable electricity
- The generation and use of renewable energy for heating and cooling
- The generation and use of renewable transport fuels

Wood-based energy has potential to contribute to all of these goals but is mainly foreseen for heating and cooling as well as for CHP production, where it can be most efficiently harnessed.

According to the EC (2011) 31 report, only a few of the Member States were expected to meet the previous 2010 targets[70] for the renewable energy in electricity generation, heating and in transport. Due to the inadequate rate of progress towards agreed EU targets, there was a clear need to reform the policy framework in order to catalyse the growth rate of the renewable energy utilisation. In this context the RES Directive was introduced, extending EU targets to 2020, raising the overall EU RES target to 20% – within which 10% of transport energy must be from bio-fuels and introducing a binding RES target for each member state. The Member States are expected to more than double their total renewable energy consumption by 2020 from the level of 2005. The electricity sector is expected to account for most of the increase, for about 45%, heating for 37% and transport for 18%.[71]

Electricity

Future electricity grid systems have to become more interconnected and flexible. In addition there is a need for the development and reinforcement of infrastructure. Small-scale, multiple, flexible methods of electricity generation require different grid and market designs in comparison to the traditional centralised large-scale power sources.

In electricity generation, the wood fuels have been traditionally used in large-scale CHP plants, especially in the countries with considerable activity of forest industry, such as Finland, Sweden, France, and Austria but also in Portugal and Denmark. Smaller capacities of wood based power generation exist mostly in central Europe.

[70] Directive 2003/30 (Bio-fuels); Directive 2001/70 (bio-electricity)
[71] EC (2011)31: Communication from the commission to the European parliament and the council – Renewable Energy: Progressing towards the 2020 target

Heat

In the heating sector, biomass will remain the dominant source of energy in the future. Among other biomass fuels, wood will have a significant role in the heat energy generation.

According to the EC (2011)31 report some regulatory instruments, such as the EU Emission Trading System (ETS) are applied at the EU level. However, the bulk of them are delivered at the member state level. The report does not give an overview of the EU level financing instruments but focuses on the situation of member state support system in 2009.

Member state instruments include feed-in tariffs, premiums, quota/certificate schemes, grants, loans and loan guarantees, equity funds, tax exemptions and fiscal incentives. Table 5.2 illustrates a summary of various instruments used by the EU 27 states to provide support in renewable energy generation in 2009. The choice of a certain instrument depends on the stage of development of the technology used and the project. They are all designed to alleviate risks involved to investments.

Table 5.2 The use of different policy instruments for renewable energy among the EU-27 states in 2009

		AT	BE	BG	CY	CZ	DE	DK	EE	ES	FI	FR	GR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	UK
Electricity	Feed in tariff	X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X			X			X	X	X
	Premium					X	X	X	X	X						X					X					X		
	Quota obligation		X													X						X		X	X			X
	Investment grants	X	X		X	X	X	X			X							X	X	X		X		X	X	X	X	
	Tax exemptions		X			X				X		X				X			X		X	X	X		X	X	X	X
	Fiscal incentives			X			X														X	X				X		
Heating	Investment grants	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
	Tax exemptions	X	X					X				X	X			X	X				X				X			X
	Fiscal incentives			X			X		X			X											X					
Transport	Quota obligation	X		X	X	X	X	X		X	X	X			X		X	X	X		X	X	X	X		X	X	X
	Tax exemptions	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X

Source: EC (2011)31 and RES Legal[72]

Especially in the early stage of wood energy project development, it is common to use grants for significant proportions of capital costs because often the high cost and uncertainty in the undeveloped technology renders the risk for the private sector too high. Especially in the heating sector, the use of these investment grants is the major support mechanism. Once the technology is more established the support mechanism should start shifting from capital support towards operating support.[73]

[72] RES LEGAL, website on legislation on renewable energy generation. German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (www.res-legal.de)

[73] Directive 2009/29/EC

The most common renewable energy promotion schemes used in the EU-27 are the feed-in laws, which are applied in 21 Member States. They are mostly used to promote the use of renewable energy sources in electricity generation. There are two different types of feed-in laws: Feed-in tariff and feed-in premium. Their basic function is to create demand for renewable electricity that would not otherwise exist. The most common feed-in law is a feed-in tariff, which is a guaranteed long-term minimum price (€/MWh). The idea is that the electricity producers are ensured a certain long-term minimum price which consequently encourages investing in immature renewable energy technology. They also provide long-term financial stability by levelling volatility and seasonal differences of energy markets.

Feed-in premium is a price added on top of the market price. This makes the feed-in premium a more market-based tool than feed-in tariff. Both instruments guarantee an electricity price that is above the actual market price. However, it is inefficient to artificially ensure a minimum price forever. Therefore the both instruments have a time limit. Also feed-in mechanisms have some technological improvement incentives, which make the investments profitable. Both feed-in tariffs and premiums are paid to electricity utilities. The two instruments differ regarding the impact of electricity price changes.

Recently (2012-13), many EU Member States have been reducing the levels of feed-in tariffs and premiums, largely as a result of limited public funds in the on-going downturn.

Climate policies that set a carbon price, such as the EU Emission Trading System, aiming the reduction of the greenhouse gases by 20% by 2020 compared to the level of 1990, are important drivers to promote the use of wood biomass in energy production[74]. The interaction of renewable energy policies and climate policies is an important topic, since the policies promoting wood-based energy may have unexpected negative impacts when the feed-in tariff is linked together with emissions trading. This is because the production of renewable-electricity might decrease when the emissions price increases. This problem could be solved by binding the instrument to be dependent either on the substitute price or the emissions price.[74]

Regulations and policies in the member states related to bio-energy

In the following a short summary of different regulatory factors affecting the renewable energy utilisation for some Member States is presented. The purpose of this is to present a cross cut of the various regulatory measures used across the European Union. The summary is based on the EC (2011)31 communication report which focuses on the situation of member state support system in 2009.

Austria

In Austria, electricity from renewable sources is promoted mainly through a feed-in tariff, which is set out in the Green Electricity Act and the regulations related thereto. The operators of renewable energy plants are entitled by the government purchasing agency, the so-called Clearing and Settlement Agency, to the conclusion of a contract on the purchase of the electricity they produce.[72]

In Austria an initiative called Klima:aktiv which started in 2004 promotes the utilisation of renewable energy. Klima:aktiv is embedded in the Austrian federal climate strategy, including a bundle of measures of regulation, taxes, and subsidies. Under this initiative

[74] Kangas H-L. 2012 Renewable energy and climate policies: Studies in the forest and energy sector. Dissertationes Forestales 136.

a programme called “Holzwärme” had a lot of importance giving incentives for house owners to install biomass heating systems.[71]

Belgium

In Belgium, renewable electricity generation is promoted through different policy instruments depending on the location.

In the Brussels-Capital region, access of electricity from renewable energy sources is regulated by the Brussels-Capital distribution grid code and by the regional electricity market ordinance.

Flanders supports renewable electricity by using a quota system, an ecological premium and a net-metering scheme. Regarding heating and cooling from renewable energy resources, the Flemish support scheme so far only provides for a quota system. Electricity suppliers are obliged to prove, by submitting certificates, that a certain statutory and continuously increasing proportion (quota) of the electricity from renewable sources. The minimum price per certificate is guaranteed by statutory law. All renewable electricity generation technologies are eligible for support.[72]

In the region of Wallonia, the generation of electricity through renewable energy plants is promoted using a federal system of green certificates as well as through regional support schemes such as energy subsidies, investment assistance for companies or for public bodies and net-metering. Renewable heat energy plants are promoted through a system of energy subsidies as well as providing investment assistance for companies.[72]

Bulgaria

The Renewable and Alternative Energy Sources and the Biofuels Act (ERSA) are the legislative bases for the feed-in tariff, which is the main element of the Bulgarian support system. The ERSA also creates an obligation to purchase and dispatch electricity from renewable sources.[72]

Czech Republic

In the Czech Republic the current regulatory framework supports the general development of renewable energy, especially electricity. Other support measures target cogeneration, energy efficiency measures and a tax relief on incomes generated by plants utilisng RES. Also, a State Environmental Fund provides subsidies for energy efficiency and heating in the residential sector. [72]

System operators are contractually entitled by the grid operator to the payment of a fixed feed-in tariff for all electricity exports to the grid. The feed-in tariff varies according to the source of energy used. The tariff for new systems commissioned after 01/01/2008 depends on the type of biomass used. [72]

Operators of renewable energy systems receive a so-called “Green bonus” on top of the regular market price for electricity. Operators generating renewable electricity to cover their own requirements only are also entitled to the payment of a bonus. Apart from the feed-in tariff, system operators may receive subsidies under either the European Structural Fund or the National Programme for the Promotion of Energy-saving Measures and the Use of Renewable Energy Sources. The detailed conditions for the subsidies are usually specified in the current call for applications. In addition profit from the sale of electricity from renewable sources is exempt from income tax. [72]

Denmark

Denmark promotes renewable electricity generation through a premium tariff. System operators receive a variable bonus on the market price. The sum of the bonus and the market price shall not exceed a legally set maximum, which depends on the date of connection of a given system and the source of energy used. In certain cases, system operators are granted a guaranteed bonus on top of the market price. In such cases the statutory maximum is not defined. [72]

In Denmark the government also provides tax exemptions for the use of wood fuels. The Regulation on Net-metering for the producers of electricity for own needs is based on the Act on Electricity Supply and authorises the exemption of certain system operators from Public Service Obligation (PSO). Electricity producers using all or part of the electricity produced for their own needs are exempt from paying Public Service Obligation on this electricity. The Public Service Obligation is a charge levied to support renewable energy. Biomass systems are eligible for the support but the system capacity must not exceed 6 kW per household or per 100 m². Only systems in non-commercial buildings are eligible and systems must be connected to a private supply system.[72]

Estonia

In the Republic of Estonia, renewable energy is promoted mainly through a premium tariff. Biomass systems are eligible under the following condition: the electricity must be generated by high-efficiency CHP plants. Electricity generated by conventional thermal power stations is not eligible. The bonus does not differ for the individual technologies. It amounts to EUR 0.0537 per kWh.[72]

Finland

The state of Finland provides subsidies for investment and research projects in the field of sustainable energy generation. The so-called “energy aid“ is a state grant for investments in RES. Grants are available for investment and research projects that involve the use of renewable energy. According to the Ministry of Employment and the Economy, all technologies are eligible for grants for research and investment projects that involve the generation of renewable energy or the application of RES technologies. Among other costs, the costs for preparation, planning costs and materials are eligible for subsidies.[72]

The generators of electricity from biomass, biogas and wind receive a variable premium feed-in tariff on top of the wholesale electricity price for a period of 12 years. The generators thus get a fixed target price for their electricity. Biomass systems that fail to meet certain requirements of the premium feed-in tariff scheme are eligible for a fixed but reduced feed-in tariff. [72]

Wood-fuel plants are eligible if they meet the following conditions:

- The plant must not have received the premium feed-in tariff before
- The plant must not have received other state grants
- The plant must be built entirely from new parts
- The nominal capacity of the generator must be at least 100 kWh and must not exceed 8 MVA
- The plant must produce both electricity and usable heat
- The plant must achieve an efficiency rate of at least 50%, or even 75% if the capacity of the generators is equal to or exceeds 1 MW

France

In France the public support has focused on improving firewood use in households and the development of cogeneration units using wood chips. Previously the national level direct support measures to promote the use of wood fuels have been small. Currently, electricity from renewable sources is promoted through a price regulation system based on a feed-in tariff and tax benefits. On the regional level, renewable energy is promoted through subsidies.[71]

In France, electricity prices are regulated through a feed-in tariff scheme. Operators of renewable electricity systems are entitled by the suppliers to payment for electricity exported to the grid. The distribution grid operator is obliged to enter into agreements on the purchase of electricity at a price fixed by law. The French government invites tenders for the construction of renewable energy systems in order to reach the target capacity set by the multi-annual investment plan (Programmation Pluriannuelle des Investissements PPI). Successful tenderers may receive a higher payment. [72]

Electricity generated from renewable energy sources is promoted through tax incentives. Persons investing in renewable energy systems are eligible for an income tax credit (Crédit d'Impôt). In general, the French support measures apply to all renewable energy generation technologies including wood biomass. [72]

Germany

Germany has a legal framework promoting the use of wood fuels. In Germany, electricity from renewable sources is supported by a feed-in tariff. The criteria for eligibility and the tariff levels are set out in the Act on Granting Priority to Renewable Energy Sources (EEG). According to this Act, operators of renewable energy systems are legally entitled to pay feed-in tariffs to grid operators for electricity exported to the grid. The EEG also introduced the so-called "market premium" and the "flexibility premium" for system operators who directly sell their electricity from renewable sources. The amount of tariff is set by law and is usually paid over a period of 20 years.[72]

As an alternative, system operators may claim a market premium for electricity they sell directly. The amount of the market premium shall be calculated each month. In general, system operators are free to choose between the regular feed-in tariff and the market premium for direct selling. For a system operator to be eligible for the flexibility premium, he shall provide additional installed capacity that may only be used on demand rather than on a regular basis.[72]

Also, the "market incentive programme", a financial support instrument and the "Renewable Energies Heat Act" (EEWärmeG) have reinforced the utilisation of pellets on the small-scale market.[71]

Greece

In Greece the system operators are contractually entitled by the grid operator to the feed-in tariff of electricity exported to the grid. The grid operator is obliged to enter into these contracts. The amount of feed-in tariff varies for each electricity generation technology. [72]

Hungary

In Hungary, electricity generated from renewable energy sources is promoted through a price-regulation system based on feed-in tariffs. The eligibility period and the maximum amount of eligible electricity are set out in implementing decrees. The feed-in tariffs are fixed and depend on the time of day.[72]

In Hungary a subsidy system funded via the Environment and Energy Operational Programme provides investment subsidies up to 50-70% for the establishment of new pellet plants.[71]

Ireland

In Ireland, electricity from renewable sources is promoted through a feed-in-tariff scheme that operates as a floor price. The tariff is allocated under the REFIT scheme, which supports various renewable electricity generation technologies. The entities entitled to the premium tariff are those suppliers that purchase electricity from renewable sources from generators with whom they have entered into a commercially negotiated REFIT power purchase agreement. [72]

Italy

In Italy the National Renewable Energy Action Plan forecasts a dominating role for solid biomass in the growth of the renewable energy use. In order to achieve the ambitious targets, the Italian government has established a group of supporting measures. The regulatory framework in Italy has been driving notable development especially in the household use of pellets and firewood. [72]

Electricity producers and importers shall satisfy a quota of electricity from renewable sources and furnish proof thereof by submitting green certificates. Renewable energy sources are promoted through several kinds of feed-in and premium tariffs, which especially benefit small systems. Small systems, except for photovoltaic systems, can also choose the guaranteed feed-in tariff as an alternative to green certificates.[72]

The Budget Act of 2008 gives municipalities the opportunity to grant a reduction in real estate tax to buildings equipped with renewable energy systems from 2009 onwards. The amount of reduction depends on the value of the property and differs from municipality to another. [71]

Latvia

In Latvia, the government promotes the generation of electricity from renewable sources through a feed-in tariff, which also includes elements of a quota system and tenders. The Latvian government has decided that a certain percentage of the total energy consumption of all Latvian final consumers shall be from renewable sources. This share varies according to the source of energy. The producers of electricity from certain energy sources are obliged to participate in tenders to obtain the right to sell electricity at a guaranteed price until the percentage set by the government is reached. In general, the feed-in tariff applies to all renewable electricity generation technologies except for geothermal generation.[72]

Lithuania

In Lithuania, electricity from renewable sources is promoted mainly through a feed-in tariff. The operators of renewable energy systems are entitled by the grid operator to payment for all electricity fed into the grid. The total amount of electricity eligible for promotion through the feed-in tariff is limited by law and depends on the source of energy used. In Lithuania, subsidies are granted by the Lithuanian Environmental Investment Fund (LEIF) and are only for those projects that aim to reduce environmental damage in the long term. These projects include renewable electricity generation systems. Also electricity from renewable sources is exempt from tax. Biomass systems are eligible for all these three types of support.[72]

Netherlands

In the Netherlands there are subsidies for both large-scale power plants as well as small-scale electricity production using biomass. Electricity from renewable sources is promoted mainly through a premium tariff (bonuses on top of the wholesale price). The SDE+ (Stimulering Duurzame Energieproductie) scheme grants a bonus payment to the producers of renewable energy to compensate for the difference between the wholesale price of electricity from fossil sources and the price of electricity from renewable sources. The bonus is paid for a period of up to 15 years and applies to newly constructed installations only.[72]

Furthermore, RES are promoted through tax benefits. A given consumer is exempt from this tax if the electricity consumed is electricity from renewable sources and was generated by the consumer himself.[72]

Poland

In Poland certificates for electricity and cogeneration using renewable energy sources have been issued. New regulations promoting the use of agricultural biomass have become a deterrent for the use of forestry residues. Electricity from renewable sources is promoted mainly through a quota system in which the electricity suppliers are obliged to acquire a certain number of so-called “certificates of origin”. Regulatory authority URE monitors compliance with the quota obligation and awards the certificates to producers of electricity from renewable sources. Certificates of origin are transferable and may either be acquired by generating renewable electricity or by purchasing them from other producers. If a company fails to present certificates of origin or does not pay the alternative fee, the regulatory authority URE (Urząd Regulacji Energetyki - Energy Regulatory Office) charges a penalty. [72]

Furthermore, electricity from renewable sources is supported with tax relief. Producers of electricity from renewable sources are exempt from the tax on the sale and consumption of electricity.[72]

Portugal

In Portugal support measures exist to promote the domestic renewable energy markets. In Portugal, the most important means of promotion is a feed-in tariff. Operators of renewable energy systems are contractually entitled by the grid operator to payment for electricity exported to the grid. The grid operator is obliged to enter into a contract on the purchase of electricity at a statutorily set price. The feed-in tariff includes two elements: a guaranteed payment rate and an amount calculated by a statutorily set formula.[72]

In addition the purchase of renewable energy systems is promoted through a reduced VAT rate. The purchase of equipment or machines to generate electricity from renewable sources is supported by a reduced VAT rate of 12%.[72]

Romania

In Romania, electricity from renewable sources is promoted through a quota system. Electricity suppliers and producers are obliged to present a certain number of green certificates, which are issued for electricity from renewable sources. These tradable certificates are allocated to the producers of electricity from renewable sources.[72]

In July 2013 the Romanian government approved a piece of legislation on cutting the incentives to renewable energy producers. The content of the legislation postpones granting a part of the green certificates to investors in small hydropower plants, wind farms and solar power plants; however investments based on biomass are not affected. For electricity generated in high efficiency CHP-plants that use biomass, liquid biofuels and biogas one extra green certificate for MWh is granted. This improves possibilities for Romania to increase the use of wood in energy generation.[75]

In addition renewable energy has been previously supported by the Romanian Environmental Fund. According to the administrative body of the Environmental Fund, call for proposals for 2013 has not been defined yet. The maximum subsidy is 50% of the eligible project costs. However, in the region of Bucharest-Ilfov, the maximum subsidy is only 40% of the eligible project costs.[72]

Slovakia

In Slovakia, electricity from renewable sources is promoted through a feed-in tariff. Energy companies are obliged to purchase and pay for electricity exported to the grid. The use of renewable energy sources is further supported through an excise tax exemption and several subsidies.[72]

”Increasing efficiency in energy production and consumption and providing progressive energy technologies” of the Operational Programme Competitiveness and Economic Growth of the European Structural Fund provides companies the opportunity to apply for investment grants for renewable energy projects. “Innovation and technology transfer” is a sub-programme of the Operational Programme Bratislava Region, which awards grants to projects in the field of renewable energy. Both types of grants are awarded through calls for applications.[72]

Slovenia

In Slovenia electricity generated from renewable sources is promoted mainly through a feed-in tariff and a premium tariff. Qualifying producers of electricity from renewable sources may choose between a guaranteed feed-in tariff, and a premium on top of the electricity price achieved in the fee market. The guaranteed price and the uniform annual premium apply only to systems of which the capacity does not exceed 5 MW.[72]

Furthermore in Slovenia, public calls for grant applications are organised and loans are provided for projects in the field of renewable energy. The Ministry of the Economy (Directorate for Energy, Energy Efficiency and Renewable Energy Sources Division) invites applications for subsidies and The Slovenian Environmental Fund (Eko sklad) invites applications for soft loans. The current calls for applications subsidise the

[75] Herzfeld & Rubin, P.C., The Romanian Digest - Renewable Energy: Romania and Legislative Instability, July 2013

reconstruction or renovation of renewable energy systems and apply to municipalities, enterprises, other legal entities and private owners.[71]

Spain

In Spain, the generation of electricity from renewable sources is mainly promoted through a price regulation system. System operators may choose between two options: a guaranteed feed-in tariff and a guaranteed bonus (premium) paid on top of the electricity price achieved on the wholesale market. Furthermore, investments in systems and equipment required for the generation of electricity from renewable sources may be deducted from tax.[72]

Biomass systems, based on the use of harvesting residues or industrial wood by-products, energy crops, agricultural or gardening waste, are eligible for subsidies until the total capacity reaches 1371 MW.[72]

Sweden

In 1991, Sweden established one of the earliest forms of general CO_2 tax on fossil fuels. Today the legal framework is based on the electricity certificate system with renewable obligations and exemptions from CO_2 taxes. Heavy taxation of fossil fuels has worked as an incentive to invest in pellet boilers. The result is that the use of wood pellets in private households has increased from 80 000 t to over 500 000 t during 2000-2012.[71,76]

Currently the main incentive for the use of renewable energy sources is a quota system in terms of quota obligations and a certificate-trading system. The Electricity Certificates Act obliges energy suppliers to prove that a certain quota of the electricity supplied by them is generated from renewable energy sources. Energy suppliers shall provide this evidence by presenting tradable certificates allocated to the producers of electricity from renewable sources. [72]

United Kingdom

The United Kingdom provides various far developed incentives to generate electricity from biomass. The UK government is forming update to legislation to address long-term contracts for low-carbon energy and capacity as well as institutional arrangements to support electricity from biomass, continue supporting the principle of no retrospective change to low-carbon policy incentives and to create a market that allows existing energy companies and new contestants to compete fairly.[72]

Under the Renewables Obligation Orders, electricity suppliers are obliged to prove that a certain percentage of electricity supplied to final consumers within the United Kingdom was generated from renewable sources. This framework supports systems or plants between 50 kW and 5 MW located in Great Britain (England, Wales and Scotland).[72]

The Climate Change Levy (CCL) is a climate protection tax, which is levied on the consumption of electricity from non-renewable sources by commercial and industrial final consumers and the public sector. The CCL aims at reducing greenhouse gases and promoting energy-efficiency in final consumers. The Climate Change Levy is collected from the electricity suppliers, who pass it on to their consumers through the electricity price. Electricity from renewable sources is exempt from this tax. [72]

[76] Swedish Association of Pellet Producers

5.3.2 Regulations impacting paper and board recycling

The Thematic Strategy on Waste Prevention and Recycling can be seen to have three different levels, including:

Framework Legislation

Waste Framework Directive (WFD) (2008 / 98 / EC)
Waste shipment Regulation (EEC / 259 / 93)

Waste Treatment Operations
Incineration Directive (2000 / 76 / EC)

Landfill Directive (1999 / 71 / EC)

REACH EC Regulation (1907/2006)
Recycling Standards

Waste Streams

Related to paper and board (Packaging and Packaging Waste (Directive 94 / 62 / EC)). This is only for packaging material – minimum recycling target of 60% by weight for paper and board.

Waste Framework Directive

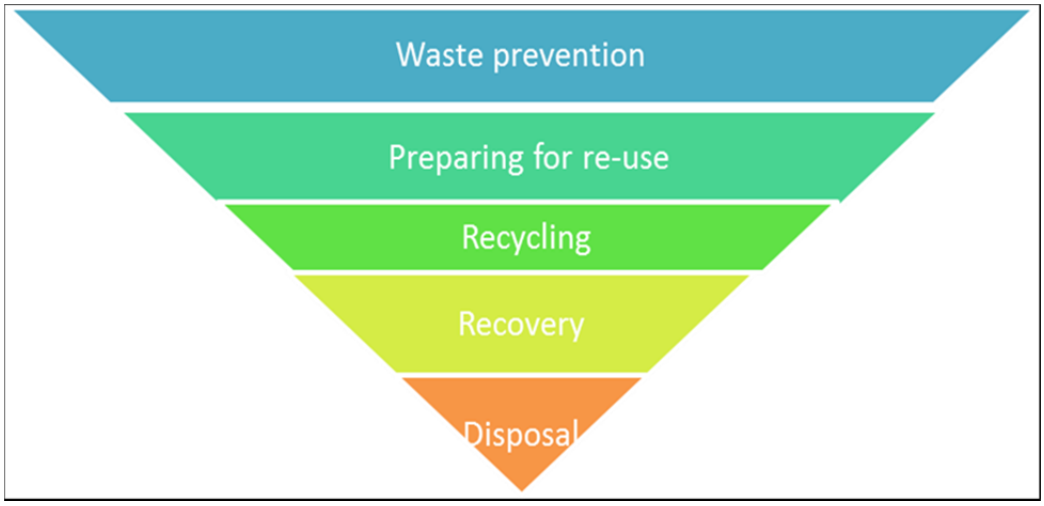
The Waste Framework Directive (WFD) sets the basic concepts and definitions related to waste management, such as definitions of waste, recycling, recovery. The general idea is to understand waste as a resource and educate people to recycle. In this respect, by-products are not waste. The WFD explains when waste ceases to be waste and becomes a secondary raw material (end-of-waste criteria), and how to distinguish between waste and by-products. The Directive lays down some basic waste management principles:

- waste must be managed without endangering human health and harming the environment
- without risk to water, air, soil, plants or animals
- without causing a nuisance through noise or odours
- without adversely affecting the countryside or places of special interest
- waste legislation and policy of the EU Member States shall apply as a priority order

The waste management hierarchy includes several hierarchy levels, namely in order:

- prevention
- preparing for re-use
- recycling
- recovery
- disposal

Figure 5.3 The EU Waste Management Hierarchy



According to the waste management hierarchy and life-cycle thinking the best environmental outcome is being achieved at the highest level of the hierarchy. The line between waste and product (non-waste) can be drawn between prevention and preparing for reuse – materials at the highest level are considered to be products (non-waste). Prevention (EU Council Packaging Directive of 20.12.1994) means reduction of the quantity and of the harmfulness for the environment of:

- paper and substances contained in paper products
- paper products and its waste at production process level and at marketing, distribution, utilisation and elimination stages
- in general, developing clean products and technology

The hierarchy also shows that e.g. material recycling is at a higher level than energy recovery and thus preferable.

The WFD sets targets to be achieved by 2020 – preparation for re-use, recycling of municipal waste, at least paper, metal, plastic, glass from households, to an overall minimum of 50%. The WDF also foresees separate collection as of 2015 and empowers the Commission to consider developing end-of-waste (EoW) criteria for paper.

As analysed in other chapters of this study, there are several issues, related to recycling targets, which must be taken into account:

Discussion

EU has set itself a target to become a “Recycling Society”. This target is included in the strategy on prevention and recycling of waste.

According to one definition made in an industry led process (European Declaration of Paper Recycling) paper recycling is the reprocessing of used paper in a production process into new paper and board. At present, in recycling rate calculations exported recovered paper (to outside EU-27) is also considered to be recovered paper utilisation. This interpretation is in line with EU-Council Packaging Directive, which defines recycling as “reprocessing of recovered paper in a production process for

original purpose for other purposes, including composting but excluding energy recovery", since there is no indication in the directive that reprocessing should take place in Europe.

Data availability and reliability issues should be stressed because at present there are no actual statistical data sources concerning the real data for collection potential, recovered paper utilisation for other uses, composting, energy use and collection from different sources.

Today, recycling is not only a significant part of the paper manufacturing process, but also a large industry by itself, linking directly or indirectly to a large number of sectors in the global economy. As the importance of recovered paper as a raw material for paper industry has grown, the need for more focused and internationally harmonised management tools have emerged. Above all it is important to harmonise terminology and data on the international level.

The European Waste Framework Directive provides a general framework of waste management requirements and sets the basic waste management definitions for the EU. The Waste Directive77 has a much stronger emphasis on the targeted recycling and more efficient use of resources. The process to turn this into national legislation and practices is still on-going.

Waste status

Paper recycling in Europe has been faced with an identity crisis, whereby policy-makers see used paper as waste and the industry sector sees it as a valuable raw material. In the legal definition, used paper is considered to be waste. The very rigid legislation defined waste as: "any substance or object, which the holder discards or intends or is required to discard".

Due to the waste status of used paper in legislation, the applied methods for handling waste are rather poor, in the sense that "waste" can't get any worse. However, applying an end-of-waste criterion could improve the quality of recovered paper and provide a possibility of moving paper up in the waste hierarchy, whereby it would be defined as a secondary material and not as waste.

The Waste Framework Directive itself does not directly define the end-of-waste criteria but gives the Commission the mandate to develop these for different sources.

Use as a fuel

Due to the waste status of recovered paper there has been concern that there is not enough raw material (EU Wood study) and that the wood demand can hardly be satisfied from domestic sources in 2020. This could also lead to a situation where paper will end up as fuel because waste is burned and used for producing energy instead of being recycled and re-used[78]. As mentioned above, recovery – including use as fuel is on a lower level in the waste hierarchy than recycling. There is also a strong focus on energy policies related to climate change, where Member States have to meet the target of sourcing 20% of their energy needs from renewables, including biomass, hydro, wind and solar power, by 2020[79]. There are divergent views regarding how to classify and hence use collected paper. The paper industry is in favour of

[77] Directive 2008/98/EC of the European Parliament and of the Council
[78] The Future of Paper Recycling in Europe: Opportunities and limitations. COST Action E 48.
[79] Renewables Directive, EurActiv 09/12/08

collection with a clear goal on good quality recovered paper and the energy industry and sometimes municipalities see recovered paper merely as a source for energy.

It is clear that recycling contributes positively to mitigating climate change. In the light of that, it seems somewhat contradictory that the EU policy package on energy and climate change could potentially reduce recycling by challenging the existing EU waste hierarchy. In this context, the EU has adopted a set of ambitious targets for renewable energy which could lead to recovered paper, in addition to much bigger volumes of wood biomass, being collected in a "mixed energy stream" and used for energy instead of material recycling.

Co-mingled collection

The typical collection systems applied to waste paper are separate collection and co-mingled collection. In the separate collection magazines and newspapers are collected separately from paperboard. In the co-mingled collection all recyclable materials (paper, glass, and cans, plastic) are collected together. At the moment there are several European countries, like the UK, where co-mingled collection is dominant. The main problems which are linked with co-mingled collection are material inefficiency and in the end low quality of recycled materials. (The future of paper recycling in Europe, COST 48)

Landfill Directive

Council Directive 1999/31/EC on the landfill of waste is intended to prevent or reduce the adverse effects of the landfill of waste on the environment. It defines the different categories of waste (municipal waste, hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into land.

The Landfill Directive stipulates that Member States shall set up a national strategy for the implementation of the reduction of biodegradable waste going to landfills. According to the target, the municipal waste shall be reduced to 75% by 2006, to 50% by 2009 and to 35% by 2016.

The goal of the Landfill Directive in prevention of waste does not alone have an impact on the amount of waste generated but is a part of a broader spectrum of setting requirements all along the production chain. At the beginning of the chain eco-design can have an influential role to benefit the aim of resource efficiency.

Packaging and Packaging Waste Directive

The Packaging and Packaging Waste Directive80 aims to harmonise national measures in order to prevent or reduce the impact of packaging and packaging waste on the environment and to ensure the functioning of the internal market. It contains provisions on the prevention of packaging waste, on the re-use of packaging and on the recovery and recycling of packaging waste.

Recyclable packaging materials identified by the Directive are glass, plastic and cardboard, metal and wood. The Directive will set different recycling and recovery targets for each packaging material separately. A target has not yet been set for wood.

[80] Packaging and Packaging Waste Directive, 94/62/EC

Recycling and Food Contact legislation

Materials intended to come into contact with food are regulated under Food Contact Regulation (135/2004) and under the Good Manufacturing Practice (GMP) Regulation (2023/2006). These regulations have no paper and board specific rules. The general requirement that material for direct or indirect food contact "must not transfer their constituents to the food in quantities that could endanger human health or change the composition or characteristics of the food" applies to paper-based products, but no specific measure exists on European level to guide how paper and board is to comply with this requirement.

5.3.3 Main Issues on legal framework

- Since the EU's wood raw material demand is largely satisfied by EU sources (90%), increased market liberalisation - if it occurs - within the WTO should not have a major effect on Europe's wood supply. Also, most of the developing countries already face low or no tariffs at all for their exports to developed countries. In addition, as the Russian Federation recently joined the WTO, the wood supply situation from Russia should improve, within the limits of the tariff reduction quotas being implemented.

- Voluntary eco-labelling and certification for sustainable forest management may play a more significant role as market-based tools for the supply of forest products in the EU market.

- The OECD's role in the policy arena is mostly advisory as it produces scientific data to help direct the development of future policies. This influence can be seen, for example, in the "greening" of public procurement. The implications of such development to forestry and wood raw material supply should be beneficial as long as the wood procurement is based on sustainable forest management. The IEA has several relevant initiative on bio-energy.

- The role of MEAs can be seen largely as the qualitative steering of policy issues and public awareness with very few direct trade-related implications. For instance, the trade of CITES-controlled wood species is very low and usually related to highly specialised industries, such as the production of certain musical instruments. The forestry related issues under the UNFCCC and its Kyoto Protocol are still largely debated in terms of technicalities and have not yet translated into solid measures globally.

- The collaboration of the ministers responsible for forests in Europe, the FOREST EUROPE process, has been of some importance at both national and international levels. FE's negotiations for a Legally Binding Agreement on Forests in Europe demonstrate a mutual effort for ensuring the vitality of the forests for the future generations and it is likely to affect the EU policies dealing with wood and forests.

- The FLEGT voluntary partnership agreements and EU Timber Regulation (EU TR) are expected to reinforce each other. Under FLEGT VPAs, forest governance in the partner country is addressed. As part of this process, the legal source and production of wood bound for the EU is verified by the VPA partner country, which will award a FLEGT export licence to each consignment that is verified as legal. The demand for FLEGT-licenced wood may increase in future as the EU TR takes effect. However, the on-going VPA

negotiations have been slow and currently there is no FLEGT-licensed timber available in the EU market.

- Concerns regarding the EU Timber Regulation are: the possibility of rerouting of import routes to “soft member states”, due to milder penalties and less frequent monitoring in some EU countries; strict implementing measures endangering the competitiveness of importers and retailers – especially SMEs, there is generally poor awareness among operators of the EU TR and there is a fear of wood losing market share to other, competing materials.

- As most of the timber placed on the EU market is procured from the EU domestic supplies, the biggest effect of the EU TR will be internal. However, because supply chains are usually longer for imported wood products’ traceability will maybe be more difficult. In this context some exporting countries may feel disadvantaged.

- The EU green procurement policy (GPP) provides a huge potential incentive for various businesses to aim for greener products. Wood, as a renewable resource, has already gained a boost in public demand in various sectors such as construction. In addition, many countries have taken their GPP measures even further than required. Even though this is beneficial in terms of the increased demand for sustainable forestry products, it also makes things more difficult for businesses operating in several countries as they have to adapt to the variety of differing national regulations

- Only a few of the Member States were expected to meet the previous 2010 targets for the renewable energy in electricity generation, heating and in transport. In this context the 2009 RES Directive was introduced, extending EU targets to 2020, raising the overall EU RES target to 20% – within which 10% of transport energy must be from bio-fuels and introducing an overall binding RES target for each member state. The Member States are expected to more than double their total renewable energy consumption by 2020 from the level of 2005. It is evident that this will have a huge further impact on the use of wood raw material.

6. COMPETITIVENESS ANALYSIS

6.1 Raw material, workforce and productivity

The competitiveness consists of three main components:

- the efficiency of the companies in their actions
- the output and input prices that are determined in the market
- the operating environment of the company, e.g. in what kind of society companies operate, including:
  - societal environment
  - infrastructure

In this chapter, we focus on the global competitiveness of the companies acting in the forest-based sector. The analysis concentrates on the countries which are the main actors on the global market, most of which are those identified in the global regions analysed in detail in this study. In general, the costs for labour and raw material are much higher in the EU than in many other global regions. Most of the forest industry products consumed in Europe are also produced in Europe. Especially some of the products with lower value and higher unit weight (high bulk/value ratio) have limited transport range due to which products are mainly traded locally (e.g. most of the reconstituted panels). To give a picture on the global competitiveness in the forest-based industry sector for the EU, this chapter concentrates on products and product groups that are produced, consumed and traded globally. Most of the hardwood products (e.g. sawn hardwood and plywood) imported to Europe are produced from tropical wood species and don't face competition from European producers. Therefore, they are left out from this comparison.

The following product groups are selected to be analysed further:

- pulp and paper industry
- softwood sawmilling industry, and
- wood pellet industry

When evaluating the global competitiveness, especially the factors below are taken into account:

- cost structure
- labour costs and development
- raw material costs and development
- productivity development

6.1.1 Cost structure

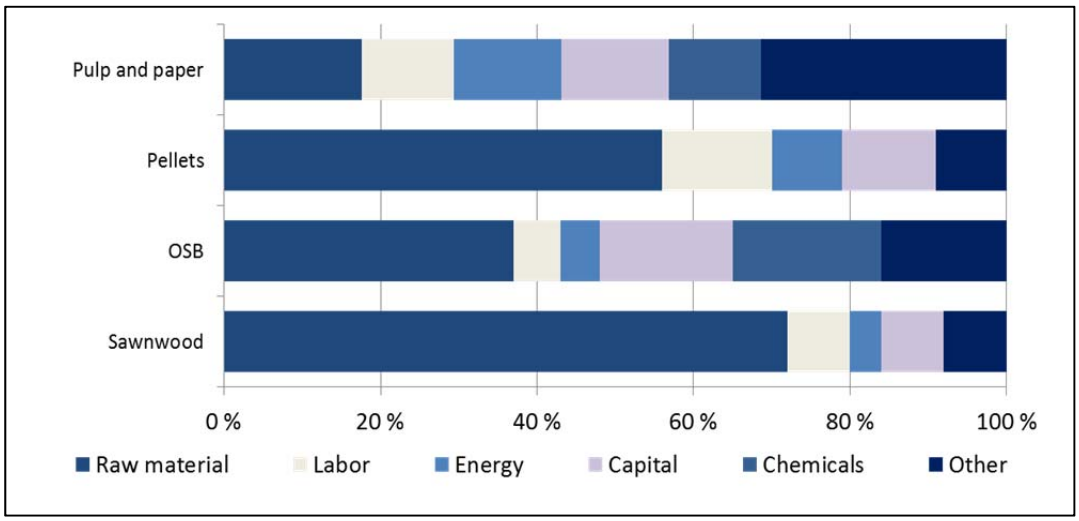
The differences between cost structures of the countries are due to differences in:

- product mix
- raw materials base
- input prices
- machinery
- logistics

In principle if two factories are producing the same product, have the same capacity and are the same age, their physical input structures are identical.

In sawmilling and wood pellet production, the raw material has a much bigger share in the cost structure than in pulp and paper industry. Pulp and paper industry on the other hand is much more capital-intensive. The part other costs is fairly high especially for pulp and paper production. It consists of costs related to transport, stock of products, marketing and sales, maintenance, repairing and other goods needed for the production.

Figure 6.1 Examples of Cost Structures in Different Forest Industry Sectors



Note: Cost structure of the average European producer in 2011

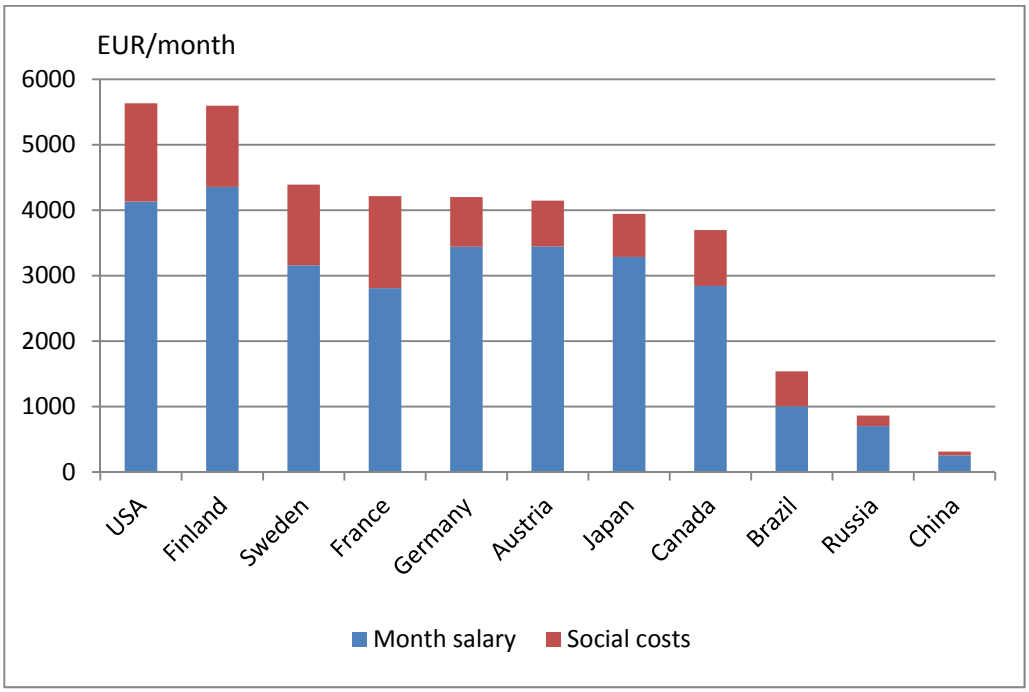
6.1.2 Labour costs and development

Pulp and paper industry

As can be seen from Figure 6.2, in the global pulp and paper industry, the labour price level is highest in Finland and the U.S., but somewhat lower in other developed countries. In the competing emerging countries the labour costs are significantly lower, but in some of these countries employers have to cover different kinds of hidden costs, including housing etc. Also, the number of employees per tonne of end product produced is significantly higher, therefore labour productivity is lower.

In Europe, the cost of labour in the pulp and paper industry is approximately 10% of the total cost. None of the individual cost items I pre-dominant and the competitiveness of the industry depends on multiple factors.

Figure 6.2 Monthly labour cost in the pulp and paper industry in major producing countries 2011



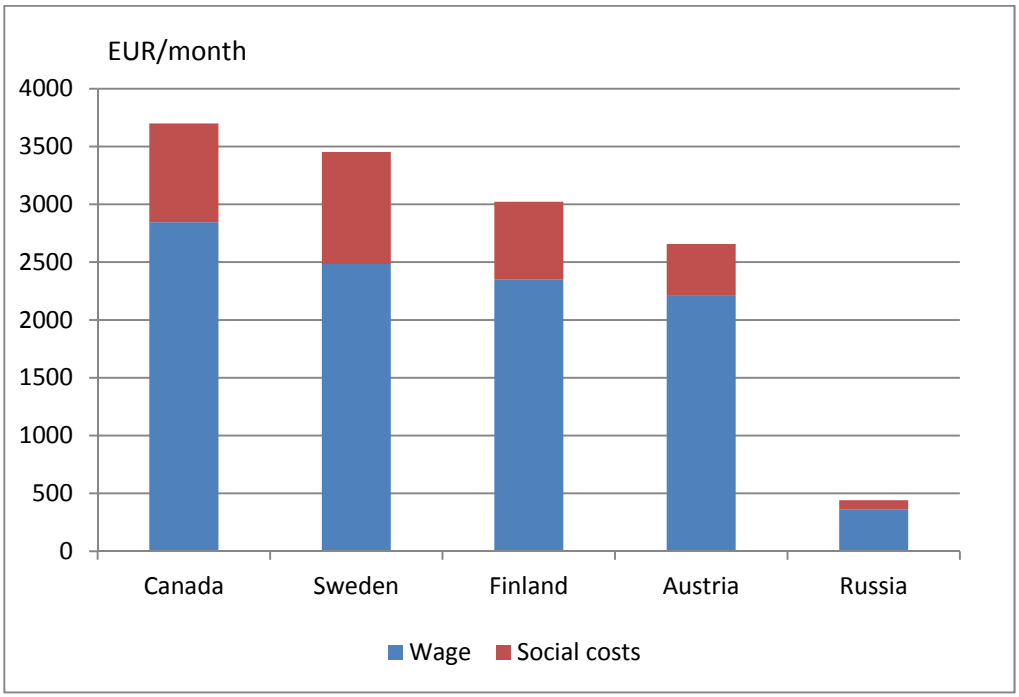
Source: National Pulp and Paper Industry Publications, National Statistical Services

Sawmilling industry

Figure 6.3 shows that the monthly labour costs in the softwood sawmilling industry are in general somewhat lower than in the pulp and paper industry. Due to the SEK/EUR exchange rate the Swedish labour costs are clearly higher than the costs among the European competitors. Only in Canada are the monthly labour costs in sawmilling approximately at the same level as in the pulp and paper industry.

In Russia, the labour costs are clearly lower than in other competing countries, but the production per employee is also significantly lower.

Figure 6.3 Monthly labour cost in sawmill industry in major producing countries 2011



Source: National Sawmilling Industry Publications, National Statistical Services

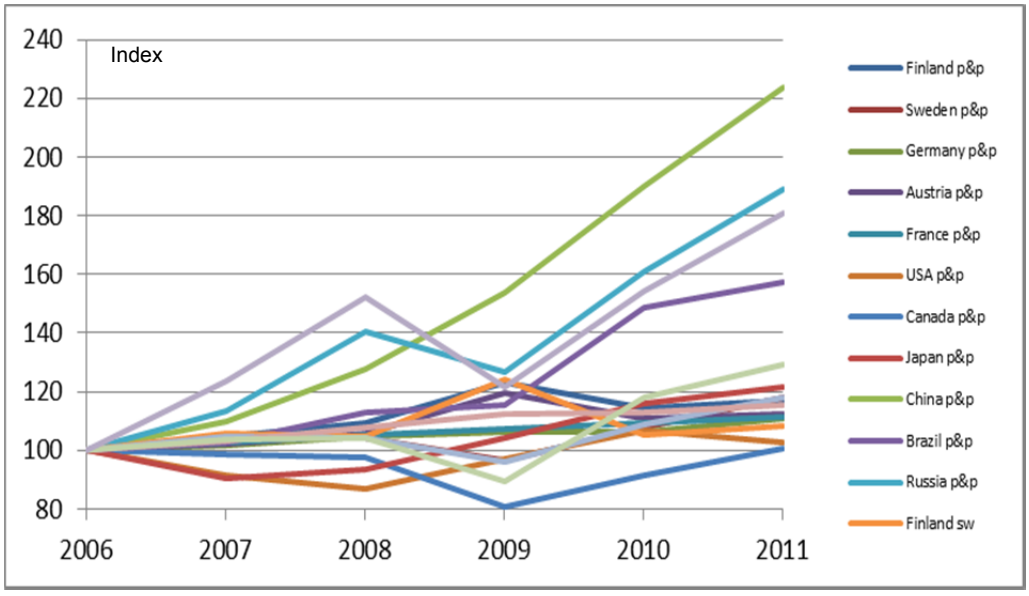
Wood pellet industry

Labour costs in the pellet industry are more or less at the same level as in the sawmilling industry. This is due to the fact that especially in Northern Europe sawmills and pellet plants are commonly located at the same site and operated by the same company. They may even have the same staff working in both of the mills.

General labour cost development

The labour cost development is fairly similar in different sectors within a country. The development has been especially fast in the developing countries, fastest in China, followed by Russia and Brazil (see Figure 6.4.). The main reason for the fast labour cost increase there is the high rate of inflation. Among the European and North American competitors the labour cost development has been modest. Therefore, the emerging economies are continuously losing their competitive cost advantage unless they can offset this development by increasing productivity. Especially in Russia, the labour productivity has not been able to offset the increases in labour prices.

Figure 6.4 Labour Cost Development Index (in EUR)



Source: National Pulp and Paper Industry Publications and National Statistical Services analysed and processed by Indufor

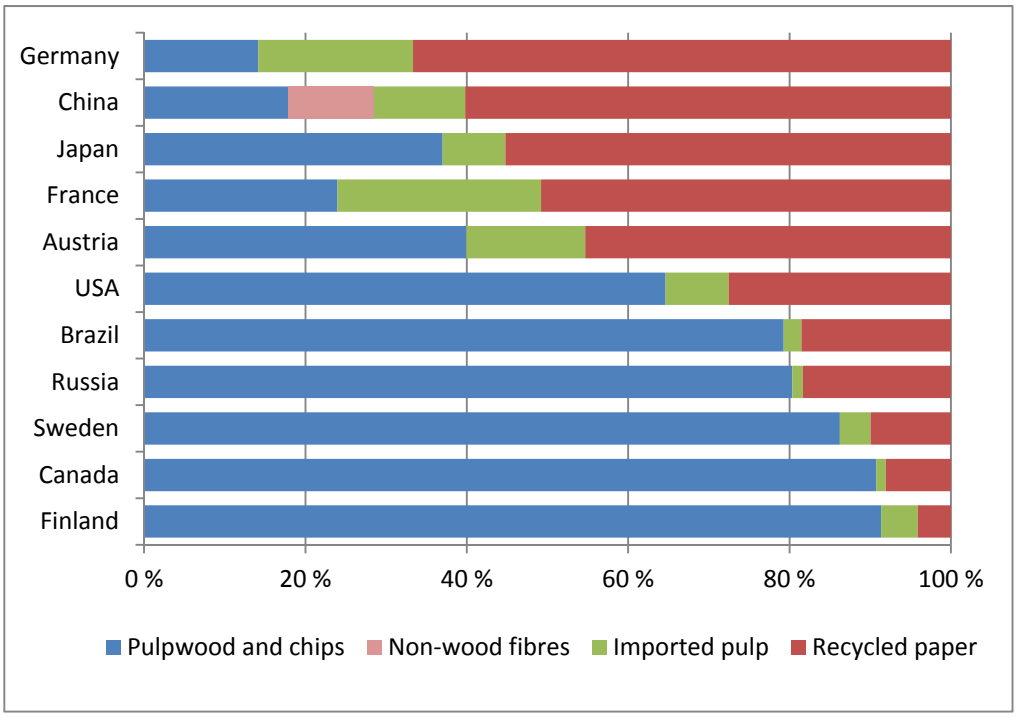
6.1.3 Wood raw material costs and development

Pulp and paper industry

The Swedish, Finnish, Russian, Canadian and Brazilian paper industries mainly use mainly wood pulp produced domestically. Therefore, changes in pulpwood prices have a strong effect on the production cost development in these countries (see Figure 6.5).

The absence of large consumption bases, relatively high collection rate and low paper consumption don't give much room for increasing the recycled paper consumption in Sweden, Finland or Canada. Therefore, competing countries using recycled paper and market pulp can gain a competitive advantage when prices of these raw materials decrease.

Figure 6.5 Pulp and Paper Raw Material Base (in pulp equivalents) 2011

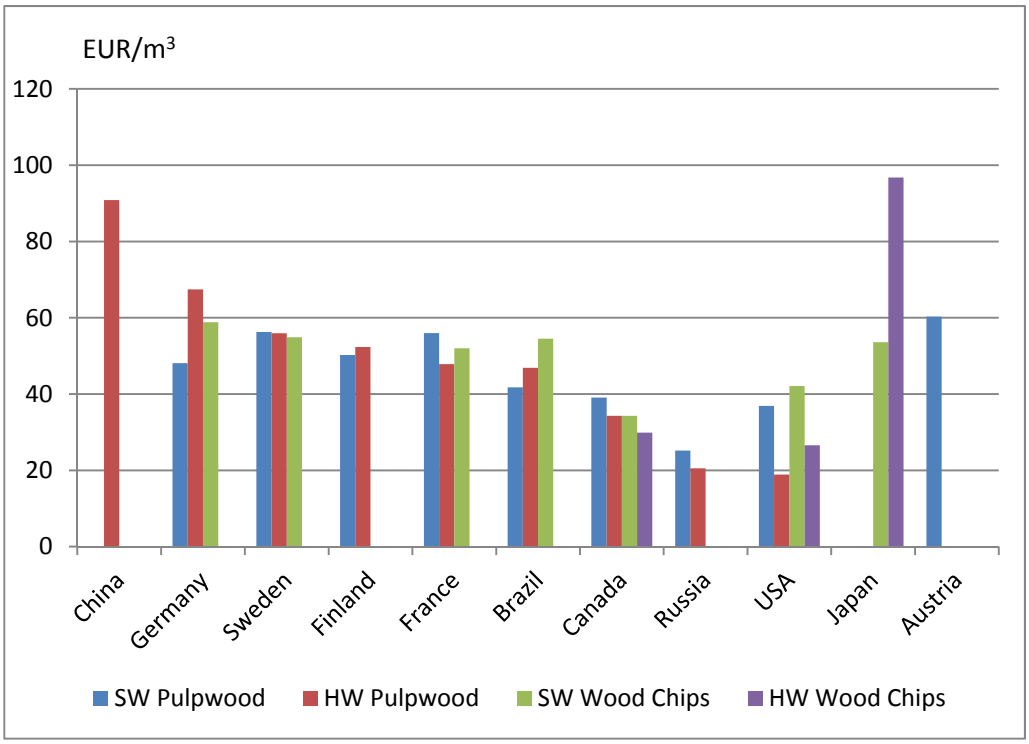


Source: National Pulp and Paper Industry Publications analysed and processed by Indufor

Pulpwood prices paid by the industry are more or less at the same level in all the European competitor countries. Pulpwood prices in Russia and North America are significantly lower compared with Europe. Also, pulpwood prices in Brazil are somewhat lower than those Europe. In China and Japan, pulpwood prices are much higher than in Europe. This is partly due to unfavourable currency development, but also largely due to the fact that these countries import much of the raw material they use.

In 2011, pulpwood prices have been increasing in all the study countries with the exception of Russia (see Figure 6.6). The rise has been especially rapid in the US, where the prices of softwood pulpwood have increased more than 30% compared to 2010. The reason for that fast increase in demand in the US South is because of decreased sawmilling and increased exports of OCC (Old Corrugated Containers) to Chinese market.

Figure 6.6 Pulp wood mill gate prices 2011 (oven-dried tonnes)



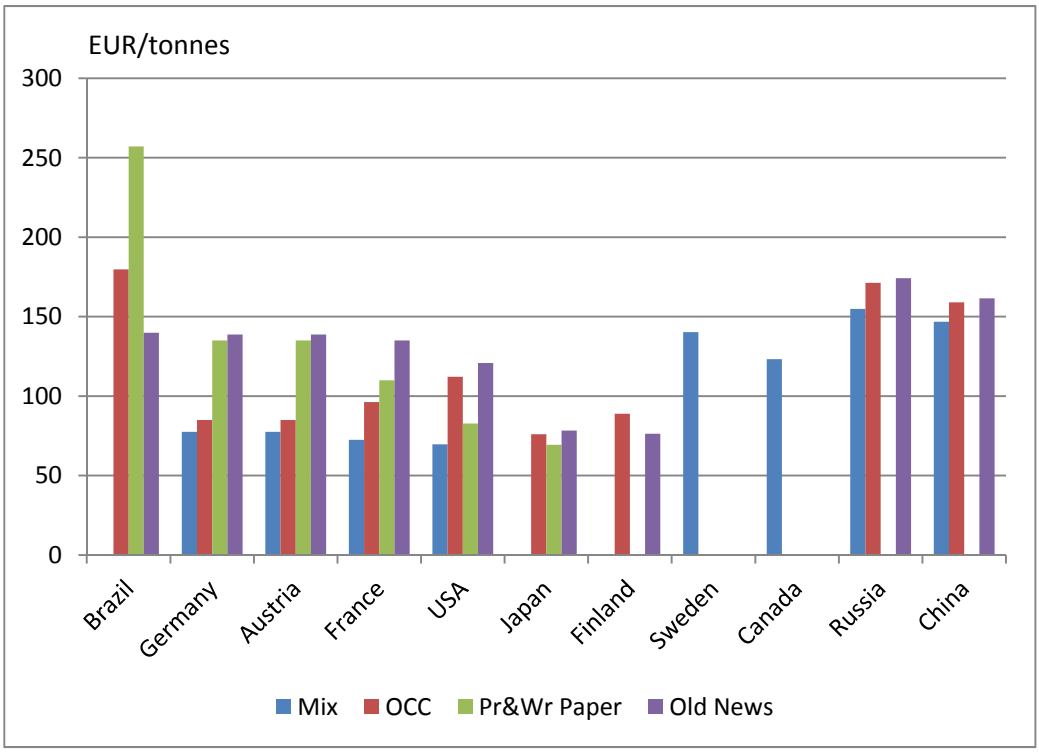
Source: Wood Resource Quarterly

The recycled paper prices are highest in China, the US and Brazil (see Figure 6.7).

In many European countries recovered paper has a significant share in the raw material base for paper. The recycled paper prices are roughly on a similar level from country to country. In Finland and Sweden, collection is organised through a company, owned by paper producers, and therefore the price levels are not in line with market prices. This does not mean that increased demand would not have an effect on the price level. For example, in Sweden the price for old newspapers has been increasing lately.

In Japan, the low recycled paper price is due to favourable exchange rate development – the Yen strengthening against the US Dollar, in which most forest-product commodities are priced globally. Nonetheless, the recycled paper prices have increased in all the European competing countries and in Japan. In Brazil, China and North America the prices have decreased.

Figure 6.7 Recovered paper and board 2011 (in pulp equivalents)



Source: RISI – PPI Pulp and Paper

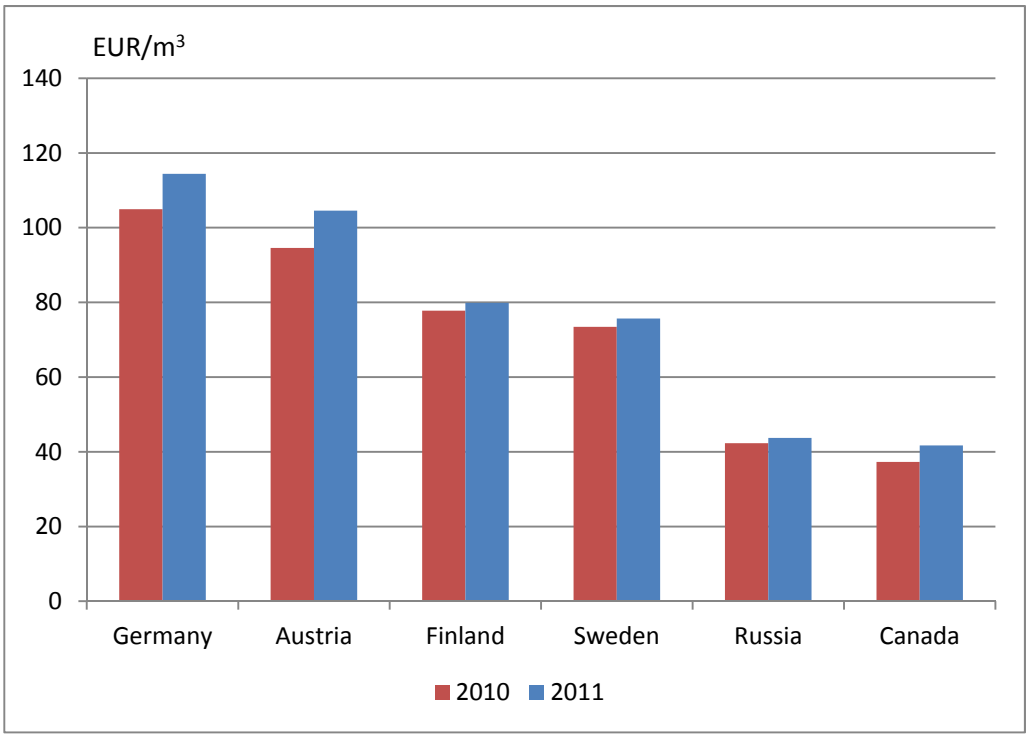
Sawmilling industry

Saw log costs are the main cost component in the sawmill industry. In Austria, the mill-gate prices for softwood logs are higher than in the other competing countries (see Figure 6.8.). While prices in Germany are not shown in the following graph, they are relatively close to Austrian prices. In Sweden and Finland, the prices are at about the same level.

In Canada and in Russia the raw material prices are significantly lower than in other competing countries. In these countries, stumpage costs per cubic metre are lower as the government owns practically all forest land.

The prices have increased strongly especially in Austria and Canada, but also in Sweden, Russia and Finland.

Figure 6.8 Softwood log mill gate prices



Source: Wood Resource Quarterly

While log costs are higher in Europe, also the product sales values (both for sawnwood and for residuals) are higher there than in Canada or in Russia. Therefore, the wood-paying capability of the European sawmill industry is considerably higher than that it is in Russia or Canada. However, EU sales prices are ultimately limited by those of competing imports from the other global regions. Profitability is the final determinant of competitiveness. In all the regions compared, profitability of the sawmill industry has been very poor in recent years. However, periods of low profitability have been more common in Europe than in competing countries during the past decade due to having to match the price of imports during a period of high Euro values.

Wood pellet industry

The traditional raw material for the European wood pellet industry has mainly been sawdust, but wood chips are also an important component. Conversely, for new large-scale projects around 1 Million metric tons a year, especially in North America but also in Russia, the number one raw material choice has been roundwood. Also, limited volumes of short-rotation coppice and recovered wood have been used as raw material.

In the wood pellet industry, there has been a transition towards larger plant sizes. Especially, the newest plants in North America and Russia are large. This is due in part to customer requirements for large volumes, but also reducing unit costs has been a goal. However, the larger the plant is, the further away it has to source its raw material. Once a certain capacity has been reached, the cost of sourcing an additional

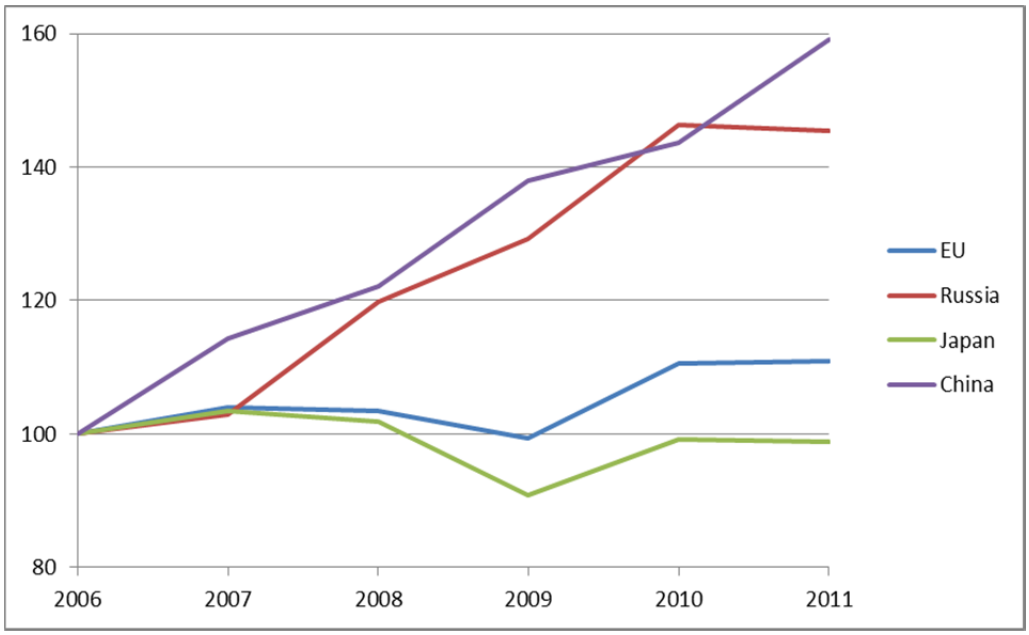
unit (marginal cost) of raw material cannot be off-set by reductions in other unit manufacturing costs.

6.1.4 Productivity development

Due to the increasing costs and stagnant end-product price development the forest based industries have been forced into productivity improvement in order to keep their business profitable. The increase in profitability is driven by increasing (Figure 6.9):

- average mill capacities
- production per employee ratios (labour productivity)

Figure 6.9 Production per employee ratio index pulp and paper industry



The production per employee ratio (labour productivity) is a good indicator to demonstrate the efficiency/productivity development in different areas. However, what if does not show is how the productivity improvement is generated.

In Europe, the US and Japan the productivity has been created through closing smaller, not very efficient mills, as demand for pulp and paper has been decreasing and the efficiency improvements through investments in new capacity have not been possible.

In China, productivity improvement has been created mainly through investments in new modern production plants although at the same time older mills have been closed down.

In Russia, the productivity has increased mainly through employee reductions as the new investments have been limited.

6.1.5 Cost structure

Europe is a high-cost production area for most forest-industry products, where sales prices are limited by those of competing imports. Consequently, the profitability of the industry is low. Both the sawmill sector and the pulp and paper sector face intense and increasing competition from outside of EU, especially from South-America and Russia, where wood input costs are lower. However, certain segments, such as particleboard are somewhat protected from outside competition due to high freight costs from other regions. In the pellet industry, outside suppliers export to the EU and the increasing demand creates opportunities for all as the domestic sources may not be adequate to fulfil the entire demand growth in the future.

While competition is hard and the input costs are high, Europe is a rather stable environment for operation. Inflation is low, infrastructure works and distribution systems are highly evolved. In some key competitor countries, such as Russia and Brazil, the inflation rate is higher and productivity increases have not been able to offset cost increases. Thus, the European industry is, in fact, gaining on competitiveness relative to them. In addition, the outlook for wood costs in Russia looks poor due to the lacking infrastructure investments.

The high price of logs keeps the European sawmills' competitiveness at a low level. This will also be the case in the future, although the increasing demand for sawmill by-products – e.g. for wood pellets - is slowly increasing the sector's competitiveness. The sawmill capacity has remained relatively high and so the log-supply situation has remained tight, even as end-product market prices have been depressed.

In the global paper production the share of recovered paper in the raw material base is fairly optimised and significant increases are not to be seen. However, the European recycled paper prices are expected to remain quite high as, there is significant import demand for European recycled paper in China. In addition to raw material competition, the European pulp and paper companies are facing a declining demand situation for their end-products in the printing and writing paper segment.

While Brazil, China and Russia may be losing some of their competitive advantage due to cost increases, new producing regions might be emerging in other developing countries. Therefore, to remain competitive in the future, the European industry will have to:

- have access to adequate and less costly raw material supplies
- increase the level of added value in the industry
- develop new products that complement existing products, raw material base and technologies (e.g. new biorefinery products).

6.2 Sustainability as a competitive advantage

In today's world, environmental, social and political concerns affect global companies' ability to access finance and manage risks, and thus be able to maintain shareholder confidence and build a corporate reputation or image. Therefore, in this context, companies that operate sustainably can benefit from a competitive advantage and perform better in the long run. In order to assess the competitive position of the six case country study countries (Finland, Lithuania, Germany, Spain, Romania and the UK) from sustainability point of view, Indufor looked at the issue through four selected indices. They are:

- Environmental Performance Index (Yale University)
- Corruption Perception Index (Transparency International)
- Ease of Doing Business (The World Bank)
- Human Development Index (the United Nations Development Programme)

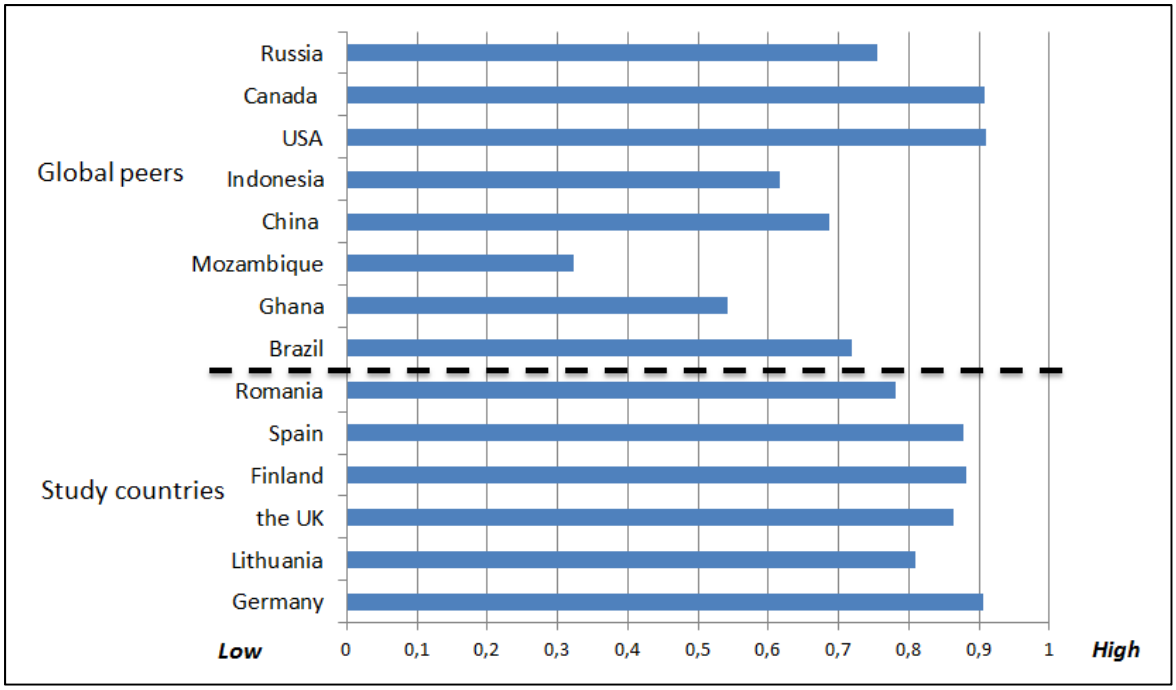
These indices were chosen because they are developed by global, well-known organisations and they cover the environmental, social, political and economic aspects of sustainability. By comparing the scoring/ranking of the six EU case countries with countries in South America (Brazil), Africa (Ghana, Mozambique), Asia (China, Indonesia), North America (the US, Canada) and Russia it is possible to get an idea of Europe's competitive position seen from the sustainability angle.

Environmental Performance Index (EPI) ranks countries on performance indicators tracked across policy categories that cover environmental, public health and ecosystem vitality. The indicators provide a gauge, at a national government scale, of how close countries are to achieving established environmental policy goals. The Corruption Perception Index (CPI) ranks countries and territories based on how corrupt their public sector is perceived to be. A high ranking on the EOB index means the regulatory environment is more conducive to the starting and operation of a local firm in a country. The Human Development Index (HDI) is a comparative measure of life expectancy, literacy, education and standard of living for countries worldwide.

Current situation of countries

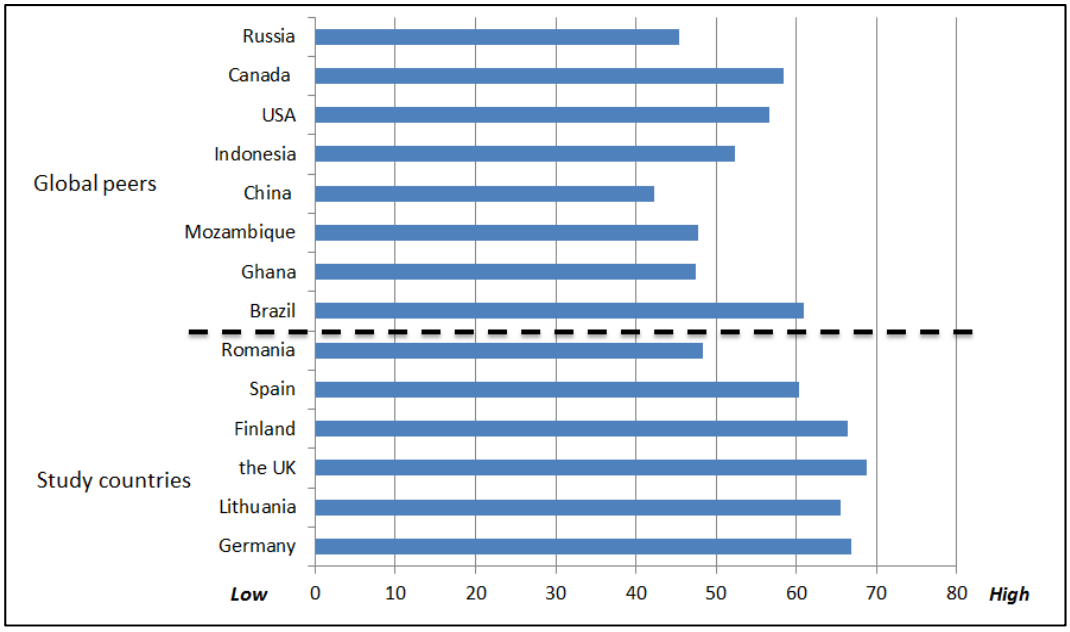
For the HDI (Figure 6.10), all six EU case study countries are ranked among the first 50 in the world, which means that their human development is at a good level and that social wellbeing is prevalent. Germany, together with N. America, shows the highest HDI, with Spain and Finland close behind. In many parts of Asia (China and Indonesia) and especially Africa (Ghana and Mozambique), the HDI is at an alarmingly low level, which means that the potential workforce is largely uneducated and poorly skilled and thus has a very low capacity to bring added value to the forest products.

Figure 6.10 HDI of six EU countries and their global peers in 2012



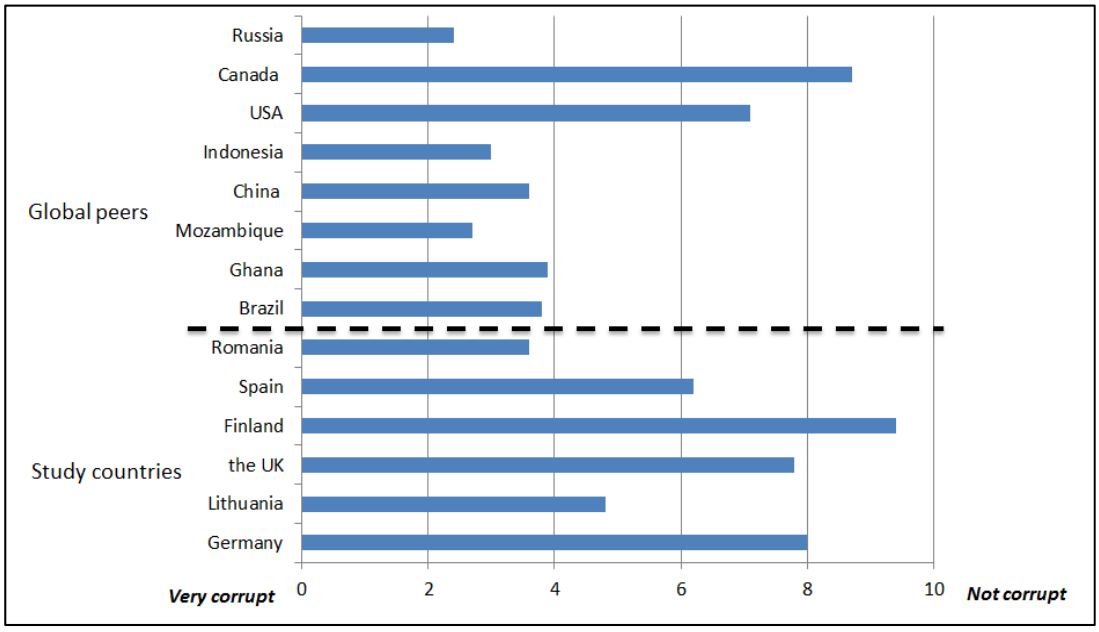
In EPI ranking (Figure 6.11), five of the six EU case study countries clearly outperform other global regions. However, Romania lacks behind the other case study countries, though still has a good global EPI rating. China and Russia are the countries that fall out of "Global 100" meaning that their level of ambition for reaching established environmental goals is very low. The UK, Germany, Lithuania and Finland get a high ranking which can mean that they can have a certain competitive advantage towards environmentally conscious clients and consumers.

Figure 6.11 EPI of six EU countries and their global peers in 2012



The CPI (Figure 6.12) reveals great differences between the case countries. Finland, Germany and the UK score high, Spain well, but Lithuania and especially Romania poorly.

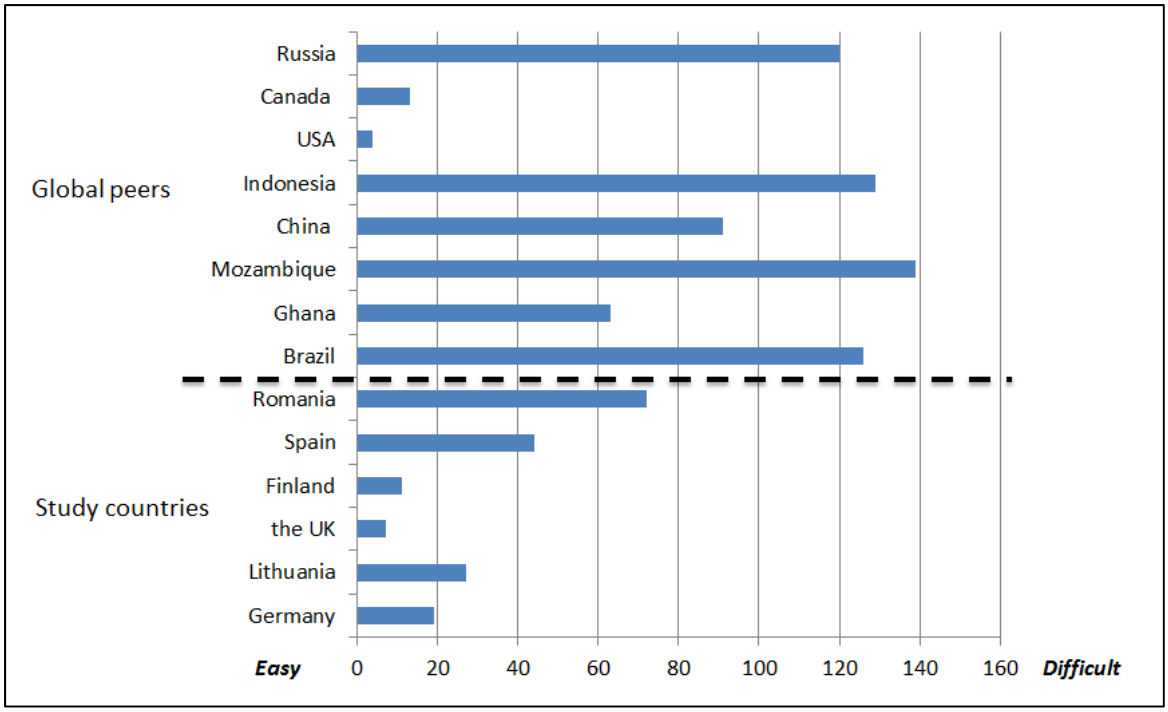
Figure 6.12 CPI of six EU countries and their global peers in 2012



The EOB index (Figure 6.13) reveals that the UK is the easiest country for starting a business out of the six case countries. It is followed by Finland, Germany and

Lithuania. Spain and Romania rank lower but nowhere near Mozambique, Indonesia, Brazil or Russia.

Figure 6.13 EOB of six EU countries and their global peers in 2012



All in all, the indexes analysed above give an indication of the sustainability positioning of the six case study countries in relation to their global peers. From the short analysis it can be seen that all the EU case countries have a sustainable profile. Germany, the UK and Finland have the most favourable positioning in the market and can gain most benefit from environmental, social, economic and political sustainability.

Development of countries from 2000 up until 2012 in HDI and CPI

Figure 6.14 shows how the HDI scoring case study countries', as well as for their global peers, has changed from 2000 to 2012. It is interesting to note that all countries had their highest score in 2005, after which they have either returned to 2000 levels or regressed. The relative difference between countries has still not changed in 12 years. Europe scores high, Germany as the leader, whereas African countries, especially Mozambique, perform poorly.

Figure 6.14 Human Development Index in selected countries from 2000 to 2012

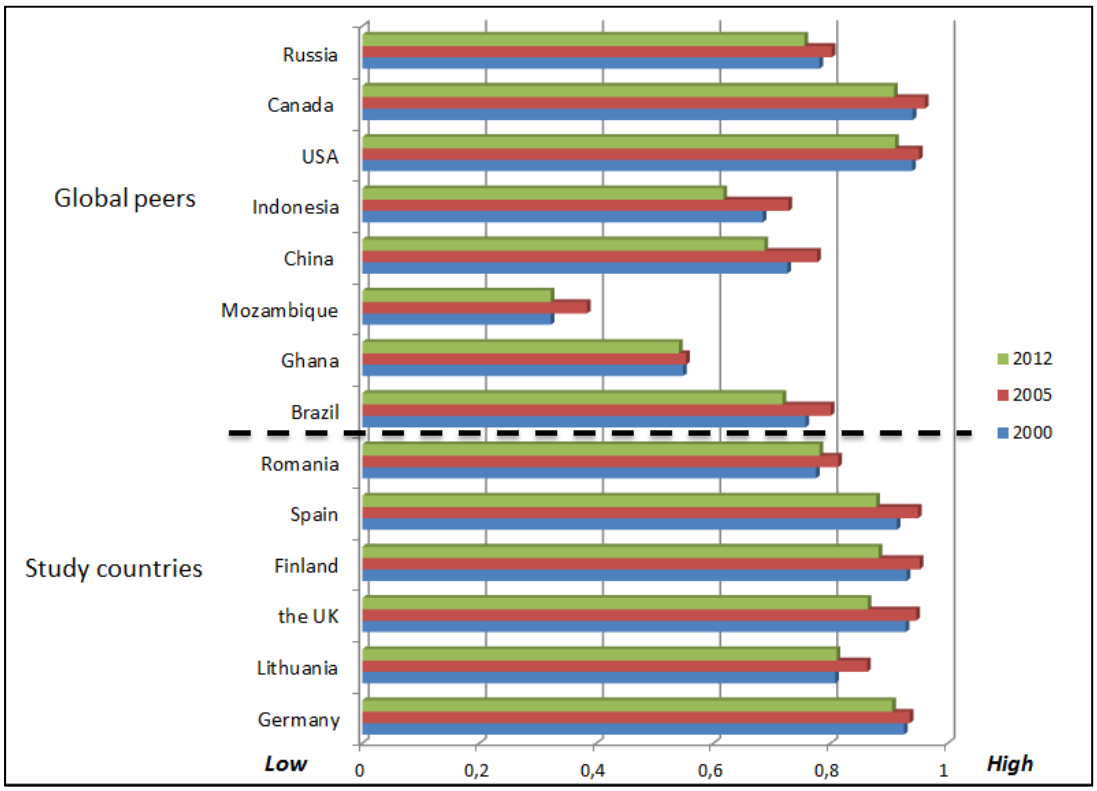
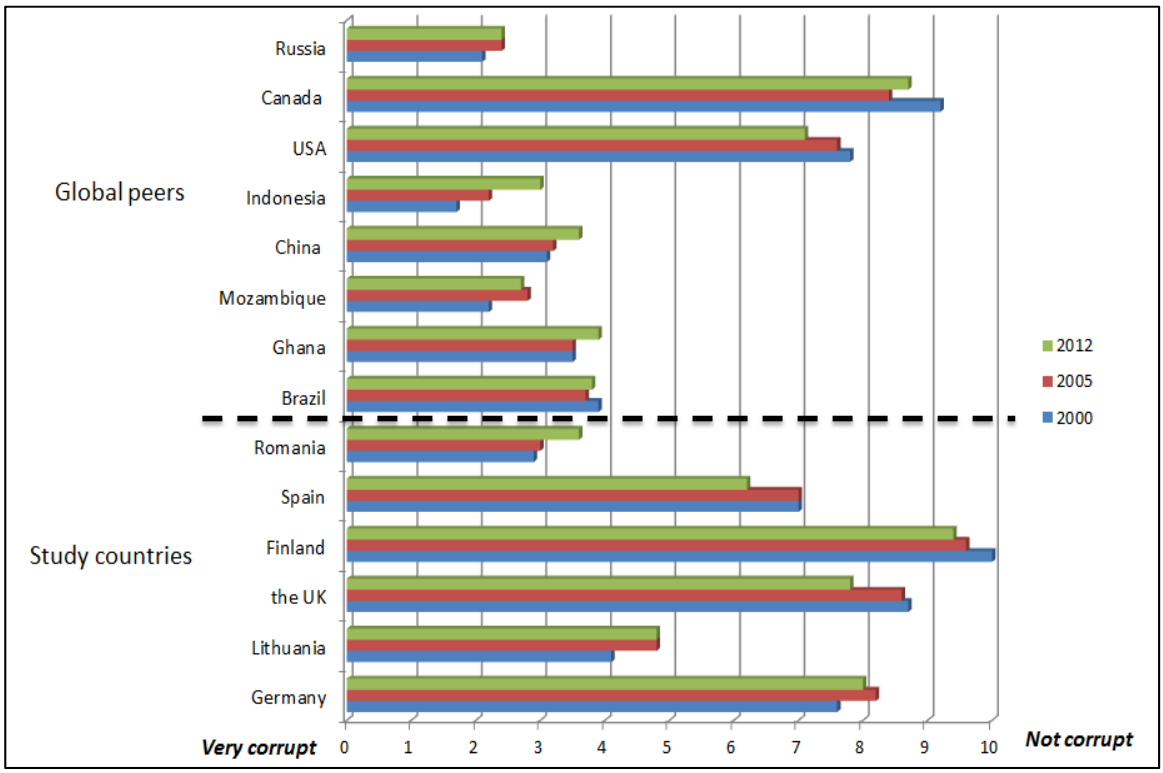


Figure 6.15 shows the development of the study countries and their global peers in CPI. On the global scale the CPI trend looks more positive than that of HDI as many countries have clearly improved their scoring, namely: Indonesia, China, Ghana, Lithuania and Romania. From the European perspective, however, the two top performers (Finland and the UK) show an unfortunate regressive trend, as does Spain.

As for the HDI, the relative difference between countries has not changed much from 2000 to 2012. Finland, the UK and Germany are clearly the leading European countries, whereas Lithuania and Romania are still perceived to have significant obstacles they are also making some progress. The US and Canada are by far the best performers outside Europe, whereas other regions perform poorly. It is worth noting that Africa ranks equally badly with Asia and Latin America. Indonesia, however, is the only country that shows a strong and steady positive record in its fight against corruption. Russia's progress has stagnated and Brazil's situation has remained very steady over the course of the 12 years.

Figure 6.15 Corruption Perception Index in selected countries from 2000 to 2012



6.3 Main issues on competitiveness

6.3.1 Quantitative competitiveness: raw material, workforce and productivity

- In general, the costs for labour and raw material are much higher in the EU than in many other global regions.

- Most of the forest-based industries' products consumed in Europe are also produced in Europe. Some of the products, especially those with lower value and higher unit weight, have limited transportation range. Due to this, products are mainly traded locally (e.g. most of the reconstituted panels).

- However, there are products and product groups that are produced, consumed and traded globally. Some of these (e.g. pulp and sawn softwood) compete with the local production in the EU. Most of the hardwood products (e.g. sawn hardwood and plywood) imported to Europe are from tropical species – or in the case of sawn hardwoods consist of temperate species from N. America which do not grow in Europe - and therefore do not face direct competition from European producers. They are therefore left out from the analysis of this chapter.

- In all the analysed products and product groups, the situation is similar – the production in Europe is either declining or relatively stable. However, in sawmilling and wood pellet production, there are high hopes among the producers that the near future demand will be increasing.

- The low price of sawn-wood in comparison with the relatively high price of logs keeps the sawmill's competitiveness at a low level. This will also be the case in the future, although the increasing demand for the by-products of sawmilling, e.g. for wood pellets, is slowly increasing its competitiveness.

- In global paper production, the share of recovered paper in the raw material base is fairly stabilised and significant increases are not to foreseen.

- In the developing countries in other regions, labour productivity growth is fastest, but also the input prices are increasing fast. Normally, the productivity increase can't compete with soaring input prices.

- Due to this, it seems that Russia, China and Brazil are losing their competitive advantage. As a result, the production is moving to new areas and the race starts again.

6.3.2 Qualitative competitiveness: sustainability

- In today's world, the environmental, social and political concerns affect global companies' ability to access finance and manage risks, so as to maintain stakeholder relations and build a corporate reputation or image. Companies that operate sustainably can benefit from a competitive advantage and perform better in the long run.

- The competitive position from the sustainability point of view, was analysed through four selected indexes:
  - Environmental Performance Index (Yale University)
  - Corruption Perception Index (Transparency International)
  - Ease of Doing Business Index (The World Bank)
  - Human Development Index (the United Nations Development Programme)

- All in all, it can be seen that all the six EU case countries have a sustainable profile. Germany, the UK and Finland have the most favourable positioning in the market and so could gain the most benefit from environmental, social, economic and political sustainability. Also, some new member states are improving in some respects, e.g., corruption.

7. INTER-RELATIONSHIPS BETWEEN WOOD SUPPLIES AND DEMANDS WITHIN AND BETWEEN THE WOOD-PROCESSING AND BIO-ENERGY SECTORS

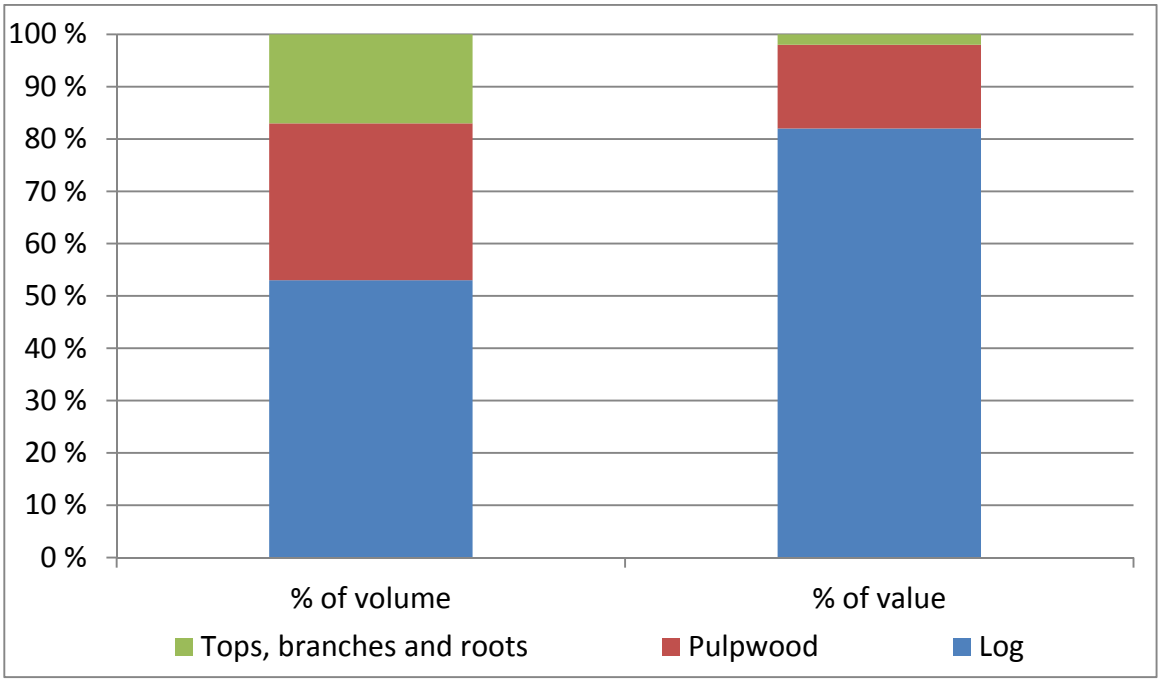
Information on the production and use of raw wood, pulp, paper, sawnwood, wood based panels (MDF, OSB, and plywood) as well as for bio-energy has been collected and analysed for the EU-27 Member States. The data are based on actual data for the years 2000, 2005 and 2011. Indufor has projected the future production of different end use and thus got an estimate of the raw material balance in 2016. In this chapter the figures are drawn for the EU-27 and for the three regional groups. In chapter 5 the data is presented for the six countries.

Indufor has calculated the use of raw material as roundwood equivalent (RWE, over bark). The idea is similar to tonne of oil equivalent, but here done for the use of wood. For instance, the use of bio-energy is calculated as the use of wood in cubic metres (instead of joules) and the use of recovered paper is also calculated in cubic metres instead of tonnes.

7.1 Inter-relationship framework

The supply of various wood categories is heavily interconnected as trees (especially in the final harvest) usually consist of a sawlog portion (bottom), pulpwood portion (middle) and the fuel wood or biomass energy wood portion (tops, branches and roots). Sawlogs are typically the most valuable part of the stem, and the revenue from logs is typically the key driver for forest owners. If sawlog prices are low, the higher prices of other categories cannot typically off-set that.

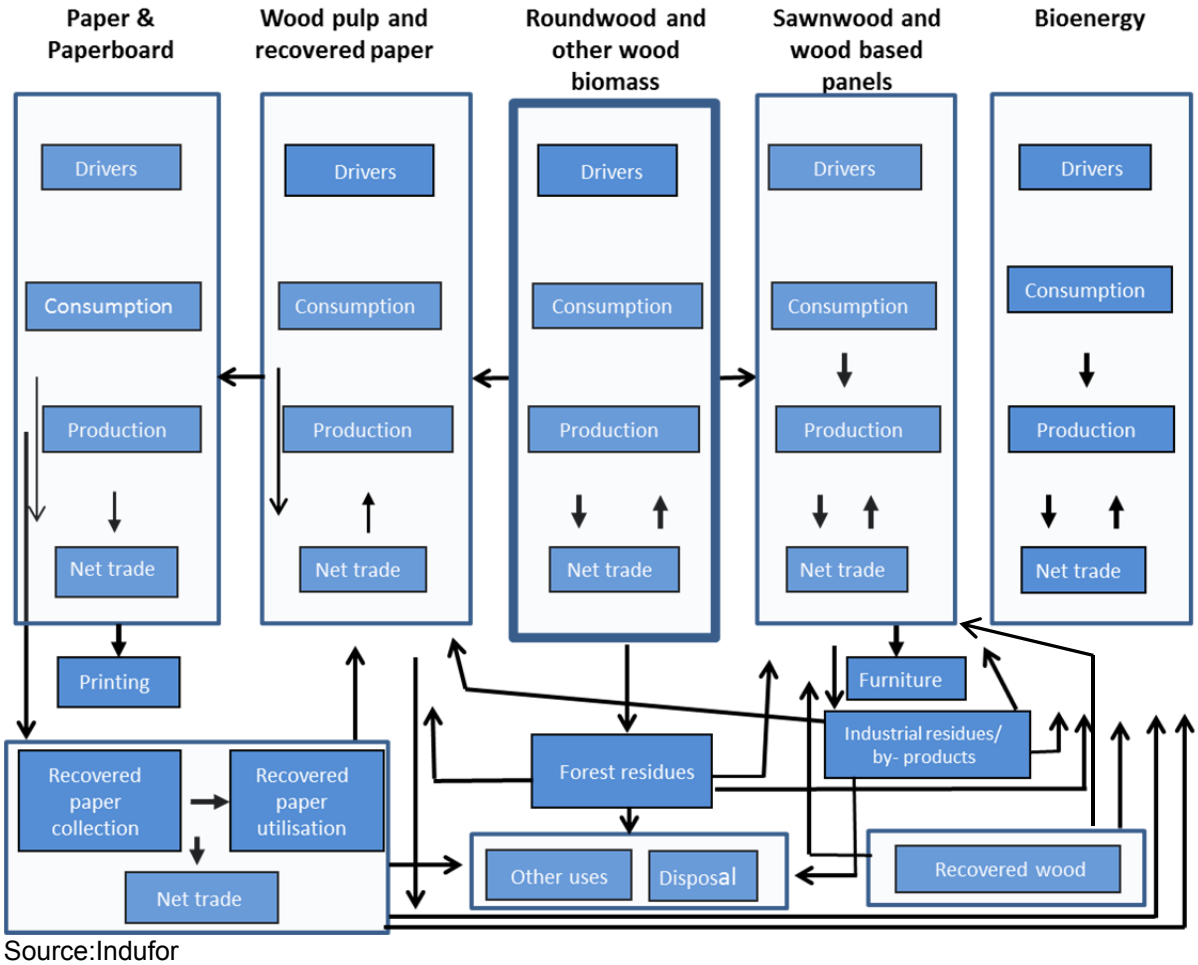
Figure 7.1 Volume and Value from Different Parts of a Tree in Final Fellings in Privately Owned Forests in Finland, 2012



In this study the use of wood has been divided among three main categories; the pulp and paper industry, the wood products industry (woodworking) and the bio-energy production.

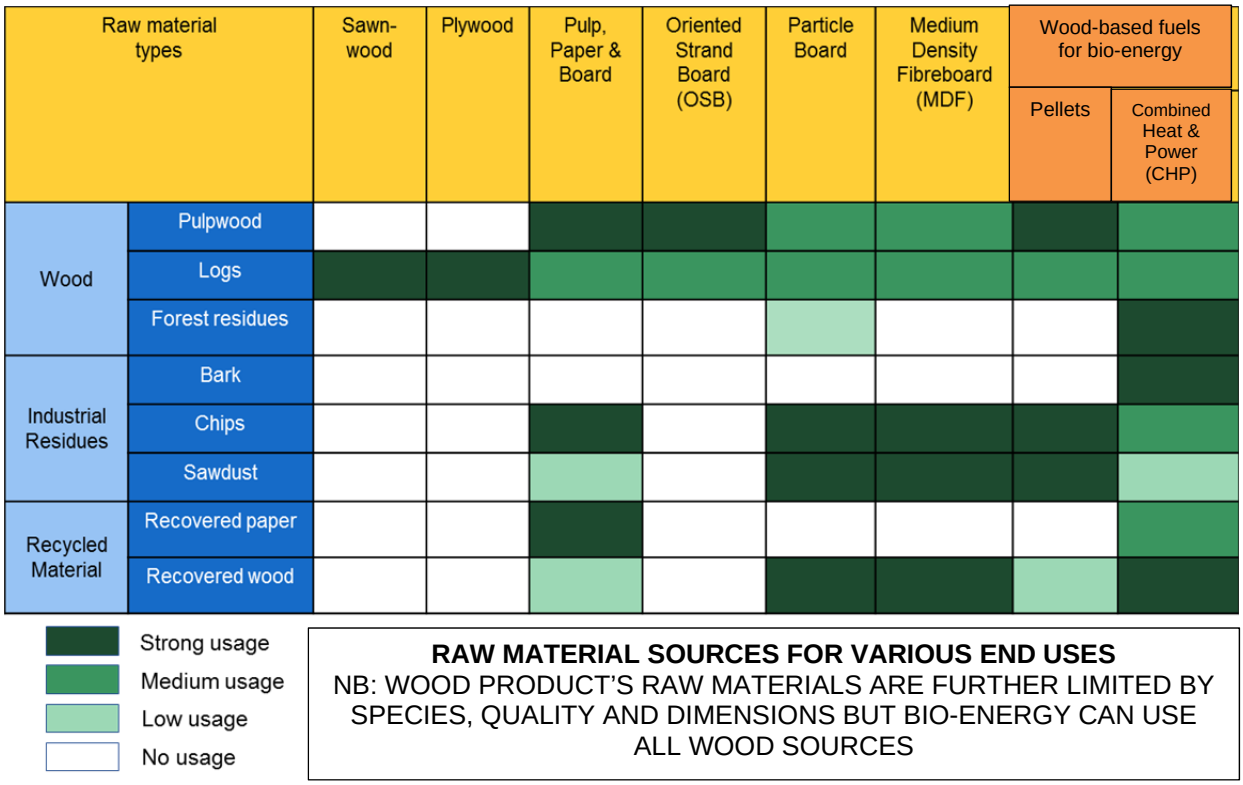
Different wood raw material types (industrial roundwood, forest residues, recovered paper, and recovered wood) each have their own optimal uses from technical and economic points of view. Some categories can in principle be used for a wide range of end products, others (for instance bark) only for a more limited number of uses (See Figure 7.3.). Therefore, the level of competition for categories varies. There are also a number of by-product flows from one use to another (See Figure 7.2.).

Figure 7.2 Wood raw material supply and demand flows in wood processing industries



Source:Indufor

Figure 7.3 Wood-based raw material demands related to: pulp paper & paperboard, wood products and wood-based fuel



The "wood" input category in Figure 7.3 can be further sub-divided by wood species, dimensions and quality, thus further limiting substitution between specific wood-based products. Conversely, wood-based fuels can be made from almost any category, allowing them to compete very widely across the range of raw materials.

As there is competition for certain wood categories in several end-uses, the wood paying capability of different end-uses largely determines who gets to use any given category. In recent years especially, the energy products (pellets and biomass energy) have competed for the same raw material base. It appears that pellets and bio-energy plants can currently pay equal or somewhat higher prices for raw materials than e.g. particleboard plants. Therefore, the competition for sawdust and low-grade roundwood materials in certain areas is fierce. Energy subsidies have an impact on this competition and they can alter the competitiveness of various end-uses considerably.

Considering the inter-relationships both in supply and demand of various wood categories, it is clear that if the demand for sawnwood declines, the supply of sawlogs and thus also other wood categories will be reduced, not to mention the loss of by-products from sawing the sawlogs. Similarly, if pulp production is considerably reduced, the bio-energy production will be reduced, due to the significant loss of black liquor pulping residue for biomass energy.

Data Analysis

In section 7.2 the use of raw material by sector is described. In the first figure regarding the total use it is important to note that some categories are included both in, e.g., sawnwood production and in pulp and paper. Thus the total is not the sum of the separate sectors.

In section 7.2 the use of raw material by type is described. There are no significant changes in other sectors, but because of the increased production of bio-energy the demand of industrial residues, but above all on forest residues as well as recovered wood will grow fairly rapidly.

For the use of wood a cascade factor was calculated in this study. The cascade factor is the overall use of wood raw material divided by the roundwood consumption.

7.2 Use of raw material by sector

7.2.1 Use of raw material by sub-sectors in EU-27

The EU-27's total wood-based material use increased to 942 million m^3 between 2000 and 2011 (+144 million m^3) and is forecasted to continue increasing by about 97 million m^3 by 2016. It should be noted that this total includes some double counting caused by the partial "cascade" effect of one sub-sector using wood residues from the processing of another sub-sector. For example, the particleboard and wood pellet industries use sawmilling residues.

Roundwood is by far the dominant wood raw material type used by the pulp and paper, wood product and bio-energy industries in the EU-27 area. The total use was around 454 million m^3 in but is forecast to increase by 41 million m^3 by 2016.

The use of recovered paper in the EU-27 was 145 million m^3 in RWE in 2011 which indicated approximately 25 million m^3 (RWE) growth in comparison to 2000. By 2016 it is expected to be fairly stable or rise somewhat.

The use of industrial wood-processing residues grew from about 135 million m^3 in 2000 to about 173 million m^3 in 2011. The growth is forecast to continue resulting in a use of approximately 186 million m^3 by 2016.

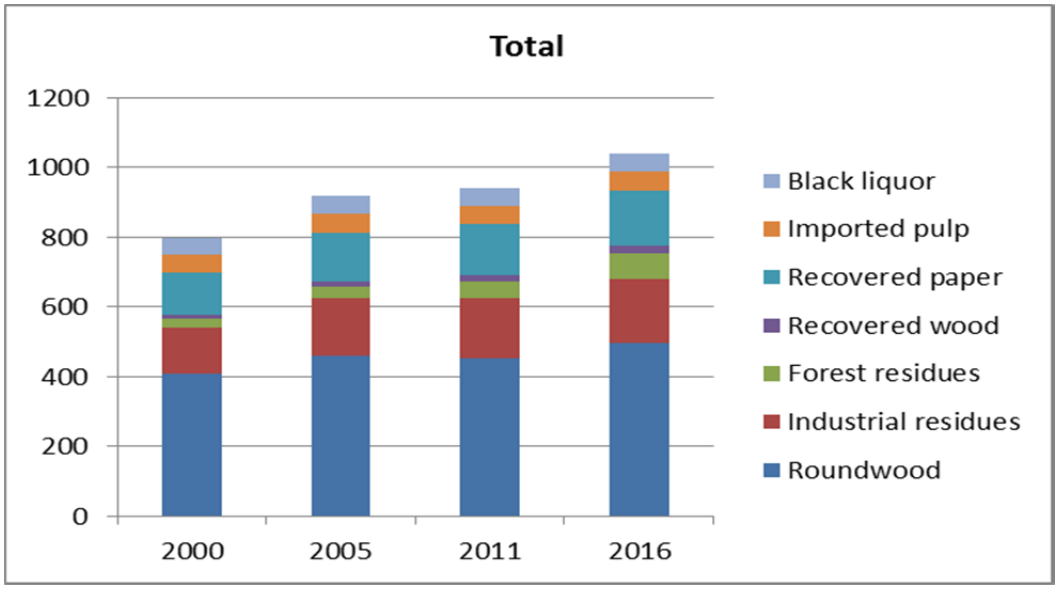
In 2011, the use of forest residues, recovered wood and black liquor amounted to approximately 118 million m^3 (RWE) and the EU-27 area imported also around 53 million m^3 (RWE) of pulp from outside the EU region. Out of these wood raw material types, forest residues (+21 million m^3) and recovered wood (+9 million m^3) increased their use the most between 2000 and 2011. The use of forest residues is forecast to increase significantly (+26 million m^3) by 2016 whereas the use of recovered wood (+3 million m^3) will increase only slightly and black liquor (-1 million m^3) is expected to decrease marginally. These trends are summarised in Figure 7.4 .

The simple cascade factor[81] for EU 27 has risen from 1,96 in 2000 to 2,07 in 2011 and is still expected to increase to 2,10 in 2016. This shows that the industry has been

[81] A simple "cascade factor" is the ratio between the total wood raw material supply, expressed as "roundwood equivalent" (RWE), and the fraction of it which is "roundwood" (from the forest and other wooded land, parks, etc.) It indicates the extent to which that roundwood has its use multiplied throughout the various value chains. A total cascade factor is the ratio of the total wood raw material supply (RWE) to all fresh wood (roundwood + forest residues) has its use multiplied throughout the various value chains,

able to intensify the use and reuse of roundwood and been able to find other sources like e.g. forest residues.

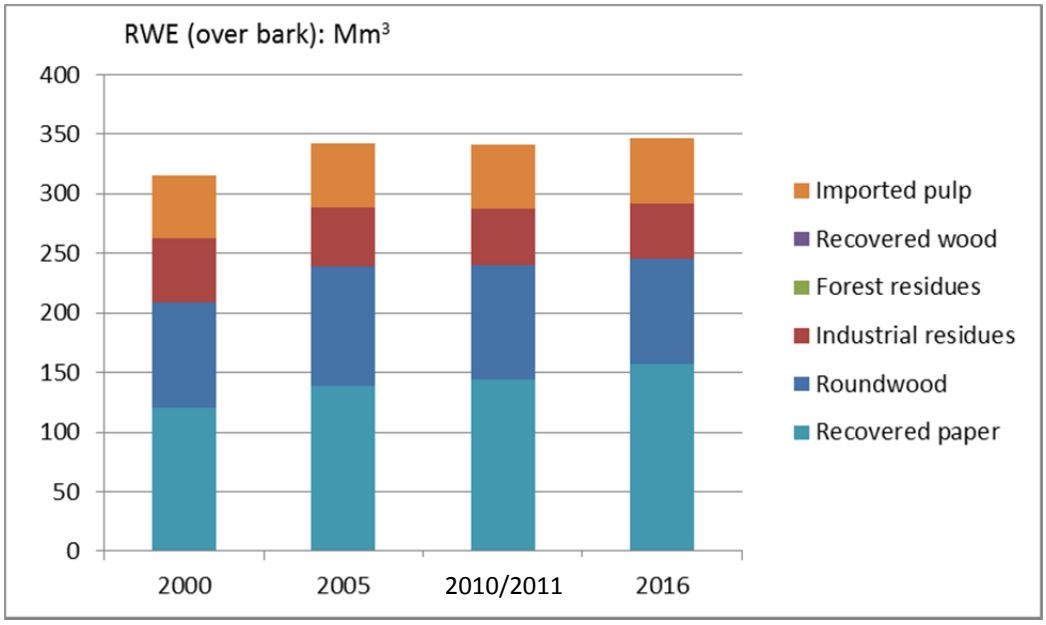
Figure 7.4 Wood raw material used in EU-27



Pulp & paper

The total wood raw material usage of the pulp and paper industry in the EU-27 is expected to remain almost unchanged between 2005 and 2016. In 2011, the pulp and paper industry used approximately 341 million m^3 (RWE) of wood, imported pulp and recovered paper. This total volume is expected to increase by only about 6 million m^3 (RWE) by 2016.

Figure 7.5 Wood raw material used in the pulp and paper industry in EU-27



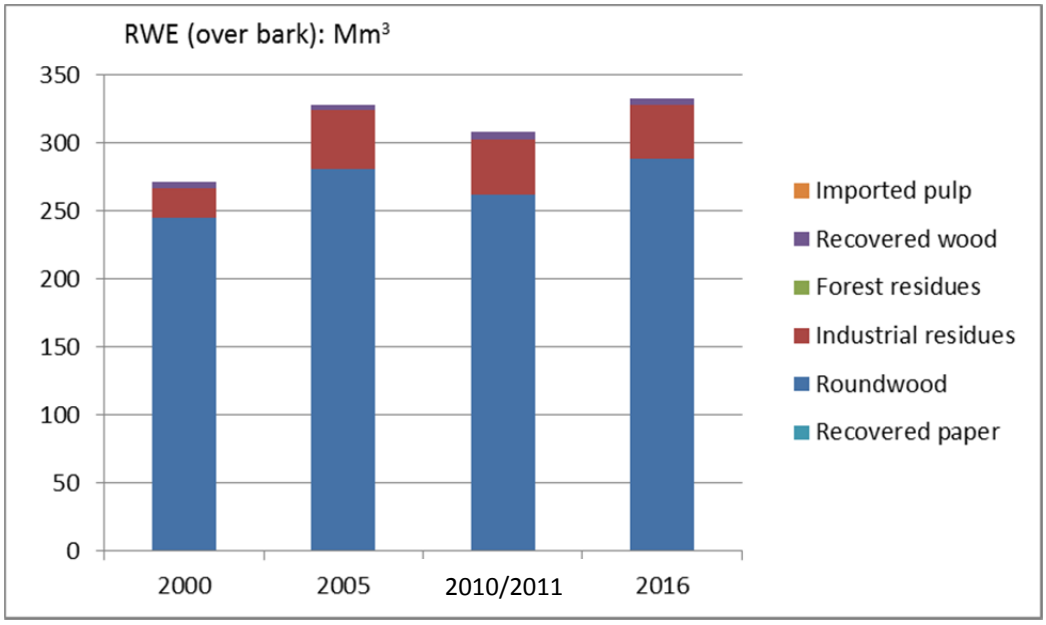
The structural change among the different wood raw material types used for pulp and paper is foreseen to continue. The use of roundwood is expected to decline by about 7 million m^3 to 89 million m^3 whereas the use of the recovered paper is set to increase by over 12 million m^3 (RWE) to 157 million m^3 (RWE), raisings its relative share to a dominant 45%.

Woodworking

Wood raw material consumption of the EU-27 woodworking industry has increased by 38 million m^3 between 2000 and 2011 and is expected to continue to grow although at a slower pace than in the previous 10-year period. 2016 consumption is forecast to amount to about 333 million m^3 indicating an increase of around 25 million m^3.

Roundwood is clearly the dominating raw material type with a share fluctuating between 85% and 90% of the total. 2016 volume is expected to slightly increase the volume recorded in 2005. The use of industrial wood-processing residues nearly doubled between 2000 and 2011 (22 million m^3 vs. 41 million m^3) but the overall consumption volume is forecast to remain almost unchanged in 2016. The volume of recovered wood used in the EU-27 wood product industry reached 6 million m^3 in 2011 but this volume is expected to decrease by approximately 1 million m^3 by 2016. The role of recovered wood is forecast to remain almost negligible in 2016: approximately 5 million m^3.

Figure 7.6 Wood raw material used in the wood products industry in EU-27



Bio-energy

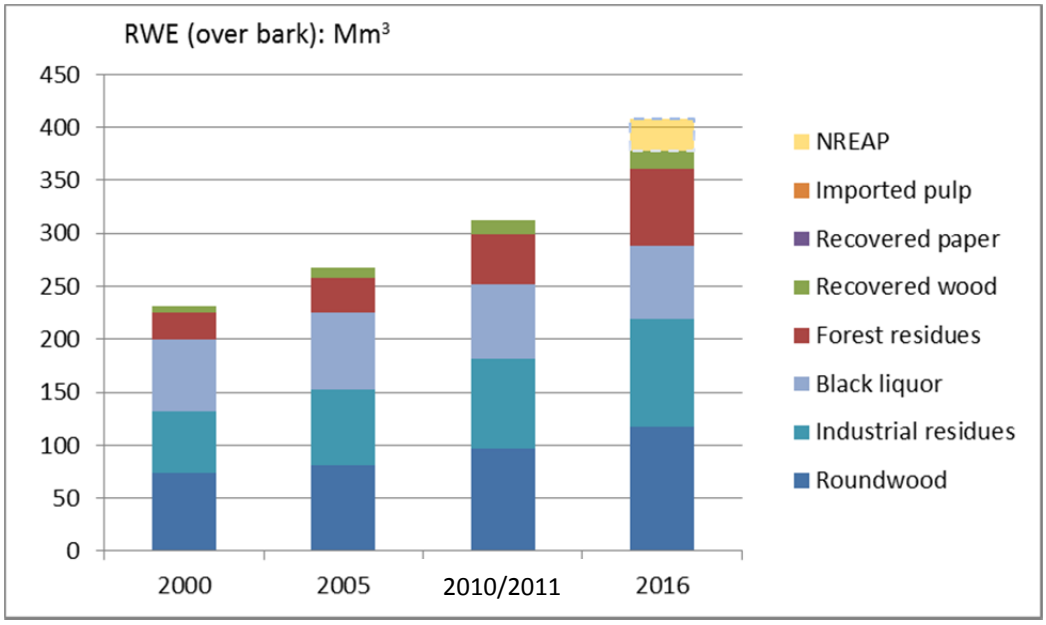
Between 2000 and 2011, wood raw material use in the EU-27 bio-energy sector grew (ca. +82 million m^3 RWE) more than double the rate in comparison to the growth of both the pulp & paper and wood product sub-sectors. Following this significant growth, the wood raw material use of the bio-energy sector approached that of the wood product sector.

Roundwood (split logs) is the dominant wood raw material type (about 73 and 97 million m^3 in 2000 and 2011, respectively) used in the bio-energy sector consisting mainly of fuel wood used in fire places in private housing. Black liquor and industrial residues have traditionally been the other main wood raw material types for energetic uses of wood biomass in the EU-27.

The use of forest residues and recovered fuel wood as fuel has increased their significance in the overall wood fuel composition. Furthermore, the use of forestry residues is forecast to increase by 2016. From the range of wood fuels, only the use of black liquor can be expected to decrease, following the decreasing trend of pulp production in the EU-27.

Based on Indufor calculations, the total wood raw material by the bio-energy sector in 2016 from the domestic sources will be about 60 million m^3 of RWE smaller than the total target, ca. 423 milli on m^3 (RWE), for energy use of wood in 2016 set by the Member States' NREAPs.

Figure 7.7 Wood raw material used in the bio-energy sector in EU-27



7.2.2 Use of raw material by sector in Group A

The total wood-based raw material use increased to around 388 million m^3 between 2000 and 2011 (+40 million m^3) and is forecast to continue increasing by about 30 million m^3 by 2016.

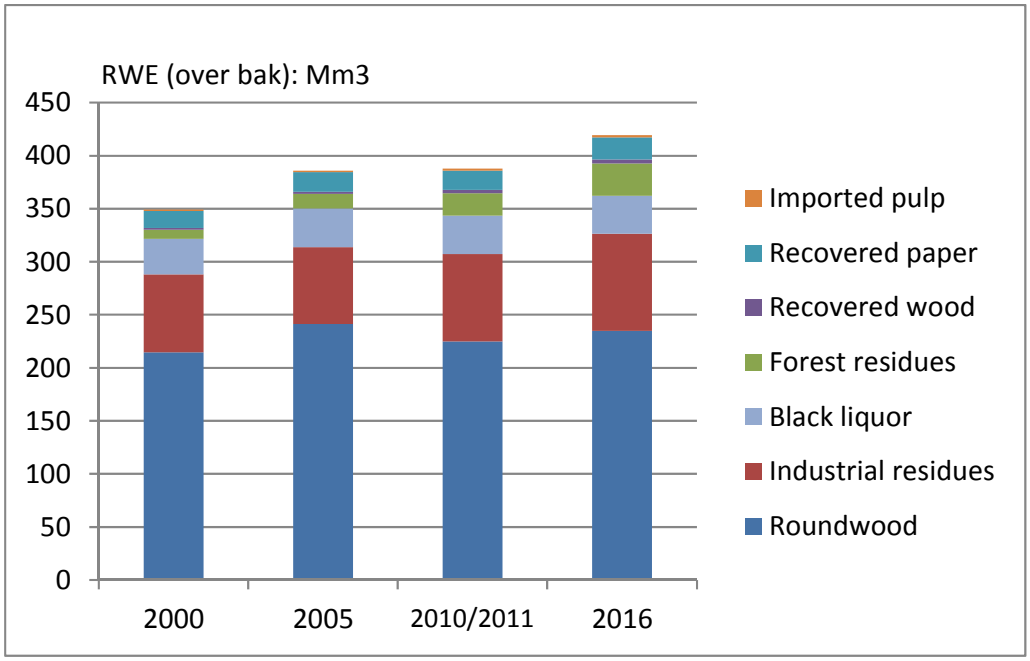
In 2011, the use of roundwood totalled approximately 225 million m^3, which was about 16 million m^3 less than in 2005. The use is forecast to rebound to about 235 million m^3 by 2016. The use of industrial residues grew by about 10 million m^3 between 2005 and 2011 and is expected to increase by another 9 million m^3 towards 2016.

The growth of forest residue use exceeded 12 million m^3 between 2000 and 2011 and the use is forecast to increase by about 9 million m^3 reaching the 30 million m^3 level in 2016. The imports of pulp are set to increase slightly by 2016.

The use of recovered paper stayed almost unchanged (about 18 million m^3 of RWE) between 2005 and 2011 but is forecast to increase to approximately 21 million m^3 of RWE by 2016. Recovered wood use among Group A countries was estimated at about 3.2 million m^3 in 2011 indicating an increase of around 1 million m^3. The use of black liquor was and is forecast to remain stable on the level of about 35 million m^3.

In Group A the simple cascade factor has grown from 1,62 in 2000 to 1,73 in 2011 and is further expected to grow and reach 1,78 in the year 2016. The main reason is the increased use of forest residues which shows that it is important to use all parts of the wood in an efficient way.

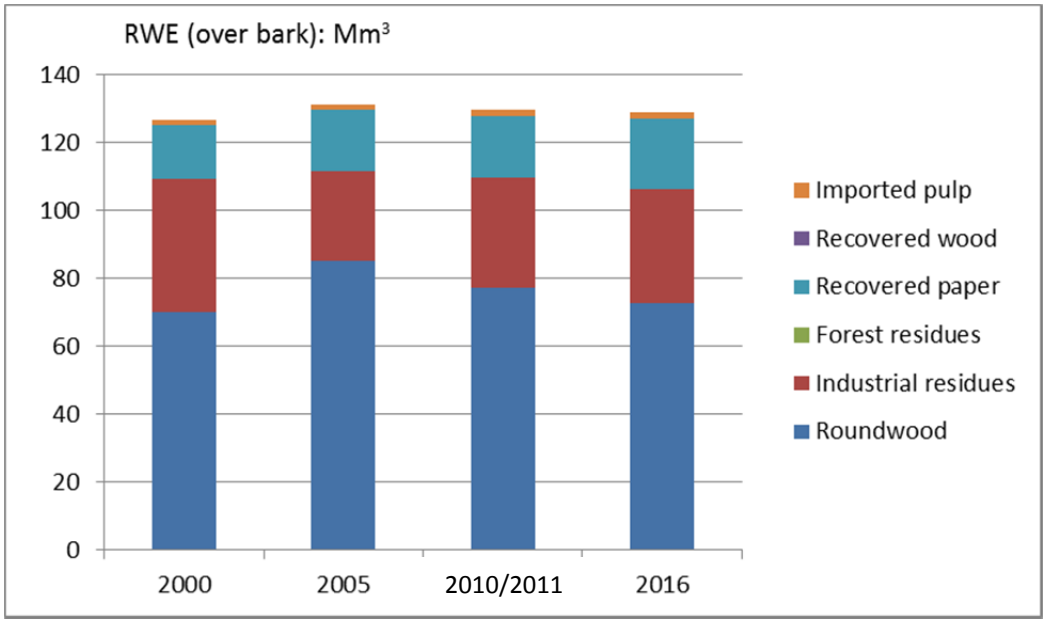
Figure 7.8 Wood raw material used in Group A



Pulp & paper

The use of wood raw material in the pulp and paper industry among Group A countries stayed almost unchanged between 2005 and 2011 and the total volume is forecast to decrease marginally by 2016. Roundwood is the dominant wood raw material type but with declining volumes (ca. 85 million m^3 in 2005 and ca. 77 million m^3 in 2011) and relative shares of volume (ca. 65% in 2005 and ca. 60% in 2011). Roundwood use is forecast to decrease further by another 4 million m^3 by 2016 indicating a 56% share of the total wood raw material use.

Figure 7.9 Wood raw material used in the pulp and paper industry in Group A



In 2011, the use of industrial residues (32 million m^3) was almost 7 million m^3 lower than in 2000 but the use is expected to increase by over 1 million m^3 towards 2016. The relative share of industrial residues is forecast to remain at the same level (ca. 25%).

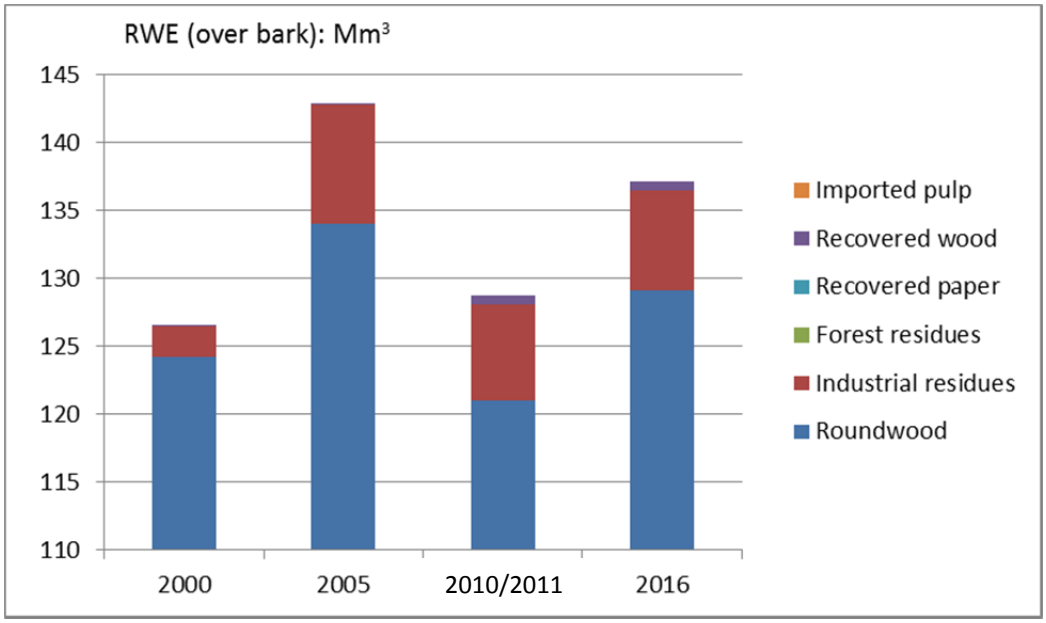
Group A countries used approximately 18 million m^3 (RWE) of recovered paper in their pulp and paper sector both in 2005 and 2011. That is about 2 million m^3 (RWE) more than in 2000 and about 2.5 million m^3 (RWE) less than the forecast use in 2016.

Woodworking

The total wood raw material use of Group A wood product industry was just under 130 million m^3 in 2011 which was only marginally higher than in 2000. This total volume is forecast to increase by approximately 8 million m^3 by 2016.

Roundwood is by far the dominant wood raw material type consisting of both sawlogs and pulpwood but its share has decreased somewhat during the last ten years (98% in 2000 versus 94% in 2011) due the expansion of reconstituted panel industry and the simultaneous use of industrial residues and recovered wood as wood raw material. The use of the latter two is expected to remain at current levels towards 2016.

Figure 7.10 Wood raw material used in the wood products industry in Group A



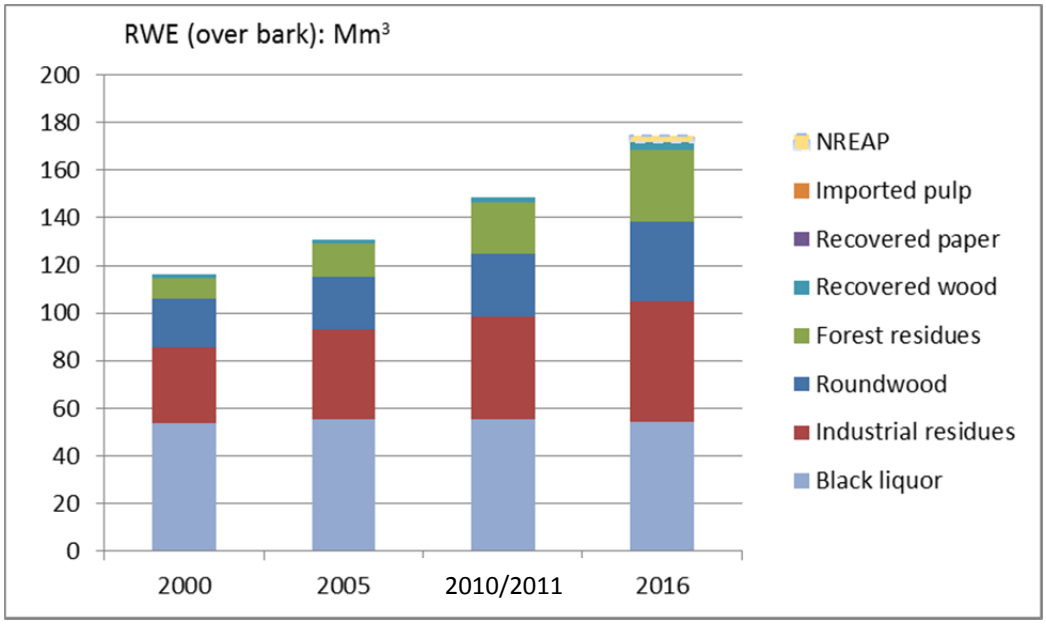
Bio-energy

The bio-energy sector is the driver of the increasing wood use among Group A countries. The growth of wood raw material use in the sector exceeded 33 million m^3 (RWE) between 2000 and 2011 and is forecast to increase by almost a further 24 million m^3 (RWE) by 2016. This volume is expected to be gained from the domestic sources. However, this level indicates a deficit of approximately 22 million m^3 (RWE) in comparison to the NREAP targets set by the Member States of Group A.

The volume of industrial residues used in the bio-energy sector among Group A countries has long been the main source of bio-energy (ca. 43 million m^3 of RWE in 2011). The consumption of industrial residues has been increasing steadily (from 32 million m^3 in 2000 to 43 million m^3 in 2011) and is forecast to increase also in the future (+7 million m^3 to 2016).

The black liquor produced as a side product in pulping has been the second largest source of bio-energy (ca. 43 million m^3 of RWE in 2011).Although the level of consumption of black liquor has been stable, its share in the total wood raw material use has been decreasing (35% in 2000 versus 28% in 2011). The use of black liquor is forecast to remain at the current level but its relative share to decrease significantly (-5%) by 2016.

Figure 7.11 Wood raw material used in the bio-energy sector in Group A



The use of forest residues for bio-energy has increased steadily among the Group A countries totalling around 21 million m^3 (16% of total) in 2011. By 2016 the growth of use (about 9 million m^3) of forest residues is expected to outpace the growth of roundwood and industrial residues and to have contributed to approximately 20% share of the total wood raw material use in the bio-energy sector.

The use of recovered wood for bio-energy was about 1,5 million m^3.The use of recovered wood grew only about 1 million m^3 between 2000 and 2011 and is forecast to increase by around half a million m^3 by 2016.

7.2.3 Use of raw material by sector in Group B

In 2011, the total wood use in the Group B was about 427 million m^3 (RWE). The wood use increased steadily (approximately 100 million m^3 of RWE) between 2000 and 2011 and is expected to continue to do so (+54 million m^3 RWE) by 2016.

Roundwood is the dominant wood raw material type used with 191 million m^3 volume in 2011 showing approximately 11 million m^3 growth since 2005. That volume is forecast to increase by about 23 million m^3 by 2016 keeping its relative share of the total wood raw material relatively unchanged.

Recovered paper has grown from 66 million m^3 in 2000 to nearly 87 million m^3 in 2011 and is expected to grow by 8 million m^3 until 2016.

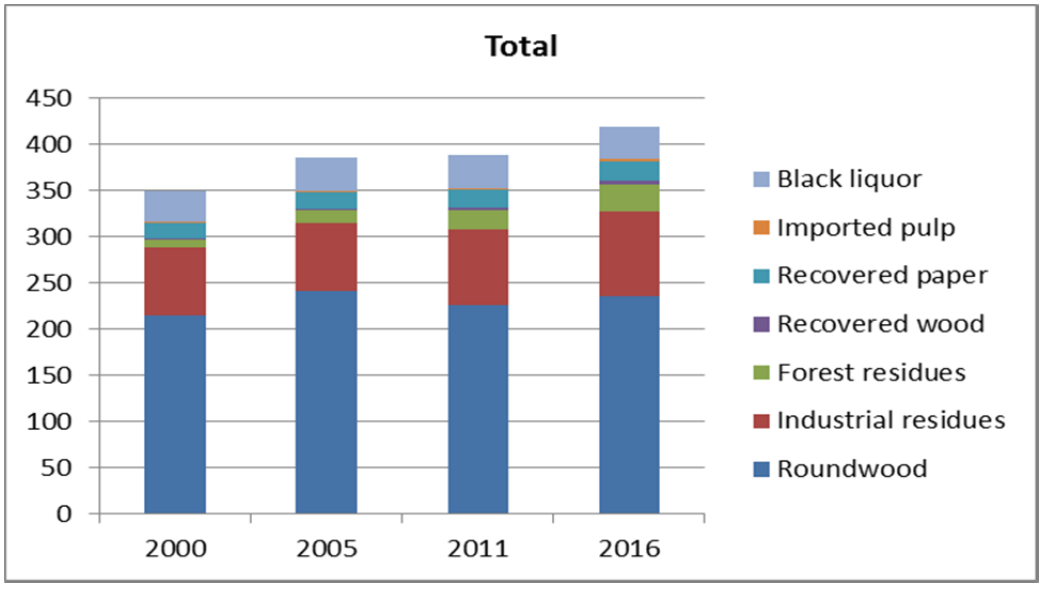
The use of industrial wood-processing residues grew rapidly from 47 million m^3 in 2000 to 70 million m^3 in 2005 and is expected to continue a more modest growth to 77 million m^3 by 2016.

In 2011, recovered wood was 12 million m^3 and is expected to grow by about 2 million m^3 by 2016.

The use of forest residues has increased by over 7 million m^3 since 2000 and the growth is expected to increase by another 16 million m^3 use among the Group B countries reaching over 37 million m^3 in 2016.

Also in Group B the simple cascade factor has grown steadily. In 2000 it was 2,18 and in 2011 it had increased to 2,29. The ratio is expected to be the same in 2016.

Figure 7.12 Wood raw material used in Group B



Pulp & paper

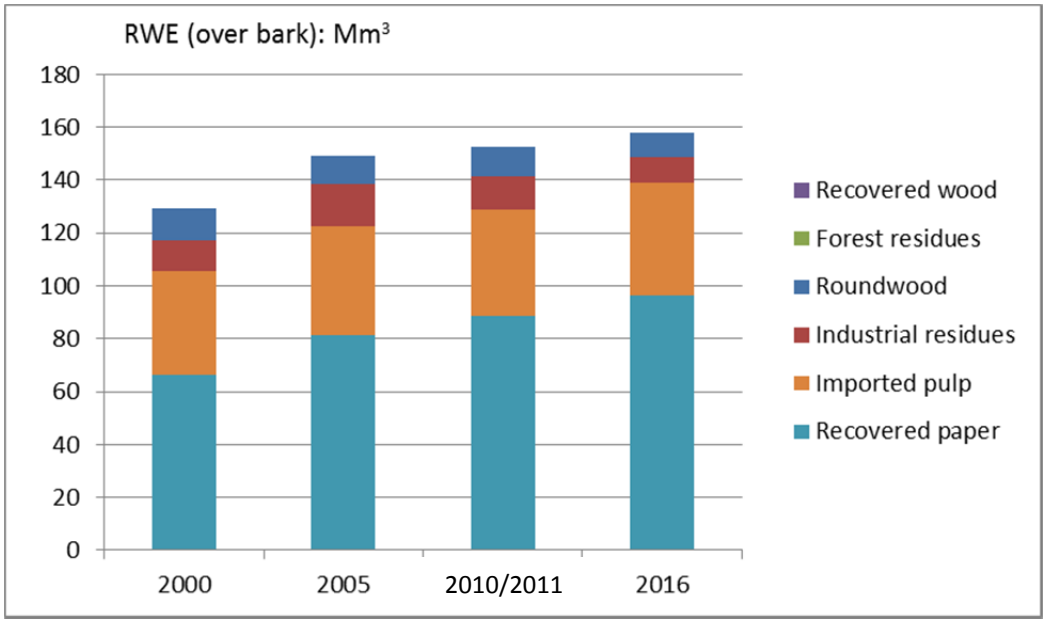
The overall wood raw material use in Group B's pulp and paper industry is expected to increase from the current 153 million m^3 (RWE) to approximately 158 million m^3 (RWE) by 2016.

Recovered paper has been the dominant wood raw material type between 2000 and 2011. In 2011, it accounted for 58% (i.e. 89 million m^3 RWE) of the total wood raw material use in the pulp and paper industry in 2011. This share is forecast to increase further (63%) by 2016 to 96 million m^3 (RWE).

Imported pulp is the other main raw material type (26% share in 2011) used in Group B. The volume of imported pulp has remained relatively unchanged (around 40 million m^3 RWE) since 2000 and is expected to increase slightly (2 million m^3 RWE) by 2016.

Roundwood (ca. 11 million m^3) and industrial wood-processing residues (ca. 12 million m^3) have rather equal roles in wood raw material use with 7% and 8% shares, respectively, in 2011. Volumes of both raw material types are expected to drop to just under 10 million m^3 by 2016.

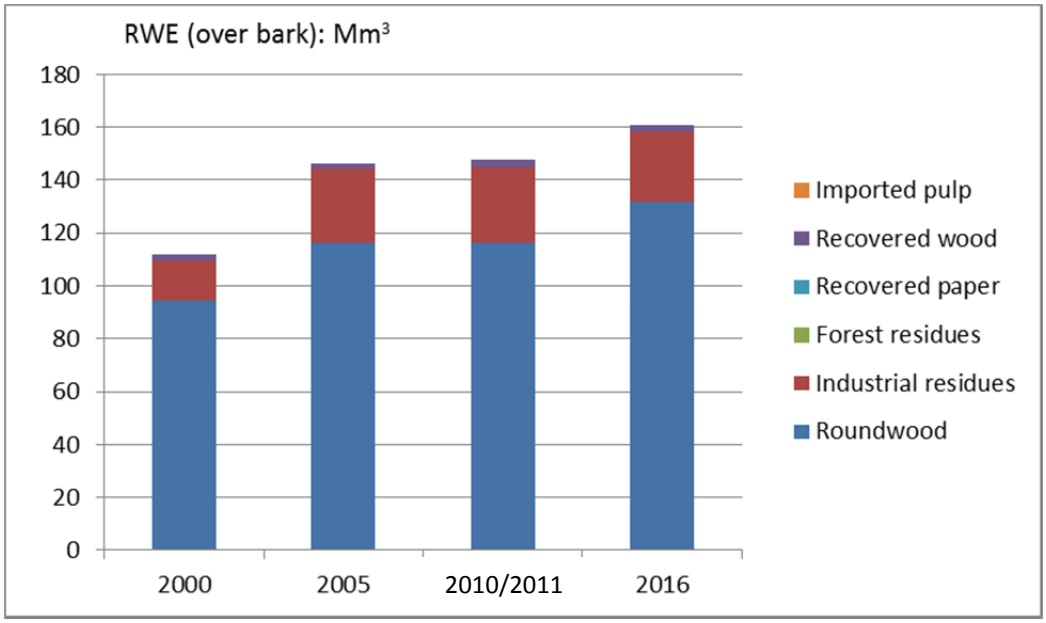
Figure 7.13 Wood raw material used in the pulp and paper industry in Group B



Woodworking

The total wood raw material use in wood product industries in Group B countries stayed relatively unchanged between 2005 and 2011 (about 146 and 148 million m^3, respectively). In 2011, roundwood accounted for approximately 80% of this volume and its share is expected to increase (82%) somewhat by 2016. The use of industrial residues amounted to 28 million m^3 in 2011 and increased by 13 million m^3 from 2000. The demand increase is forecast to continue (+7 million m^3) towards 2016.

Figure 7.14 Wood raw material used in the wood products industry in Group B



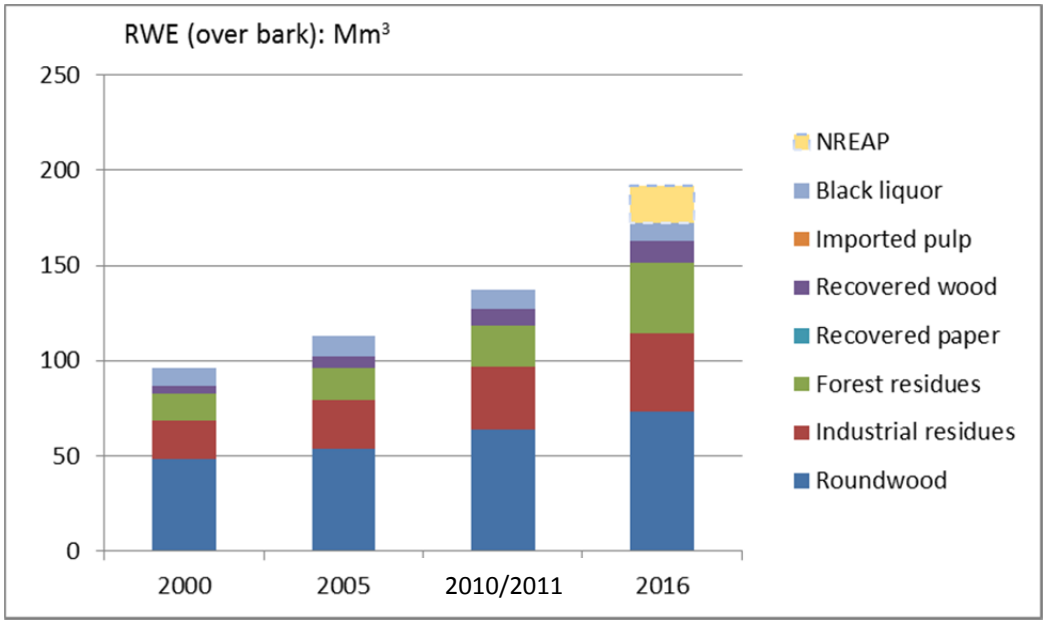
Bio-energy

The growth (41 million m^3 RWE) of wood raw material use by the bio-energy sector in Group B countries between 2000 and 2011 outpaced the growth in pulp and paper as well as that in wood product industries. Following the expected growth, wood raw material use (172 million m^3 RWE from domestic sources) by the bio-energy in 2016 is forecast to be higher than in either the pulp and paper or the wood product industries in Group B countries. Furthermore, NREAP targets set by the Group B Member States indicate a wood raw material deficit of about 25 million m^3 (RWE) to be filled by extra-EU imports.

Roundwood (mostly split logs, used mainly at fire places in residential housing) has been the dominant wood raw material type (63 million m^3 in 2011) in Group B countries but its share is decreasing gradually (50% in 2000 versus forecast 43% in 2016).

Between 2000 and 2011, the use of industrial residues grew (13 million m^3) almost as much as the use of roundwood. This use is forecast to increase by approximately 7 million m^3 by 2016. The use of forest residues is expected to grow the most (ca. 16 million m^3) towards 2016 and to approach the use of industrial residues (37 versus 40 million m^3).

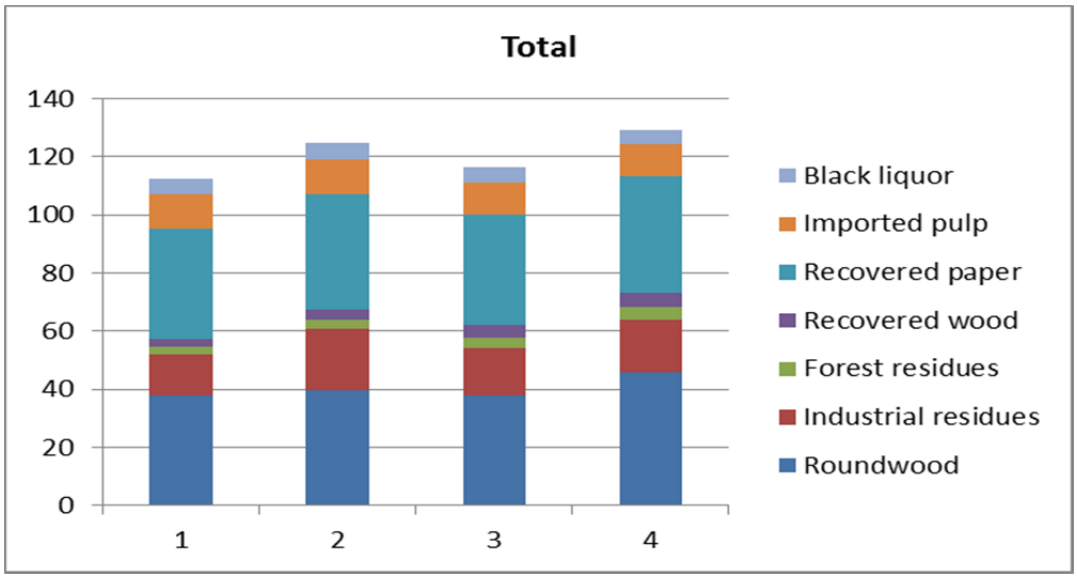
Figure 7.15 Wood raw material used in the bio-energy sector in Group B



7.2.4 Use of raw material by sector in Group C

Total wood raw material use in the Group C increased during 2000-2011 reaching about 117 million m^3 RWE in 2011. The total wood use is expected to grow slightly to about 129 million m^3 RWE by 2016. Recovered paper has been the most important raw material (38 million m^3 in 2016) together with roundwood with exactly the same amount. Also industrial residues with 16 million m^3 plays an important role for the countries in Group C.

Figure 7.16 Wood raw material used in Group C



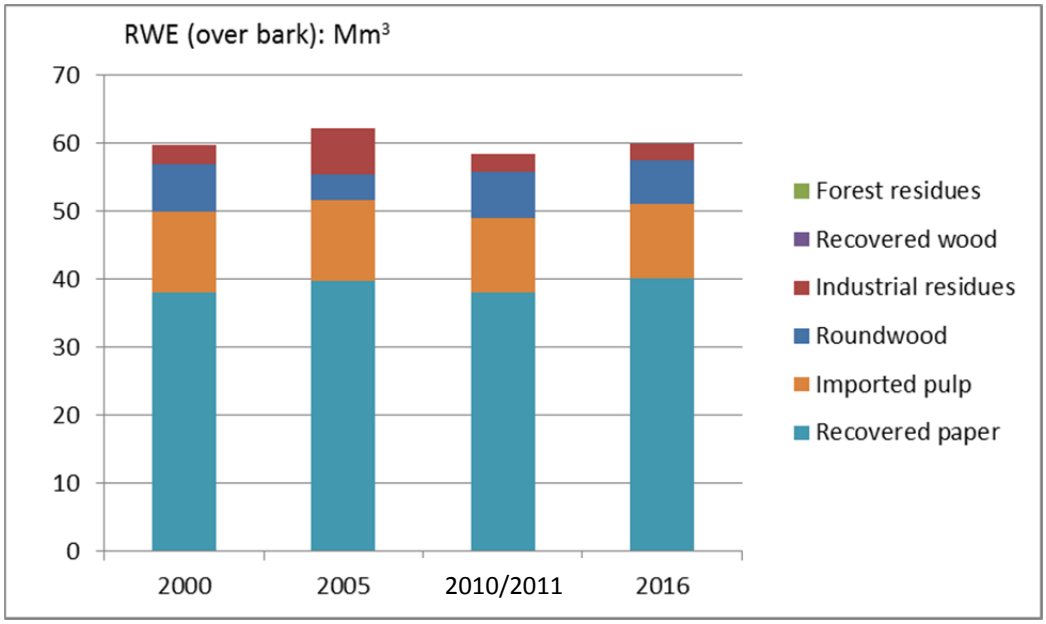
The simple cascade factor in Group C is high as can be expected in this Group consisting of countries with less availability of roundwood and thus a bigger need to use other types of wood raw material. The factor was 2,95 in year 2000 and had increased to 3,08 in 2011. It is not expected to grow until 2016, on the contrary is it possible that the factor will decline because of increased use of roundwood in this group.

Pulp & paper

Recovered paper (38 million m^3 RWE) represented almost two thirds of the pulp and paper industry's wood raw material use in 2011. Imported pulp (ca. 11 million m^3 RWE) accounted for almost 20% and roundwood (7 million m^3) for about 12%.

The use of recovered paper is expected to increase slightly (ca. 2 million m^3 RWE) by 2016 which would bring its use to approximately the same level as in 2005. With this increase recovered paper's relative share of the total wood raw material use is expected to rise to 67%. The use of roundwood is forecast to decline slightly and the use of imported pulp to remain almost unchanged.

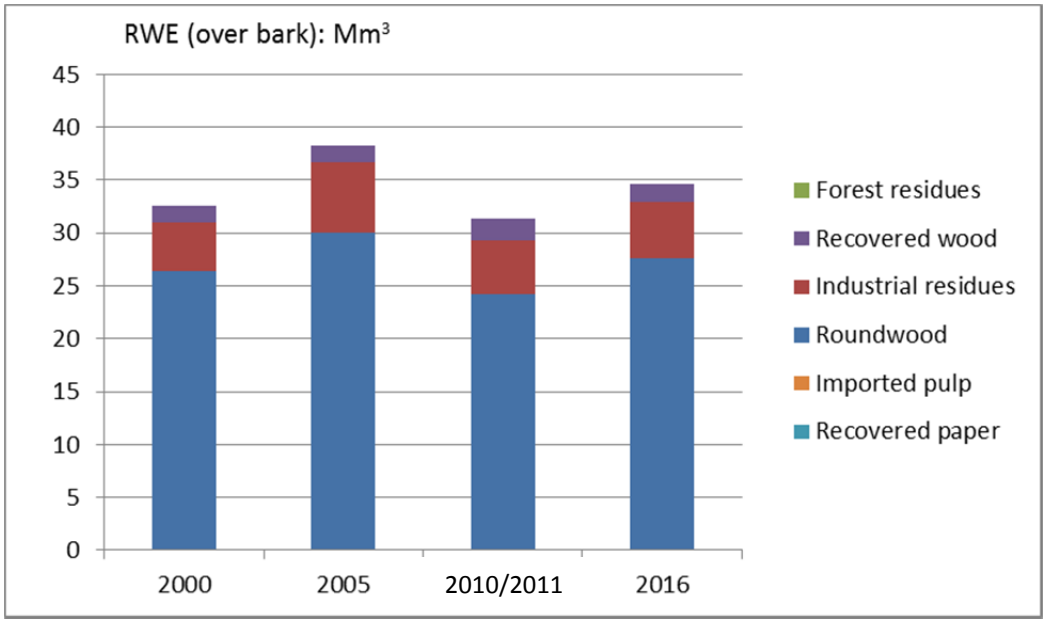
Figure 7.17 Wood raw material used in the pulp and paper industry in Group C



Woodworking

The share of roundwood has fluctuated between 75% and 80% of the total wood raw material use within the wood product industry in Group C countries. The share is forecast to remain around 80% in towards 2016. The use of industrial residues was about 5 million m^3 (i.e. 15% of total) in 2011 and is foreseen to remain almost unchanged. The use of recovered wood was about 2 million m^3 and it is expected to decrease moderately by 2016.

Figure 7.18 Wood raw material used in the wood products industry in Group C



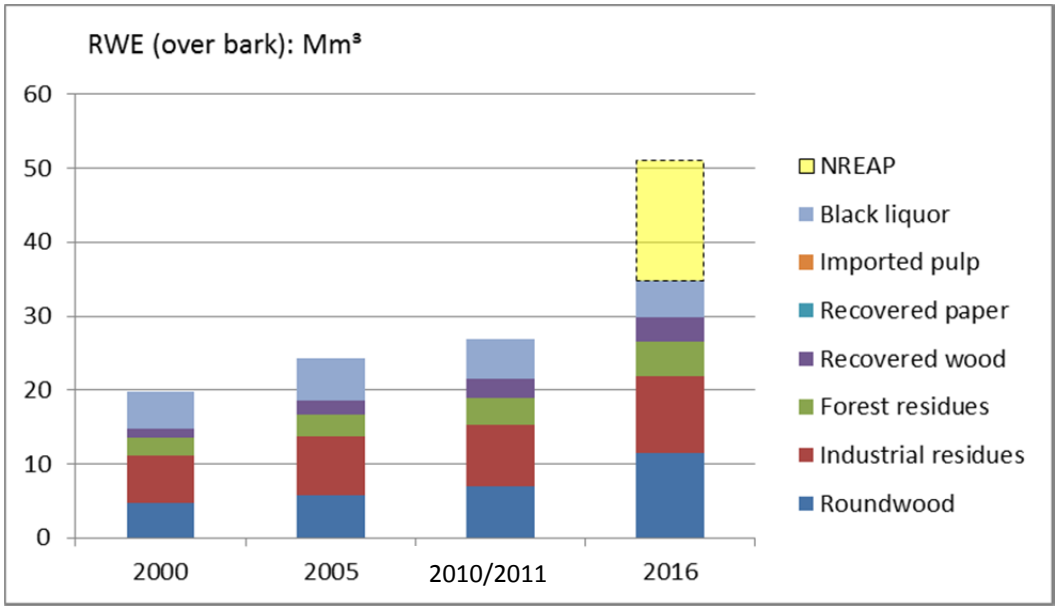
Bio-energy

In Group C countries, the use of wood for bio-energy increased from about 20 million m^3 (RWE) in 2000 to about 27 million m^3 (RWE) in 2011. Industrial residues (ca. 8.5 million m^3) were the dominant (ca. 31%) wood raw material type used followed closely by roundwood (26%). The use of black liquor has decreased marginally (relative share from 26% to 20%) between 2000 and 2011 whereas the use of forest residues has kept its position (13%) with slightly increased volumes.

The use of roundwood is forecast to increase the most (+4.6 million m^3) by 2016 raising its share to one third of the overall wood raw material use within the Group C bio-energy sector. Industrial residues and forest residues are expected to retain their relative shares and recovered wood to increase its share to about 10% of the total wood-equivalent use. The use of black liquor is forecast to decrease marginally resulting in a significant loss (-6%) in its share of wood raw material use.

Although there has been an increase in the use of domestic wood as an energy source in the Group C, the total use is expected to leave about 16 million m^3 (RWE) short from the target set in the NREAPs which has to be imported or sourced from domestic sources if the NREAP targets are to be reached (NB see dotted area in right-hand side bar of Figure 7.19).

Figure 7.19 Wood raw material used in the bio-energy sector in Group C



7.3 Use of raw material by type

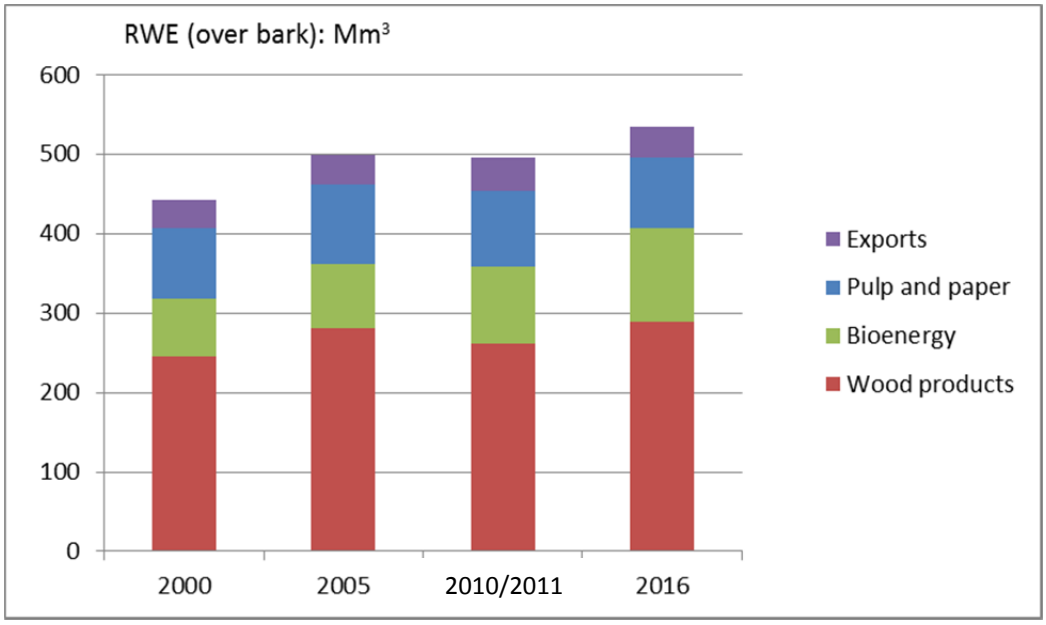
7.3.1 Use of raw material by type in EU-27

Roundwood

Wood product industry is the dominant user (ca. 260 million m^3 in 2011) of roundwood in the EU-27 area. This volume includes both logs for sawmills and veneer/plywood industry as well as pulpwood for reconstituted panel industries. Wood product industry's share of the total EU-27 roundwood use has fluctuated between 50-55% between 2000 and 2011 and expected to remain so towards 2016.

In contrast to the pulp and paper industry's stagnated, or even reducing , roundwood use in the EU-27 area, the bio-energy sector used more roundwood (mostly split logs) in 2011 (95 versus 97 million m^3, for P&P and bio-enegy respectively) and is clearly forecast to use more roundwood (89 versus 118 million m^3, respectively) in 2016.

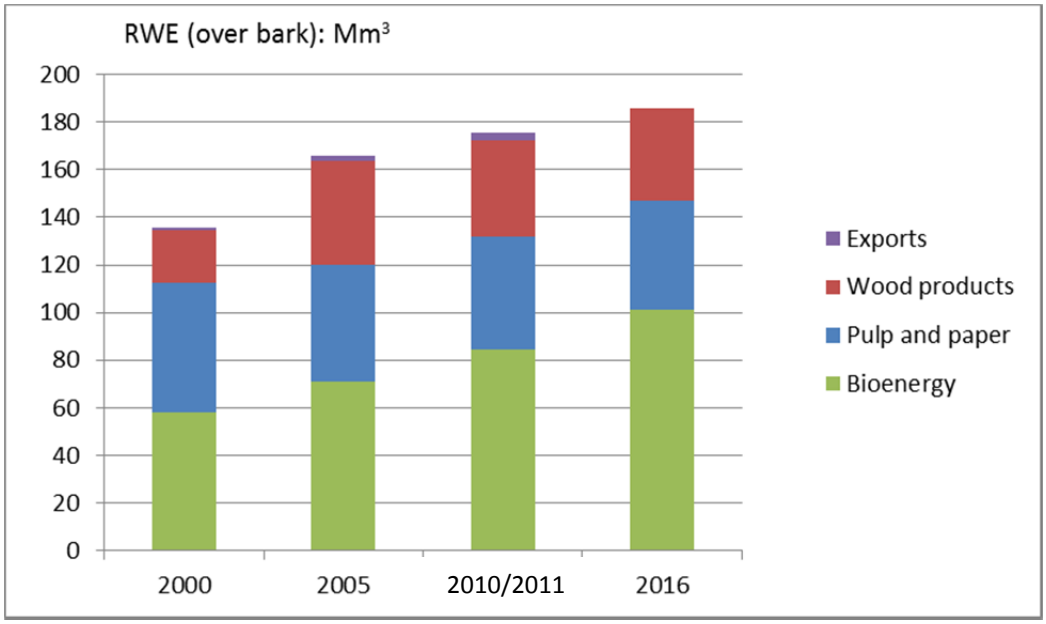
Figure 7.20 Use of roundwood in EU-27



Industrial wood-processing residues

The use of industrial residues in the EU-27 grew by 30 million m^3 between 2000 and 2005 and by 10 million m^3 between 2005 and 2011, partly through the increase of a low level of import. The bio-energy sector is by far the largest user (84 million m^3 in 2011) of industrial residues with its relative share of the total use increasing from 43% in 2000 to 48% in 2011. The use by the sector is forecast to increase to around 100 million m^3 by 2016 indicating a 54% share of the overall industrial residue use in the EU-27 area. Notably, by 2016, exports of industrial residues will be virtually zero.

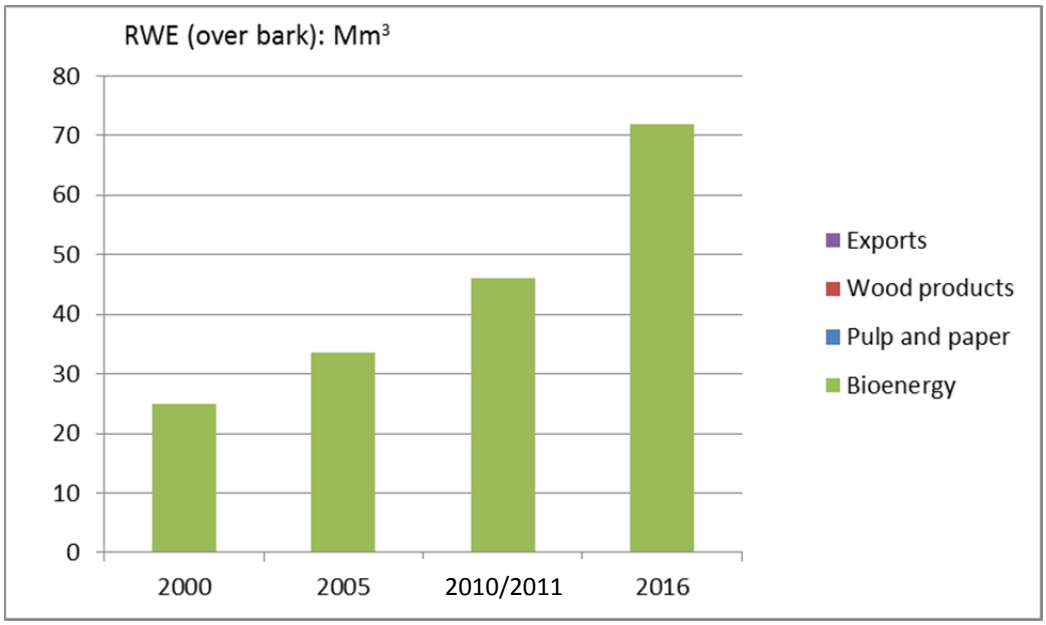
Figure 7.21 Use of industrial residues in EU-27



Forest residues

The use of forest residues in the EU-27 area was estimated to amount about 46 million m^3 in 2011. Except for some minor uses, bio-energy is the sole consumer of the whole volume and is expected to remain so. Their use has increased from about 25 million m^3 in 2000 to about 46 million m^3 in 2011 and is forecast to exceed 70 million m^3 by 2016.

Figure 7.22 Use of forest residues in EU-27

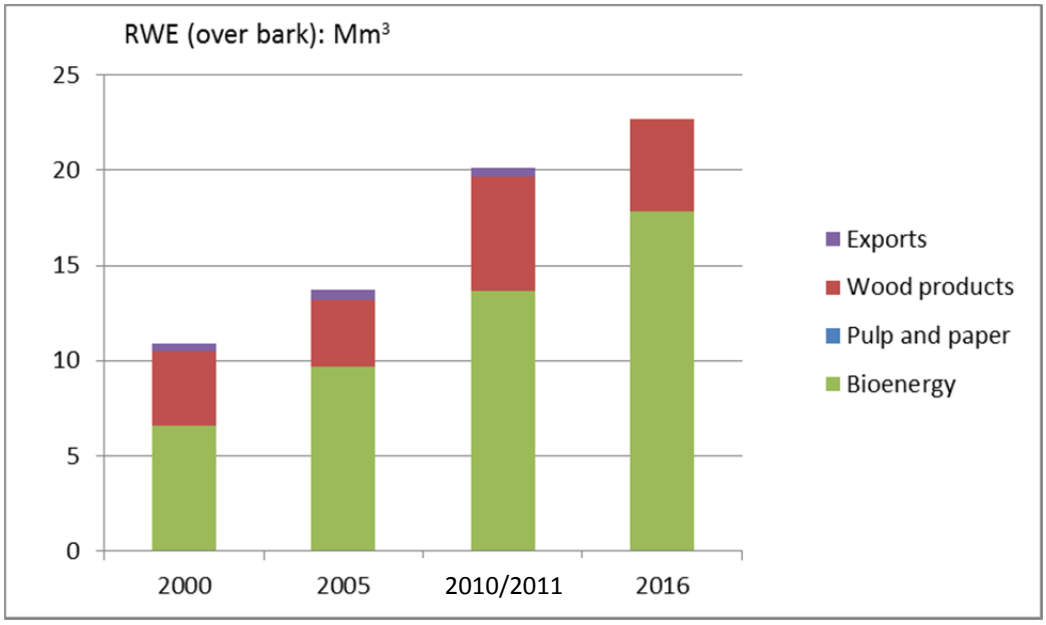


Recovered wood

The use of recovered wood has increased from about 11 million m^3 in 2000 to about 20 million m^3 in 2011. The bio-energy sector is the main user accounting for approximately two thirds of the total volume with the balance used mainly in the reconstituted panel industry.

The bio-energy sector is forecast to increase (by about 4 million m^3) its use by 2016, whereas the use is expected to decline in the EU-27 wood based panel industry because of increased competition on the wood raw material. By that time, exports will virtually cease.

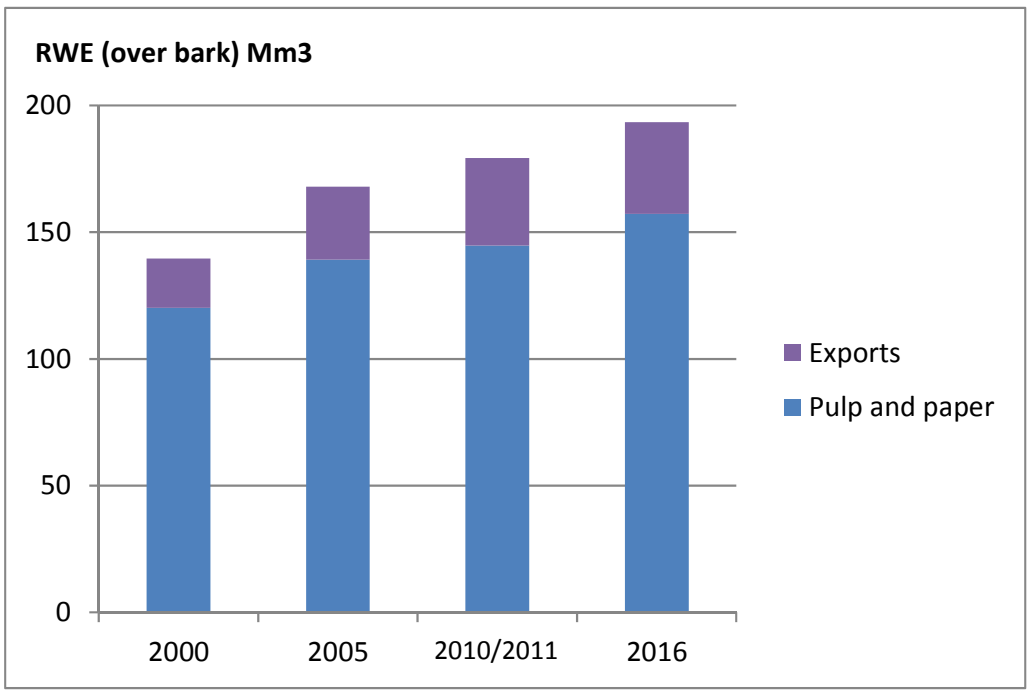
Figure 7.23 Use of recovered wood in EU-27



Recovered paper

In 2011, the EU-27 pulp and paper sector used approximately 145 million m^3 (RWE) of recovered paper – the volume was almost 25 million m^3 (RWE) higher than in 2000. Furthermore, the use is forecast to increase by more than a further 13 million m^3 (RWE) by 2016, with exports continuing at a stable level.

Figure 7.24 Use of recovered paper in EU-27



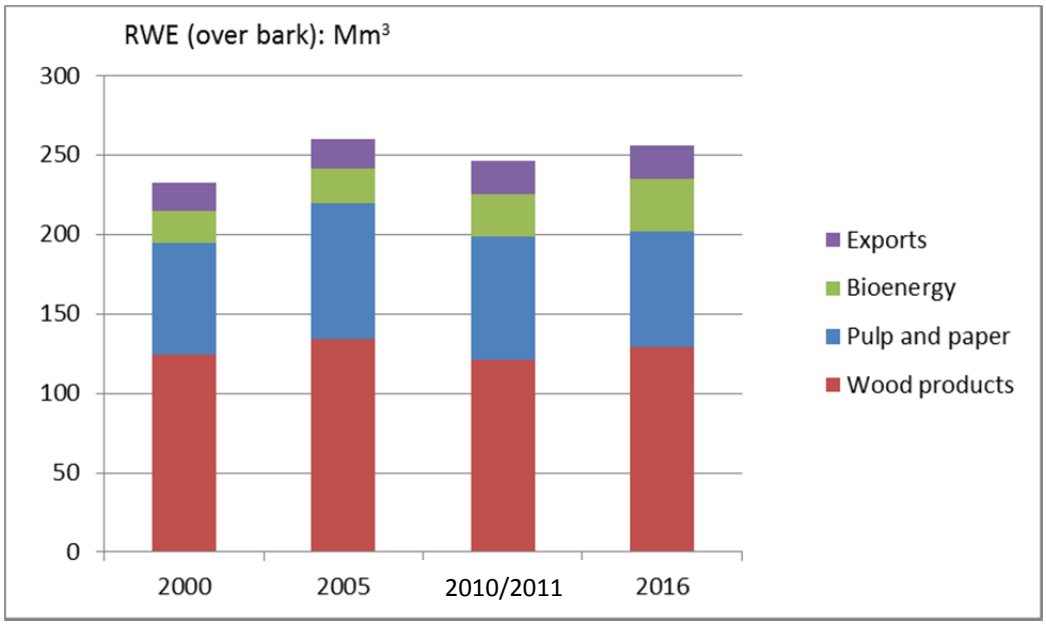
7.3.2 Use of raw material by type in Group A

Roundwood

In 2011, Group A countries used about 246 million m^3 of roundwood. This was almost 14 million m^3 more than in 2000 but over 14 m^3 less than in 2005. The total use is forecast to increase by about 5 million m^3 by 2016 to 251 M m^3.

The wood product industry used approximately half (ca. 121 million m^3) of the total roundwood use in Group A countries. Pulp and paper industry's share is almost one third with bio-energy accounting for about 11% of the volume. The wood product industry and the bio energy sector are expected to increase their use, ca. 8 and 6.5 million m^3 respectively, by 2016 whereas the use of roundwood in the pulp and paper sub-sector is forecast to decrease by approximately 4.5 million m^3.

Figure 7.25 Use of roundwood in Group A

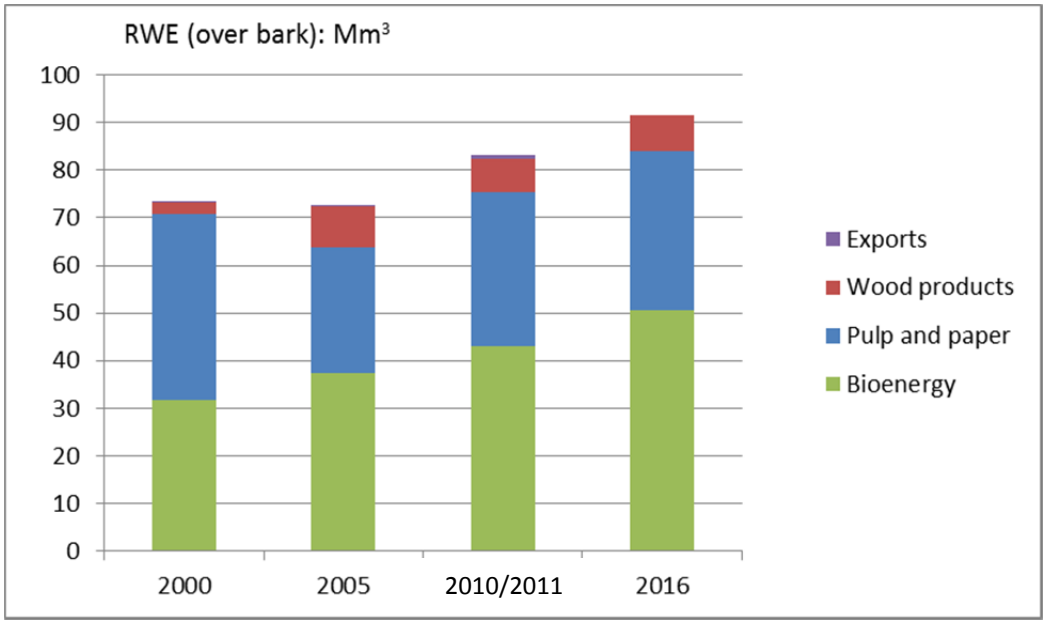


Industrial residues

The use of industrial residues totalled about 83 million m^3 in 2011 which is approximately 10 million m^3 more than in 2005 and 2000. The shares of different end users remained almost unchanged between 2005 and 2011 but a significant structural change occurred between 2000 and 2005 due to the pulp and paper industry's share decreasing from 53% to 36% and the bio-energy sector's share increasing from 43% to 52%. In addition, the wood product industry increased its share to 12%.

The bio-energy sector is forecast to increase its use further towards 2016 (+7.5 million m^3). Also the pulp and paper industry is expected to increase its use (+1.2 million m^3) but resulting in a smaller overall share of the total industrial residue use.

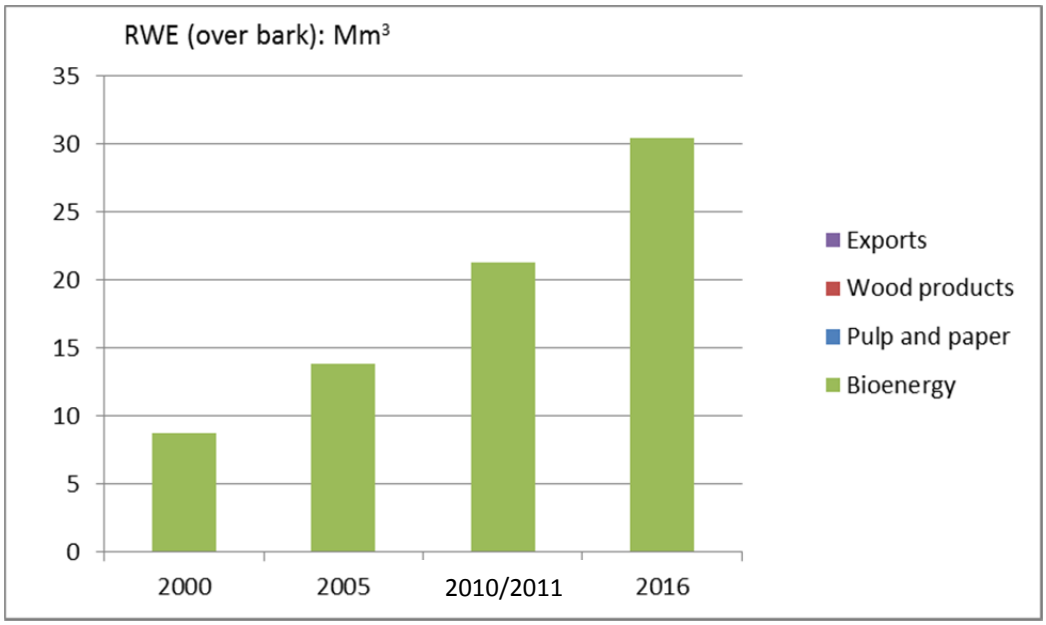
Figure 7.26 Use of industrial residues in Group A



Forest residues

Up to 2011, Group A bio-energy sector has increased its use of forest residues to over 20 million m^3. The great majority (over 80%) of this volume was used in Sweden and Finland. The total use of all Group A countries in 2011 was over 12 million m^3 more than in 2000 and is forecast to increase by approximately a further 9 million m^3 by 2016.

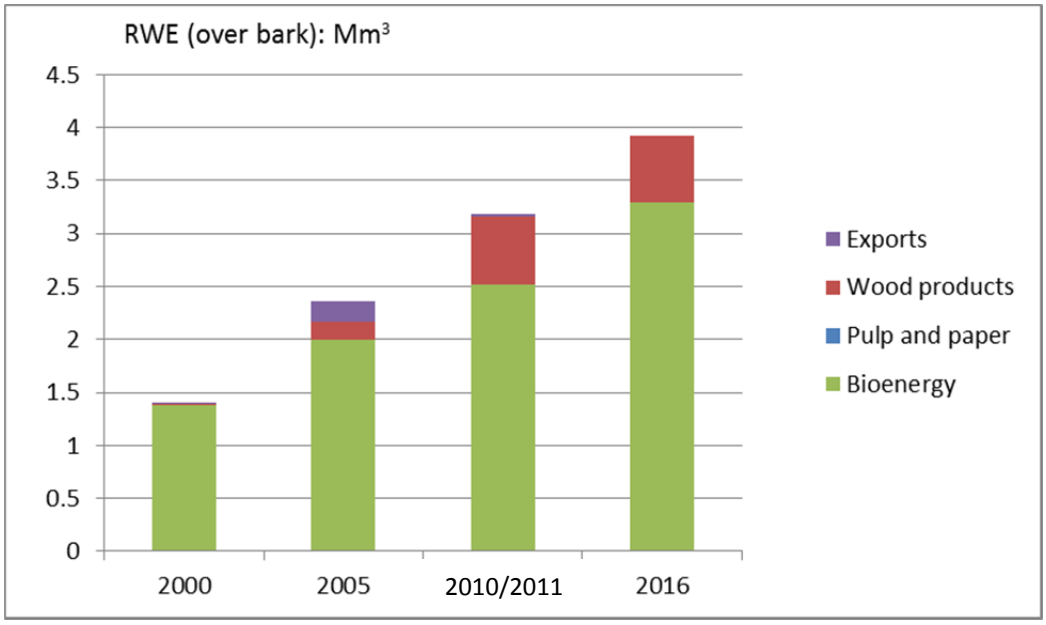
Figure 7.27 Use of forest residues in Group A



Recovered wood

In 2011, Group A countries represented about 16% of the overall EU-27 use of recovered wood. Bio-energy was the sole user in the beginning of the previous decade but by 2005 the wood product industry had increased its share of the total use to about 7% and by 2011 the share had increased to about 20%. In the same interval, exports virtually ceased. The overall use of recovered wood is expected to increase only marginally by 2016 and bio-energy is forecast to account for this extra volume.

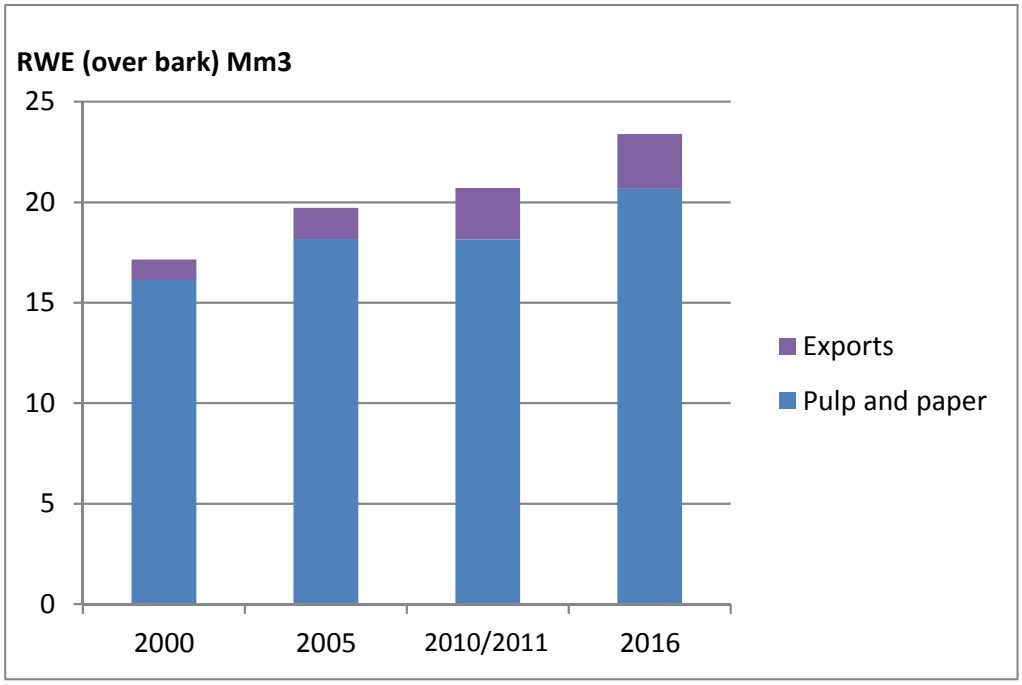
Figure 7.28 Use of recovered wood in Group A



Recovered paper

Group A countries used almost 21 million m^3 (RWE) of recovered paper in 2011. That volume was about 3.6 million m^3 (RWE) higher than in 2000 and it is forecast to increase by 2.7 million m^3 (RWE) by 2016. Approximately 6% of the volume (2.6 million m^3 RWE) was exported and that volume is expected to remain almost unchanged till 2016.

Figure 7.29 Use of recovered paper in Group A

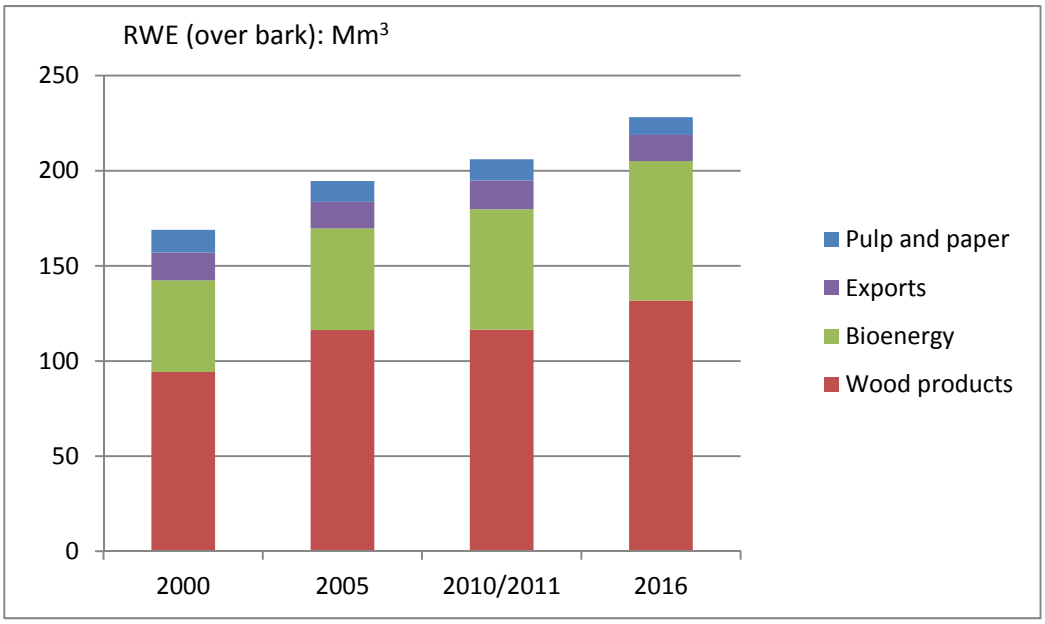


7.3.3 Use of raw material by type in Group B

Roundwood

The wood product industry increased its roundwood use by over 22 million m^3 between 2000 and 2011. Its relative share of the total use remained almost unchanged (56% versus 57%) as use increased also in the bio-energy sector (+15 million m^3). Roundwood use declined by 0.7 million m^3 in pulp and paper industry during the same time period.

Figure 7.30 Use of roundwood in Group B



By 2016, the use is forecast to increase the most in wood products industry (+15 million m^3) followed by the bio-energy sector (+10 million m^3). Pulp and paper industry is expected to continue to face a declining trend (-1,5 million m^3) in its roundwood use.

Industrial wood-processing residues

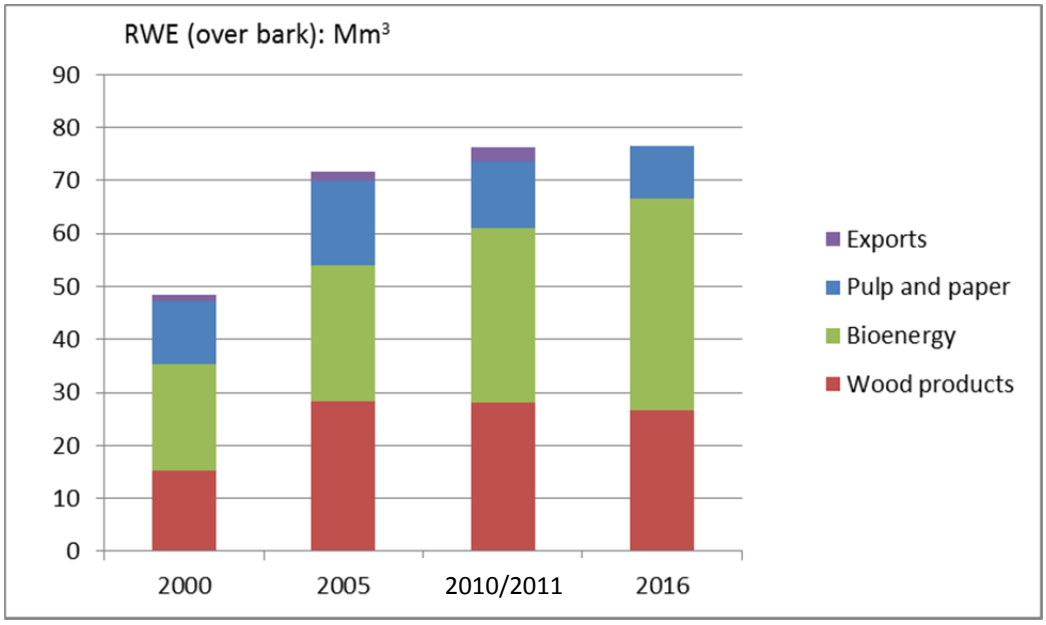
In Group B countries, the bio-energy sector has dominated (with 42% and 43% shares in 2000 and 2011, respectively) the use of industrial residues. At the same time, the volume used within the sector has increased by almost 13 million m^3.

Also the wood product industry, namely reconstituted panel industry, has significantly increased (+13 million m^3) its use of industrial residues since 2000. That is industry's share of the total industrial residue use has increased from 31% to 37% between 2000 and 2011.

Use within the pulp and paper sector has changed only marginally (+0.7 million m^3) during the same time period and industry's share of the total use has dropped from 25% in 2000 to 17% in 2011.

By 2016, the share of the bio-energy sub-sector will grow at the expense of the pulp & paper sub-sector and reduced exports. However, the EU-27's overall use will remain at about the same level.

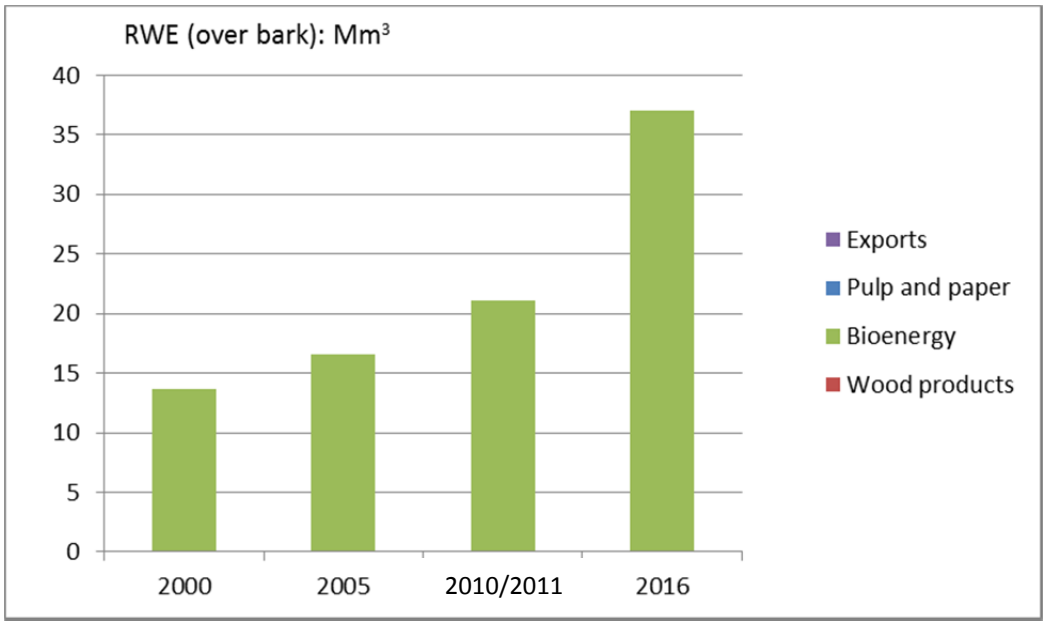
Figure 7.31 Use of industrial residues in Group B



Forest residues

Group B countries were estimated to have used approximately 21 million m^3 of forest residues in 2011. That combined volume is about the same as the total use in Group A countries. Germany is by far the forerunner among Group B countries using over half of the total volume.

Figure 7.32 Use of forest residues in Group B

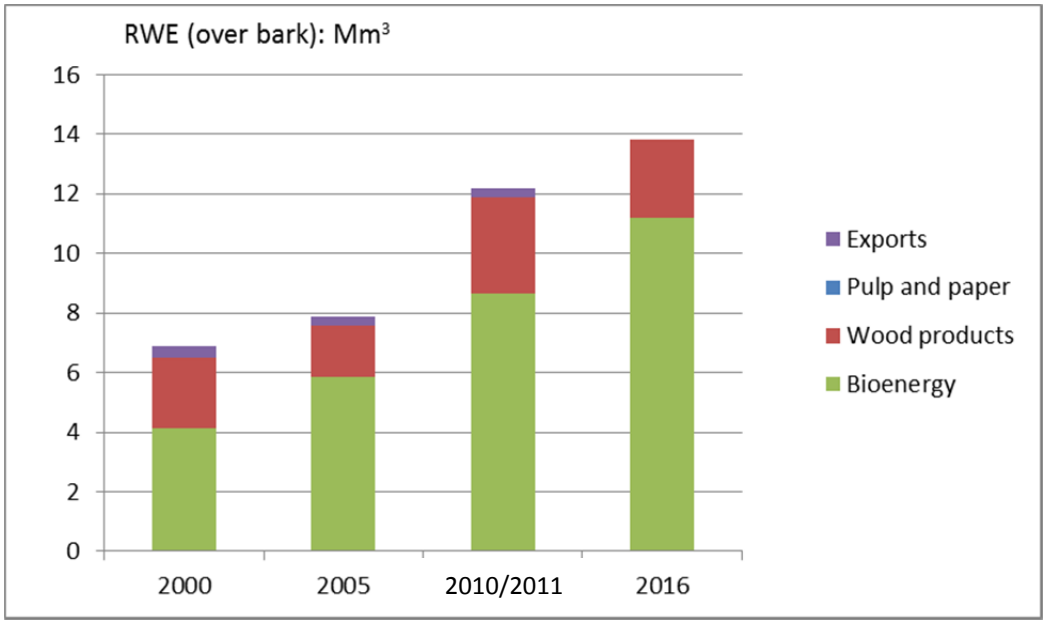


The use of forest residues is forecast to increase by approximately 16 million m^3 by 2016. That growth would represent about 60% of the expected overall growth in the EU-27 area.

Recovered wood

The use of recovered wood amounted to about 12 million m^3 in 2011. Approximately 70% of this was used in the bio-energy sector and the balance in the wood-based panel industry. The bio-energy sector is forecast to increase its relative share of the total use to over 80% by 2016, whereas the wood product industry is expected to face a drop (27% versus 19%) in its share. During the same period, exports are virtually eliminated.

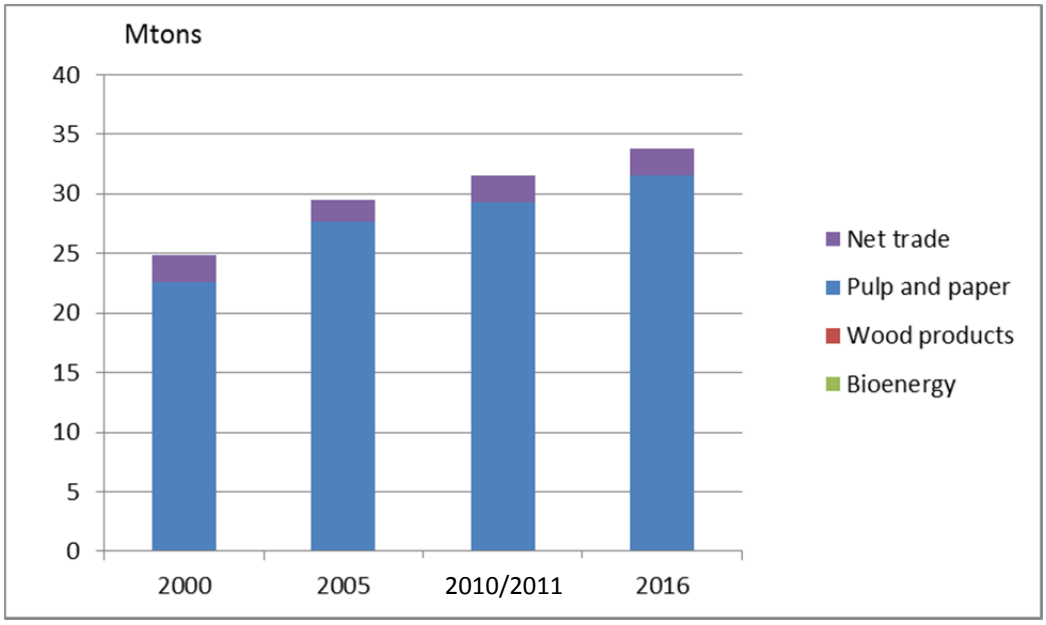
Figure 7.33 Use of recovered wood in Group B



Recovered paper

Group B countries used about 99 million m^3 (RWE) of recovered paper in 2011. That volume was about 20 million m^3 (RWE) higher than in 2000 and it is forecast to increase by 9 million m^3 (RWE) by 2016. Approximately 10% of the volume (10,5 million m^3 RWE) was exported and that volume is expected to increase slightly by 2016. No recovered paper goes to bio-energy, given that its unit price is much higher than for the various kinds of wood available.

Figure 7.34 Use of recovered paper in Group B

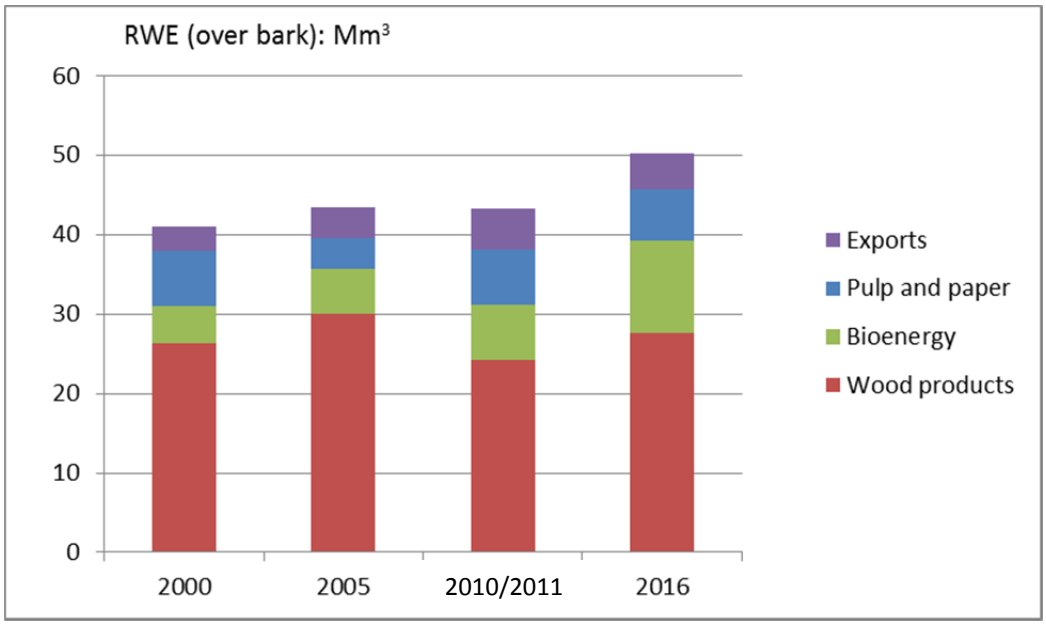


7.3.4 Use of raw material by type in Group C

Roundwood

The total roundwood use in Group C countries was 43.2 million m³ in 2011. The total roundwood use is estimated to increase up till 2016 by 16.3%, as the bio-energy sub-sector's use increases and the wood products sector recovers. Roundwood use in the pulp and paper sub-sector is predicted to decline slightly by 2016.

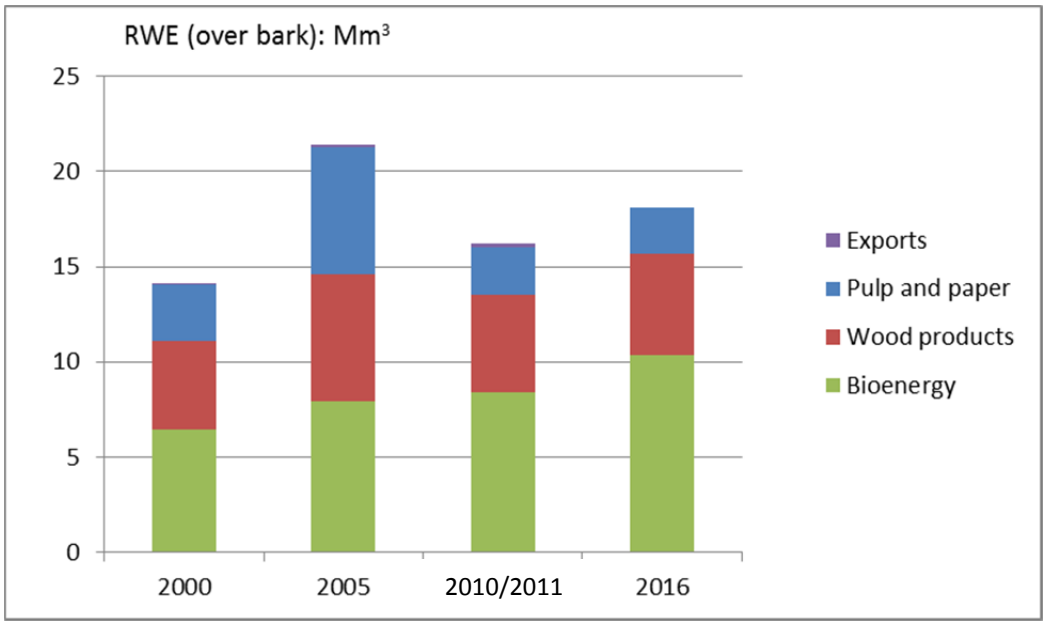
Figure 7.35 Use of roundwood in Group C



Industrial wood-processing residues

The total use of industrial residue was 16.2 million m³. The use of industrial residues in the pulp and paper sub-sector dropped heavily (-4 million m³) from 2005 to 2011. No revival is predicted by the year 2016, but the growing bio-energy sub-sector is estimated to increase its use of industrial residues by 23.2% (+2 million m³) growing the total from 2011 of 11 M m³.

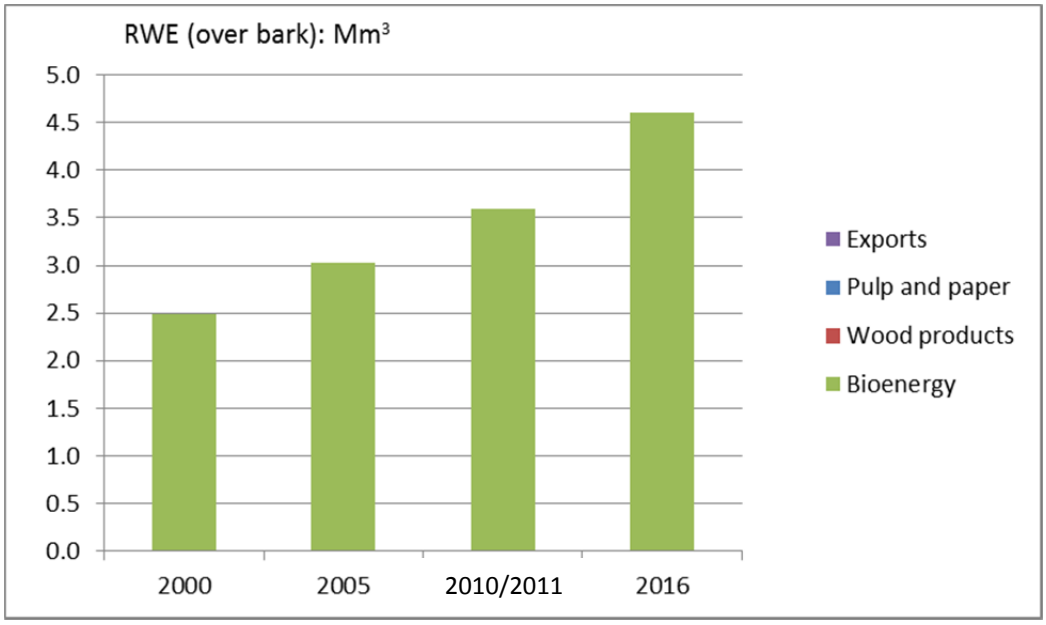
Figure 7.36 Use of industrial residues in Group C



Forest residues

Group C countries' use of forest residues totalled only 3.6 million m³ in 2011. Thus the increase in the use of forest residues has been relatively slower than in Groups A and B. Still, the overall trend is similar between the groups and for Group C an increase of 26.8%, up to 4.6 M m³, is projected by 2016.

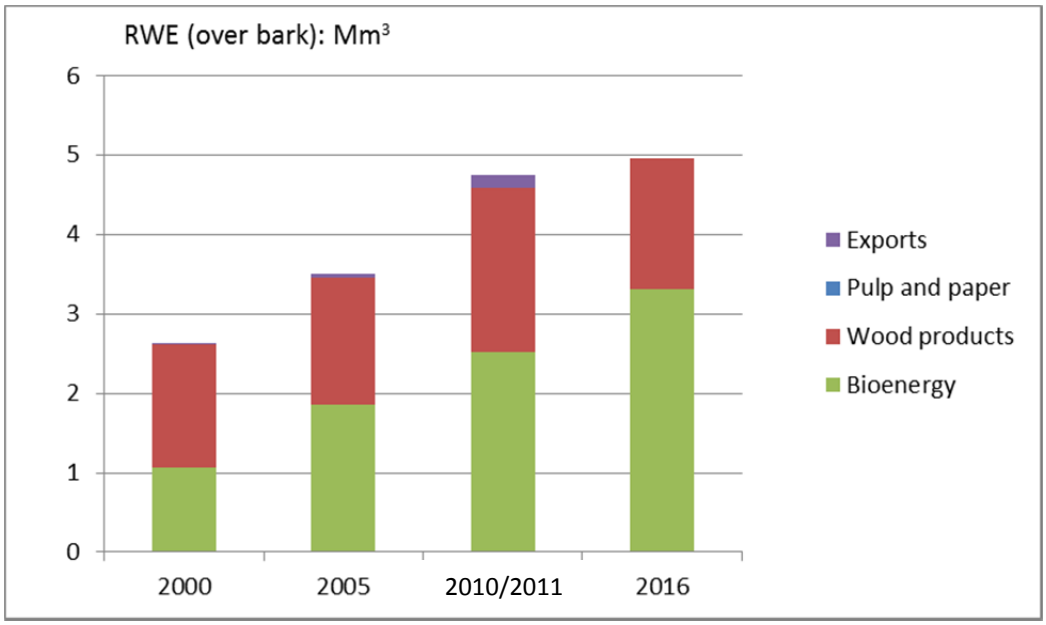
Figure 7.37 Use of forest residues in Group C



Recovered wood

In Group C, the total use of recovered wood was about 5 million m³ in 2011. The wood products sector had a slight drop in its share of the total use of recovered wood from 2005 to 2011, although the absolute amount of recovered wood used by the wood products sector grew by 500,000 m³. In the 2016 estimate the bio-energy sector increases its share (to about 70%) of the total use of recovered wood and becomes even more distinctly the largest user of recovered wood, taking over 3 M m^3.

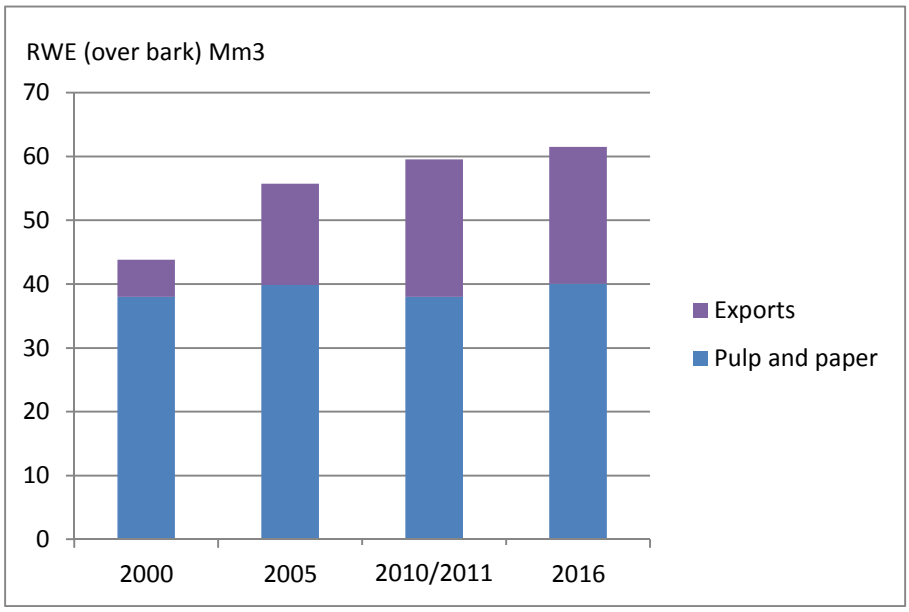
Figure 7.38 Use of recovered wood in Group C



Recovered paper

Group C countries used about 60 million m^3 (RWE) of recovered paper in 2011. This volume was about 16 million m^3 (RWE) higher than in 2000. The increase is solely due to increasing exports as the real consumption has remained unchanged between 2000 and 2011. The use of recovered paper is forecast to increase only slightly (+2 million m^3) up to 2016, due to an increasing use by pulp and paper industries.

Figure 7.39 Use of recovered paper in Group C



7.4 Main Issues arising on the Inter-relationship between the wood-processing and bio-energy sectors

- Indufor has calculated the use of raw material as roundwood equivalent (RWE, over bark). The idea is similar to the tonnes of oil equivalent (toe), but here done for the use of wood. For instance, the use for bio-energy is calculated as the use of wood in cubic metres (instead of e.g. Joules) and the use for recovered paper is also calculated in cubic metres, instead of tonnes.

- Different wood raw material types (industrial roundwood, industrial processing residues, forestry residues, recovered paper, and recovered wood) have all their own optimal use from a technical and economic point of view. Some categories can in principle be used for a wide range of end products, others (like bark) only for a more limited number of uses. Therefore, the level of competition between end uses for the different categories varies. There is also a number of by-product flows from one use to another – a partial cascade effect – such that the total of overall raw material inputs to the various end uses is greater than the amount of wood harvested from the forest.

- As there is competition for certain wood categories in several end-uses, the wood-paying capability of different end-uses largely determines who gets to use any given category. In recent years the bio-energy sector has competed for the same raw material base as the wood-processing industries. There is particular competition between energy producers and particleboard plants, especially for wood-processing residues and recovered wood. Energy

subsidies have an impact on this competition and they can alter the competitiveness of various end-uses considerably.

- Considering the inter-relationships both in supply and demand between the various wood categories, it is clear that if the demand for sawnwood declines, the supply of sawlogs and thus also other wood categories – as well as residues from sawing – will be reduced. Similarly, if pulp production is considerably reduced, the bio-energy production from black liquor will also be reduced, due to the significant role it has in fuelling biomass-based energy.

- Roundwood is by far the dominant wood raw material type used by the pulp and paper, wood products and bio-energy industries in the EU. The total use was around 470 million m^3 between 2000 and 2011 but is forecast to increase by almost another 40 million m^3 by 2016.

- In 2011, EU-27 pulp and paper sector used approximately 145 million m^3 (RWE) of recovered paper – a volume was almost 25 million m^3 (RWE) higher than in 2000. A further increase – of over 13 M m^3 is forecast by 2016, with a significant quantity still being exported.

- The use of industrial residues grew from about 136 million m^3 in 2000 to about 146 million m^3 in 2011. The growth is forecast to continue resulting in a use of approximately 160 million m^3 by 2016. Most of the increase will be for use in the bio-energy sector.

- In 2011, the use of forest residues, recovered wood and black liquor amounted to approximately 50 million m3 (RWE) and the EU also imported around 50 million m^3 (RWE) of pulp outside the EU region. Out of these wood-based raw material types, forest residues (+13 million m^3) and recovered wood (+9 million m^3) increased their use the most between 2000 and 2011. The use of forest residues is also forecast to increase significantly (+26 million m^3) by 2016.

- Between 2000 and 2011, wood-based raw material use in the EU-27 bio-energy sector grew (ca. +82 million m^3 RWE) by more than double in comparison to the growth rates of both the pulp & paper and the wood products sectors. Following this significant growth, the wood-based raw material use by the bio-energy sector approached that of the wood product´s sector. From the category of wood fuels' however, the use of black liquor might well decrease, following the trend of decreasing pulp production.

- Based on Indufor calculations, the total wood-based raw material use by the bio-energy sector in 2016, from the domestic sources will be about 60 million m^3 of RWE, and thus smaller than the total target for energy use of wood in 2016 set by the Member States' NREAPs.

- The use of industrial wood-processing residues in the EU-27 grew by 30 million m^3 between 2000 and 2005 and by a further 10 million m^3 between 2005 and 2011. The bio-energy sector is by far the largest user (84 million m3 in 2011) of industrial residues with its relative share of the total use increasing from 43% in 2000 to 48% in 2011. The use by the sector is forecast to increase to around 100 million m3 by 2016 indicating a 54% share of the overall industrial residue use in the EU-27 area.

- The use of forest residues increased from about 25 million m^3 in 2000 to about 46 million m^3 in 2011. The use is forecast to exceed 70 million m^3 by 2016. Except for some minor uses, bio-energy is the sole consumer of the whole volume and is expected to remain so.

8. EU COUNTRY CASE STUDIES

8.1 Finland

8.1.1 Raw material supply

About 26 million hectares, or 86%, of Finnish land area is classified as forest land. Under this area, about 23.4 million ha is classified as forest available for wood supply.

Forest lands are mainly owned by private forest owners (52%), followed by state (35%) and companies (8%). The rest is under municipal, parish, shared or joint ownership. State-owned forests are managed by Metsähallitus and mostly situated in the Northern part of Finland. There are about 350 000 private forest estates with an area over 2 ha. The average size of all forest holdings is about 30 ha.

Finnish forests belong to the boreal forest vegetation zone. The growing stock is 2.3 billion m^3 (over bark). The standing volume has been increasing since the 1970s and is now more than 60% higher than in the early 20^{th} century. 50% of the growing stock is pine, 30% spruce and 20% hardwood species.

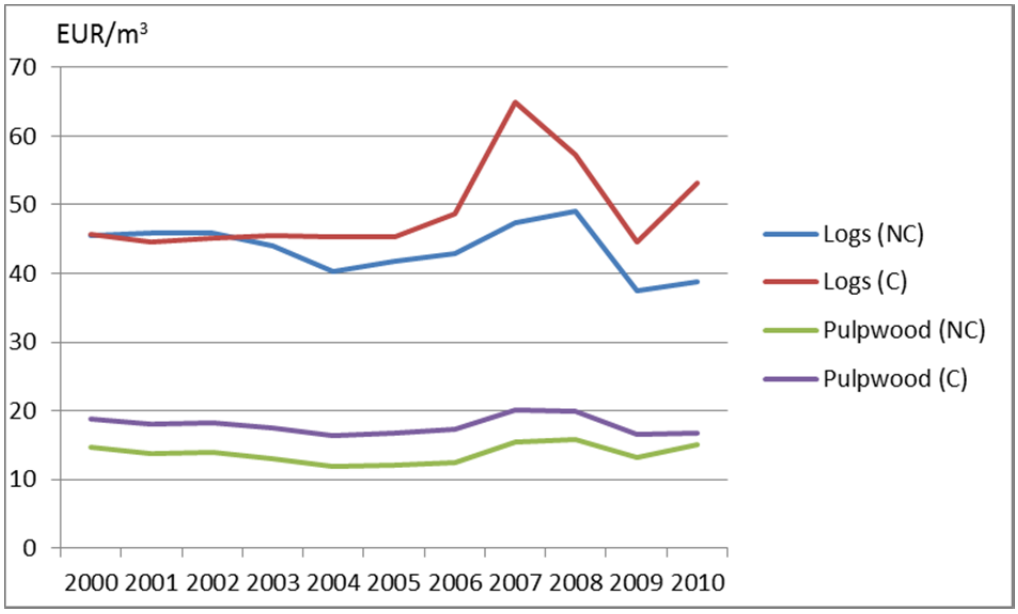
The annual increment of forests is about 100 million m^3. The annual increment started to increase rapidly during the 1970s. About 50% of the annual increment is pine, 30% spruce and 20% hardwood species. The growth has exceeded annual removals since the 1970s. During the last decade the annual level of harvest has decreased by about 8 million m^3. In 2000, the annual fellings were 67 million m^3 and have decreased to a level of 59 million m^3/a in 2011.

Forest certification started in Finland during the 1990s and Finland was among the early adapters of forest certification. About 95% of Finnish forest area is certified under the PEFC scheme. The interest in the FSC scheme has increased lately and at the moment about 395 000 ha of forest is managed under the FSC scheme.

Finnish forestry is based on the management of native tree species. The management of forests seeks to respect their natural growth and mimic the natural cycle of boreal forests. The objective is to secure the production of high-quality roundwood, and to preserve the biological diversity of forests as well as the preconditions for the multiple use of forest.

The roundwood price development has been rather fairly stable in Finland. Especially softwood log prices peaked in 2007 to decrease to historically low level in 2009 due to economic crisis, mill closures and decreased construction activity (Figure 8.1). In 2011 almost all roundwood category prices rose. The softwood log stumpage prices increased by 10% from 2009.

Figure 8.1 Stumpage price development for industrial roundwood categories (coniferous/non-coniferous) in Finland in 2000-2011



Source: Finnish Forest Research Institute

The Finnish forest industry companies have for some time been seeking a mechanism for an end product based roundwood pricing to stabilise the market. A product based roundwood pricing would include a mechanism were the seller and buyer of wood could bind the price to the future development of the price of ready products. This has proven to be difficult task due to scattered forest ownership structure and lack of professional forest management. The efforts to find this kind of mechanism are continuing as the scattered ownership structure is seen as one of the main hindrances to improving competitiveness of Finnish forest industries,

As Finland is a country with large land area compared to amount of people living on it and with only few large cities, the volume of waste wood is rather low compared to Central European countries. This is the case even though the collection systems in Finland are rather effective. The amount of waste wood collected is about 850 000 tonnes of which 670 000 tonnes is construction waste. Most of the waste wood is collected from large consumption centres in the Helsinki-Turku-Tampere triangle.

The Finnish paper and board industry uses mainly virgin wood pulps as raw material in its production. In 2011 the paper and board industry production was 11.8 million tonnes and utilisation of recovered paper 579 000 tonnes. The recovered paper utilisation rate of about 5% is the lowest amongst the CEPI member countries.

The Finnish recovered paper collection was 737 000 tonnes in 2011. With a recycling rate of 67% Finland is close to the European average recycling activity of 69%. Both the utilisation rate and recycling (collection) rate have stayed at this level for several years and it can be expected that no greater changes will happen in the near future.

Due to low population density and vast land area there are challenges to collect recovered paper effectively, especially from rural areas. Collection from industry, converting and trade sources is well organized, in general. Household collection in

urban areas and apartment blocks is also well organized; people sort recovered paper already at source using collection bins of real estates. In rural areas paper is being collected outdoors in local collection points which are situated e.g. close to shopping centres or parking areas.

One of the most important reasons for the relatively high collection activity is the tradition, education and environmental consciousness amongst citizens. However, recovered paper substitutes virgin wood pulps in paper and board production. According to the Indufor furnish model, an additional volume of 1.6 million m^3 of wood raw material would be required to replace the paper industry raw material gap with virgin wood pulp if no recovered paper were available.

Energy consumption per capita in Finland is the second largest in the EU and almost twice as large as the EU countries on average. In addition of the northern location of the country, this also results from the production structure of Finnish industries. The share of energy intensive industries, such as pulp and paper, metal and chemical industries is significant in Finland.

Almost half of total energy consumed in 2011 was generated from fossil fuels. The share of renewable energy was 27%. The most important source of energy in 2011 was oil products. Wood fuel was the second important one and covered more than one fifth of consumption. Wood fuels are divided into black liquor and solid wood fuels.

The use of woody biomass has increased strongly during the decade. Also the structure of the use of different raw material particles has changed. Traditionally harvesting residues have been the most important source of woody biomass, but during 2011 small diameter wood has taken place as a most important woody biomass group.

8.1.2 Main factors affecting supply and demand

The total harvested volume was 59 million m^3 in 2011 of which about 90% was used by forest industry. In addition 10 million m^3 of wood and chips were imported for forest industry uses. Of the stem wood harvested, about 6 million m^3 was used as bio-energy.

Most of the wood is used by the pulp and paper industry. The pulp and paper industry uses about 38 million m^3 straight from the forest and 8 million m^3 from sawmilling industry residues. The wood product industry utilised 24 million m^3 in 2011.

Finland has traditionally been importing roundwood, especially from Russia. The net imports were at its largest in 2005-2006 (exceeding 16 million m^3). Due to the Russian export tax increase the net imports decreased fast being only 3 million m^3 in 2009. It is expected that the bilateral agreement between EU and Russia regarding export taxes as a part of the WTO-negotiations and the joining of Russia to the WTO will increase the amount and there are signs regarding this already. However, the amount is not expected to rise nearly to the same level as it once was.

The production levels of Finnish sawnwood started to decrease in mid-2000s when large integrated forest companies started to shut down their old and non-profitable sawmilling capacity. The production decrease continued with increasing pace after the construction level in Europe started to fall after 2007. The production levels started to increase again in 2011 owing to an increase both in exports and domestic consumption. The overall sawnwood production has decreased significantly more in

Finland than in the main European competitors, such as Germany, Austria and Sweden.

About 50% of Finnish sawnwood production is exported. The main market areas for Finnish sawnwood are Europe, the Middle East and Africa and Japan. The total exports have decreased significantly during the last decade, from 8 million m^3 in 2000 to only about 5 million m^3 in 2011. In hardwood sawnwood Finland is a marginal net importer.

The production of wood-based panels decreased during the last decade. Plywood production decreased substantially and fibreboard as well as particleboard production nearly stopped and only one mill produces particleboard anymore.

The reason for decreased fibreboard and particleboard production is the decreased furniture production and increased raw material costs due to the increased competition from the bio-energy sector. For plywood industry, the main drivers are the decreased construction activity and the increased competition from the Russian plywood producers.

Due to the reasons presented above, the net exports of plywood have decreased by one third and net exports of particleboard have decreased from 0.2 million m^3 to near to zero. The net imports of MDF have increased during the last decade as the popularity of laminate flooring has increased.

Pulp production has decreased from the beginning of the 2000s about 1.3% annually. Especially the production of mechanical pulp has decreased (2.4% per annum) due to decreased newsprint production capacity. The mechanical pulp production capacity closures have counted for about 1 million MT.

The production of chemical pulp has decreased about 5% (367 000 t/a) since 2000. During the last decade Kaskinen, Kemijärvi and Tervasaari pulp mills have been closed down (together 800 000 t/a capacity), but remaining pulp mills have increased their production. The capacity of semi-chemical pulp has increased 500 000 MT/a due to the start-up of Metsä-Board's BCTMP mill.

Most of the pulp production in Finland goes to raw material for local paper industry. Still Finland has been a net exporter especially in chemical pulp products. At its largest the net exports amounted to more than 2 million tonnes in 2006 and they were at their lowest in 2009 only a bit more than 1 million m^3. In 2011 the net exports recovered to 1.5 million m^3 equalling the early 2000s levels.

During 2001-2011 the Finnish paper and paperboard production decreased at a pace of 1% per annum. At the same time, the global production increased with a rate of 2% per annum, and the European production increased a little.

The decrease of production in Finland has been mainly due to decreased production capacity of newsprint and printing and writing papers. During the decade mills in Kajaani, Kankaan, Summa and Voikkaa have been closed down. The latest closure was the mill in Myllykoski (production 465 000 in 2011). The remaining mills have increased their production at the same time with 800 000 tonnes per annum.

Most of the paper and board production in Finland goes to exports. The product group with largest net exports is printing and writing papers. Most of these products are exported to Central Europe and the United Kingdom. In the beginning of 2000s, the

net exports of newsprint were more than one million tonnes. In 2011 the figure was near to zero.

The use of woody biomass for energy has increased strongly during the decade. Also the structure of the use of different raw material particles has changed. Traditionally harvesting residues have been the most important source woody biomass, but during 2011 small diameter wood has taken place as a most important woody biomass group.

8.1.3 Inter-relationship between supply and demand

The most important hindrance affecting the raw material availability in Finland is the small average size of privately owned forest areas. Private forest owners are not living only on their forests but have other main sources of income. This decreases the level of wood selling activity. To increase the wood availability, the policy incentives increasing professional forest ownership should be set.

The other important factor affecting especially wood biomass availability is the Act on Financing of Sustainable Forestry. This law makes the harvesting of wood biomass for energy economic viable as without the subsidies this law guarantees the collection would not happen. Subsidies can be given to harvesting of young stands if wood is used for bio-energy. The idea is to combine a necessary silvicultural measure with collection of bio-energy in stands where the measure otherwise would not be viable.

The basic structure of inter-relationships between different wood using groups in Finland has been fairly clear till these days. One buyer has collected wood from the whole harvesting area and switched the wood categories that the operator has no use of with other parties. Also the wood chips from sawmill have had only one major buyer, the pulp and paper industry. Bio-energy has mainly been produced from forest residues and only sawdust has had multiple industrial uses.

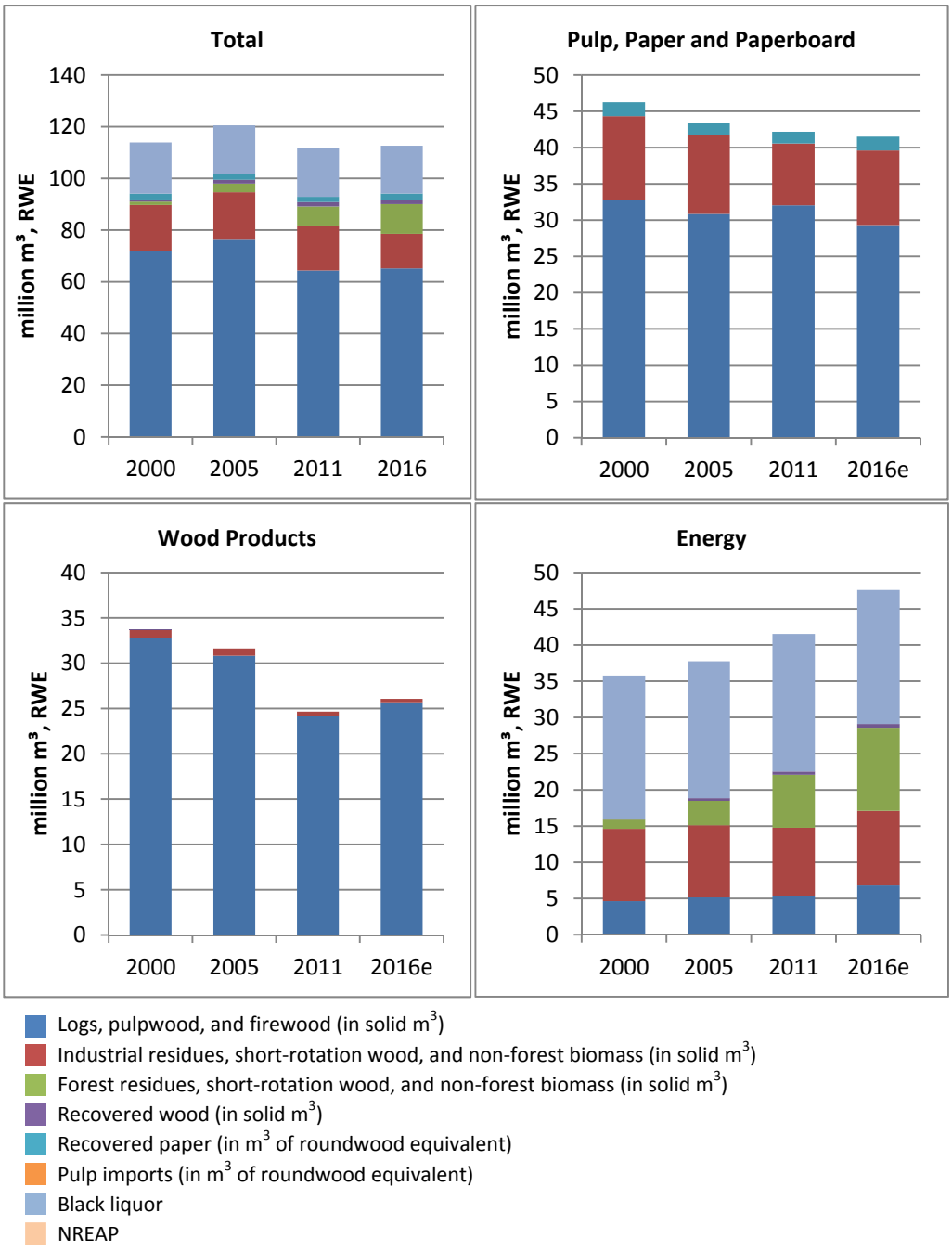
This is changing with major energy producers reaching for pulpwood sector especially in areas with lesser use for pulpwood. Also pulp and paper and woodworking industry companies have started to act as biomass traders to bio-energy sector selling forest chips generated from their harvesting to energy sector.

The important fact to remember still is that without economic use for all the categories no wood is collected from Finnish forests. With current wood prices only sawmills and plywood mills can buy the logs and if there would be no demand for logs that would affect to the availability of other wood categories. Therefore there is a clear need to keep a strong traditional forest industry (pulp, paper, sawmills and board production) sector in Finland.

The use of wood based raw material has been decreasing in Finland. This is mostly due to decreasing demand in wood product industry. Also the demand for pulp and paper has decreased, but not substantially. The raw material for energy has increased rapidly.

Roundwood has been mostly used (around 90% of the total) in pulp and paper and wood products production. Especially the latter has decreased significantly (33 versus 24 million m^3) from the beginning of 2000s. Energy sectors roundwood consumption has been stable through 2000-2011, but expected to increase slightly till 2016. The use of industrial residues for pulp and paper has been decreasing (-3 million m^3) but is expected to rebound somewhat (+1.8 million m^3) by 2016 (Figure 8.2).

Figure 8.2 Use of raw material by sector in Finland



Source: Indufor

It is estimated that paper and board production will decrease marginally towards 2016 and amount to 11.7 million tonnes. The only product group increasing marginally is the coated wood containing papers.

Pulp production is expected to develop similarly compared to the paper and board production amounting to 11.5 million tonnes in 2016. Some increase is expected to be

seen in softwood pulp production. This is mainly as a cost of hardwood pulp production.

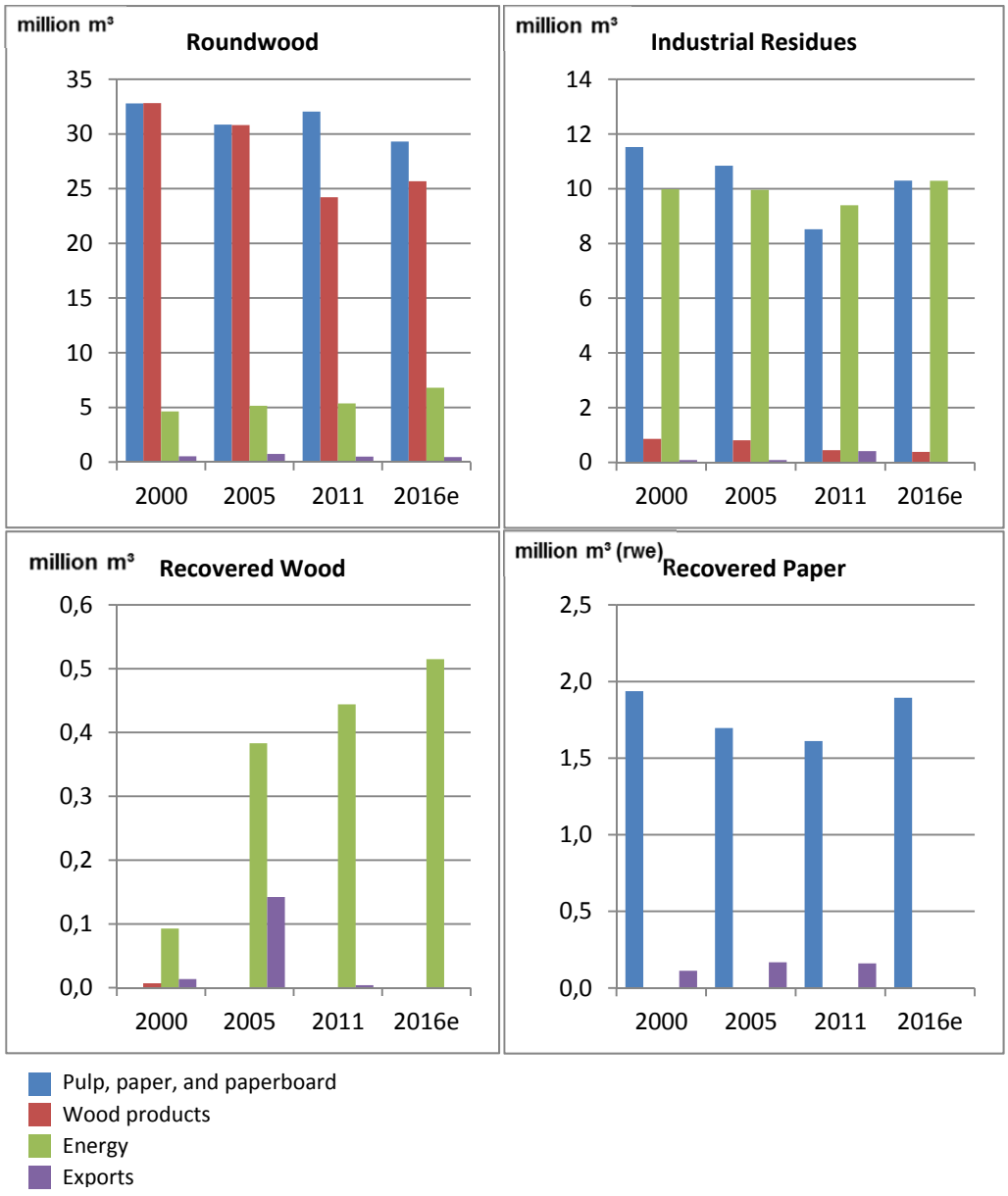
The Finnish soft sawnwood production is expected to recover gradually to 11.5 million m^3 by 2016. Also plywood production is expected to increase marginally. This is mainly due to increase of construction activity in Finland and most important export markets.

The wood products industry uses almost purely (97% in 2000 with a higher share expected in 2016) industrial roundwood and to a limited extent other biomass as industrial residues. Pulp and paper industry is also based on industrial roundwood, but the share of other woody biomass is bigger; 20% in 2011. The share of recovered paper in the pulp and paper industry's raw material supply was only 1.4% in 2011.

The overall energy use increased almost threefold between 2000 and 2011 to over 8.2 million m^3. Main sources for energy use are industrial and forest residues. Their utilisation has increased considerably together with roundwood utilisation. The amount of recovered wood used for energy production was 470 000 m^3 in 2011. The use of woody material for energy use is expected to increase to roughly 47.6 million m^3 by 2016. The most notable increase is expected to be in the use of forest residues, which is predicted to increase by 56.8% from 2011 to 2016, accounting 11.5 million m^3. The increase in forest residues is due to Finland's national goals to increase the share of renewable energies by 2020.

The industrial roundwood has been mostly used to pulp and paper (33 million m^3 p.a.) and wood industry production (24 million m^3 p.a.). The wood industry demand has decreased significantly from the beginning of the 2000s. The amount of wood residues used for pulp and paper production has been decreasing during the last 10 years, and being replaced by the energy use. Recovered wood goes almost entirely to energy production. Recovered paper is mainly used in pulp and paper production, but the quantities are decreasing, while recovered paper is exported as well (Figure 8.3).

Figure 8.3 Use of raw material by type in Finland



Source: Indufor

8.1.4 Possibilities on increasing the supply of wood

In Finland the raw material hierarchy has so far been working rather well and raw material has been used in most economic end use from the national economy's point of view. This will hopefully continue also in the future although e.g. planned biodiesel projects can have a change to that situation.

Also the subsidies have more or less been set the way that larger market disturbances have been avoided. The opinion of Finnish forest industry has been that subsidies should be set the way they increase the wood biomass availability generally, not the way they improve the competitiveness of one industry sector on a cause of another.

The small-scale forest holdings with a scattered forest ownership structure are a challenge and attempts have been done in order to improve the situation. The forest owners are already well organized which reduces the negative implications of the scattered ownership. Different types of incentives like tax-benefits for merging of holdings or restrictions to divide holdings into too small areas have been discussed, but they are not politically easy and have therefore ended in compromises with some, but not tangible, impact.

It seems that the importance of Finland as a virgin fibre based producer of wood-based products increases in the future as the amount recycled paper in paper and board production grows. As the interest in Finnish long-fibre pulpwood is increasing it is important to guarantee the use of the coniferous logs.

8.2 Germany

8.2.1 Raw material supply

Even though the consumption in 2011 recovered to the level of 2005 the demand of roundwood resources for material use can be expected to increase slowly in the future in Germany[82]. Also the supply will stagnate or even decline as the pressure in forest protection takes areas out of wood sourcing[83]. As most of the capacity in forest industry is mainly based on softwood roundwood there is a threat of short and long term bottlenecks in wood supply due to high roundwood prices. According to the National Forest Inventory, in German forests the share of softwood growing stock is declining as in the same time share of hardwoods increases due to active planting of hardwood species[84]. About one third of the forests are privately owned and the estates are very small in average. However a lot of roundwood potential is currently unused in this owner group. In the future more emphasis should be put to find means of supplying wood with long term contracts with these forest owners.

There are already strong signs of raw material competition between several forest industry branches. Covering the future demand with imported wood can be a risky option in a long run. There is a risk of fluctuating transhipment and transport costs which can lead to a major increase in raw material prices. The environmental impact of imports must be considered as the procurer must ensure that the timber comes from legal, sustainable production.

It has been estimated that 22 million m^3 of firewood is harvested and combusted annually from German forests. This amount is equivalent to roughly 40-60% of the annual industrial roundwood harvest in Germany. A large share of this amount is not showing in the statistic because it is mainly harvested from privately owned forests for household use. This fact should be considered very carefully because if the calculations of harvested wood and annual sustainable harvesting potential are based only on the officially reported amounts, they can lead in the wrong direction.

[82] Interview Expert in German softwood sawmilling industry
[83] Interview with German hardwood sawmilling expert
[84] Arbeitsgemeinschaft Rohholzverbraucher e.V. and Bundesverband Säge- und Holzindustrie Deutschland 2012 – Wahrheiten über den deuschen Wald

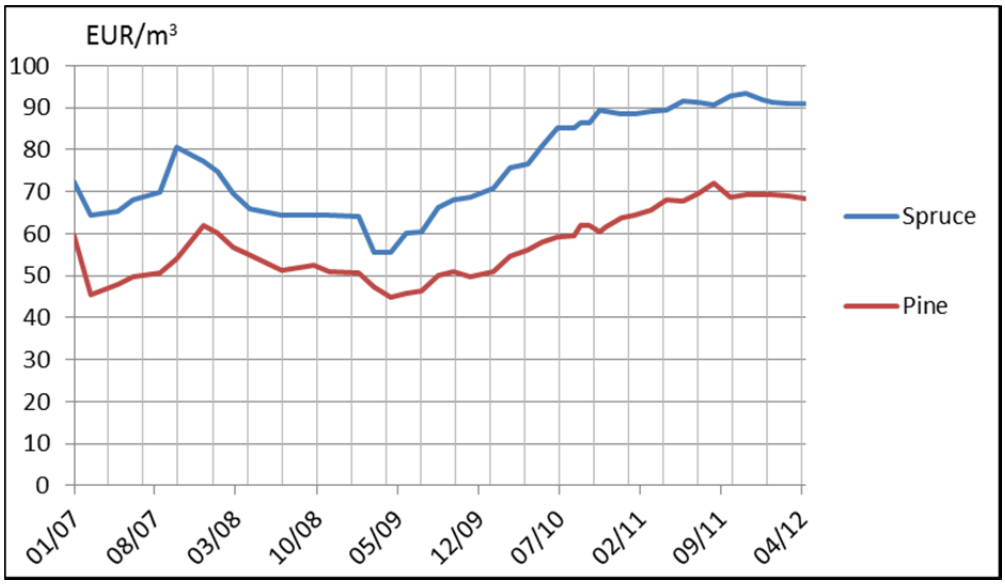
8.2.2 Main factors affecting the supply and demand

Supply

The price of softwood sawlogs has been increasing since 2009, but stagnated during the last year. High prices are hindering the domestic supply of softwood sawlogs as well as pulpwood. The price of hardwood sawlogs have been acting more modestly and have increased slowly. The increasing price of firewood has been driving the price of hardwood sawlogs as well. Sawmilling companies must ensure that they are paying more than the price of firewood to secure their wood supply. The pulpwood prices also increased since 2009, but are now stagnated. The increasing energy use of wood triggered by the EU RES targets intensifies, according to some stakeholders, the competition from pulpwood resources between the material and energy use in Germany.

The increase of prices of sawmilling by-products has been driving the notable increase of softwood sawlog price during 2009-2011. This has increased the wood paying capability of sawmills. The prices of sawmilling by-products have been increased due to increasing competition of the resource between wood based panel producers, pulp industry and bio-energy sector.

Figure 8.4 Price development of softwood sawlogs in Germany in 2007-2012



Source: EUWID – Wood Products and Panels, Price watch softwood roundwood Germany

As a consequence to the stagnating or only slightly increasing production of sawnwood the volumes of sawmilling residues available for pulp industry, wood based panel production or pellet manufacturing can only expect to increase moderately.

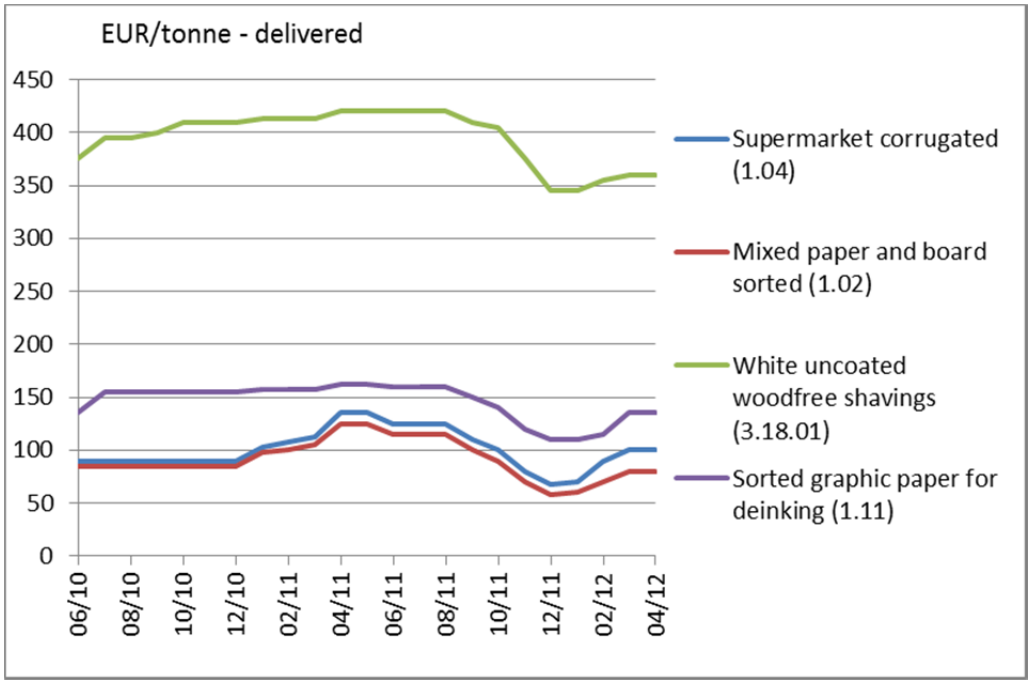
After the sorting and treatment, depending on the source about 5-6 million tonnes of recovered wood is used for material recycling and energy conversion in Germany.

The only possibility for Germany to increase recovered paper collection has been to intensify collection practices and increase collection activity. However the increase in collection activity has been difficult and will be ever harder to do in the future because

the German collection rate was considerably high already. Also, major increase of paper consumption is improbable.

Recovered paper price development in Germany indicates price development in the whole European region. Recovered paper prices fluctuate according to pulp and paper industry price cycles and they are closely related to other pulp and paper industry determinants. The increasing Asian demand for recovered paper tightens the global supply/demand balance. It can be expected that in real terms the recovered paper prices will increase trend wise.

Figure 8.5 Price development of recovered paper in Germany



Source: RISI, PPI Markets and Prices

Demand

Consumption of softwood sawnwood has recovered from the downturn but it cannot be expected to increase rapidly in the near future. Despite high expectations, the wood construction sector is developing slowly. Hardwoods, mainly beech have traditionally been an important raw material for the manufacture of high quality furniture, parquet flooring and kitchens. Small and medium size joinery, carpentry and furniture manufacturers are dependent on a continuous and regional supply of beech wood. Future opportunities in processing and marketing of both soft- and hardwood sawnwood should be developed by specialising the production in terms of species, lengths and dimensions. This needs to be done to be better able to respond to the increasingly diverse needs of customers.

Germany is a major producer of wood-based panels in Europe. The production of particleboard is the biggest in the EU. The increasing cost of oil and non-wood raw materials is burdening the German particleboard industry. It competes for the same raw materials with the energy use of wood which brings additional pressure to the

branch. The public sector subsidies favouring the energy use of wood has increasingly strained the availability of wood raw materials for the wood based panels industry.

The German renewable energy subsidy system sets feed-in-tariff and market premium, a guaranteed price for energy which the grid operator pays to the system operators. This allows the entities using wood for energy to pay more for the same raw material as the competing sectors such as wood based panels manufacturers, thus getting a competitive edge in the raw material market. Therefore feed-in-tariffs increase the wood paying capability of renewable energy sector in comparison to the situation where the wood price for energy would be completely market based. For users of biomass the amount of feed-in-tariff is EUR 0.06-0.143 per kWh depending on system size.

In German paper industries the raw material situation is mostly satisfied with current sources which are domestically produced and imported pulpwood, domestically recovered paper and imported pulp. The fibrous raw material basis is dominated by recovered paper and will continue to do so. Exports of packaging products and printing and writing papers continue to be the strong drivers of German paper industry. These consisted of about 44% and 43% of total output of German paper industries in 2011. Other grades such as hygiene and special papers and boards have less significance comprising 12.5% of the total output in 2011.

Domestic markets of wood pellets will remain the most important driver of German wood pellet supply. Small amounts of industrial and certified high quality pellets are exported mainly to neighbouring regions. In German bio-energy supply the certification plays a crucial role in measuring and ensuring product quality. Lately, ENplus certification has been accepted in most European countries among pellet producers, traders, boiler manufacturers and customers by pioneering in overcoming national differences in terms of fuel quality parameters.

The goal of the ENplus certification system is to secure the supply of wood pellets with defined and consistent quality for heating purposes. The system consists of requirements for wood pellet production and quality assurance; the product; labelling, logistics and intermediate storage as well as delivery to end customers. The European Pellet Council (EPC) has the license rights to the ENplus certificate by a contract with the developer, the German Pellet Institute (DEPI). Inspection and testing bodies verify that producers and traders comply with the ENplus requirements.

The demand of wood chips has increased steadily throughout the period and this trend can be expected to continue as Germany seeks to meet the goals set in the RES policies. Unlike pellets, wood chips are bulky and therefore have a characteristic of being more local fuel for communal small and medium scale district heating. High costs of supply chain are hindering the procurement of wood chips.

8.2.3 Interrelationships with supply and demand

Hardwood sawmilling industry has had difficulties in sourcing enough sawlogs because of the increasing amount of exported hardwood roundwood. The logs are mainly exported to China, Vietnam and Korea. The export has increased because the roundwood traders are able to pay a bit more of the wood than sawmills. Also intensifying measures in beech forest protection and intensifying competition of hardwood roundwood between sawmilling and the bio-energy sector present a risk of hindering the supply. It is important for the sawmilling industry to make long term supply contracts in the future to ensure the raw material supply.

In the wood pellet production the full amount of available sawmilling residues for pellet raw material has almost been met. If the demand of softwood sawnwood is increasing only moderately, the sources of traditional wood pellet raw material cannot be expected to increase. The future increase in production of wood pellets would have to be based on fresh wood chips.

Recovered wood is also a scarce resource, which potential is already utilised on a high rate, both in energy and material purposes. Best quality recovered wood is well utilised by the wood based panels industry.

The German wood based panels industry, wood energy sector and partly pulp and paper industry is competing of the same raw materials. Subsidies targeted to the energy use of wood are turning the streams of wood processing residues and roundwood increasingly towards bio-energy production. This has caused the wood based panels and pulp and paper industries to increasingly rely on imports.

The German renewable energy subsidy system is based on two main schemes: EEG feed-in-tariff and market premium. The feed-in tariff is the guaranteed price for energy which the grid operator pays to the system operators. The amount of tariff is set by law and is usually paid over a period of 20 years. As an alternative, system operators may claim a market premium for electricity they sell directly. The amount of the market premium shall be calculated each month. Generally, system operators can choose between the regular feed-in tariff and the market premium for direct selling.

Modern and sophisticated wood harvesting and transportation methods are essential in utilizing the available industrial and energy wood potential in cost efficient and environmentally sound way. Uncertainty of long term logging contracts is currently hindering the investments of harvesting entrepreneurs to new machinery. This is a problem especially among contractors who operate among scattered small-scale private forest owners.

The German sawmilling industry in both softwood and hardwood sector is running with overcapacity causing several mills to run with only partial production capacity which is hindering their competitiveness. In addition, the industry struggles with Europe's highest sawlog prices and short domestic supply of sawlogs. Availability of the softwood sawlogs would be sufficient in domestic markets, but the increasing price has forced German softwood sawmills to increase the imports of softwood sawlogs from outside Germany.

From the production and marketing point of view, the sawmills both in softwood and hardwood branch must be flexible in responding to the customers need in terms of species, length and dimension. There must be a proper understanding of markets and potential customers and their needs. The high competitiveness cannot be reached anymore by just minimising the costs.

If there will be closures of sawmills it can be expected that the remaining ones will be able to utilise their production capacity better thus being more competitive. The material flow of sawmilling residues is linked with the sawnwood production. With potential closures the total supplied volume of sawmilling residues will probably remain the same, but the resources will be more centrally available. This will have effect on the pellet industry which has traditionally sourced its raw material from sawmills nearby. The average transportation distances for pellet raw material will increase as there are larger but fewer sawmills.

The total use of wood raw material in Germany is increasing steadily, from 146 million m^3 (RWE) in 2000 to 201 million m^3 (RWE) in 2011. The increase is distributed quite evenly between the different raw materials; all of them show increase in the overall demand. Roundwood remains the biggest raw material group with 36% of total supply. Recovered paper (56 million m^3, RWE) is the second biggest group, followed by industrial residues (29 million m^3 roundwood equivalent) (Figure 8.6).

The pulp and paper industry raw material demand has increased from 53 to 78 million m^3/year. The share of recovered paper has increased rapidly, from 56% in 2000 to 64% in 2011 while the amount of imported pulp has remained stagnant and the share of it has been decreasing from 29% in 2000 to 21% in 2011.

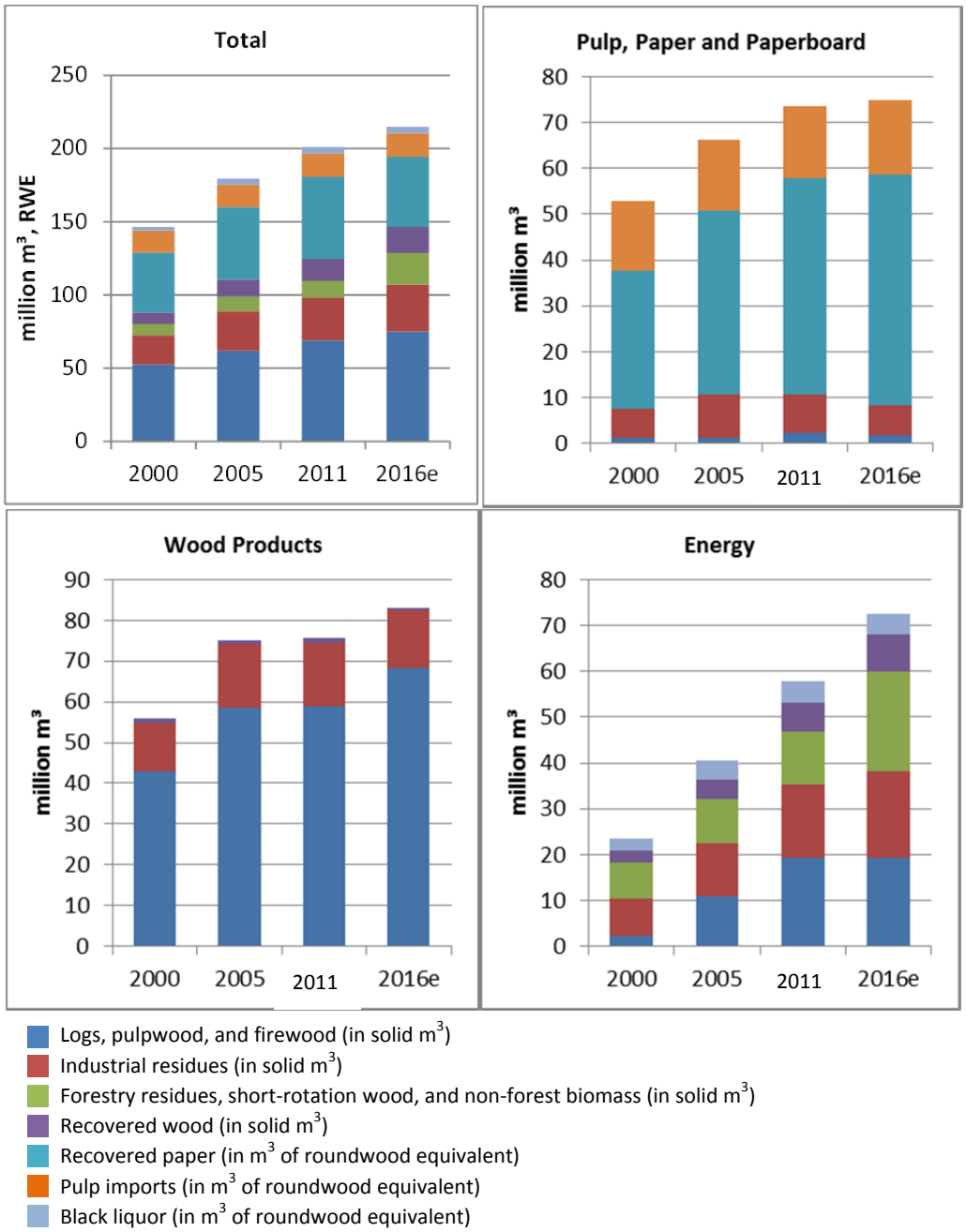
Wood products raw material is based on roundwood and industrial residues, with a little recovered wood. Especially the use of roundwood has been increasing, from 43 million m^3 in 2000 to 68 million m^3 in 2011.

The biggest change in the raw material base has been in the energy sector as the consumption of wood based raw materials have more than doubled from 2000 to2011 the sector has been forced to find new raw material sources. This can be seen especially in roundwood consumption that has increased from 2.2. million m^3 in 2000 to 19.3 million m^3 in 2011. Also the use of recovered wood has more than doubled.

In the energy sector the use of forest residues is estimated to keep on rising. Relatively minor increases in recovered wood and industrial residues speed up the energy sector's growth with roughly 14.8 million m^3 from 2011 to 2016. Wood products sector is predicted to increase its use of logs by 2016. No major changes are assumed for the pulp and paper sector, although a slight change towards higher use of recovered paper is predicted.

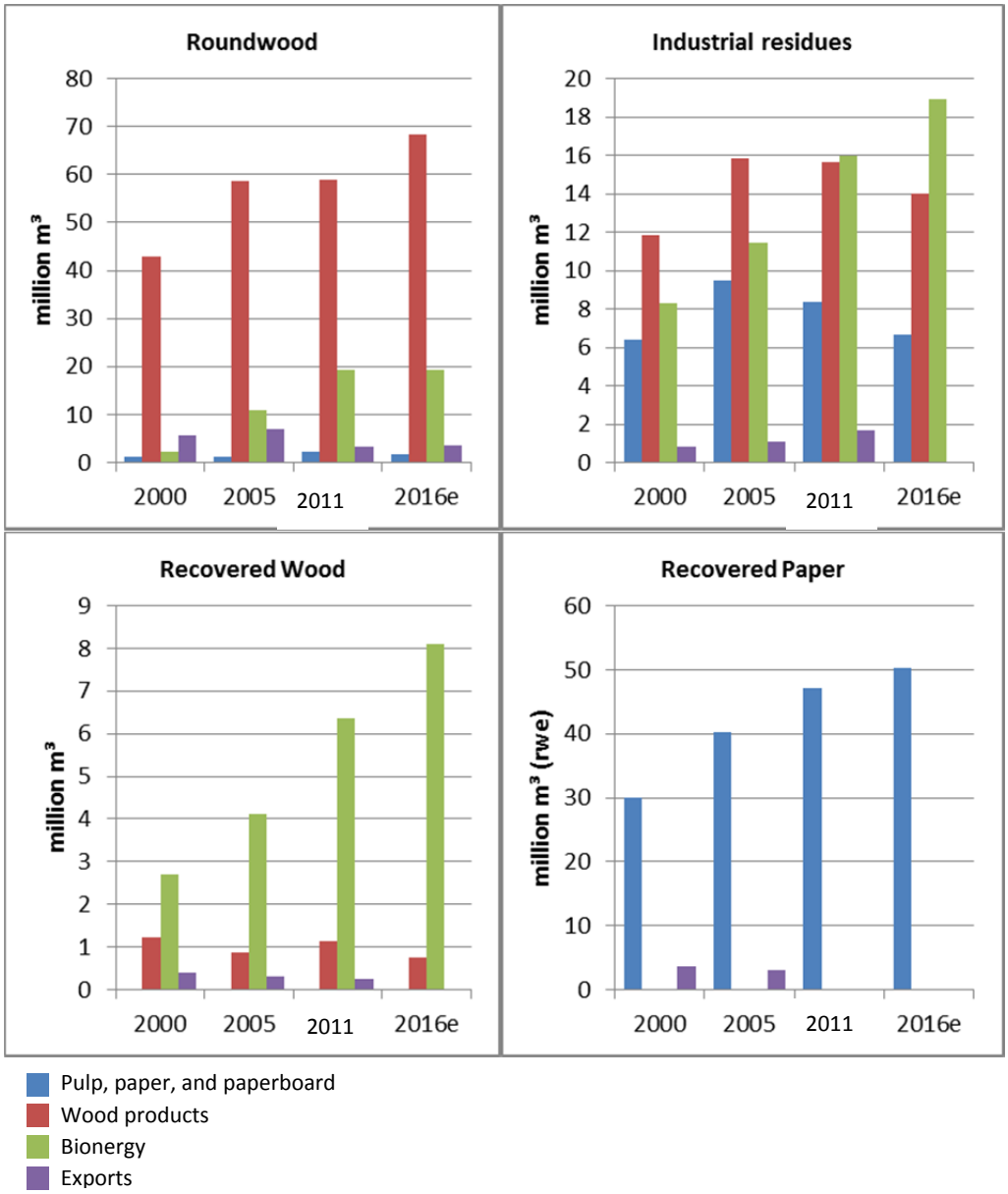
As expected, the main user of roundwood is the wood products industry, whose demand is slightly under 60 million m^3 per year. Sawlogs exports are decreasing, although in 2011, still 3.4 million m^3 was exported. The total export volume of roundwood was 4.3 million m^3. Very little roundwood is utilised by the pulp and paper industry (2.3 million m^3 in 2011). The energy sector has increased its roundwood use rapidly (+17 million m^3 between 2000 and 2011)(Figure 8.7).

Figure 8.6 Use of raw material by sector in Germany



Source: Indufor

Figure 8.7 Use of raw material by type in Germany



Source: Indufor

Industrial residues utilisation has increased from 27 million m^3 in 2000 to 42 million m^3 in 2011. Main users are wood products industry (16 million m^3 in 2011), pulp and paper industry (8 million m^3 in 2011) and bio-energy production (16 million m^3 in 2011). Energy use is increasing, while other uses have a decreasing trend.

Recovered wood is increasingly used by the energy sector, at the expense of the wood products industry. Of the total demand of 8 million m^3 in 2011, two thirds (5.4 million m^3) was utilised for bio-energy production. Recycled wood's collection potential is already well utilised, both for energy and material purposes.

Recovered paper collection has increasing sharply; from 30 million m^3 roundwood equivalent (RWE) in 2000 to 47 million m^3.

The German wood-based panels industry, wood energy sector and partly pulp and paper industry are competing of the same raw materials. Subsidies targeted to the energy use of wood are turning the streams of wood processing by-products and roundwood increasingly to bio-energy production.

8.2.4 Possibilities on increasing the supply of wood

Annual harvest of roundwood in Germany is between 50-60 million m^3, of which about ¾ is softwood. Most important raw material for German forest industries is the softwood sawlogs. Currently about 27 million m^3 of sawlogs is supplied from domestic sources annually. The amount of domestic pulpwood is about 13 million m^3, about 80% consisting of softwood pulpwood. In Germany, the demand of roundwood will probably continue at the same level. Due to high roundwood prices, competition of industrial and energy use of wood, and increasing political pressure for forest protection, problems can be expected in the domestic roundwood supply for woodworking industries.

Main issues identified affecting the possibilities on increasing the supply of wood in Germany:

- High prices of softwood sawlogs
- Minor activity of small scale forest owners in selling timber
- Uncertainty on legality/sustainability and economic risks of roundwood imports
- Allocation of wood material either energy or material use

The exports of hardwood roundwood reduce the amount of wood available for the domestic hardwood sawmilling industries. At the moment sawlog potential is at some areas used extensively but, because there are plans to protect many of these areas within the next five to ten years, there may be a problem in the wood supply in the near future.

The softwood sawlog supply situation is unbalanced. Availability of the softwood sawlogs would be nearly sufficient in domestic markets, but the increasing price has forced German softwood sawmills to increase the imports of softwood sawlogs outside Germany. Prices must be negotiated down to enhance the possibilities of German sawmills to supply timber from domestic sources.

Small scale privately owned forest estates hold currently a large unused roundwood potential. Increasing the willingness of small scale (<10 hectares) forest owners to manage their forests more intensively and sell timber is crucial in releasing this potential. Thus it is important to encourage the small scale forest owners to networking and discussion about the use of their forests.

According to FAO, Germany produces about 10 million m^3 of fuel wood annually. A recent study by Mantau (2012) estimate that in 2011 German households consumed 22 million m^3 of roundwood from domestic sources as firewood[85]. The difference between these two estimates gives a signal that the household use of firewood has to be charted more accurately in the statistics. If current utilisation that is not entirely

[85] EUWID – Issue 27/2012 Fuel-wood consumption by German private households in 2010 totals 34 million m^3

mapped in statistics, it can distort the estimates of sustainably available wood raw material. Additionally according to AGR – Raw Wood Users Working Group has estimated that roughly half of the annually consumed 22 million m^3 of firewood would be suitable in manufacturing wood products.[85]About 10 million m^3 of primary forest fuels are used in energy production annually and it is estimated that another 10 million m^3 could be used[86,87]. Although the calculations of the potentially available wood for energy use look promising they should be critically evaluated to be certain that the total annual wood use does not exceed the sustainable limit. One of the most important issues in the future will be the allocation of wood material for either energy or material use. In the German Forest strategy 2020 from November 2011, it has been stated: "Given the on-going competition between material usage and energy generation support policy incentives are, in principle, to be avoided".

The strong increase in imports of softwood sawlogs and pulpwood has been amplified by the increasing prices of industrial wood in Germany. According to Eurostat international trade statistics, in 2011 Germany imported altogether about 5.8 million m^3 of softwood and 350 000 m^3 of hardwood roundwood. The share of German wood supply outside the EU/EFTA is small in comparison to the total supply of roundwood. From the total only about 100 000 m^3 of softwood roundwood and 60 000 m^3 of hardwood roundwood was importer from outside the EU/EFTA countries. Most of the softwood imported outside EU/EFTA originated from Russia, about 100 000 m^3. In hardwoods outside the EU/EFTA area, most of the timber originated from Africa (30 000 m^3) and North America (20 000 m^3). About 7 500 m^3 of hardwood roundwood was imported from Russia, CIS-countries and Balkans together. The import volumes from Asia and South America were only 1 500 m^3 and 500 m^3 respectively.

Covering the future demand with imported wood can be a risky option in the long run. The environmental impact of imports must be considered as the procurer must ensure that the timber comes from legal, sustainable production. To achieve the legality of timber imports the application of the EU Timber Regulation (EU TR) is highly important. There is also a risk of fluctuating transhipment and transport costs which can lead to a major increase in raw material prices.

8.3 Lithuania

8.3.1 Raw material supply

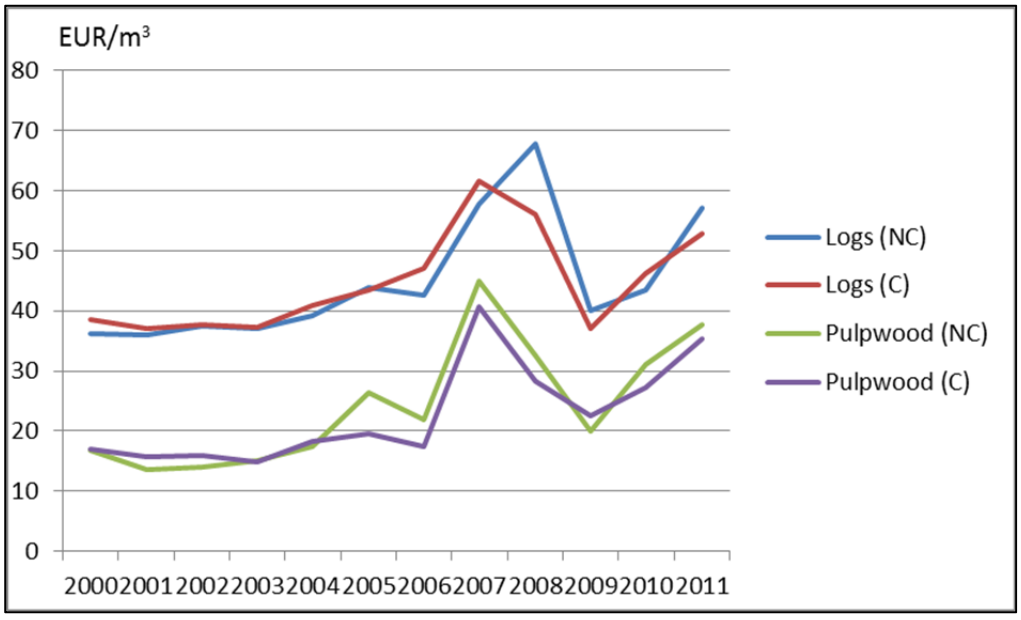
Lithuania's forests cover 2.2 million hectares, which is about 33% of the total land area. Lithuania strives to increase this amount up to 33% through afforestation of land that is unsuitable for agriculture. During the last ten years the forest area available for wood supply has increased from 1.7 million ha to 1.8 million ha. A total of 110 000 ha of forests are still reserved for restitution (the return of state property to former private owners). Not all of the restitution forests are production forests. About one third of forests are privately owned. The number of private forest owners amounted to almost 245 000, a forest estate averaging 3.3 ha in size. State-owned forests are managed by 42 State Forest Enterprises and one National Park, which is under the Ministry of Environment. A great variety of tree species and mixed stands characterise Lithuanian forests. Softwood stands of pine and spruce consist about 60%. The rest of area is covered by broadleaved stands. Most of the Lithuanian forests are FSC certified.

[86] Holzmarktbericht 2010 – Federal Ministry of Food, Agriculture and Consumer Protection 2011
[87] Mantau, U. et al. 2010: EUwood – Real potential for changes in growth and use of EU forests. Final report.

The long-term average harvest of industrial roundwood and fuel wood in Lithuania has been around six million m^3 per annum. About 80% is industrial roundwood and the rest is used as fuel wood. The amount of harvested roundwood decreased considerably in 2007-2009. Recovery in the roundwood market started in the middle of 2009 and increased again in 2011, to 7.2 million m^3, by 30% from the previous year. Prices continued to increase throughout 2011.

Prices started to increase in 2009 and continued to do so slowly throughout 2011. The most significant increase was in pulpwood prices in State Forest Enterprises. At the end of the year, the price of spruce and pine pulpwood was 70% higher than at the end of 2009. The price of birch pulpwood increased by one and half times during the same period. The prices of sawlogs increased by 20-25%. The price of small size softwood logs increased by 38%. The increase in fuel wood price was similar up to 39%. The price of wood for the wood board industry increased by 63%. Average roundwood roadside (without VAT) price in State forest enterprises increased from LTL 86 to LTL 110 per m^3 (EUR 25-32) during 2011. Prices have continued to increase until 2012 (Figure 8.8 shows prices for different categories in January 2012).

Figure 8.8 Price development for industrial roundwood (coniferous and non-coniferous) in Lithuania in 2000-2010



*Stumpage price, excl. VAT. Source: Finnish Forest Research Institute

Recovering and recycling are on the increase. The total amount of recovered wood in Lithuania is about 1.2 million tonnes/year. Most of this is recycled (about 80%) and the rest goes to landfills as waste (9%), is used to energy (5%) or composting (5%). As demand for renewable energy increases, the energy use is expected to increase at the expense of other uses. The share of recovered wood in Lithuania's energy supply is increasing considerably. Compared with the level of 27 000 TJ produced in 2000, the amount was 42 000 TJ in 2011.

Lithuanian paper and paper board production and consumption are small. The paper and paperboard production was 113 000 tonnes and consumption 185 000 tonnes in 2011. Main part (85%) is packaging materials and 15% of total production is tissue

papers. Paper and paperboard production is based mostly on recovered paper raw material. As domestic production is very small, different papers and paper products are imported. Lithuania's net imports are 72 000 tonnes or close to 40% of the paper consumed in the country. The biggest imports are printing and writing papers. During the last decade both the paper and board production and consumption have grown fast; the production by 7.9% and consumption by 6.9% per annum, in average. The consumption of paper was about 56 kg per capita and collection of recovered paper 32 kg per capita in 2011. The biggest product groups consumed in the country are printing and writing papers (imported) and packaging materials (produced locally).

The recovered paper collection and utilisation have grown accordingly. The recovered paper collection was 104 000 tonnes and utilisation 150 000 tonnes in 2011. During the period 2000-2011 the collection has grown, by about 12% and utilisation by about 9% per annum, in average. The Lithuanian recovered paper collection rate was about 50%. Recovered paper is the most important paper and board raw material in the country with utilisation rate of about 106% in 2011. This high figure means that the Lithuanian paper industry raw material supply is totally based on recovered paper. However, recovered paper collected in the local market is not sufficient for the existing domestic demand. About one third of the consumed recovered paper is being imported. In fact, the recovered paper collection and utilisation activity has not changed considerably during the last ten years. The increased recovered paper collection and utilisation volumes are based on growing paper and board production (utilising more raw material), and growing paper and board consumption (increasing the local collection potential). In spite of low figures in 2009 both the recovered paper collection and utilisation volumes have grown steadily, but collection and utilisation rates have not changed considerably.

Due to high utilisation rate and domestic demand for recovered paper, Lithuania has been a net importer of recovered paper during the whole period of 2000–2011, while the domestic collection has been unable to satisfy the local demand. The total recovered paper net imports were 46 000 tonnes in 2011, the main deficit grades being OCC (old corrugated containers) and mixed grades. The main import sources have traditionally been other Baltic countries, Estonia and Latvia.

8.3.2 Main factors affecting supply and demand

The production of sawnwood in Lithuania has been between 1 and 1.4 million m^3 annually. The production in 2011 was 1.2 million m^3. About 2/3 of the sawnwood production is softwood, and 1/3 hardwood. Lithuania is a net exporter of sawnwood, although the traded amounts are very small, divided almost equally between softwood and hardwood. Consumption of sawnwood in Lithuania increased in the early 2000s, collapsed with the recession in 2008, and has increased since. According to Lithuanian Statistics and State Forest Service sawnwood production in 2003 was 1.4 million m^3 and reached the top in 2006 with production considering 1.4 million m^3. Thereafter it decreased in 2007 up to 1.37 million m^3 and achieved its minimum with 1.04 million m^3 in 2009. Exports in 2011 were 556 000 m^3, which was 28% more than in 2009. Germany is the most important export country for Lithuanian sawnwood. Exports of sawnwood to Germany increased by 15% (to 144 000 m^3). Sales in Denmark and the UK increased, too. Main import countries are neighbouring Belarus, Ukraine, Latvia and Russia, but the amounts are very small.

Particleboard is the main product in the wood-based panels production in Lithuania with an annual production of about 550 000 m^3 showing also the fastest growth rate. Production of plywood reached 20 000 m^3. The production of fibreboard increased

from about 16 million m^2 to about 23 million m^2. According to Lithuanian statistics and "Lietuvos mediena" association production of fibreboard in 2007 was 23,4 million m^2 and slowly decreased in 2008 considering 21 million m2. The production result in 2009 was only 15,9 million m^2. In 2011 however it increased up to 23,1 million m^2. Since there is no MDF industry in Lithuania, the demand fully relies on imports. The share of furniture in wood industry export was 51%, making it the biggest wood products export group. The companies produce veneered cabinet furniture, tables and furniture components for IKEA to the other EU countries: Sweden, Germany, the UK and Denmark. The value of furniture export increased by 19% (to EUR 720 000) in 2011.

There is no pulp production in Lithuania since 2000. A 500 000 tonne/year pulp mill investment project was in the planning phase in 2004, but this was finally not carried forward. Lithuania imports and exports wood pulp, but the amounts are very small. In 2011, the imports of chemical pulp were 23 800 tonnes, and the exports 14 100 tonnes. There is some small-scale domestic further processing of pulp and re-exportation to neighbouring countries.

Wood briquettes and pellets have been produced since 1994 and 1999 respectively in Lithuania. Only 5% of wood pellets produced in Lithuania are used internally. Remaining 95% are exported to Scandinavian countries (Denmark, Sweden, and Finland), Germany, Italy, etc., because the demand of pellets in Lithuania is limited due to their high price. There are no industrial pellet consumers in Lithuania and only a small part of households has installed pellet boilers. Wood briquettes are still used in Lithuanian households, as they can be used in the old firewood stoves. The price for wood briquettes in Vilnius is about EUR 120 per tonne (FCA) and price for wood pellets in Vilnius is about EUR 160 per tonne (FCA). The market price for pellets on domestic market depends on export prices since there are no alternatives for lower prices.
Use of wood for fuel is increasing as the number of district heating plants increase. This activity started rather slowly, but in 2009 more than 360 district heating plants using biofuel were operating, and increased volumes of heat were produced from wood and other biomass. Biomass share in the houses within the district heating supply network raised up to 18% of the total fuel used in Lithuania and in the near future, it should rise up to 50%, partly because of rapidly increasing gas prices.

8.3.3 Inter-relationship between supply and demand

In Lithuania restoration of private forest ownership created a large number of small, fragmented forest holdings, which creates difficulties in supply from private forests. According to the Forest Owners Association of Lithuania (FOAL) the main problems of private forest owners are:

- limited size of forest estate, max 25 ha
- problems in obtaining forest cutting permit
- lack of incentives for forest owners (except some CAP support)
- poor acknowledgement of forest management by some forest owners
- high fees charged by forest state enterprises for their services
- still low demand for small sized trees
- restrictions in protected forest areas and lack of compensation
- difference in forest felling ages in Commercial and Protective forests.

Short term supply and demand seem to be balanced in Lithuania at the moment. However, according to local wood industry, this doesn't reflect real situation because of unstable future raw material availability and increasing demand due to the further

development of forest industry and increased use of bio-energy. Local roundwood market is strongly export-oriented at the moment. Law on the procedure for the control of the compliance of biofuels and other bioliquids with the sustainability criteria is prepared by Ministry of Agriculture, which is also responsible for the development of procedures for the certification of biofuels and other bioliquids. The full potential of the forest residues is not currently used, due to economic reasons.

The overall demand for wood raw materials in Lithuania is about 10 million m^3 (RWE) per year. The demand is increasing steadily, and the main source is roundwood with its 77% share of the total supply. Industrial residues cover a little less than 20% (Figure 8.9).

Lithuanian wood product industry uses almost 4 million m^3 (RWE) of wood per year. The wood product sector used 3.5 million m^3 of roundwood and 0.4 million m^3 of industrial residues in 2011. Both the share and absolute quantity of industrial residues has increased; from 5% (0.2 million m^3 in 2000) to 11%.

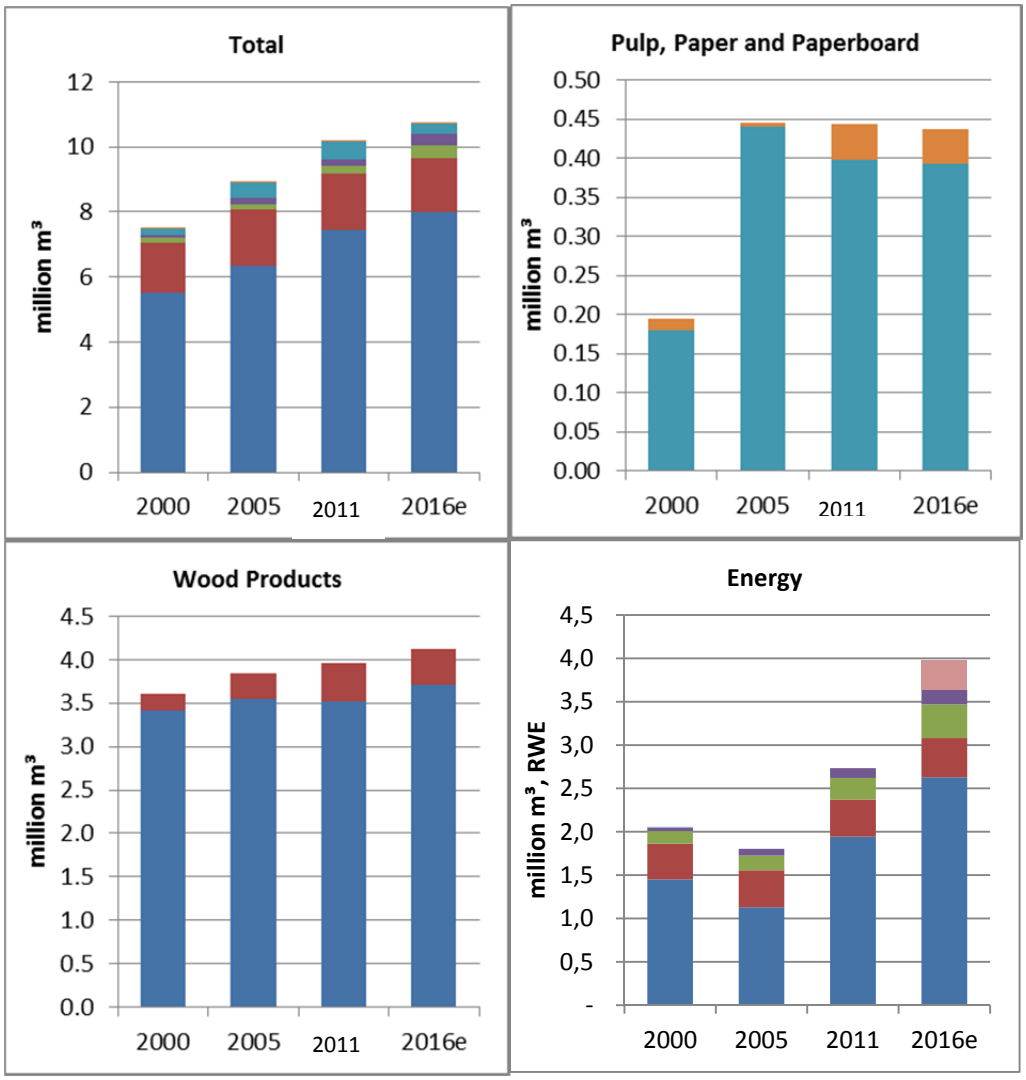
The Lithuanian paper industry (as there is no pulp manufacturing) uses mainly recovered paper and some imported pulp as raw material: share of recovered paper was 80% in 2011.

Bio-energy production in Lithuania is increasing, and it still relies heavily on roundwood (about 70% of total demand) and to industrial and forest residues (23%). The wood-based panel manufacturing is partly competing for the same raw material with the bio-energy sector. The capacity of energy sector is growing and accordingly competition will increase.

The roundwood demand in Lithuania is shared by bio-energy production, the wood products industry and some exports. Of the total demand of a little more than 10 million m^3 in 2011, The wood products industry is the biggest user with about 3.5 million m^3 of roundwood equivalent (RWE). The energy sector uses 1.9 million m^3 of roundwood per year, and 1.4 million m^3 is exported. Utilisation of industrial residues has increased from 0.6 million m^3 in 2000 to 1 million m^3 in 2011. Forest residues are used solely for bio-energy production (Figure 8.10).

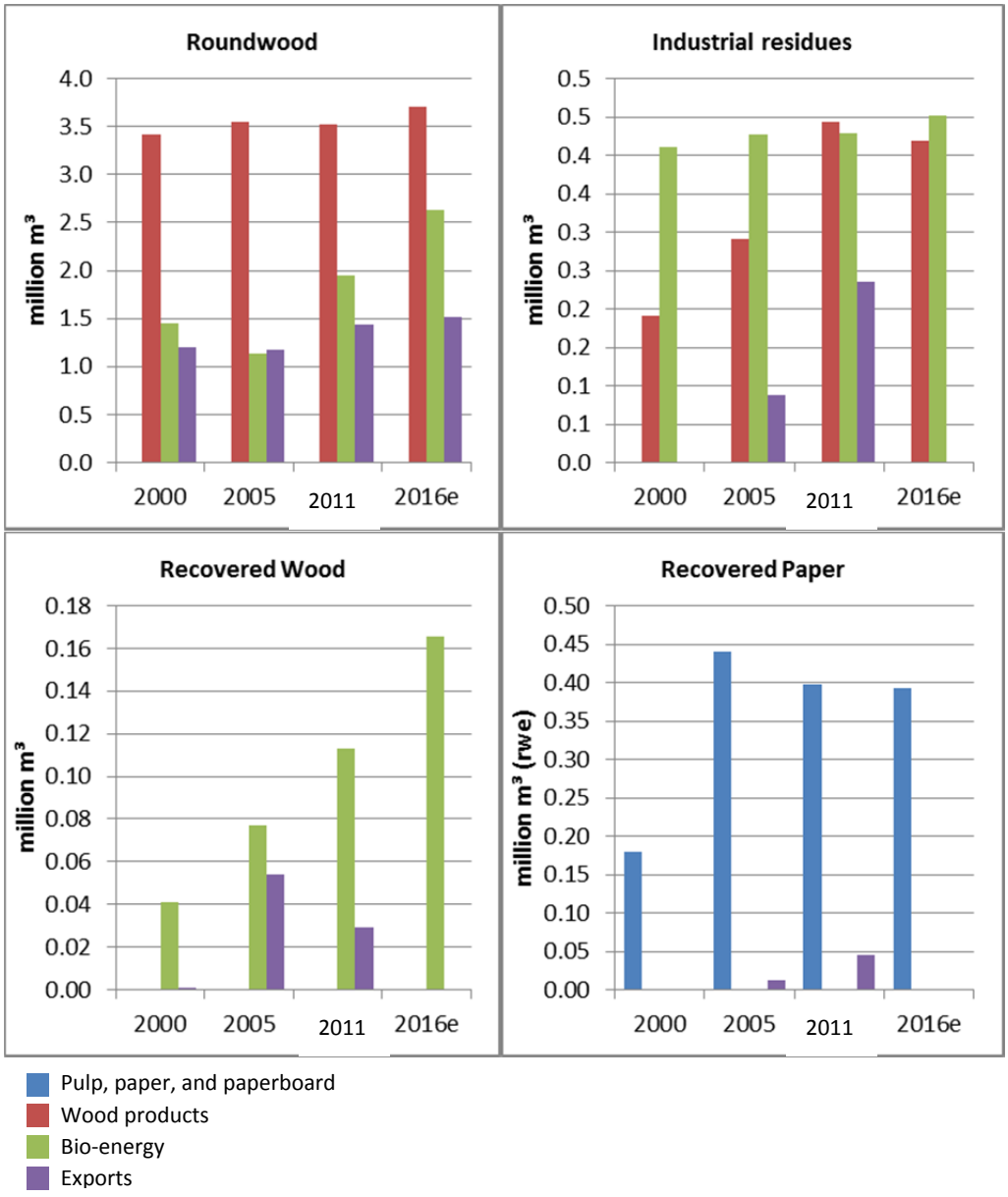
Collection of recovered wood is very small and what is collected and recorded in the statistics (30 000 m^3 in 2011), is exported. The amounts of recovered paper have increased considerably during the 2000s; from about 200 000 m^3 (RWE) to 400 000 m^3 (RWE).

Figure 8.9 Use of raw material by sector in Lithuania



Source: Indufor

Figure 8.10 Use of raw material by type in Lithuania



Source: Indufor

8.3.4 Possibilities on increasing the supply of wood

Amounts of annually harvested wood are considerably under the gross annual increment. Decreasing of forest felling in 2008-2009 is mostly related for reduced harvestings in private forests due to the market situation and low prices for roundwood. According to estimations of Lietuvos Mediena Association (the Organisation of the Lithuanian Produces and Traders of Wood Products) roundwood harvesting volumes are expected to increase by 20% up to 8.34 million m^3 by 2030.

Forests reserved for restitution will be put in use (12% of the forest land) and process of forest estate concentration will be finished.

The supply of roundwood can be increased by the following measures:

- renewing the economic-commercial activities in forests reserved for restitution (about 0.5 million m^3 of additional roundwood for the market);
- better promotion and supporting of forest owners cooperation for forest management and wood marketing
- promotion and supporting of pre-commercial thinning, especially in private forests and in context of preparing of wood biofuel (i.e., wood chips).

Obstacles of roundwood supply:

- Main obstacles related to the private forestry mentioned above.
- The environmental restrictions of forest management, in particular Natura 2000.
- Reserved for restitution are not in use (still 11.8% of total forests in 2011).

In Lithuania, pulp and paper industry is still underdeveloped and because of that, the share of pulpwood in the total export of industrial roundwood exports is relatively high, about 1 million m^3/a from the total export of roundwood of 1.4 million m^3 in 2011.

The public policies are set towards the development of a well-managed forestry sector and forest industry as well as increased share of bio-energy use. This will probably increase the domestic demand for wood and reduce some of the roundwood exports.

Both the demand and supply of forest residues for wood energy are growing rapidly, together with the increasing demand for domestic wood fuel. Main reasons for that are supported conversion of central heating boilers for usage of wood biofuels (i.e., wood chips) and support for wood biofuel preparation in context of renewable energy promotion.

Lithuanian Environmental Investment Fund (LEIF) is in charge of financing and supervising environmental investment projects in Lithuania. Within established procedure, investment projects are subsided from LEIF funds. LEIF allocates subsidies to projects aiming to reduce environmental damage in the long term.

“The maximum subsidy is LTL 690 000 (approximately EUR 200 000) and must not exceed 80% of the total project expenses” -Chapter I Item 4.7, Chapter II Item 7 Order No. D1-303.

“Applicants shall demonstrate that they are able to provide funding for the rest of the project through their own resources -Chapter II Item 12 Order No. D1-303.

“The first part of the awarded subsidy (60%) is paid when the applicant has acquired, installed and started operating facilities as intended in the project plan. The remaining part of the awarded subsidy (40%) is paid when the applicant has submitted data on the environmental compliance achieved during the first year of the supported project. The remaining part of the subsidy is paid under the condition that during the first project year the environmental indicators set in the grant application are met by at least 95%. If 50% – 95% of environmental indicators are met, the grant shall be reduced accordingly. Finally, if during the first project year less than 50% of environmental indicators are met, environmental compliance is considered as not achieved and the second part of the subsidy will not be paid to the applicant. In this case the applicant shall also pay back the first part of the subsidy (which he has already received) to LEIF” – (Chapter II Item 9 Order No.D1-303).

Biomass is illegible for funding. Electricity from renewable sources is exempt from tax in Lithuania.

LEIF is partly funded from the Lithuanian budget and partly from the financial support received from other countries e.g. the European Commission etc. -Chapter VII Items 7.2. – 7.4. Statutes of LEIF).

The increased use of wooden biomass in district heating is to be covered mainly by increased use of forest residues. The present availability of wood raw material for bio-energy is about 4 million m^3 of solid wood. According to the State Forest Service, an additional 0.5-0.6 million m^3 of forest harvesting residues could be used for wood energy from state and private forests, taking into account annual felling volumes, environmental and other technological requirements. The utilisation of forest residues is increasing; State forest enterprises sold 155 000 m^3 of forest residues in 2011, compared with 75 000 m^3 in 2011.

8.4 Romania

8.4.1 Raw material supply

In terms of roundwood resources, there is a great potential in Romanian forests. The total growing stock has increased slowly during the last ten years. It consists mainly of beech, spruce and minor species such as oak and fir. Supply of wood for material and energy use has potential in developing the economic and employment opportunities especially in the rural regions of Romania. However the development in utilizing this potential faces several obstacles.

During the last ten years there has been a significant transition in forest ownership structure in Romania. Between 2000 and 2011 privately owned forests had grown to 2.1 million ha equalling a share of about 32% of total forest area. This is a result of a legal process which aims to return the publicly owned forests back to the lawful inheritors of the original owners from the era before the Second World War. However, this process has led to very scattered ownership structure because the lawful owners did not necessarily get the previously owned holdings but same area of forest from another location. The challenging process is still going on.

The average size of a privately owned forest holding is smaller than 1 ha. About half of the total forest area is in economic use. Nowadays, typical for Romania are several investors, forest funds and private co-operatives that own large areas of forestland.

Silvicultural practices in Romania are mimicking the natural processes. E.g. old age of final harvested stands, small-size harvest areas and natural regeneration have been favoured since 1950s. However nowadays the system is considered old fashioned because it is unnecessarily constraining the wood supply. In addition, illegal logging of forests is an often encountered problem in the rural areas; however this problem is only prevalent in areas close to public roads and tracks leading to over harvesting of these areas.

The price of the roundwood depends on the species, timber quality and the forwarding distance. In 2009, the roundwood prices decreased substantially for hardwood species and increased slightly for softwood in comparison to the level of 2008. Based on the interviews of wood buyers in private lands in mid-2008, the stumpage price of softwood roundwood was approximately EUR 25-45 per m^3 for the whole stem and

hardwood roundwood, mainly beech about EUR 34-41 per m^3 for the whole stem depending on the wood quality.

Since mid-2010 the roundwood prices in Romania have been increasing along with increasing demand. Currently the stumpage price of softwood is about EUR 20-60/m^3 for whole stem and for hardwood EUR 15-40 per m^3 for whole stem depending on the wood quality. It is expected that the strong demand of sawlogs and softwood pulpwood continue in the near future. At the moment, demand of softwood sawlogs surpasses the supply.

The export price of the industrial roundwood in Romania is among the highest in Central- and East-European countries EUR 99 per m^3. The reason for this is that Romania exports considerable amount of good quality hardwood sawlogs. The main export market for Romanian hardwood sawlogs is China

8.4.2 Main factors affecting the supply and demand

Majority of the growing stock is located in mountainous or hilly areas which influences the available harvesting method and timing. Also the density of forest road network is very low, which gives access only to about 2/3 of forests in economic use. The road network density is considerably lower in comparison to other European countries with mountainous forests. If the obstacles related to wood mobilisation are not overcome, the supply cannot be expected to increase in the near future. The most important steps forward are building up currently poor infrastructure, updating the forest management regime, and developing subsidy systems for energy use of wood.

Due to low level of labour cost, Romania has become an attractive target for foreign companies. Especially Italian and Austrian forest industry companies have moved their production to Romania. Especially the softwood sawmilling, wood based panels and furniture manufacturing has developed due to foreign investments. Investments have been driving the development production technology especially related to processing of smaller diameter roundwood. Small feedstock from the timber auctions and resulted uncertainty in raw material supply has hindered the investments to more developed supply technology.

Romania is a major hardwood sawnwood producer in Europe. Annual production volumes have been fluctuating between 1.6-1.8 million m^3. The production of softwood sawnwood has slowly increased due to investments made by West-European companies establishing sawmills to Romania. The production of sawn softwood in Romania has been between 2-3.5 million m^3 annually. In softwood sawmilling the problems affecting the roundwood supply continue to hinder further investments to the sawmilling capacity. New processing and drying capacities and improved logistics are needed in Romania especially to add value to the hardwood sawnwood products. Also, in the future the grading of the sawnwood should be done in qualities and prices according to international standards of the hardwood sawnwood trade e.g. National Hardwood Lumber Association rules.

Low consumption rate of paper products per capita and insufficient environmental education, thinking and motivation are major obstacles for increased recovered paper collection in Romania. Overall the development of Eastern Europe will be important for paper recycling in Europe. Paper consumption, production and recovered paper collection probably increase from the relatively low present level. The supply of recovered paper is the most important raw material source for the small Romanian pulp and paper industry.

The total supply of energy from wood and wood wastes has been increasing in Romania since the early 2000s from about 90 PJ to 160 PJ by 2010. Presently wood and wood chips are being used in heating of private households and providing them with warm water. Also small amount is combusted in modern low-emission power plants. It is estimated that there are over 14 million stoves and ovens in which wood and agricultural waste is combusted. It has been estimated that about 1.6 million m^3 of wood fuel is used in the heat production annually[88]. There are several plans in investing for Romania's district heating and biomass power generation. If these plans are realised further demand of wood biomass for energy use can be expected. However, on green certificates from renewable energy, a new policy has been introduced from summer 2013 reducing significantly the awarded quota for green certificates and associated incentives.

In 2008, the wood pellet production capacity had grown to 260 000 tonnes, actual production being about 114 000 tonnes. Wood pellet production is dominated by the West-European sawmilling companies owning pellet manufacturing facilities in the vicinity of the mills. These facilities produce high quality wood pellets meeting the requirements of German standards. A number of small scale local pellet manufacturers exist. Domestic markets of wood pellets are undeveloped because of lack of pellet combustion systems and distribution channels. Most of the pellets produced in Romania are exported to Central-Europe. In Romania the lack of policy support systems for bio-energy must be developed in order to attract investments for wood use in heating and electricity generation and intensify the currently marginal domestic wood pellet market. Also the improvements in wood supply would enhance the raw material basis of pellet production improving the opportunities for further investments in production capacity. As being a member of the EU there is an existing political pressure to develop the renewable energy generation. Current development has been slower in comparison to the other EU.

In Romania, the main means of bio-energy promotion is a system based on quota obligations, tradable certificates, and minimum and maximum prices. Electricity suppliers and producers are obligated to present a certain number (or quota) of green certificates. These tradable certificates are then allocated to the producers of electricity from renewable sources. The system came into effect in October 2011. In addition the Romanian Environmental Fund (AFM – Administratia Fondului pentru Mediu) provides funding for projects for environmental protection. One of the schemes under the AFM is the "Programme for the Promotion of Electricity Generation from Renewable Sources", which also applies to energy generation projects.

However besides these, there is no subsidy scheme supporting private persons in small scale stove investments for household wood energy use[89]. It can be expected that the developments in the Romanian wood energy use will continue slower in comparison to the other EU countries. Although combusting wood for heating is very common and the volume of wood used annually in energy production is high, the stoves where the wood is burned are primitive and inefficient in comparison to modern wood fuel combustion technology used e.g. in Germany. Adopting new technology takes time since the general standard of living in Romania is among the lowest of the EU countries. There is not enough capital for investing in modern combustion

[88] Scarlat Nicolae, Blijdea Viorel, Dallemand Jean-Francois 2011. Assessment of the availability of agricultural and forest residues for bio-energy production in Romania. Biomass and Bio-energy, Volume 35, Issue 5, May 2011

[89] RES LEGAL (www.res-legal.de) – German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

equipment and there is a lack of subsidy system supporting private persons in small scale stove investments for household wood energy use.

8.4.3 Interrelationships with supply and demand

Currently the demand of softwood sawlogs exceeds the domestic supply. Almost all of the available good quality sawlogs in the central parts of Romania is purchased by Schweighofer. Smaller Romanian sawmills in the North are importing softwood sawlogs from Ukraine. The supply of hardwood sawlogs is mostly consumed by local hardwood sawmilling or imported.

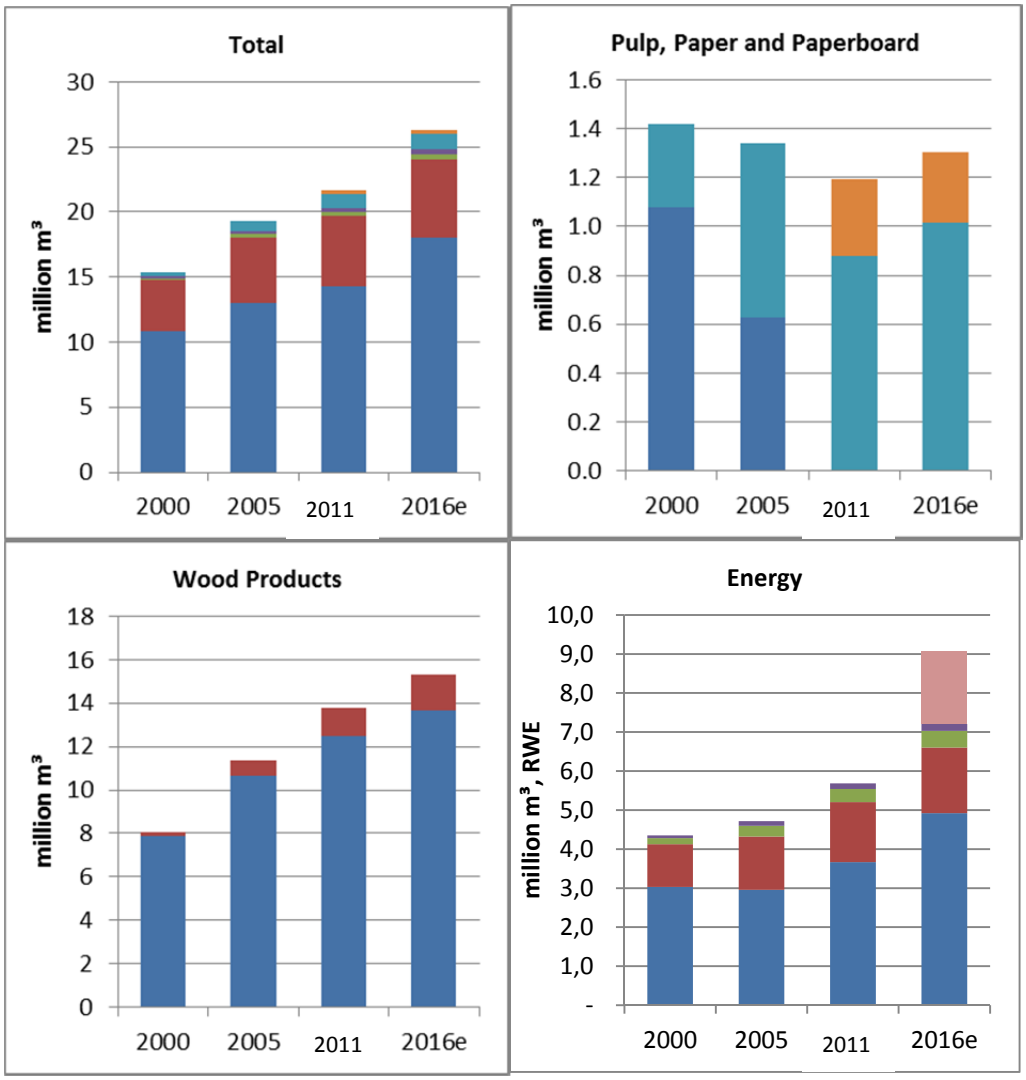
Romania is a major producer of hardwood sawnwood and a competitive player in the global market; however the export prices are among the lowest ones. There are several reasons for this. The sawmilling sector consists of many small size sawmills processing 10-12 m^3 of logs per day and this is casting a crippling effect on the sector. Even though Romania is quantitatively an efficient producer, the quality of the produced sawnwood needs improvement. Mostly the lumber is sold fresh or air dried from the producer's yard.

Exports of both hardwood and softwood sawnwood are driving the local sawmilling industry. The investments of West-European companies to wood-based panels industry have strongly driven the development of the branch in Romania during the period.

Supply of wood pellets is strongly linked with softwood sawnwood production, because sawmilling residues establish the raw material basis for wood pellet production. Increase in sawmilling production capacity will have positive impact on pellet production potential.

Total wood utilisation in Romania has increased steadily in the 2000s from 15 to 22 million m^3/a. Two thirds are roundwood and the rest is mostly industry residues (Figure 8.11). The use is approximately half of the annual increment in the country and re-emphasises the untapped potential in low-accessible forests and areas reserved for nature protection.

Figure 8.11 Use of raw material by sector in Romania



Source: Indufor

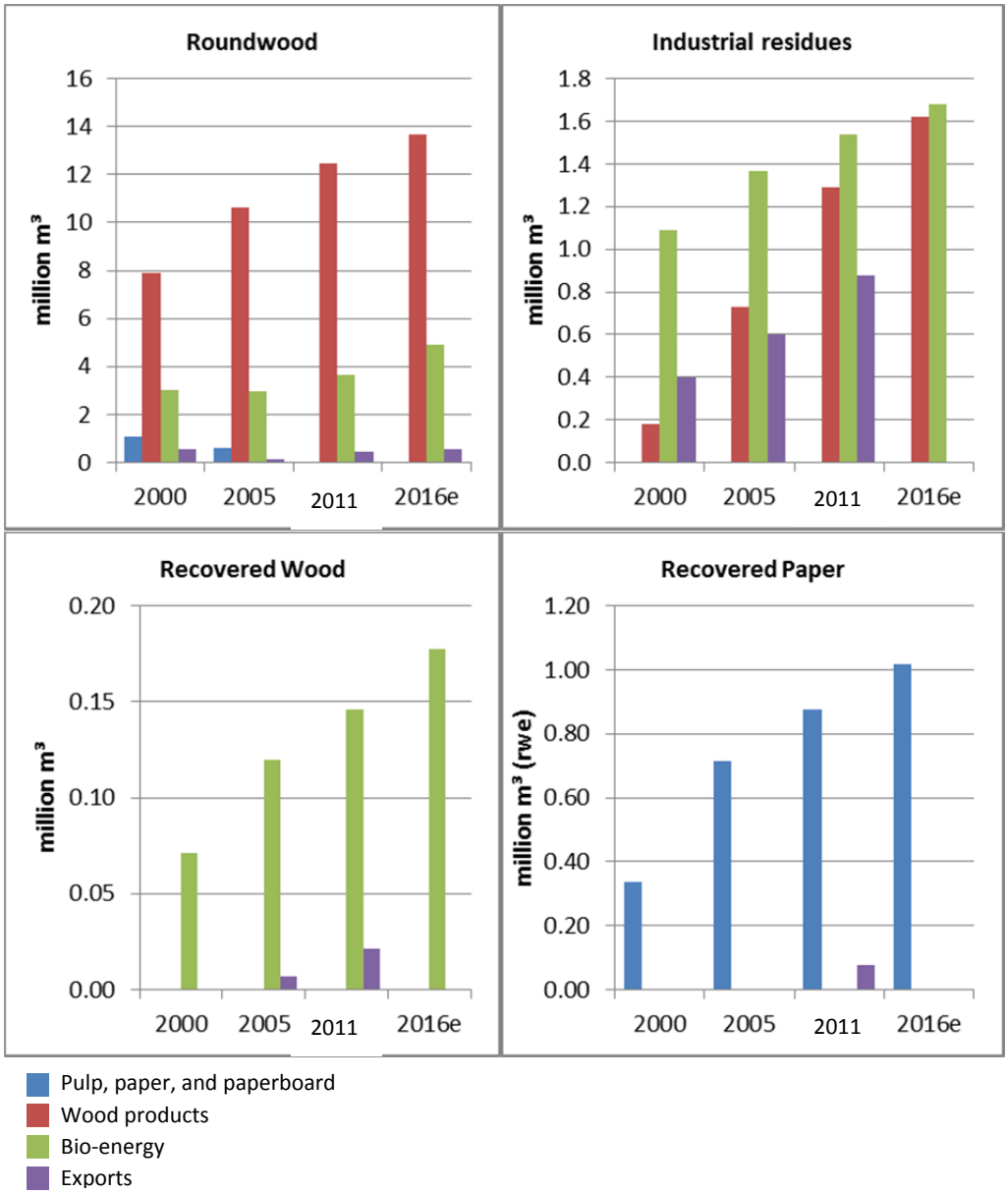
Pulp and paper industry's annual demand has remained stable around 1.2 million m^3 from 2000 to 2010. There has been a structural change, too; in 2010 the roundwood previously utilised was replaced by imported pulp. The decrease of raw material use in pulp, paper and paperboard industry is caused by the decrease of pulp production capacity at the same time. Currently there is no pulp production in Romania. The remaining paper and paperboard manufacturing capacity is based on using imported pulp or recovered paper.

Wood products industry's total demand has increased considerably. It uses mainly roundwood and some industrial residues. The energy sector is using mainly roundwood (about 4 million m^3 in 2010) and industrial residues (1.5 million m^3). Also forest residues and recycled wood are used at low levels.

In Romania, wood products industry is the main user of roundwood (13 million m^3 in 2010), but almost 4 million m^3 of roundwood is used for energy purposes. Industrial residues have been traditionally used for energy (about 1.5 million m^3/year), but between 2000 and 2010 the wood products industry has increased its consumption by 1.1 million m^3 to 1.3 million m^3. This development has been driven by the establishment of new wood based panels production capacity in Romania by Schweighofer and Kronospan, which take a big share of the residues. Residues are also being exported increasingly (Figure 8.12).

The recovered wood amounts increased from 7 000 m^3 in 2000 to 21 000 m^3 in 2010, and all has been consumed by energy sector. Similarly, recovered paper amounts increased from 135 000 m^3 roundwood equivalent (RWE) in 2000 to 445 000 m^3 in 2010. Previously all of the recovered paper was used by the pulp and paper industry, but in 2010 small amounts were exported.

Figure 8.12 Use of raw material by type in Romania



Source: Indufor

8.4.4 Possibilities on increasing the supply of wood

Efficient supply chains and accessibility are a necessity to enhance the mobilisation of roundwood in Romania. Two main lines of necessary future development can be distinguished:

a. Renewal of the forest management regime and
b. Investments to wood supply infrastructure, logistics and equipment

Old-fashioned forest inventory and management regime unnecessarily prevents the harvesting of timber in economic and ecologically feasible way. The shortening of

rotation time in forest management regime can have positive effect on quality and quantity of supplied wood. Harvesting timber when diameter is smaller allows the adoption of modern logging and forwarding systems.

Also new investments to the wood supply infrastructure such as forest roads and logistic terminals are necessary to decrease the costs of wood supply. The problems related to roundwood supply delays the further investments to new sawmilling capacity and technology. Currently Schweighofer produces over 50% of the softwood sawnwood in Romania. Increased competition would be good from the market point of view. In addition the roundwood pricing system should be developed further and statistics improved. Price information is not easily available. Partly same reasons hindering the roundwood supply (forest inventory, management regime, and infrastructure) are hindering the development of wood energy utilisation in Romania.

In order to attract higher export price for sawn hardwood lumber new investments in processing and drying capacities are needed in Romania. Also, in the future the grading of the sawnwood should be done in qualities and prices according to the international standards e.g. National Hardwood Lumber Association rules.

There is no established system for educating professional loggers or other field personnel in harvesting and transportation. This clearly affects the productivity of the forestry operations and partially prevents the adopting of modern harvesting methods. Educational system for wood harvesting labour must be established to ensure professional workforce in the future.

More options should be added in the forest management practices to allow more flexibility for the forest owner in the decision making process. One good benchmark would be the forest management system used in Germany targeted to good silvicultural practice and producing high quality wood, which could be adopted to fit Romanian forest management conditions. Also the forest inventory systems should be updated to fit better the actual local site and climate conditions.

Bureaucracy should be decreased in the political field. Often the problems are acknowledged but due to the heavy bureaucracy the efforts in making development are limited. Heavy bureaucracy also increases the risk of corruption.

There is pressure from the organisations aiming for the increase in forest conservation. Rationalizing the forest management practices would have a positive effect in ecological values as well. The goals in land use management should be more organized. Forest management based on timber production can act side by side with recreational use and conservation of forests.

8.5 Spain

The past five years have been hard in Spain. The global economic crisis that started in 2008 has hit the Spanish economy in a dramatic way and the very recent past (2012) gives an increasingly pessimistic forecast for the future. Many companies in the wood product sector are closing down leaving thousands of people unemployed. The recovery is expected to be long and slow, and only the export oriented companies are expected to survive these turbulent times.

In general the recession has had a stronger negative impact on the woodworking industry than on the pulp and paper industry. This can be explained by the different structure and market orientation of the sectors. The structure of small companies

operating in the woodworking industry is much more vulnerable to economic turbulence because the markets for woodworking products are local. As the country drifted into the crisis, the domestically operating woodworking sector followed. In addition, the market of the woodworking industry is closely linked to the construction sector (structural wood and furniture), which has collapsed totally in Spain during the last years. However, big companies that operate in the pulp and paper sector have extensive global sales networks and their markets are outside Spain (and Europe) in areas that did not suffer from the crisis. Therefore the crisis did not affect the Spanish pulp and paper sector in such a drastic way.

8.5.1 Raw material supply

In Spain forests and other wooded land occupy 27.7 million ha which is over 55% of the total land area of the country. Spain ranks the second, only after Sweden, in the EU-27 in terms of forest area. However, neither the quantity nor the quality of wood that Spain can provide ranks very high compared to the other EU countries. Currently the FSC certified forest area is 100 000 ha and PEFC certified forest area 1.5 million ha.

The harvesting volume of industrial roundwood and fuel wood has varied from 12 million m^3 to about 14 million m^3. The role of forests and the wood-based industries varies a lot between the different autonomous regions of Spain. The autonomous region of Galicia is clearly the area with the largest harvesting volumes (over 6 million m^3 over bark). Galicia produces 50-55% of Spanish roundwood and 40% of the sawn wood. The forest sector is very relevant in Galicia and has a contribution to the GDP similar to the one in Sweden and Finland. Galicia, however, covers only 5.8% of the total land area of the country and has only 4% of the area suitable for roundwood production.

The main species harvested are eucalyptus (32%), maritime pine (30%) and Monterey pine (15%). Only a small proportion of the Spanish territory is under Forest Management Plans; only 6.1% of private forest land in under management and 28.3% of the public forest land. In addition there might, however, be single purposed plans such as hunting plans, fire plans or Natura 2000-plans for certain forest areas.

The stumpage prices for forest owners have remained roughly the same for the last years, and the tendency is that they will remain stable for the coming years as well. In a medium-term view, the demand of biomass for energy production will increase the overall demand for wood in Spain. Therefore the price of wood is also assumed to rise.
The Spanish paper and board industry has grown firmly, by about 2.7% per year, during the last decade. In 2011, the paper and board production was 6.2 million tonnes and recovered paper consumption 5.1 million tonnes, thus recovered paper is the most important paper and board industry raw material with an utilisation rate of about 82%.

Paper industry production growth together with a high recovered paper utilisation rate puts the Spanish industry in a challenging situation in arranging its raw material supply. In spite of the fast increase in collection activity, the country has stayed as a net importer of recovered paper. Annual net imports of recovered paper was 0.5 million tonnes in 2011.

Recovered paper substitutes virgin wood pulps in paper and board production. According to the Indufor furnish model, an additional volume of 16 million m^3 of wood

raw material would be required to replace the paper industry raw material gap with virgin wood pulp if no recovered paper were available.

In paper production, domestic eucalyptus accounts for 50% of the wood use, imported wood accounts for around 30% and the rest (20%) is domestic pine.

The production of wood-based panels in Spain peaked in 2006-2007 and then decreased drastically as the financial crisis started in 2008. The wood-based panels sector is closely linked to the construction sector, and as the financial crisis paralyzed construction, the wood-based panels industry suffered concurrently. 2011 showed a slight recovery driven by an increase in particleboard production. Spain has MDF production capacity of 1.6 million m^3 and the total production reached 1.2 million m^3 in 2011. Fibreboards are the most exported wood-based panel products in Spain, followed by particleboard and plywood, veneer and laminated wood. The sawmilling industry consumes mainly domestic logs, but also from France and Portugal, and smaller proportion from other countries.
The volume of non-industrial biomass originating from wood-based agricultural residues (fruit, olive and vine trees) is about 16 million tonnes per year. Out of this, less than 2 million tonnes was consumed in 2006, meaning that a great proportion (88%) of the potential has been unexploited.

8.5.2 Main factors affecting the supply and demand

Currently there is a clear shortage of wood in Spain and the country imports large amounts of roundwood from abroad. Roundwood imports have doubled in the last fifteen years. Before the start of the economic crises Spain consumed twice as much wood as it produced, due to the boom in construction – with a construction rate of over half a million new houses every year along the last decade.

There is plenty of wood raw material in Spain, but the problem is that it is located on small private forest holdings scattered around the country and there are limited possibilities (infrastructure) to get it to the market, especially in the mountainous areas. Other problems in both supply and demand of Spanish wood are the following:

- Rampant forest fires that destroy approximately 150 000 hectares of forests per year and cost approximately 1.8 billion euros per year
- Low quality of wood for the use of sawmills and relatively high costs of logging due to the topography
- Unpredictability of the roundwood supply: contracts are negotiated separately each year
- Natura Network 2000, under which almost half of the forest land is located, means heavy restrictions on forest harvesting
- Dismemberment/disconnection of the chain between forestry and wood processing industry: lack of operators, technology, modern machinery
- Instability of the Government support to renewable energies: the Royal Decree (RD 1/2012) has paralysed new investments in bio-energy since all subsidies have been suspended.
- Lack of awareness of the possibilities and benefits of wood-based bio-energy
- Definition of wood-based biomass (related to the minimum diameter of tree trunk)

In order to be economically viable, the forest sector – in collaboration with the wood industry – have to be able to get wood at mill gate at the price of EUR 45/t. If not, it will be cheaper to get exported wood from a port.

8.5.3 Interrelationships with supply and demand

Between 2000 and 2011 the harvesting of fuel wood has increased by 65%, having an annual growth of 4.5%. But this substantial increase in fuel wood harvesting is due to the growing demand in the biofuel sector in the country. The fluctuation in the harvested volume of industrial roundwood has been much less.

As Spain does not use its vast forest resources optimally, but leaves much of the forest potential unexploited, a short way of depicting the relationship between the wood-processing industry and bio-energy sector is to state that there is not that much competition between them – as long as the bio-energy sector only uses wood that is not suitable for the wood-processing industry.

The Spanish forestry and bio-energy sectors rather try to seek links that would strengthen them both. One recent example is the agreement signed in March 2012 between the Spanish Network of Forest Municipalities and Avebiom. They decided to join forces in promoting the use of forest biomass for the sake of creating new jobs, reducing Spain's energy dependence and reducing the risk of forest fires. This cooperation can also be interpreted so that the industry sectors have joined forces against the Royal Decree 1/2012 (that is cutting the subsidies on renewable energies).

The Royal Decree 1/2012 has paralyzed all new investment for bio-energy. In short the main provisions of the RD 1/2012 are the following:

The objective of the Royal Decree:

a) The removal of economic incentives from energy production facilities of special regime as well as from similar technologies of ordinary regime that are included in the special regime as detailed in Article 2.1.
b) The suspension of the pre-allocation procedure for granting subsidies for new energy production facilities.

The Royal Decree applies to the following facilities:

a) Those installations under special regime that were not registered in the pre-allocation record provided in Article 4.1 of Royal Decree 6/2009 of 30 April at the date of entry into force of the Royal Decree 1/2012.
b) Those installations under special regime of solar technology that were not registered at the date of entry into force of the Royal Decree in the pre-allocation record provided for in Article 4.1 of Royal Decree 1578/2008 of 26 September.
c) Those installations of ordinary regime that at the date of entry into force of the Royal Decree did not have an official authorization from the Directorate General of Energy Policy and Mines.

All in all, the Royal Decree 1/2012 cancelled subsidies from all new energy production facilities (planned or under preparation) that were not yet connected to the grid. It affects all installations of electricity generation (not only Research and Development), i.e. energy production from renewable sources, combined heat and power (cogeneration), and energy production from residues. Because subsidies will no longer be given, companies no longer have an incentive to build new or complete unfinished facilities. A compromise between the government and political groups is needed in order to have a long-term strategy on bio-energy.

Spain's total wood raw material demand decreased slightly between 2005 and 2011 from 49 million m^3 to 48 million m^3. The main raw material types are roundwood (17 million m^3, or 36%), and recovered paper (18.5 million m^3 of roundwood equivalent, 38%) (Figure 8.13).

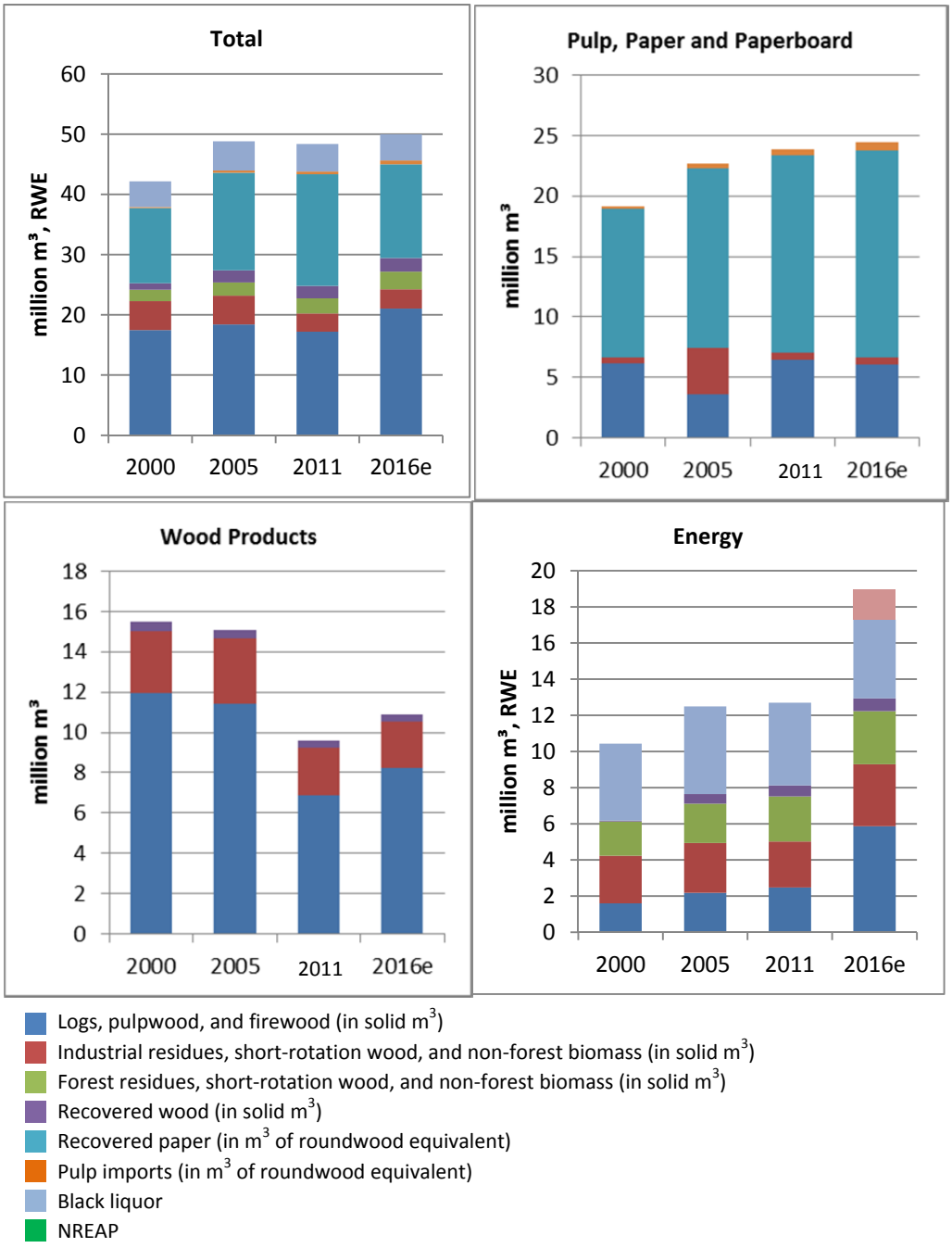
Recovered paper is the most important raw material used by pulp and paper industry (about 16 million m^3 in 2011) and the raw material structure has been increasingly based on recovered paper (+ 4 million m^3 between 2000 and 2011). The use of wood fibre has been stable (about 7 million m^3 2000-2011), but the share of roundwood versus industrial residues has been fluctuating.

Wood products utilisation of raw material collapsed in 2011. Raw material base is mainly roundwood, with some residues and recovered wood. Energy use has increased fast, from 10 million m^3 (RWE) in 2000 to 13 million m^3 (RWE) in 2011. The main sources is black liquor (5 million m^3 RWE) in 2011.

The overall roundwood demand of 17 million m^3 (RWE) in Spain is spread more equally to different end-uses than before; in 2000 the main user was wood products (12 million m^3 RWE), but till 2011 the consumption has decreased (7 million m^3 RWE). The second largest use was pulp and paper industry (7 million m^3 RWE in 2011). The volume used by energy sector and volume to exports have been increasing (Figure 8.14).

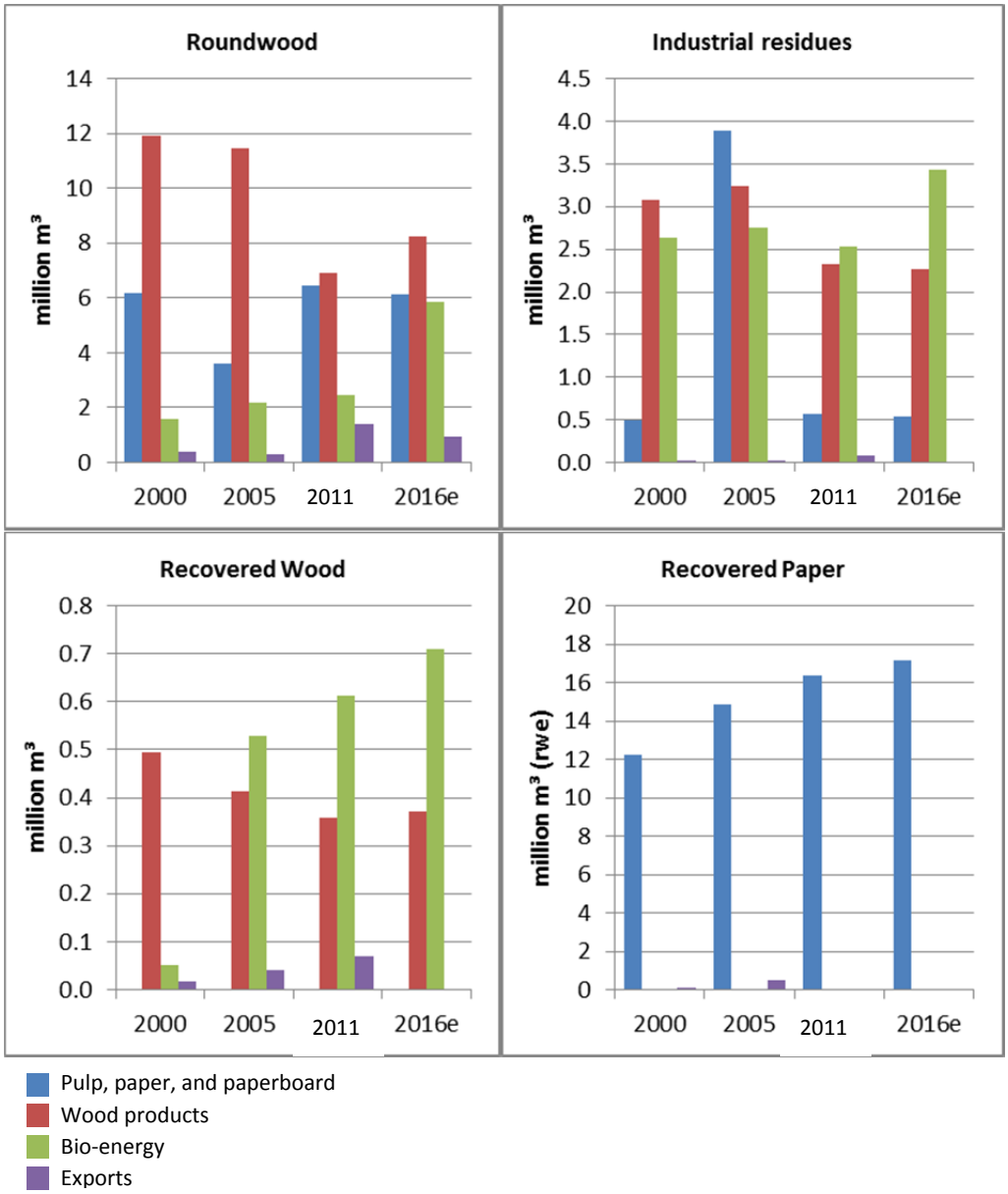
The total utilisation of industrial residues is decreasing; from 6.2 million m^3 (in solid m^3) in 2000 to 5.5 million m^3 in 2011. The main user groups are the energy sector and the wood products industry. Recovered wood collection is very small; the amounts were 0.6 million m^3 in 2000, 0.9 million m^3 in 2005, and 1.1 million m^3 in 2011. Recovered paper utilisation has been increasing; from 12 million m^3 (RWE) in 2000 to 16 million m^3 (RWE) in 2011.

Figure 8.13 Use of raw material by sector in Spain



Source: Indufor

Figure 8.14 Use of raw material by type in Spain



Source: Indufor

8.5.4 Possibilities on increasing the supply of wood

There are a variety of issues that currently hamper wood supply in Spain. The small size of forest holdings is one of the most important problems. In addition, forest holdings are widely scattered around a country with a high variety of different topographies. Specific plans – e.g. for hunting, forest fire management or forest conservation purposes – often exist, but forests are rarely under a holistic forest management plan which hampers their management for commercial wood supply purposes. The transportation of wood from remote plots to the market is also difficult and costly. Due to these reasons wood does not find its way to the market easily. In order to increase the supply of wood, private forest owners should be encouraged and

motivated to form associations and other cooperative arrangements for the sake of clustering the small forest plots in larger units that can be managed in a rational and profitable manner.

The paper company Ence works to solve the problem through making deals with private forest owners' associations. Ence has recently signed an agreement with the Forestry Sector Association of Galicia (Asefoga), composed of local forest owners, for the purchase of eucalyptus. Ence has signed similar agreements also with other forest owners' associations. These types of initiatives are a good way to build alliances between forest producers and companies in order to boost the use of Spanish forest resources.

The most severe environmental (and socio-economic) problem in Spain is the high occurrence of forest fires. Some the burnt forest material could be used as raw material for the wood-processing and bio-energy industries. According to the Spanish Association of Forestry Engineers biomass production activity reduces the risk of forest fire occurrence by 70%. Stronger use of forests for bio-energy would be a very cost-efficient way to (i) control forest fires, and (ii) increase the supply of raw material for the bio-energy sector.

There are very few incentives and other support directed to the forest sector in Spain. The use of Common Agricultural Policy (CAP) in the field of forestry is minimal. The recently enacted Royal Decree 1/2012 has created additional difficulties for the bio-energy sector. There is a clear need for stronger governmental support to the Spanish forest sector. Private forest owners should be encouraged to use their holdings for wood production purposes and motivate them to sell their wood. The Rural Development Regulation of the CAP could be used to promote especially poplar plantation development since poplar fits perfectly with the spirit of the regulation.

One further problem is the shortage of operators linking supply and demand of wood in Spain. There is a lack of bigger or medium-sized active players who would buy wood from the forest owners, collect larger amounts and do the harvesting and transport to the end-user. Some publicly owned companies exist, (owned by the State or by the autonomous communities) that have experience of conducting logistical works and that could perform the work of large logistics operators that the forest biomass sector requires. Some potential operators, such as city councils (*ayuntamiento*) can combine all the phases of the process of producing energy from biomass. As they have municipal forests (resource) as well as citizens (users of electricity and thermal energy), they would only lack the processing stage to complete the biomass cycle. Spanish municipalities should be encouraged to undertake small and medium-sized projects of turning forest biomass into energy.

Attitudes and lack of knowledge on the possibilities and benefits of wood-based bio-energy do not as such affect the supply of wood, but reduce enthusiasm for its use. A positive image of forest biomass-based bio-energy should be promoted. The positive impacts of wood-based bio-energy should be emphasised and its beneficial influence for local employment, for decreasing the risks of fire, for emission reductions, for external energy dependence, etc. should be communicated better locally, regionally and nationally. A higher demand for bio-energy is needed in order to achieve an increase in biomass supply.

46% of the wooden land in Spain is included into a Natura Network 2000 which means heavy restrictions on forest harvesting.
Decision making concerning forest-related issues in Spain happens at regional level and therefore decisions concerning subsidies to biomass for energy are taken by

regional governments. In most regions the subsidy level is around 30-40% of the biomass harvesting reference cost, but Andalucia is an exception with 60-80% subsidy level. In addition, some regions have specific subsidies aimed directly at forest management work, like Valencia (subsidized work type: hauling of forest biomass) and Catalonia (subsidized work type: hauling of forest biomass, densification of biomass in the field storage place).

In Spain, woody biomass is eligible for subsidies when a tree trunk diameter is 7 cm or less. In reality, in Mediterranean conditions forest harvesting for biomass purposes is viable only when a tree trunk diameter is 20 cm or less – and subsidies should be given accordingly.

In contrast with the most of the other countries, wood-based biomass harvesting in Spain produces (as a sub-product) logs that are suitable for the sawmilling industry. For this reason it is important to mobilise the biomass potential in the country – not only for bio-energy purposes, but also in order to support the traditional wood industry.

8.6 United Kingdom

8.6.1 Raw material supply

The area of woodland in the UK is about 3 million hectares. There is no natural forest, except some remnants on islands, but about 650 000 hectares of semi-natural woodlands, which are mainly mixed broadleaved forests and the native pine forests of highland Scotland. The UK woodland Assurance Standards (UKWAS) is the national forest certification standard. It is endorsed by both FSC and PEFC as it meets the stringent requirements of both schemes. About 1.6 million hectares have been certified under FSC and about 1.3 million hectares under PEFC. The UK has made an effort to increase forest area and therefore, industrial wood harvests during the last ten years have increased to 8.3 million m^3 in 2011. Harvesting for fuel wood has increased from a very modest level of 230 000 m^3 in 2000 to 1.4 million m^3 in 2011. The UK is still a very modest wood producer country, compared to other European countries.

Supply of energy from wood and wood waste in the UK has increased remarkably, from 27 600 TJ in 2000 to more than double 60 359 TJ in 2011.

The UK's annual waste wood recovery (arisings) was estimated at 4.1 million tonnes in 2011, main sources being construction and demolition activities and packaging, recoveries from municipal sources, and joinery and furniture manufacture. The price of recovered wood has changed from negative to positive; previously gate fees (negative price) were required to dismiss of recovered wood, and now, with increasing demand especially for good quality clean pallet wood, there is a small (positive) payment.

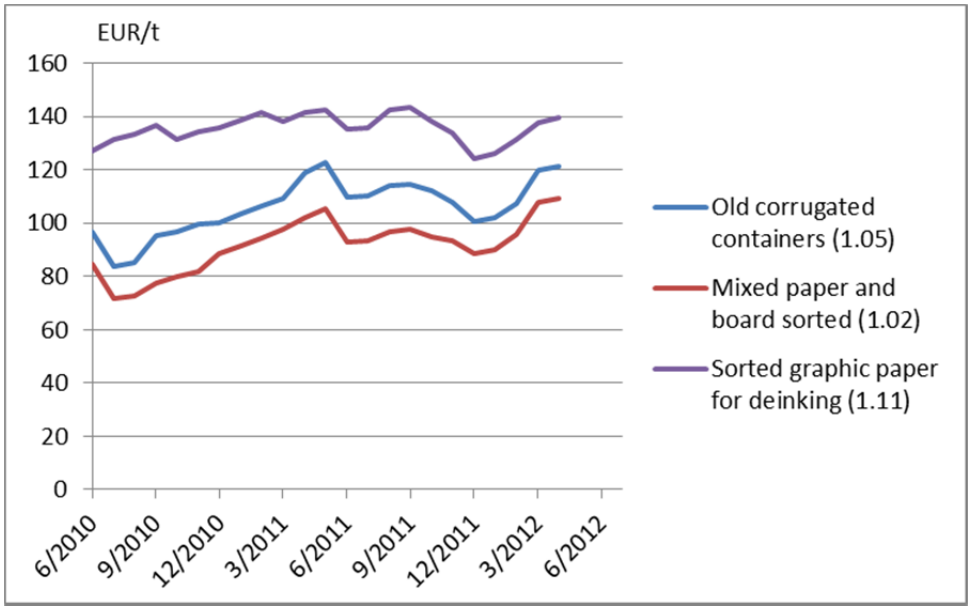
The UK is the third biggest paper and board consumer in Europe with 10.6 million tonnes in 2011. With recycling (collection) rate of 76% (about 8 million tonnes) it is well above the average European level in collection activity. During the last decade the UK has increased considerably its collection activity from 45% in 2000. Due to lack of forests paper recycling is crucial in the UK. Recovered paper is the most important paper and board industry raw material as it covers two thirds of the fibre source. The utilisation of recovered paper was 3.8 million tonnes with an utilisation rate of 88% in 2011.

The UK collection of recovered paper exceeded the domestic demand in all grades. The UK net exports of recovered paper were 4.4 million tonnes in 2011 which is 53% of the total collected volume. At present, the UK is the biggest recovered paper exporter in Europe, the main destinations being Far East and especially China.

Different recovered papers are traded commodities and their prices fluctuate according to pulp and paper industry price cycles. Recovered paper prices in the UK tend to follow the general European price level.

In the UK, the recovered paper market can be roughly divided into two distinct markets, home market and export market. Domestic prices in 2010-2012 are shown in Figure 8.15.

Figure 8.15 Price development of recovered paper in the UK



Source: RISI, PPI Markets and Prices.

Other sources of woody biomass in the UK include broadleaved wood fibre not currently used, short rotation coppice, softwood forest residues, and arboricultural arisings.

8.6.2 Main factors affecting supply and demand

Consumption of industrial roundwood in the UK was about 7.9 million m^3 in 2011, almost all of it softwood produced domestically. In recent decades there has been a significant expansion of wood processing capacity in the UK, encompassing the production of sawnwood, wood-based panels and paper products. Major part of the UK wood production is delivered to sawmills (45%). Wood-based panel mills used 15%, integrated pulp and paper mills 4%, and other uses, including round fencing, wood fuel, shavings and exports of roundwood, amounted to 25% of the total domestic production in 2011.

The UK is a big net importer of sawnwood. It produced only 3.1 million m^3 of sawnwood in 2011, an increase of 7% from 2009, while imports are in the range of

5 million m^3 annually. Domestic roundwood continues to increase its market share in the UK and is now thought to be reaching 40% for sawnwood. The continued depression in the UK construction sector is a serious concern for many in the domestic wood processing sector. The consumption of soft sawnwood decreased in the UK from 10.7 million m^3 in 2007 to less than 7.5 million m^3 in 2009. In 2011, the sawmilling industry returned to growth, after two years of decline, with sawn softwood consumption rising by 8.4% to a level just over 8.1 million m^3.

Production of wood-based panels in the UK was 3.4 million m^3 in 2011, an 11% increase from 2009. Particleboard is the biggest product group, with annual production of 2.2 million m^3. MDF is the second biggest product, with annual production between 865 000 m^3 (in 2007) and the present 776 000 m^3 (2011). OSB production has been steadily at about 300 000 m^3 per annum, although the production in 2011 was at its highest level of 389 000 m^3.

Annual production of wood pulp in the UK was 218 000 tonnes of mechanical pulp in 2011. Production has decreased by about half from 474 000 tonnes in 2000, and the production of semi-chemical pulp stopped entirely in 2005. Due to small domestic production, the UK is a net importer of wood pulp and very dependent on imports. In 2011, 1 072 000 tonnes of mainly chemical pulp were imported, which was a significant reduction from the highest level of over 1.5 million tonnes in 2000.

The UK is still the third biggest paper and board consumer in Europe with 10.6 million tonnes in 2011, after Germany and Italy, despite of the decrease in consumption during the last decade (-1.1% per annum). The country is very dependent on imported paper and board; about 60% or 6.3 million tonnes of the domestically consumed paper has to be imported. Total domestic production of paper and paperboards in the UK has decreased from 6.6 million tonnes in 2000 to 4.3 tonnes in 2011 (-4.2% per annum). Packaging products remain the largest product group. Both tissue and newsprint production have remained at constant levels (780 636 and 1 093 818 tonnes per year on average, respectively), while printing and writing and other papers' production has decreased. Newsprint demand has dropped considerably.

Recovered paper collection continues to increase. The Waste and Resources Action Program (WRAP) has had an important role in this development. Recovered paper substitutes virgin wood pulps in paper and board production. According to the Indufor furnish model, an additional volume of 11 million m^3 of wood raw material would be required to replace the paper industry raw material gap with virgin wood pulp if no recovered paper were available.

The UK was the first country to make CO_2 emission reductions legally binding through the 2008 climate Change Act, which set targets for emissions cuts at 34% by 2020 and 80% by 2050. Renewable energy (including electricity, heat and transport fuels) deployment is one of the vehicles to help reaching those goals, with a legally binding target of 15% of overall energy demand by 2020 (2.3% in 2008). The development of the UK biomass sector has been encouraged by government policies and incentives aimed at increasing the proportion of energy generated from renewable resources, which – although most of the wood biomass for bio-energy will be imported – also increases the demand for British grown timber and recovered wood for heat and/or power purposes. There is an increasing interest in far greater utilisation of wood fibre, in various forms, sourced from the UK and overseas, by large scale electricity generation plants.

8.6.3 Inter-relationship between supply and demand

Demand for wood fibre is expected to increase dramatically in Britain in the next 15 years. The principal reasons behind this rise are Government policies and incentives which encourage the use of wood as a source of renewable energy.

Presently it is estimated that up to about 150 000 tonnes per annum of British wood fibre is being used for co-firing. The major factor in determining the scale of future use of wood fibre, whether British sourced or imported, is likely to be the requirements and incentives offered under the Renewables Obligation. It is understood that co-firing may be only marginally attractive at present, but if this changed and if even only 10% of the increased supplies were sourced from Britain, this increase of 10% would mean an additional 3.3 million m^3 per annum in demand for wood fibre.

At the end of 2011, there was 2.5 GW of biomass-based electricity capacity installed in the UK, accounting for 11.9 TWh of generation, about 2/3 of which was generated from landfill gas. This was the largest contribution to UK's renewable electricity generation. Currently approximately 6-7 GWe of biomass capacity is at various stages of development in the UK. The pace at which biomass capacity is actually developed is likely to be influenced by changes in relative fuel prices, de-risking the supply of sustainable feedstock, access to finance and minimising investment risks, government legislation and regulatory framework, amongst other factors, so not all of the capacity identified may become operational or, if it does, not necessarily under the current planned timescales. The planned capacity, if realised, means a potential annual demand of about 60 million m^3 of solid biomass/wood.

Resulting imbalances between potential availability and forecast demand could result in significant supply and price pressures which would have major consequences for existing wood processing industries and for the future shape of the biomass energy sector in Britain.

Forecasts show that softwood roundwood production in Britain is expected to increase until about 2020, with peak production of about 12.7 million m^3 per annum; thereafter production declines due to the gap in plantation activity after 1990s. Including other types of wood fibre available in Britain, such as sawmill residues, recovered wood fibre, short rotation coppice, forest residues – both softwood and hardwood, and arboricultural arisings, the total availability of wood fibre is forecast to peak around 2019, giving a combined total of just over 22 million m^3 per annum and thereafter declining.

Based on the most recent estimate by WRAP the quantities of recovered wood fibre have been assumed to remain constant at 4 million tonnes per annum after making a deduction for recovered wood that is heavily contaminated and needs to be disposed of under special conditions. The quantities of recovered wood that could be potentially available could increase slightly as the economy grows and as greater use is made of wood and wood products because they are renewable natural products.

The total wood raw material use in the UK has increased from 37 million m^3 in 2000 to 48 million m^3 in 2011. Industrial roundwood and recovered paper are the biggest groups of fibre source. The share of recovered paper has increased considerably and is close to reaching the industrial roundwood utilisation. Pulp imports are decreasing in the UK (Figure 8.16).

Pulp and paper industry's total production and therefore demand for raw material has decreased from 23 million m^3 in 2000 to 16 million m^3 in 2011. Raw material base has

shifted slightly towards imported pulp as the volume of recovered paper has decreased (15 million m^3 in 2000 to 11 million m^3 in 2011). Pulpwood has replaced the utilisation of forest residues.

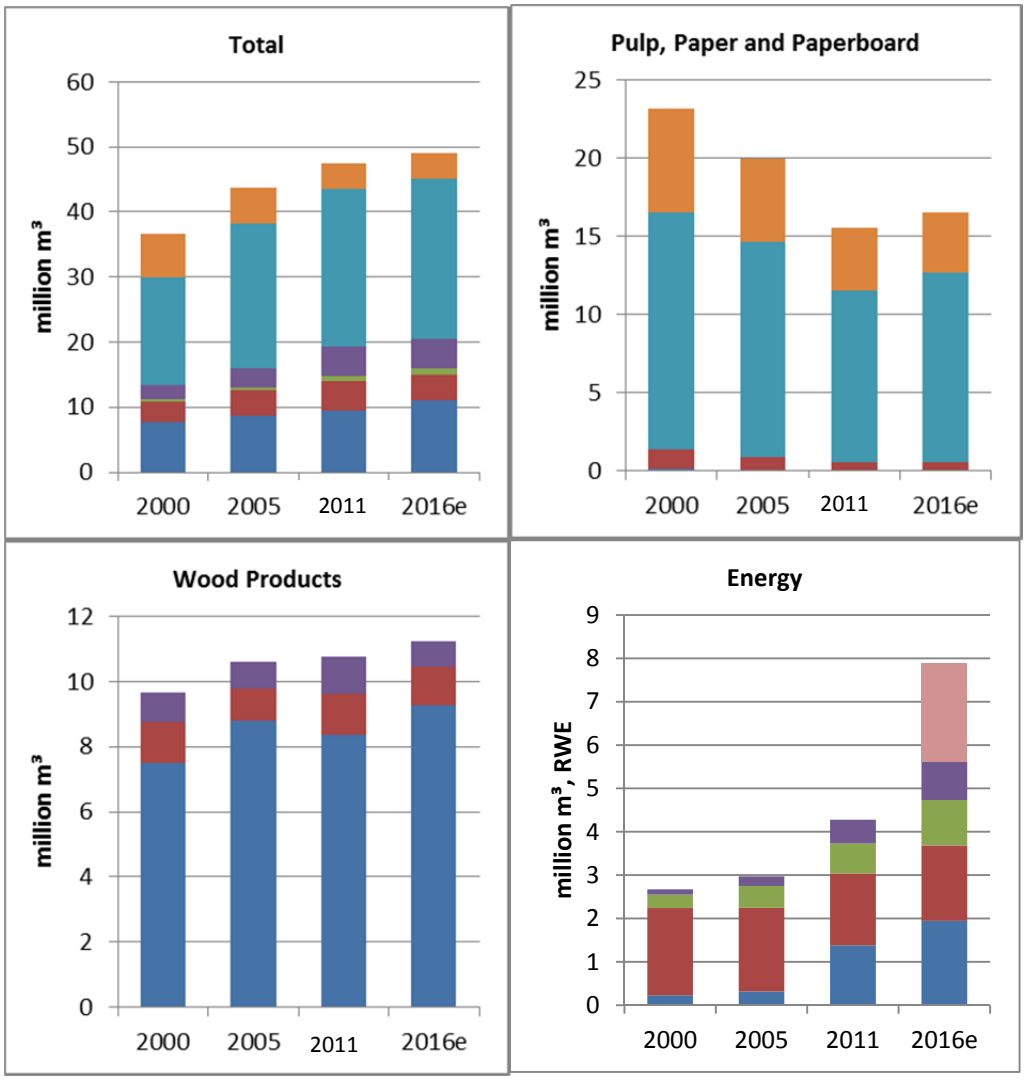
Wood products industry's wood utilisation has increased slightly during the 2000s and reached 11 million m^3 in 2011. Roundwood has the 78% share of the raw material base, rest is industrial residues and recovered wood (about 10% each).

Energy sectors use has increased considerably, from 3 million m^3 in 2000 to 6 million m^3 in 2011.

Roundwood is used mostly by the wood products industry. Industrial residues are used in the energy sector and by the wood products industry. The pulp and paper industry is mainly using recovered paper, but also some imported pulp. The use of recovered wood has increased due to the use of energy sector, but the wood product industry is still the largest user. As the recovered paper collection has increased rapidly, but use by the pulp and paper industry has decreased, the recovered paper exports have been increasing rapidly (Figure 8.17).

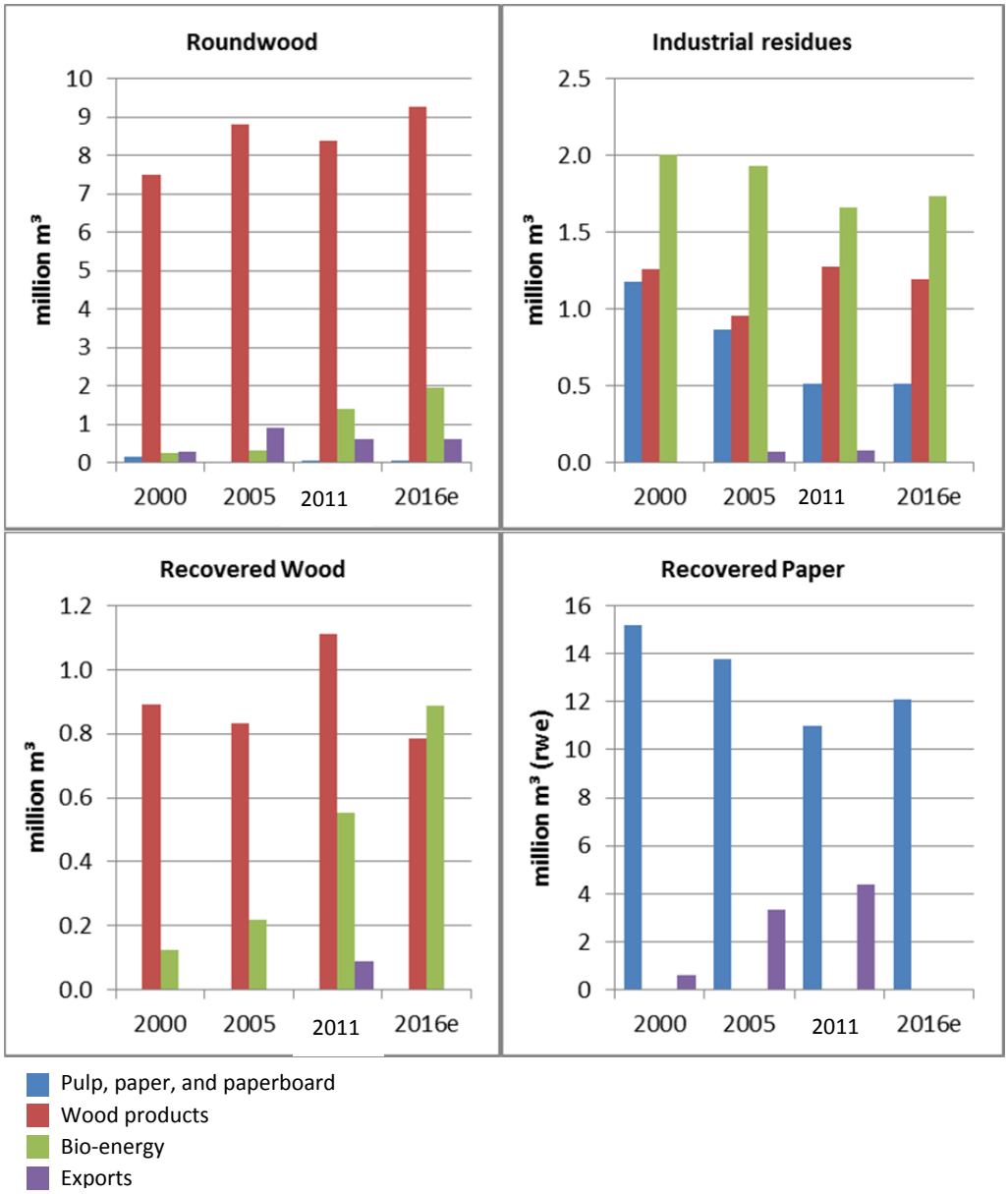
In the UK, there is an on-going debate on the use of wood fibres. The wood industry is afraid that the government energy subsidies are distorting the wood market. On the other hand, there are the UK Government's climate change and renewable energy engagements, which oblige the Government to invest in increased use of renewable energy sources.

Figure 8.16 Use of raw material by sector in the United Kingdom



Source: Indufor

Figure 8.17 Use of raw material by type in the United Kingdom



Source: Indufor

8.6.4 Possibilities on increasing the supply of wood

The UK government's priorities lie in the energy policy. The bio-energy subsidies have an effect on the wood biomass demand and wood prices, as the energy companies and wood industry compete for the same resources. With subsidies, the energy companies can pay more for their wood than the traditional wood industries.

The raw material sourcing of the planned wood energy plants is mainly based on imports. The plans are that starting in 2012, the imports of wood chips and pellets for new wood energy plants could rapidly rise to about 27 million tonnes of wood fibre per

annum. If this quantity could be secured in the form of long term supply contracts, it would imply an almost doubling of the present world trade in wood chips and pellets. It must be born in mind, however, that there will be international competition for the global wood fibre sources, as many other countries are in a similar situation with their bio-energy objectives.

Promotion of increased short rotation coppice (SRC) production has not been very successful. The required change from traditional agricultural practices is not easy for farmers. Income creation of SRC has been uncertain due to the initial stages of the biomass energy sector, and rotation time which is longer than with agricultural produce. In addition, the CAP area-based agricultural support will be lost if a farmer turns his fields into forestry coppice, further reducing the attractiveness of SRC production. In England, the Energy Crops Scheme provides grants for establishing short rotation coppice and miscanthus in appropriate locations. The scheme is part of the Rural Development Programme for England (RDPE). The rate of grant paid is 50% of all eligible establishment costs incurred.

The harvesting of softwood forest residues is likely to increase significantly over the next years. The total amount could reach about 300 000 tonnes per annum by 2014 which will be a useful new potential additional source of wood fibre for wood energy plants, but the potential of sites to provide further wood fibre for wood energy from brash and stumps will be limited in practice by environmental constraints such as ground damage, soil carbon loss, loss of soil fertility and acidification.

The future supply of feedstock for the biomass energy sector comprises of:

- Imported solid bio-feedstocks (i.e. woody type biomass and agricultural residues).
- There can be a considerable increase in availability of biomass internationally between 2011 and 2030, due to the potential planting of energy crops.
- Key areas for imported solid biomass are: the EU, Eurasia and the other non-EU countries, and North and South America. China could be a large net exporter by 2030 if it plants energy crops.
- The availability of sustainable global biofuels is considerably lower than that of solid feedstocks.

The UK is facing a real challenge in filling the woody biomass raw material/feedstock gap in the near future. The planned import quantities may be too optimistic in view of the limited global markets and increasing international demand of wood chips. Increased international demand for biomass energy may cause changes in other countries' land use (e.g. by removing land from food production), and the other biomass energy sources are smaller than expected.

Using energy more efficiently is the fastest and most cost effective way of cutting carbon dioxide emissions. Carbon emissions can be reduced by improving energy efficiency at all levels (in housing and transports) while increasing the share of biomass energy. New, alternatives sources for biomass energy (e.g. landfill and sewage gas) should be looked at, although their role may be over-estimated. Development of other renewable energies must be also continued.

8.7 Conclusions on EU country case studies

8.7.1 General

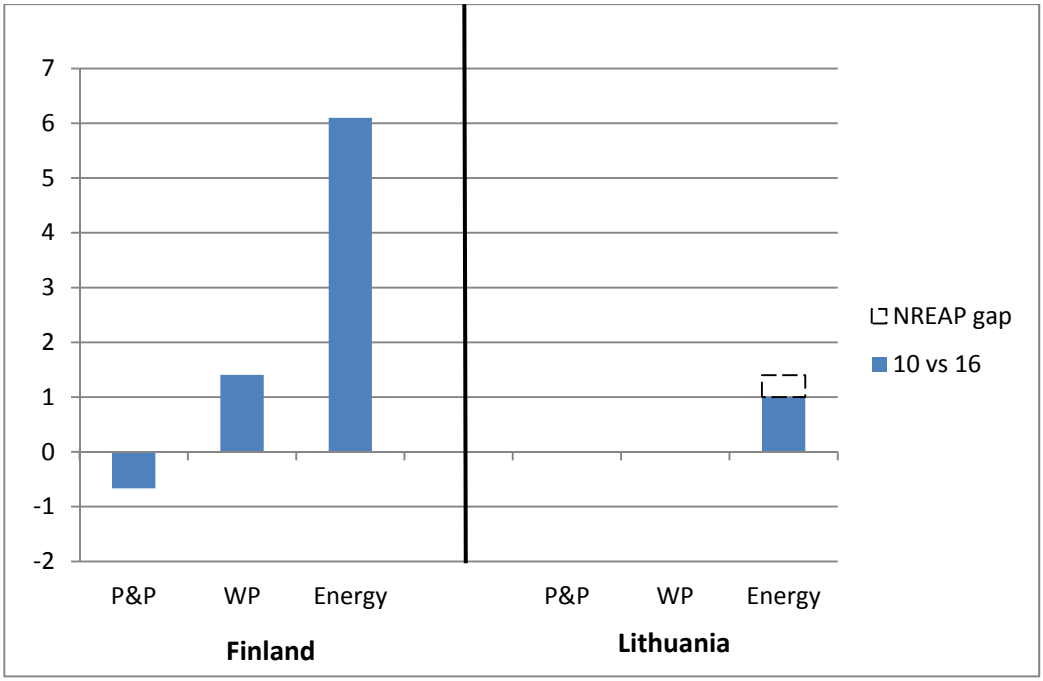
There is an increasing demand for natural resources in general and renewable natural resources in particular. Therefore, there is also an increasing demand for wood which is emphasised by the efforts to utilise biomass as renewable energy.

The inter-relationships between the different wood using sectors have traditionally been in balance within a specific country. However, this is changing with the major energy producers reaching for pulpwood sector especially in areas with lesser use for pulpwood. Also pulp and paper as well as woodworking industry companies have started to act as biomass suppliers to the bio-energy sector. In addition, the future plans for biodiesel plants are based on the new raw materials, e.g. pulpwood, due to the substantial volumes of biomass needed on their production.

In Finland, the total wood raw material use is forecast to increase by almost 7 million m^3 by 2016 of which a great majority (ca. 6 million m^3) is expected to occur within the bio-energy sector. Use in wood product industry is expected to grow gradually towards 2016 whereas to decrease marginally in pulp and paper industry.

In Lithuania the use of wood based raw materials is expected to increase by 2 million m^3 with local bio-energy sector expected to represent approximately 80% of this growth. In addition, NREAP targets set by the local governments indicate about 0.4 million m^3 (RWE) deficit of domestic wood raw material requiring imports outside the country.

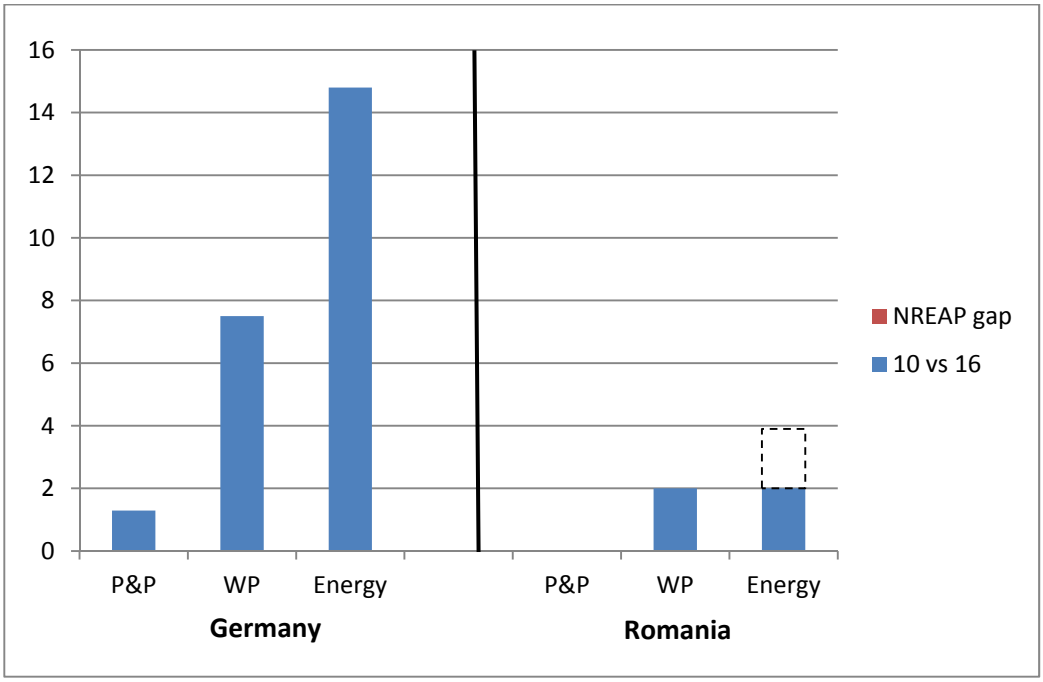
Figure 8.18 Change in total wood raw material use in Finland and Lithuania



The total wood raw material use is forecast to increase significantly in Germany. Volumes are expected to grow the most in the local bio-energy sector but also in the wood product industry, namely in extra-EU driven sawmilling industry. Unlike in Finland and Lithuania, German pulp and paper industry is expected to increase its overall wood raw material use, even rather marginally (+1.3 million m^3) by 2016.

In Romania, the use of wood raw material is expected to increase at rather similar pace (around 2 million m^3) in local wood product as well as bio-energy sector. In addition, NREAP targets set by the local governments indicate almost 2 million m^3 (RWE) deficit of domestic wood raw material requiring imports outside the country.

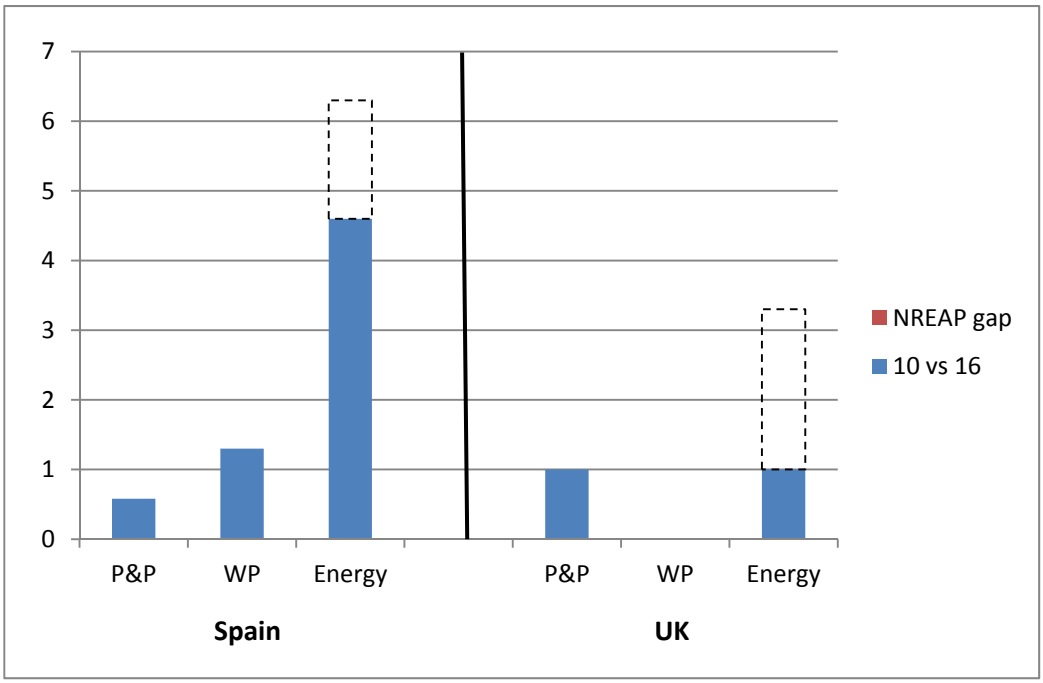
Figure 8.19 Change in total wood raw material use in Germany and Romania



Spanish energy sector is expected to lead the increasing wood raw material use in the country towards 2016. The growth is forecast to amount approximately 4.5 million m^3 (RWE) which, however, would not be enough (ca. -1.7 million m^3 RWE deficit) to meet the national NREAP targets for domestic raw material sources.

Like in Romania, UK pulp and paper industry and local bio-energy sector are forecast to increase their total wood raw material use by rather similar volume (ca. 1 million m^3 RWE) by 2016. The UK is also the only EU country case country where domestic wood raw material availability is expected to be smaller than wood raw material deficit regards the national NREAP target in 2016.

Figure 8.20 Change in total wood raw material use in Spain and the UK



In Spain, Germany, and the UK, the responsibility of the forest policy is largely on the regional instead of national level.

The uncertainty in the Eurozone affects business confidence negatively in the entire EU for the time being. Among the country case studies carried out, this is most clearly true in Spain, but all countries are affected. The future of the industrial use of wood as well as that of the use for bio-energy can change substantially hand in hand with the changes in political climate.

8.7.2 Organisations and co-operation

World-wide most of the forests are state owned. In the EU, however, private family forestry is very common. Compared to state owned forests it is evident that the size of private forest holdings is fairly small. There are historical reasons for this, and well-managed private holdings are a cornerstone for the forest sector in many EU Member States. Compared to private forest holdings in non-EU countries the private forests in the EU are not small per see, the difference is that private forests play such a huge importance for the wood sourcing in the EU. However, small-scale privately owned forest estates hold currently a large unused roundwood potential. In many of the new EU countries the restitution of former private land back to the old owners has also had an effect on the average size of the forest holdings.

Increasing the willingness of small scale forest owners to manage their forests more intensively and sell roundwood is crucial in releasing this potential. Thus, it is important to encourage the small scale forest owners to networking and discussion about the use of their forests.

Often the small-scale forestry is not very profitable, and therefore the forests are often unmanaged. Policies exist to support the forming of forest owners associations or cooperatives and in some countries subsidies are given only to organised forest owners.

The image of the forest sector as a place of work and the status of forest workers is low. In Spain and Lithuania in particular, the lack of formal education for forest workers is one of the reasons for lower productivity in forestry and this problem appears to be widespread. There is no or little education for professional loggers or other personnel in harvesting and transportation. This clearly affects the productivity of the forestry operations and partially prevents the adoption of modern harvesting methods. In Spain, steps are taken to create a Forest Worker Professional Card.

8.7.3 Policies on infrastructure and forestry

Intensified forest management is a necessity in order to produce enough biomass in the future. Earlier efforts to produce more wood (e.g. large planting projects in the UK, forest drainage in Finland) have had an immense impact in the annual increment and for the possibilities to utilise the forest resources today. In some cases forest management activities have been considered “old-fashioned” and efforts have been cut down. For instance, in the UK a major drop in annual increment in the near future is expected due to the greatly reduced planting activities in the 1990s. Tree breeding, fertilisation, thinning, and shorter rotation cycles are other important means to increase the amount of wood.

Mobilising of wood is very much dependent on existing infrastructure and well-functioning transport. Government support for building of a forest road benefits the mobilisation of wood for both bio-energy and traditional industrial use. In some countries, support is also given through subsidies for transport or for fuel used by trucks in professional use. One factor is also the size of trucks; in Finland bigger trucks are allowed for primary transport of raw materials to mills, whereas Spain has national limitations which are lower than the EU norm. The truck size naturally affects the price of transportation. Improved logistic planning can diminish the cost of transport of wood for all users of wood and biomass.

One way of mobilising more wood in some countries, such as Lithuania and Romania, could be to add more options and freedom in the forest management practices to allow more flexibility for the forest owner in the decision-making process. Nowadays citizens are in many cases given more freedom and options than before. The same should be applied to forest owners and this could increase the use of the forests if new and earlier passive forest owners are activated because they have more freedom to manage the forests according to their own requirements. Naturally some minimum requirements need to be kept in legislation.

8.7.4 Use of biomass for energy

Roundwood is the dominating wood raw material type used in bio-energy sector especially in the UK, Lithuania and Romania as countries have no significant pulp and paper industry to produce black liquor. Roundwood is the most used wood raw material type also in Germany but with a clearly lower share in comparison to Lithuania and Romania.

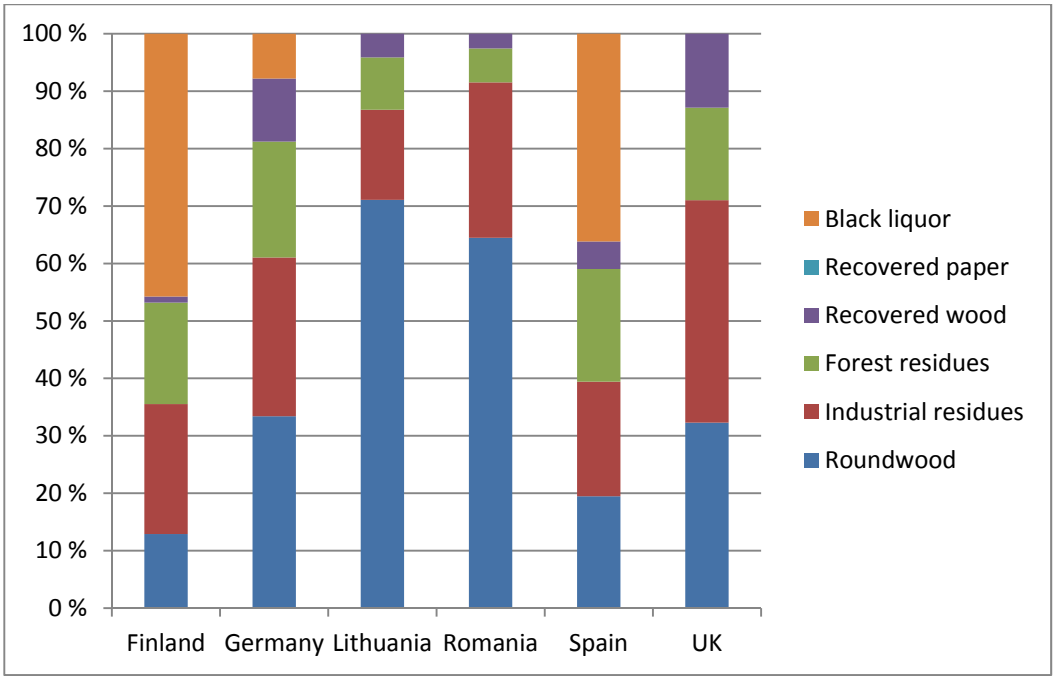
Industrial residues dominate the wood use in the UK bio-energy sector and have a significant role also in Finland, Germany and Romania being the second most common wood raw material type used.

In 2011, forest residues had approximately 20% share of the total wood raw material use in Finland, Germany, Spain and the UK but less than 10% share in Lithuania and Romania.

The use of recovered wood in the bio-energy sector was relatively the highest in the UK and Germany, 13% and 11%, respectively. The use is much less (below 5%) in Spain, Lithuania and Romania and only marginal in Finland.

Black liquor is the dominant wood raw material type (in RWE) in Finnish (ca. 46%) and Spanish (36%) bio-energy industries. In Germany, the share was about 8% in 2011. Due to the non-existing domestic pulp production black liquor was not used in bio-energy industries in Lithuania, Romania or the UK.

Figure 8.21 Use of wood raw material by type in the bio-energy sector in the 6 country case countries in 2011



Reoccurring changes in government policies to support renewable energy is seen as a problem for the ones who want to increase the use of bio-energy, for the forest sector, as well as for the society in general. In the country case studies, either concerns regarding the firmness of existing subsidies or uncertainty regarding planned incentives have affected investments negatively.

In Europe, the use of wood for energy mainly competes with the use for wood-based panels i.e. mainly industrial residues. The production of fibreboards and particleboard has already been affected. Supporting the energy use of wood has increasingly boosted the price for the raw material and thus strained the availability of wood raw materials of the wood-based panel industries.

In Finland, the overall use of industrial residues decreased by approximately 3.7 million m^3 between 2000 and 2011. This was mostly due to the decreased sawnwood production. Majority of this drop (ca. 3 million m^3) occurred in pulp and paper industry but the use decreased also in the bio-energy sector.

However, the overall use of industrial residues is expected to increase towards 2016 and total around 21 million m^3. As the construction activity followed by sawnwood production is expected to increase. A majority of the increase in consumption (ca. 1.8 million m^3) is forecast to occur in the pulp and paper industry but also in the bio-energy sector resulting in a higher consumption level (ca. 10.3 million m^3) than seen earlier.

The overall use of industrial residues in Lithuania is at rather low level, only about 1.1 million m^3 in 2011, in comparison to for example Finland. Local wood-based panel industry and bio-energy sector are the major users with the latter forecast to increase its use slightly towards 2016.

In Germany the use of industrial residues in bio-energy sector amounted to over 16 million m^3 in 2011 exceeding the volume used in wood product sector. The use within the bio-energy sector is forecast to increase by about 3 million m^3 by 2016 whereas pulp and paper and wood product sectors are forecast to witness declining volumes in their consumptions.

Bio-energy sector used approximately two thirds of the overall industrial residue use (ca. 1.7 million m^3) in Romania in 2000. The use in the sector exceeded 1.5 million m^3 in 2011 but its relative share of the overall use decreased approximately 42% as local wood product industry increased its use by about 1.1 million m^3 during the ten year period.

Both the wood product sector as well as the bio-energy sector are expected to increase their use of industrial residues by 2016 and use rather equal volumes of the forecast overall volume (3.3 million m^3).

In Spain, wood product (49%) and bio-energy (42%) sectors dominated the use of industrial residues in 2011. The use within the wood product sector decreased by about 0.8 million m^3 during the next ten years and as the use within the bio-energy sector remained almost unchanged, the consumption level (ca. 2.5 million m^3) of the latter exceeded the level of wood product industry (ca. 2.3 million m^3).

Spanish bio-energy sector is forecast to increased (0.9 million m^3) its use of industrial residues further by 2016 whereas use in wood product sector to decrease slightly.

Despite the declined consumption volume (0.3 million m^3), UK bio-energy sector increased its dominant share (45% versus 50%) of the overall industrial residue use between 2000 and 2011. The use within the local wood product industry remained almost unchanged during the last decade but relative share of the total use increased from 28% in 2000 to 36% in 2011 as the use within the pulp and paper industry dropped significantly (0.7 million m^3). The total use of industrial residues in 2016 is forecast to remain almost unchanged with bio-energy sector to increase its use marginally.

Energy sector is basically the sole user of forest residues in the EU. Among the 6 case countries, the use grew the most (about 6 million m^3) in Finland between 2000 and 2011 but that level was still clearly lower than in Germany where the use increased from approximately 8 million m^3 to almost 12 million m^3 during the same time period.

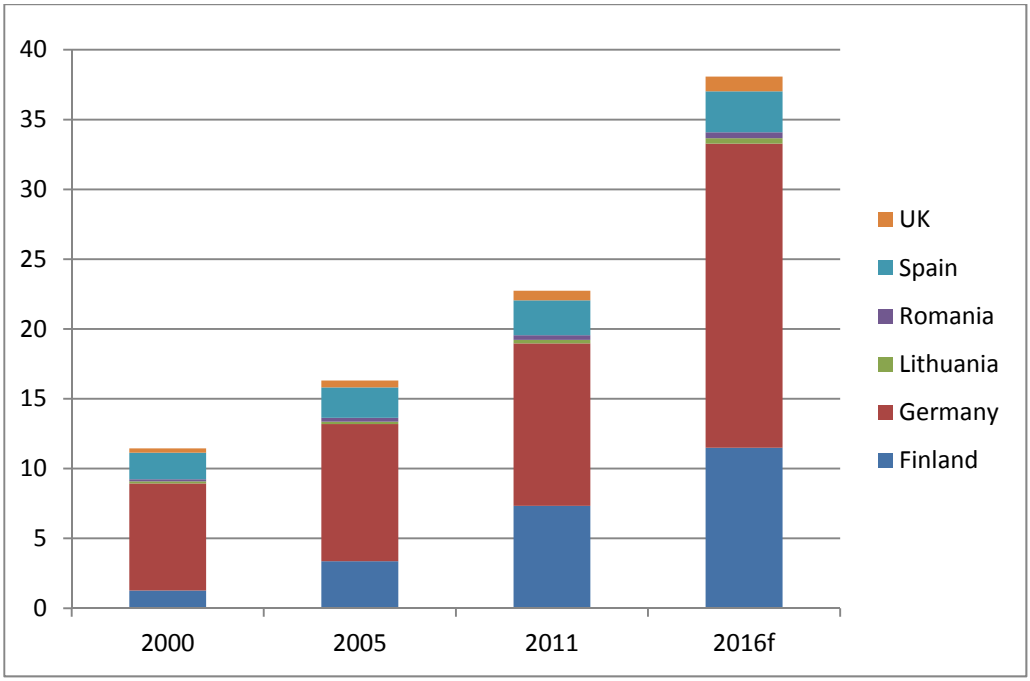
The use of forest residues within the bio-energy sector has been rather limited in Lithuania and Romania (0.2 and 0.3 million m^3 in 2011, respectively) and only slightly higher in the UK (0.7 million m^3 in 2011).

By 2016, the use of forest residues is expected to grow the most (ca. 10 million m^3) in Germany but also Finland is expected to show clearly higher (+4 million m^3) consumption level.

The use is forecast to increase also in Spain and the UK but at much slower pace (approximately 0.4 million m^3 in both countries).

The use of forest residues is expected to amount to approximately 0.4 million m^3 in both Lithuania and Romania by 2016 indicating very minor volume increase.

Figure 8.22 Use of forest residues in the 6 EU case countries

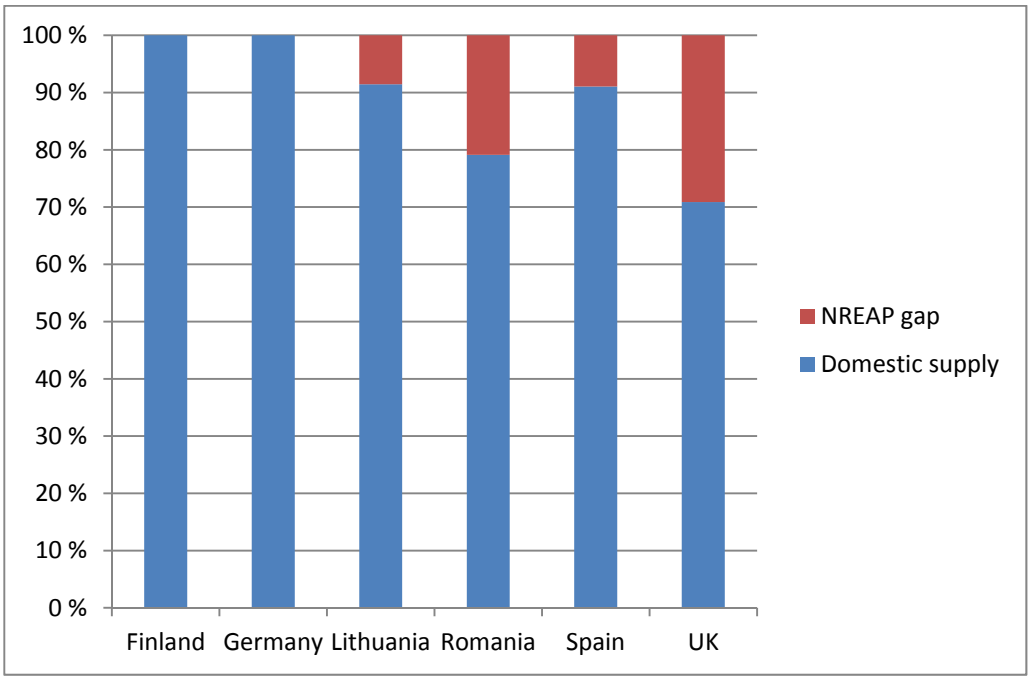


Despite the increasing use of wood raw material in the bio-energy sector in all of the 6 country case countries, only Finland and Germany are expected to be able to meet the NREAP target levels set by them for 2016.

Situation in Finland (19 million m^3 RWE or 46% of total bio-energy sector's wood raw material use in 2011) and Spain (5 million m^3 RWE or 36%) but also somewhat in Germany (4.5 million m^3 RWE or 8%) is affected by the massive use of black liquor. The significant use of roundwood (ca. 19 million m^3) is notable in Germany. Germany and Finland are also forerunners in the use of forest residues in the bio-energy sector.

Lithuania and Spain are forecast to be approximately 10% short of their national NREAP targets based on domestic wood raw material sources in 2016. In Romania the gap is expected to be around 20% and almost 30% in the UK.

Figure 8.23 Domestic wood raw material supply to bio-energy vs. NREAP target gap in the 6 EU country case countries



8.7.5 Protective measures and public opinion

Rampant forest fires are a problem in some EU countries. An increased use of the biomass for bio-energy would clean the forests from litter that might burn easily and aggravate forest fires.

Environmental regulations and increased administrative burden for e.g. Natura 2000 is seen as an obstacle to use the forests for economic purposes in some cases. For instance in Spain, 46% of the wooded land is included in the Natura Network 2000.

Public opinion and the public values of forests are increasingly related to recreation and protection, which may be a restricting factor in wood production. In studies carried out in 2011 in the UK, the role of trees in removal of carbon dioxide from the atmosphere and storing it in the wood was recognised (73% of respondents), but then 52% agreed with the statement “Cutting down forests and woodlands makes climate change worse, even if they are replanted”.

Hardwoods, mainly beech have traditionally been an important raw material for the manufacturing of high quality furniture, parquet flooring and kitchens. Small and medium size joinery, carpentry and furniture manufacturers are dependent of a continuous and regional supply of beech wood. Intensifying protective measures in beech forests (especially in Romania and Germany) is likely to hamper the supply of hardwood sawlogs for the sawmilling industry.

8.7.6 Other measures

Recovered paper is utilised well in most of the EU countries, but can still be increased in some countries that most recently joined the EU, especially as their paper

consumption increases. Recovered paper prices fluctuate according to pulp and paper industry price cycles and they are closely related to with other pulp and paper industry determinants. The increasing Asian demand for recovered paper tightens the global supply-demand balance. It can be expected that in real terms the recovered paper prices will increase.

Recovered wood is important for the users of wood in many countries, such as the UK and Germany). Traditionally the wood-based panel sector has been the major consumer and the ones who have developed the recovered wood supply chain. In other countries (Lithuania, Romania, and Finland), there are still possibilities to increase the recovery and re-use of wood. The EU waste directive, the EU targets for renewable energy, the increased cost for landfills (which is a direct result of the EU waste directive), as well as an emerging market value for recovered wood are all likely to increase the use of recovered wood.

The EU-27 was a net importer of industrial roundwood during the last decade. According to Eurostat, the total import volume of roundwood outside the EU-27 area reached to 11.6 million m^3 in 2011 whereas exports amounted to about 6.7 million cubic metres.

Import of roundwood is already important for some countries (the UK, Spain and Finland) and much of the future use of biomass for energy builds on a scenario where a significant share of this amount is imported (especially in the UK). In Spain the roundwood import has doubled in the last fifteen years.

8.8 Main Issues on EU country case studies

- Roundwood is the dominating wood raw material type used in the bio-energy sector, especially in Lithuania and Romania. Industrial residues dominate the wood use in the UK bio-energy sector and have a significant role also in Finland. Forest residues have a share of about 20% of the total wood raw material use in Finland, Germany, Spain and the UK but less than 10% in Lithuania and Romania.

- The use of recovered wood for bio-energy was relatively the highest in the UK and Germany, 13% and 11%, respectively, much less in Spain, Lithuania and Romania and only marginal in Finland.

- Black liquor is the main wood material type in Finnish (46%) and Spanish (36%) bio-energy industries, in Germany the share was 8%. Black liquor was not used in Lithuania, Romania or the UK.

- Reoccurring changes in government policies to support renewable energy is seen as a problem. In the country case studies, either concerns regarding the firmness of existing subsidies or uncertainty regarding planned incentives have affected investments negatively.

- In Europe, the use of wood for energy competes mainly with the use for wood-based panels i.e. mainly industrial residues. The production of fibreboards and particleboard has already been affected. Supporting the energy use of wood has increased the price for the raw wood.

- Environmental regulations and increased administrative burden are seen as an obstacle to use the forests for economic purposes in some cases. For

instance in Spain, 46% of the wooded land is included in the Natura Network 2000 and in Romania and Germany intensifying protective measures in beech forests is likely to hamper the supply of hardwood sawlogs for the sawmilling industry and for the production of high quality furniture, parquet and kitchens, especially for SME manufacturers.

- Recovered paper is utilised well in most of the EU countries, but can still be increased in some countries that most recently joined the EU, especially as their paper consumption is set to increase.

- Recovered wood is important in many countries, such as the UK and Germany. Traditionally the wood-based panel sector has been the major consumer and the ones who have developed the recovered wood supply chain. In other countries, efforts need still to be taken to increase the recovery of wood.

- Import of roundwood is already important for some countries (the UK, Spain and Finland) and much of the future use of biomass for energy builds on a scenario where a significant amount is imported (especially in the UK). In Spain the roundwood import has doubled in the last fifteen years.

- The inter-relationships between the different wood using sectors have traditionally been in balance within a specific country. However, this balanced situation is changing with the major energy producers reaching for more wood. Also pulp and paper as well as woodworking industry companies have started to act as biomass suppliers to the bio-energy sector. In addition, the future plans for biodiesel plants are based on substantial volumes of biomass, among others wood.

- To increase the willingness of small scale forest owners to manage their forests more intensively and sell roundwood is crucial. Policies have to be in place to support the forming of forest owners associations or cooperatives. In some countries subsidies are given only to organised forest owners.

- The image of the forest sector and the status of forest workers is low. In some countries, the lack of specialised training for forest workers is one of the reasons for lower productivity in forestry.

- Intensified forest management is a necessity in order to produce enough biomass in the future. Earlier efforts, in several countries, to produce more wood have had an immense impact on the annual increment.

- Mobilising of wood is very much dependent on the existing infrastructure and well-functioning transport. Government support for building of forest roads benefits the mobilisation of wood for both bio-energy and traditional industrial use. Also the size of trucks affects the price of transport. Improved logistic planning can diminish the cost of wood transport for all users of biomass.

- In some Member States, one way of mobilising more wood could be to add more options and freedom in the forest management practices to allow more flexibility for the forest owner in the decision-making process. Naturally some minimum requirements need to be kept in legislation.

9. CONCLUSIONS AND RECOMMENDATIONS

A. General conclusions

EU forests and other sources of wood raw materials

The EU forest resources cover 178 M ha or 41% of the Union's land surface. In terms of tree species, stocking rates, wood quality, bio-diversity, public amenity and – not least – ownership, forests vary greatly across the EU, both between and within the member states. These differences have direct and indirect effects on patterns of wood availability, its processing and use. In this context, this study has confirmed the validity of the regional breakdown of EU Member States suggested in its terms of reference and offer, namely into:

A: net exporters: Austria, the Czech Republic, Estonia, ***Finland***, Latvia, ***Lithuania***, Portugal, Slovakia, Slovenia, Sweden

B: traders: Bulgaria, Cyprus, France, ***Germany***, Hungary, Italy, Luxembourg, Poland, ***Romania***

C: net importers: Belgium, Denmark, Greece, Ireland, Malta, the Netherlands, Spain, ***the United Kingdom***

(NB the countries in italics were the subject of in-depth case studies)

The table below gives some indicative features for the groups of countries used in this study and indeed reconfirms that there are differences within the EU.

Table 9.1 Some indicators for the country groups used in this study

	Total amount (appr.)	Group A, share of EU total, %	Group B share of EU total, %	Group C share of EU total, %
Population, million	499,2	12 %	57 %	31 %
Forest area	178 million ha	43%	34 %	23%
Forests with legal or environmental restrictions	45 million ha	41%	39 %	20 %
Removal of industrial wood	454 million m^3	54 %	36 %	10 %
Forest residues	35 million m^3	57 %	40 %	3 %
Production of sawnwood	93 million m^3	51 %	40 %	9 %
Production of particle board	31 million m^3	19 %	62 %	19 %
Paper and paperboard production	95 million tonnes	33 %	48 %	19 %

It should be noted that the level of forest having restrictions is disproportionately high in Region B and disproportionately low in Region C, especially when taking into account the relatively low percentage of forest cover in the latter.

Conversely, the high levels of particleboard production and paper production in Region B is entirely in keeping with its high levels of both wood and paper residues.

EU Wood supplies

Internal (EU domestic) wood supplies

Roundwood and wood-based residues

According to estimates[90] the theoretical biomass potential from European forests in 2011 was around 1 300 million cubic metres per year, including bark. This potential is based on the average volume of wood harvestable over a 50 year period, taking into account the increment, age structure, stocking level and harvesting losses. The total biomass estimate consisted of stem wood, logging residues, stumps and other biomass such as wood from pre-commercial thinning.

While all of the forest area is theoretically available for wood harvesting, only 75 % is potentially fully available without legal restrictions. For example in the EU, 20.4 million hectares are protected for environmental reasons, such as Natura2000 areas and other forest reserves. Over the remaining area (25 %), there are several limitations, like legal and ecological restrictions. Even within the available forest area, ownership structure and the goals of the forest owner, as well as economic and technical restrictions, reduce the real level of wood which is harvestable. For example in the EU, 20.4 million hectares are protected for environmental reasons, such as Natura2000 areas and other forest reserves.

According to Eurostat, in 2011, out of a total EU forest harvest of 428 M m³, some 338 M m³ was industrial roundwood, of which 5 M m³ were exported outside the EU. The remainder, together with net imports of 12 M m³, comprised 345 M m³. Thus, domestically grown industrial wood formed about 97 % of the roundwood entering the EU's industrial wood-processing chain. The rest of the EU-grown roundwood (90 M m³) was fuelwood. The overall EU total of roundwood was therefore 435 M m³. Since wood harvests and utilisation vary from year to year, and some differences arise between measuring wood "over bark" or "under bark", harvested wood volumes do not always correlate exactly with the recorded roundwood intake of the wood-using industries. Thus an adjustment has been made to allow for such inconsistencies, resulting in a figure of 357 M m³ of industrial roundwood being delivered to EU wood-processing industries for the period 2010/11. Based on this and together with forest residues, industrial processing residues, recovered wood and recovered paper, a total EU wood-based raw material input volume for both wood-processing industries and bio-energy has been calculated by Indufor for 2010/11 at 942 M m³ of roundwood equivalent (RWE), of which 454 M m³ were roundwood.

Since this total of "roundwood equivalent" used overall is much greater than the amount of actual fresh wood (roundwood + forest residues), it is clear that there is already a partial "cascade" use of wood from the main roundwood supply – the EU forests – downstream through the wood-processing industries, including re-use and recycling, to final disposal (by land-filling or energy recovery). Cascade factors[91] are shown in the tables below. Sawmills take in large industrial roundwood (sawlogs) and, in producing sawn timber used in construction and other uses, also create the flow of by-products (slabs, chips, sawdust, etc.) which can be used in downstream wood-processing industries, such as wood-based panels manufacture and pulping, as well

[90] Verkerk, H.; Lindner, M.; Anttila, P. and Asikainen A. 2010: The realistic supply of biomass from forests. pp. 56-79. in: EUwood – Final report. Hamburg/Germany, June 2010. 160 p.

[91] NB cascade factors in the context of wood supply and use were first developed by Prof. Udo Mantau of Hamburg University

as for producing bio-energy, either directly or indirectly. Thus to some extent, sawmills act as a "priming pump" for subsequent wood flows.

Thus, the physical availability of harvestable sawnwood to sawmills largely determines the scope of the availability to the whole set of downstream wood flows. If this availability is restricted by limitations on harvesting or by price, sawmills cannot buy so much, so less wood will flow downstream. Over the last decade, the increasing reluctance of forest owners to sell wood – at times even being counter-intuitive by not selling when prices are high, has contributed to making EU sawlogs the world's most expensive. In this context, competition for those sawlogs which are available has been added to by buyers from outside the Union being able to compete under conditions which are advantageous for them. For example, a significant EU sawlog export trade has grown up to Asia, aided by more or less free transport being available in the guise of empty containers making up their back-loads after delivering manufactured goods to the EU. However, examination of this phenomenon based on the limited price data so far available is inconclusive as to the extent to which either the quantities involved and/or their prices are instrumental in causing price changes in the EU internal market for sawlogs. Thus, further detailed work is needed in this area to try to establish cause and effect.

The cascade factor[92] based on the ratio between the total roundwood equivalent and roundwood only indicates the extent to which that roundwood has its use multiplied throughout the various value chains, bearing in mind that some end uses, such as sawmilling and plywood, can only use roundwood. Conversely, the cascade factor based on the ratio of the total wood raw material supply to that of all fresh wood (roundwood + forest residues) indicates the extent to which all the wood-based raw material coming directly from the forest (and other wooded land, parks, etc.) has its use multiplied throughout the various value chains, without special regard as to the limited substitutability of particular wood categories between end uses. (See Table 9.2 below).

This means an overall EU "cascade factor" (Σ RWE/roundwood) of 2.07, resulting from the fact that industrial processing residues, recovered wood, recovered paper and black liquor are all ultimately derived from processing roundwood before forming the inputs to other intermediate wood-based materials or end uses.

By 2016, the total wood input is forecast to increase to 1040 M m³ RWE, of which roundwood will comprise 495 M m³, thus the "cascade factor" will be 2.10, given the lower volume of roundwood (- 7 M m³) that is foreseen to be used by the pulp & paper industries but the significantly higher volumes forecast for both the wood products industry (+ 27 M m³) and the bio-energy sector (+ 21 M m³).

If the cascade factor is calculated as (Σ RWE/(roundwood + forest residues) to show the full potential of the forest production the factor is 1.88 and will sink to 1.83 by 2016 because of the increased use of forest residues, especially by the bio-energy sector.

[92] A simple "cascade factor" is the ratio between the total wood raw material supply, expressed as "roundwood equivalent" (RWE), and the fraction of it which is "roundwood" (from the forest and other wooded land, parks, etc.) It indicates the extent to which that roundwood has its use multiplied throughout the various value chains. A total cascade factor is the ratio of the total wood raw material supply (RWE) to all fresh wood (roundwood + forest residues) has its use multiplied throughout the various value chains

Table 9.2 EU wood cascade factors by end uses and their trends 2000-2016

End use	Wood raw material type	Use in 2000	Change 2000 - 2005	Use in 2005	Change 2005 – 2010/ 2011	Use in 2010/ 2011	Change 2010 2016	Use in 2016
Wood products	Round-wood	244.8	35.5	280.3	-18.6	261.7	26.9	288.6
	Forest residues							
	Industrial residues	22.1	21.5	43.7	-3.4	40.3	-1.1	39.2
	Recovered wood	3.9	-0.5	3.5	2.5	6.0	-1.1	4.9
Sub-total		270.9	56.5	327.4	-19.5	307.9	24.7	332.6
Pulp & paper	Round-wood	88.9	10.9	99.8	-4.4	95.4	-6.8	88.6
	Forest residues							
	Industrial residues	53.9	-5.0	48.9	-1.4	47.5	-1.8	45.7
	Recovered paper	120.2	19	139.2	5.5	144.7	12.4	157.2
	Imported pulp	52.8	1.9	54.6	-1.5	53.2	2.1	55.2
Sub-total		315.8	26.8	342.6	-1.7	340.8	5.9	346.8
Bio-energy	Round-wood	73.4	8.0	81.4	15.4	96.8	21.0	117.8
	Forest residues	25.0	8.6	33.6	12.6	46.1	26.1	72.2
	Industrial residues	58.5	12.7	71.2	13.7	84.9	16.6	101.5
	Recovered wood	6.6	3.1	9.7	4.0	13.7	4.1	17.8
	Black liquor	48.3	4.9	53.2	-1.4	51.8	-1.2	50.5
Sub-total		211.7	37.3	249.0	44.2	293.2	66.6	359.8
Grand total		798.4		919.0		941.9		1039.2
Cascade factor (ΣRWE/roundwood)		1.96		1.99		2.07		2.10
Cascade factor (Σ RWE/ (roundwood + forest residues)		1.85		1.86		1.88		1.83

In addition the cascade factors for the three different regions were calculated. They clearly show the huge differences in the raw material bases, including bio-energy, between the regions.

Table 9.3 Additional results on cascade factor (including bio-energy) in the different country groups 2010/2011

	Group A	Group B	Group C
Cascade factor (ΣRWE/roundwood)	1.73	2.29	3.08
Cascade factor (Σ RWE/ (roundwood + forest residues)	1.58	2.06	2.81

Wood from outside the forest

Other trees from other wooded land, parks, gardens, road-sides, landscaping, etc., could provide up to an additional 19 M m³. One other possible significant raw material source for the wood-processing industries and/or bio-energy is vineyard clippings, and prunings from fruit trees in commercial orchards. Currently, these are used mainly as an energy source and, although it is difficult to grasp the overall extent of this resource and the possibilities to increase its use across the EU as a whole, in Spain it is estimated that 14 M m³ are available annually. However, figures for these additional

wood sources are not currently included in the official EU statistics for wood supply and hence not in the above calculations.

Sawlog exports

The EU is a small but increasingly significant exporter of sawlogs, especially hardwoods. Since 2000, the EU-27 has gradually increased its overall sawnwood net export volume which currently exceeds 10 million m³. Whilst this is bearable volumetrically, there are likely effects on domestic sawlog prices and possibly on market cycles, with a knock-on effect on the EU sawmilling industry, which is at the top of the EU wood "cascade".

Purpose-grow wood biomass energy crops

The potential for purpose-grown energy biomass crops on agricultural land is difficult to estimate, given uncertainties about land status (agricultural versus forest land) in a number of member states. However, a conservative estimate would be 1 M m³.

Recovered wood

This study forecasts that fairly little more post-consumer or post-industrial wood will be recovered (2016: 23 M m³) in the future. Development of legislation towards decreasing the amount of wood going to land-fill will increase the availability of recovered wood. Whilst about 2 Mm³ of recovered wood currently go to the production of wood-based products, the largest beneficiary of the extra recovered material is likely to be the bio-energy sector, since if significant subsidies are still in place for power generation from biomass, it will have more paying capacity than competing wood-processing industries. However, contaminated recovered wood will still go to landfills also in the future.

External (imported) wood supplies

Roundwood

Russia is by far the biggest single international supplier of roundwood but applies export taxes which limit or even impede the viability of those exports into the future. However, the EU is relatively well treated, having had a bilateral tariff-reduction deal on certain wood categories since 2004 and has negotiated a more comprehensive bilateral deal in 2010, including a TRQ (tariff-reduced quota), which has been enshrined in Russia's WTO membership. Assuming the "teething troubles" of implementing this (licence application system; intra-EU quota allocation) can be overcome, the EU should be well placed vis-à-vis Russia's other inernational customers, especially China. Even so, EU roundwood imports from Russia will probably continue at a lower level than the peak period 2005-6. Smaller but significant supplies from the Ukraine should be assured within the WTO context. Those from Belarus may be more problematic, including for political reasons.

Another major roundwood import vector is temperate hardwood sawlogs from N. America. This concerns tree species which do not grow in Europe and so cannot be directly substituted. Their future supply looks healthy, given the continuing increase in the growing stock in N. America, particularly the USA, where the standing wood volume has increased by 50% in the last 60 years[93]. Their accessibility is already good

[93] Alvarez, M. 2007. The State of America's Forests. Bethesda, MD: Society of American Foresters.

and EU market access is free of tariffs and quotas. Access to supply on an open-market basis should be further strengthened by the free-trade agreements (FTAs) which the EU is negotiating with each of Canada and the USA.
Given development trends in the tropical wood-producing and exporting countries, tropical roundwood is less and less exported as such. This is partly because of diminishing supplies from shrinking natural forests but also because of government policies in wood-exporting countries to promote domestic wood processing. Increasingly, wood imports arrive in the form of sawnwood and/or wood-based panels, including veneer sheets, plywood and even particleboard, OSB and MDF. In addition, a number of countries, such as Liberia, Gabon and Indonesia implement permanent or temporary log-export bans.

Pulpwood and wood pulp

Given its high bulk/cost ratio, relatively little pulpwood (small industrial roundwood) is imported to the EU. However, certain categories, such as short-fibred Eucalyptus, required for making high-quality printing and writing papers are imported from low-cost producing countries, such as Brazil. More commonly though, the wood is processed there and imported as pulp. Similarly, certain grades of coniferous softwood pulp, needed for specific grades of paper, are imported, largely from N. America. All these vectors are also unrestricted by tariffs or quotas.

Overall, the quality of the EU's recovered paper fibre will decline as less high-quality papers, which provide the first input for recycling, are produced and consumed. Additionally, less fibre will be used as paper grammages reduce and mineral fillers and coatings continue to have a bigger role. Nonetheless, the EU should continue to export significant quantities of recovered paper which are in excess of needs but too costly even for bio-energy. Most of this will continue to go to China.

Wood-based fuel imports

Wood-based fuels (e.g. wood pellets, briquettes and wood chips) are likely to be imported in increasing quantities, though their supply may shift partly from N. America, as those markets use more for domestic purposes. Russia will increasingly supply, though internal demand is growing there too. Some tropical countries like Brazil, Uruguay, Argentina and Chile may have excesses to export and also, to a smaller extent, some African countries like Ghana, Liberia and Mozambique may have contributions to make. Overall however, imports of wood-based fuels to the EU, though significant, will be minor (2016: 60 M m³; 14 %) in comparison to the raw material supplied to the bio-energy sector from EU forests and other trees, industrial wood-processing residues and recovered wood.

Future global availability of wood raw materials

Given the above description of the EU wood-processing industries - in the context of analysing the global trade in wood-based products, although the EU may gain scope in terms of products markets from further bilateral and multi-lateral trade liberalisation, its imported raw material supply would not be much affected by e.g. a global sectoral trade agreement on forest products.

Nonetheless, other international (external) and EU domestic (internal) factors will become increasingly important, as follows:

External factors

Demands

There will be increasing global competition for wood raw materials from:

- other international players competing for resources, e.g. China for recovered paper
- wood-producing countries having less accessible resource, e.g.
  - British Columbia will lower its AAC
  - log-export bans
- producing countries' growing domestic demands.

Supplies

The EU is likely to continue to supply its excess recovered paper to global markets, although the conditions under which it does so, and hence its amount, may be influenced by possible changes under the revision of the EU Waste Framework Directive and/or the potential definition of "end of waste" for recovered paper.

Pulpwood and moreover pulp should continue to be available on global markets for EU paper manufacturers, given their supply from countries with which the EU has good relations, if not bilateral free-trade agreements. This fact will help meet the small but growing demand for "dissolving" pulp, used in textiles and other specialised applications.

Limited supplies of tropical hardwood logs may continue to be available to the niche EU markets concerned, e.g. for plywood. Supplies of temperate saw logs from N. America, Russia and elsewhere should remain plentiful and hence their export to the EU limited only by price.

Internal factors

Increasing EU domestic demands for wood will be from:

- Increased demand from wood-processing industries; (333 M m³ in 2016)
- Increased demand from bio-energy and bio-fuels; (360 M m³ in 2016)
- Increased demand from bio-economy, e.g. textiles

It is very difficult to estimate the increased demand from the bio-economy. In addition the definition of bio-economy at large is not yet well defined and depends on how broad a perspective is used.

The composition of the demand for wood-based products may shift, so as to be composed of more building and furnishing elements in the context of sustainable construction in the household, office, public functional and infrastructure sub-sectors.

EU wood-based products

The EU sawmilling sub-sector

The sawmills are in a key position at the start of the processing supply chain in this dynamic system, because sawlogs are usually the most valuable parts of the trees and hence often the most interesting ones from the wood sellers' point of view. Their presence in the wood mix is often determinant in a forest owner's decision to harvest wood or not. If sawlog prices are low, the higher prices of other categories cannot typically offset that. To get the market of wood raw material running, it is therefore extremely important that the sawmills are profitable and act as drivers for the downstream wood market. This brings also pulpwood as well as energy wood to the

market and other forms of woodworking industries, pulp and paper industries and power plants can benefit from this as well as from the industrial wood-processing residues.

The EU wood-based panels sub-sector

If the sawmilling sector can be said to be in the front line of competing for access to wood with forest owners and competition from outside the EU, the wood-based panels sector can be said to be in direct competition for wood raw material with the bio-energy sector. Whilst bio-energy can use low-quality forest residues, this is not the case for wood-based panels, for which a higher quality is required for the wood chips and particles used in panel making. Both sectors use huge quantities of industrial wood-processing residues, mostly produced by sawmills, and their price will determine who gets the material. Thus, the role of subsidies to the bio-energy generation industry is a key one.

An additional component of increased competition for wood raw material, whether roundwood or industrial residues, is the haulage distance needed to get such material to its point of use. A typical delivery distance to a wood-based panel mill is 150 km (EPF). However, if the purchase of wood is indirectly subsidised, the distance over which it can be transported increases.

Based on the present status quo for subsidies – which may change, the forecasts made by Indufor for the future of the wood-based panels industries indicate a gradual decline in production of particleboard, the most ubiquitous and mature of the panels, down to 29 M m³ in 2016 from a high of 37 M m³ in 2007, MDF will see a small but significant decline in EU capacity to 14.8 Mm³, as new production opens in new member states and neighbourhood countries. However, the capacity utilisation of existing EU MDF mills is set to rise from 76 % in 2011 to 83 % in 2016. For OSB production and capacity at 3.7 Mm³ and 5.3 Mm³ respectively mean a relatively low capacity utilisation in 2011.

Conversely, the small but growing wood-fibre insulation (softboard) segment increases its European production capacity, thus providing potential to contribute to EU policies such as energy saving.

The EU pulp & paper sub-sector

The EU pulp and paper industry faces challenges on two major fronts. On the one hand demand for many of the graphic grades of paper, such as newsprint, magazine and office papers is in long-term, gradual but steady decline, except for some relatively small growth which may continue in the new EU member states. On the other hand international competition threatens its fibre raw materials. Costs of pulpwood and pulping are much lower in third countries such as Brazil than in Europe. Though Europe has amongst the world's highest levels of paper recovery and recycling, much of that material is set to be exported, while the recovered fibre available in Europe will have a lower average quality because of less high-quality graphic paper being manufactured and recovered.

Demand for soild wood products, including wooden furniture, should continue to grow overall, boosted by the legislative framework and linked incentives for sustainable construction, in which the natural, renewable, recyclable, acoustic and thermal properties of wood could give it an advantage over other materials, so long as it performs to technical and price criteria. Conversely, demand for most paper grades

has matured; some, e.g. graphic papers, are even in decline. Significant growth is only foreseen for some hygienic grades, mostly linked to the EU's ageing population.

EU wood-based products from the woodworking, furniture and pulp and paper industries are generally high-quality and produced to high environmental and social standards. However, together with the high costs of wood raw materials, energy and labour, this fact makes EU firms high-cost producers on a global scale. They are able to compete internationally through high labour productivity, for example in softwood sawmilling and paper production, two commodities for which the EU is a net exporter. This global competitiveness – as well as the maintenance or even growth of domestic market share - can only be brought about by increased competitiveness, largely through:

- continued and improved access to domestic and overseas wood raw materials at affordable prices
- adding value to products whilst reducing production costs through
- innovative process and product designs which anticipate and match evolving societal needs
- continuous improvement of resource (e.g. "cascade") & energy efficiency in manufacturing
- meeting customer demands through
- active marketing of wood-based solutions (not passive sale of commodities)
- after-sales follow-up (feed-back; replacement, repair, maintenance).

Influence of the policy and legislative frameworks

The **EU TR** may initially create difficulties, both for domestic (EU) and imported wood and derived products, especially for composite products like furniture. This will largely be due to a lack of wide-spread familiarity with its real requirements. However, in the medium to long terms, it should help improve transparency in both the EU domestic and the imported wood-supply chains.

Certification for sustainable forest management (SFM) may have a useful role to play as part of the due diligence systems required by the EU TR, if it can be reliably, demonstrably and economically transposed through the chain of custody. It may have more significance if ever a pan-European LBA on forests is adopted, ratified and stringently enforced. However, that would in any case be beyond the 2016 time horizon.

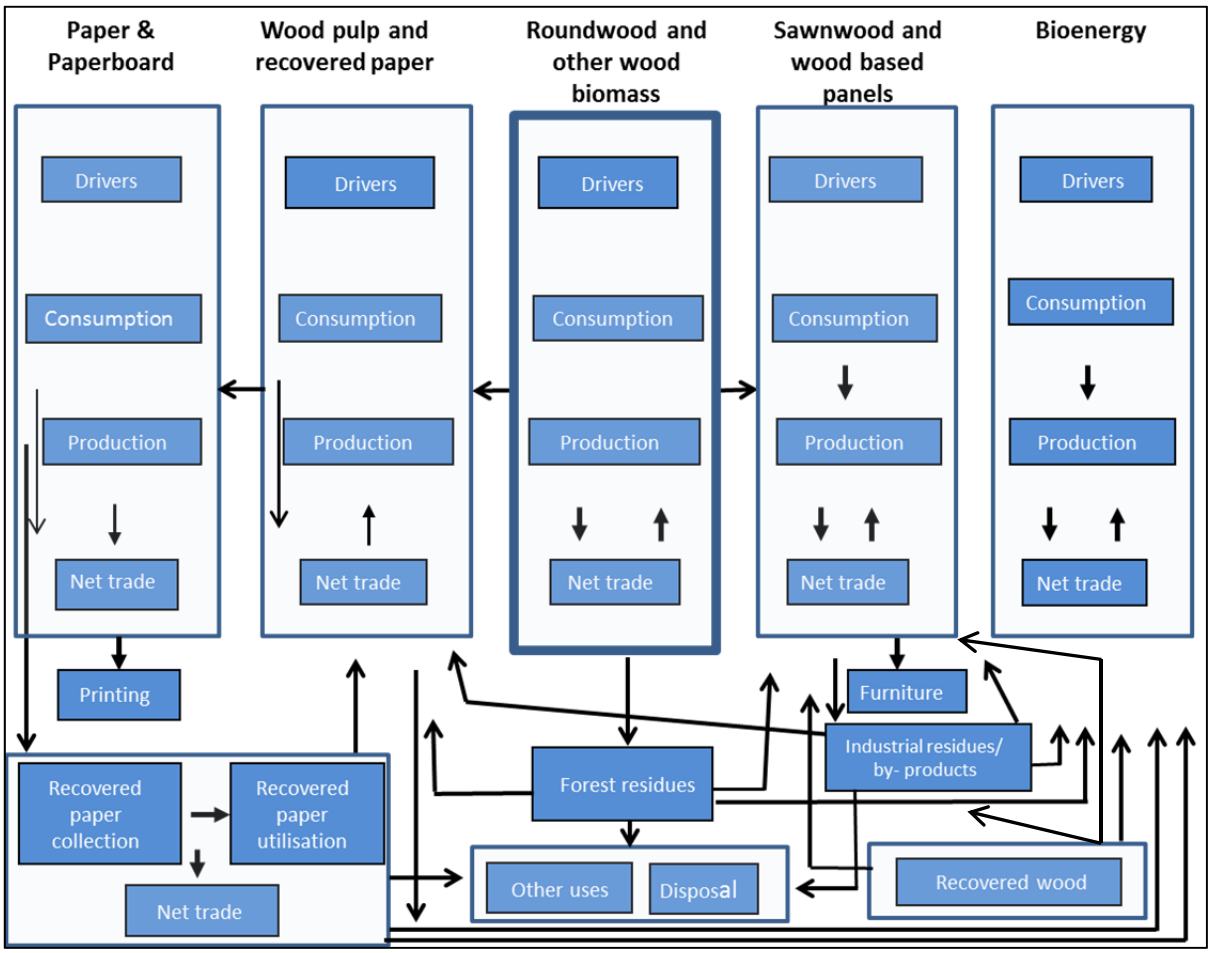
Inter-actions within and between the EU wood-processing industries and with the bio-energy sector

When a tree that is felled, it can be divided into different parts (e.g. logs, pulpwood, branches, tops and stumps) and all parts have their own optimal uses from economic and technical points of view in different wood-processing industries or as bio-energy. Some wood categories can, at least in principle, be used for a wide range of end products, others (for instance bark) only for a more limited number of uses. Therefore, the level of competition for categories varies. There are also a number of by-product flows from one use to another, as shown by Figure 9.1.

However, since all or most of the tree parts are usually harvested at the same time, the supplies of wood raw material for the EU wood-processing industries and their uses of it, as well as those of the bio-energy sector, are interlinked and form a conglomerate of different streams that depend on each other for their wood availability, logistics and from an economic point of view. Considering the inter-relationships both in supply and demand of various wood categories, it is clear that, if

the demand for sawnwood declines, the supply of sawlogs and thus also other wood categories will be reduced. Also, if pulp production is considerably reduced, the bio-energy production will be reduced, due to the significant role of black liquor in biomass energy.

Figure 9.1 Wood raw material supply and demand flows in wood processing industries



Source:Indufor

The "cascade" use of wood"

Definition of "cascade" use of wood (See above wood-flow diagram).

"Wood used firstly for the production of wood-based products, followed by post-consumer recovery, then: re-use of products, recycling into other wood-based products and ultimately use as bio-energy. At each stage of the cascade, decisions are based on e.g. costs, adding value & creating jobs."

The cascade can be made to flow better by (inter alia) the following measures:

- Removing bottlenecks to supply (domestic: improve market transparency, reconciling Natura 2000; external: international trade agreements (FTAs, VPAs) with wood-exporting countries, investments by EU wood-processing and bio-energy industries in overseas wood plantations and pulping;
- Reposition incentives currently paid as premia for energy generation to mobilising more wood from EU forests and other trees for all end uses;
- Reduce wood waste, improve its recovery, re-use and recycling, in particular avoiding land-filling which generates carbon dioxide and methane;
- Using purpose-grown, wood-based energy crops, e.g. short-rotation coppice;
- Using agricultural, horticultural and viticultural residues.

Therefore, a certain balance in the system of wood raw material needs to be maintained, since what affects one part of the system will in fact affect the whole chain. This is especially so in relation to incentives or restrictions that may be used to encourage or dampen specific wood streams. Potential conflicts between competing end uses of wood need to be managed to the best mutual advantage of different end users.

To meet better the various increasing, competing and sometimes conflicting end uses, augmenting the supply of wood raw materials is an important way forward. All wood-processing industries and the bio-energy sector can benefit from this. In this context, it is appropriate to use policy, legislation and (dis-)incentives to direct the raw material in the most efficient way to the end uses so as to fulfil the principles of the cascade approach.

B. Specific conclusions and corresponding recommendations:

The following specific conclusions and corresponding recommendations are made at EU level. However, for the implementation of many, these findings will have to be modulated at member-state and even sub-national levels.

Conclusion	Recommendation	Actors; time-scale S = short term; M = medium term; L = long term
1. Supply of Raw Material		
The future increased use of wood for bio-energy and the bio-economy will put pressure on the use of wood in the EU. If adequate and concrete measures are not taken in due time, there will simply be a gap between the supply and demand of wood. Nonetheless, this potential gap can be filled by increased wood mobilisation in the EU, by increasing imports of biomass and/or wood-based products outside the EU. However, the last option is the least desirable from the point of the EU wood-processing industries.		
1.1. Roundwood and residues		
The **forest ownership structure** in Europe is fragmented. . In privately owned forest holdings the share of the holdings smaller than 10 ha is at about 85%. Currently there are about 15-16 million forest owners.Therefore, it is important to get a more professional role for the forest ownership in Europe. This fact can sometimes be an obstacle for wood mobilisation. In some countries there are ways to overcome the fragmentation for instance by ensuring that there are organisational structures for forest owners (D, FIN, etc.) or by regulations preventing fragmentation (SWE).	Organisational structures, capacity-building as well as cooperation between forest owners could be promoted by legislation and/or by incentives to establish and develop cooperatives or associations for forest owners.	Member States Region private sector (e.g. forest owners) M, L
	Halt increased fragmentation by incentives (taxation or subsidies) and if necessary legislation that prevents further fragmentation and/or promotes the formation of bigger forest holdings. Education, training and skills development for forest owners, particularly through co-operatives.	Member States, Regions, private sector (e.g. forest owners) M, L
Market stakeholders, including forest owners, often do not have **sufficient information on** the current situation and likely trends in **the wood markets**. Increased transparency on wood availability and demands, according to tree species, wood sizes, qualities etc. Such market information could help forest owners and others to make informed decisions and also avoid false expectations both amongst sellers and buyers in the wood market.	Legislation, guidelines as well as best practices that promote transparency on wood markets, without giving too exact data on individual players should be developed.	Member States (national forest inventories), regions, private sector (forest owners, harvesters, wood merchants, wood-processors) S, M, L

Conclusion	Recommendation	Actors; time-scale S = short term; M = medium term; L = long term
Increasing the annual increment (This ensures that there is enough wood for all end-users and does not cause imbalance between users). Subsidies for one group of users of wood usually create challenges for other users and cause market inefficiencies. Incentives should be re-directed away from energy generation to wood mobilisation, so as to be proportionate, equitable, preferably temporary and in any case re-adjusted periodically.	Legislation and possible financial incentives, for instance to reach the EU renewable energy targets, should be directed to improving the state of the forests and to increasing the annual increment. Incentives to harvest wood, including pre-commercial thinnings, so as to improve the tree crop and provide fuel wood and/or pulp wood. (If member states do not do this under their own initiatives, Directive 2009/28 will need to be adapted accordingly).	EU, Member States S, M, L
In forestry **not all of the annual increment can be harvested**. There are a lot of restrictions and limitations (legal, economic, technical, logistical and environmental). In addition to this the forest owners are the final decision-makers as to whether wood is harvested or not. The views and preferences of the forest owners vary and not all want to use their forests to harvest wood. Therefore it is important to distinguish the theoretical supply of wood from the supply that is available in practice to meet the demands.	Increasing wood available for harvest by addressing limitations of conditions and restrictions imposed on wood supply by Natura 2000 and other statutes. EU legislation and strategies should guide in the direction to improve the supply. The Member States should then develop their own national legislation to fulfil this. Another way to improve the supply is to enable the creation of forest management services to get more forest owners having their forests under management.	EU, Member States, Regions, private sector S, M
Infrastructures and logistics are important both to get wood to the industries as well as for the transport of industry products to the end users. Especially for wood transport, the infrastructure both within forest and on public routes in rural and remote areas is important and forestry is the main or only user of the infrastructure.	Public roads should be adapted (or built) and maintained, possibly on dedicated routes in rural areas so that transport of wood can be done, if not year-round, then at least seasonally.	Member States, regions, private sector S, M, L
	Forest roads are important to get wood transported in an economic way. Therefore state incentives are necessary to get a good network of forest roads and infrastructures, including in small-scale forestry and in mountainous regions.	Member States S, M, L
Harvesting and transport of biomass for energy is still fairly new and there is **potential to improve the efficiency and to diminish cost for biomass sourcing, especially from forest residues.** When the costs are lower the sourcing area for a certain facility grows and more wood can be sourced in an economically viable way.	Research and development on new and innovative harvesting techniques and machines (e.g. low-cost harvesters, capable of dealing with small and low-quality wood) in forests in general and in particular for harvest and transport of biomass for energy. These could be developed through EU research Framework Programmes and national research programmes.	EU, Member States, private sector, e.g. machine manufacturers. S, M, L

Conclusion	Recommendation	Actors; time-scale S = short term; M = medium term; L = long term
To help reach the NREAP-targets for renewable energy, and specifically bio-energy, without undue competition between end users of wood, it is also necessary to increase the use of **forest residues** (tops, branches, stumps). This is a largely untapped potential in many Member States. Therefore, the use of forest residues for energy does not diminish the amount of raw material for other users of wood raw material. Based on calculations, about 35% (46 M m^3) of the forest residue potential is currently utilised in the EU-27 countries.[94]	Remove legal restrictions to removing extra forest biomass (e.g. stumps, roots), provided it does not provoke the release of soil carbon. Consider legal obligations to collect forest residues from clear cutting areas whenever this is sustainable and could e.g. prevent or reduce the intensity of forest fires. National and EU support measures to decrease the negative impact of the increased costs of biomass, such as the re-direction of energy subsidies to wood mobilisation. Measures could be targeted to the forest owners and/or harvesters as support for delivering wood. Statistics, terminology and data on forest residues need to be harmonised within the EU.	EU, Member States, regions, private sector (farmers, co-ops and associations) S, M, L.
Agricultural, horticultural and viticultural wood, like residues from fruit tree-gardens, vineyards, trees and brush along roadsides, etc., is used to some degree but there is still vast potential (around 40-50 M m^3 to increase the amount collected and used above all as biomass for energy production. Recovery of woody residues outside traditional forests might represent a substantial wood source, particularly in wine and fruit-growing regions.	National incentives currently used to increase the generation of bio-energy could be geared towards incentives for forming collection structures as well as to support producers of agricultural, horticultural and viticulture residues to collect these and provide them to producers of bio-energy. In some cases also restrictions to burn such residues on the spot could be developed.	EU, Member States, regions, private sector (farmers, co-ops and associations). S, M, L
There is a need for continued and improved access to domestic and overseas wood raw materials at affordable prices.	In addition to implementing the above measures, the EU and MS should address the EU's need for access to wood raw materials from other producer regions through bilateral and multilateral trade agreements and, as appropriate, trade defence instruments.	EU, MS S,M,L
1.2. Recovered Paper		
Paper for recycling (recovered paper) is a good raw material technically and economically for the paper industry, as well as requiring less primary energy, therefore a lower "carbon footprint". **Increasing recycling activities** reduces the share of virgin fibre and thus helps diminish the pressure on the wood procurement from forests.	Increasing, the separate collection and sorting of used paper should be encouraged by educating households, especially in the new Member States	EU, Member states, regions, municipalities.

[94] Asikainen A. et al. 2008. Forest energy potential in Europe (EU-27). Working Papers of the Finnish Forest Research institute 69.

Conclusion	Recommendation	Actors; time-scale S = short term; M = medium term; L = long term
Paper and board consumption and production structure will change. The demand for graphic papers will stagnate and the share, for e.g., packaging and hygienic grades is forecast to increase. This means the demand and supply **structure of different recovered paper grades will change, with a consequent general downgrade of quality**. Different end products utilise different recovered paper grades which are being collected from different sources.	Recovered paper recyclers should be able to react to challenges of the changing recovered paper supply and demand structure. One helpful measure in this respect would be clarity at EU level on the "end-of-waste" for paper. Collection systems should promote that the right grade of recovered paper is used for the most suitable purpose.	EU, Member states, municipalities, paper collectors. S, M, L
Recovered paper is globally an important commodity. **Europe is a net exporter** of recovered paper, mainly to Asian and especially to Chinese markets. Prices, together with volume demand, are expected to rise in the long run. The average EU collection rate is fairly high and the recycling rate is around 70%. However, there are big differences between countries and there is potential to increase the collection rate in some Member States, which currently have very different practices.	All potential recovered paper collection sources should be utilised effectively in all EU-27 member countries to secure a constant fibre raw material flow to European paper mills in the future. To be able to further intensify and increase collection and recycling activity, more detailed description system about collection and recycling volumes and different sources as well as different grades of paper for recycling is essential.	Signatories of the European Declaration of Paper Recycling S, M, L
Collection potential (paper and board consumption) should be **collected effectively** by taking into account quality issues. Quality of collected paper is important.	Quality of recovered paper should be ensured during the collection and sorting chain, according to Norm EN 643. Collection of recovered paper separately from other waste streams should be encouraged to minimise raw material contamination in the collection chain	EU, Member States, Signatories of the European Declaration of Paper Recycling, waste management companies, local authorities. S, M, L
Legislative recycling targets, like the EU Waste Framework Directive (WFD) and voluntary ones like the Paper Industry Declaration on Paper Recycling, support increasing recycling activity. WFD hierarchy clearly puts (material) recycling at a higher level than (energy) recovery. To direct activities into right **direction reliable statistical data is needed.**	Reliable and accurate statistical measurement system to indicate the real recycling and recovery activity should be developed for paper for recycling in all EU-27 member countries. Also a development of a verification system to measure the recycling from household sources should be considered. An international standard method for comparing recovered paper grades from different countries should be developed.	EU, CEPI, CEN, ISO S, M, L

Conclusion	Recommendation	Actors; time-scale S = short term; M = medium term; L = long term
Awareness amongst the public needs to be increased. Motivation amongst citizens is the most important single factor affecting paper collection activity.	Education and campaigning for separate collecting and sorting of used paper amongst citizens to support (material) recycling is essential. This would be a good field to increase cooperation between different counterparts while all parties of the recycling chain share the common target: high recycling activity	EU, Member States, CEPI, National forest industry associations, local companies, municipal authorities, environmental groups. S, M, L
1.3. Recovered Wood		
The **classification of recovered wood is not yet developed** and standardised internationally since this has not been seen as very important as long as the amounts have been fairly small. However there is a growing demand for recovered wood globally, as well as a huge potential to increase its collection.	Common classification on categories of post-consumer wood needs to be defined and agreed on an international level.	EU, Eurostat, FAO, National organisations for recovered wood, CEN, ISO. S, M, L
There are **limited data and statistics** on the use of recovered wood in different countries. Therefore it is difficult to compare the situation between countries and hence to build the complete picture on the total use of recovered wood in the EU and globally.	The parameters of data and statistics needs to be developed and the responsibility to collect the data has to be assigned to an international organisation.	EU, Eurostat, FAO, National organisations for recovered wood, OECD. S, M, L
Recovered wood is often contaminated. To improve trade in, and thus use of, recovered wood it is **important to agree internationally on contamination limits**.	**Internationally agreed limits for contaminated wood in different end-uses need to be defined.**	**EU, Eurostat, FAO, National organisations for recovered wood,** MS health and consumer protection authorities. S, M, L.
		S, M, L.

Conclusion	Recommendation	Actors; time-scale S = short term; M = medium term; L = long term
1.4. The limited sustainability of wood between end uses		
Conclusion	**Recommendation**	**Actors; time-scale S = Short term; M = Medium term; L = Long term**
As demonstrated by Figure 7.3, different wood-based raw material types (roundwood, forest residues, industrial processing residues, recovered paper, and recovered wood, black liquor, etc.) each have a range of end uses within which there are optimal uses from the technical and economic points of view. (There are also a number of by-product flows from one use to another, as shown by Figure 7.2.).	According to the cascade principle and real available market outlets, prioritise the end uses of wood, by matching the technical suitability of the various categories available with end-user requirements, so as to optimise the adding of value and job creation and/or maintenance.	EU, Member States, Wood producers (forest owners); wood marketing bodies; processing firms.
Some categories can in principle be used for a wide range of end products, others (for instance bark) only for a more limited number of uses. Therefore, the level of competition by end–users – such as the pulp and paper industry, the wood products industry (woodworking) and the bio-energy industry - for wood-based raw material varies between the above categories.		
The “wood” input categories in Figure 7.3 can be further sub-divided by wood species, dimensions and quality, thus further limiting substitution between specific end uses of wood in wood-based products. Conversely, wood-based fuels can be made from almost any category of wood input, thus allowing bio-energy to compete very widely across the range of wood-based raw materials.	As appropriate, further work needs to be done at EU, national and sub-national levels to determine the cross-substitutability of different wood categories between the various real end uses available in a given geographic area as one basis for determining priorities.	S, M, L.

Conclusion	Recommendation	Actors; time-scale S = short term; M = medium term; L = long term
As there is competition for certain wood categories between several end-uses, the wood-paying capability of different end-uses largely determines who gets to use any given category.	Market distortions which favour one group of wood buyers over another should be eliminated or at least curtailed or better directed. For example, national incentives for the generation of bio-energy could be more efficiently focused on generalised wood mobilisation and marketing, so as to make more raw material available to all potential end-users on a fairer ba-sis.	EU, Member States S, M, L.
It appears that pellet manufac-turers and bio-energy plants have competed with and have been able to pay equal or somewhat higher prices than e.g. particleboard plants for the same raw material base, i.e. sawdust, chips and low-grade roundwood. In certain areas such competition is fierce. En-ergy-generating subsidies have an impact on this competition and they can alter the competi-tiveness of various end-uses considerably.		

2. Wood and Wood-Based Products		
To get wood out from the forests it is vital to have healthy wood-processing industries. The sawmills are extremely important as they have a fairly high wood paying capability and the pulp and paper industry is also important. The different parts of a tree should be directed to the industry that can add the most value: logs to the sawmilling industry, pulpwood to the pulping industry and wood-based panels, and forest residues to energy production. In this way, the different sub-sectors support each other and all participate in the meeting costs of wood procurement.		
2.1. Use of Wood and Wood-Based Products		
Building is very important. The building of new houses in particular has a positive impact on the economy as such. However, other buildings, including offices, public function facilities and infrastructures are also important as markets for the wood-processing industries. This is true independently of what the main material for the building activities are but reinforce if wood-framed structures are involved.	Public building should be emphasised, for instance by supporting building of houses to rent. Different measures for this can be: direct state support, subsidies, taxation incentives or support of interest rates.	Member States and sub-national authorities. S, M, L
Promoting of one specific raw material in construction is difficult and can even be anti-competitive. However, **climate-smart solutions in buildings, constructions and products** are gaining more importance and increased attention, thus offering potential for wood.	Life-cycle analysis and regulations to diminish the climate footprint of construction and building activities should be developed. Material-neutral, objective frameworks for sustainable building, its implementing regulations and assessment systems.	EU, Member States S, M, L
Tighter requirements for sulphur emissions, especially for maritime “bunker” fuels will increase costs for transporting wood and wood-based products to and from markets.	Implementation of the EU Sulphur Directive so as to make costs bearable and equitable for forest-based sector stakeholders.	EU, Member States S, M, L
Increased efficiency in the use of wood is highly important to avoid unnecessary pressure on the wood procurement and on the availability of wood for all end-users. **Especially in energy production biomass could be used much more efficiently**. In many cases only electricity is produced instead of Combined Heat and Power (CHP).	Active development of innovative, resource- and energy-efficient processes and products and active marketing of the latter. National legislation and infrastructure should promote the use of CHP in energy production. Also increased use of district heating increases the efficiency of the use and distribution of bio-energy.	Private sector (wood-processing industries) S, M, L
The bio-based sector, e.g. wood-based bio-refineries, has a potential from an economic, as well as from an environmental point of view. Bio-refinery products can generate new business opportunities for the use of both forest and industrial residues. From an environmental point of view the products have advantage because they are climate-smart and bio-degradable.	Research and development in bio-economy should be strengthened and pilot-projects supported now when bio-based products are reaching both the technical and commercial readiness. Better assess quantitatively and qualitatively the needs for and likely sources of biomass required by the bio-economy.	EU, Member States, Companies S, M, L

2.2. Adding Value to Wood and Wood-Based Products		
There is a need to add value to products whilst reducing production costs.	Innovative process and product designs which anticipate and match evolving societal needs; continuous improvement of resource (e.g. “cascade”) & energy efficiency in manufacturing; meeting customer demands through active marketing of wood-based solutions (not passive sale of commodities); after-sales follow-up (feed-back; replacement, repair, maintenance).	Companies, research bodies. S, M, L

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Annex 1

The study overall objectives are:

- to evaluate quantitatively (physical units) and qualitatively the **current (2011) and recent past (10 years: 2001-2010) supply, demand** and **balance** situations for wood, including recovered wood, and recovered paper for both the industrial wood-processing industries1, including their sub-sectors, and the biomass-based renewable energy sector at EU and at disaggregated regional levels. (NB see note below on defining regions and sub-sectors);

- to prospect quantitatively (physical units) and qualitatively **the likely supply and demand situations** over the period **2012-16** for wood, including recovered wood, and recovered paper from both the industrial wood-processing sector, including its sub-sectors, and the biomass-based renewable energy sector at EU and at disaggregated regional levels;

- to evaluate **current (2011), recent past (10 years: 2001-2010) and near future (next five years: 2012-16) levels**, ratios and **trends of prices and costs** for wood, including recovered wood, and recovered paper for both the industrial wood-processing sector, including its sub-sectors, and the biomass-based renewable energy sector at EU and at disaggregated regional levels. (NB see note below on defining prices and costs);

- to identify differences and similarities between the situations and trends relating to the above and other relevant factors, both within and between the disaggregated regions;

- to analyse relevant existing and emerging EU, member-state and, as appropriate, regional (sub-national) regulatory and other framework conditions, being at least those outlined in Task 3 below, in order to evaluate their likely implications for and impacts on the supplies of and demands for wood (including its physical quantities, costs, prices, etc.) by the EU wood-processing industries, including their sub-sectors, and the EU biomass-based renewable energy sector for the period 2012-2020 (2012 – 2016 only for prices);

- to analyse and evaluate, based on the above information and analyses, the interactions – in the context of EU-level policies affecting the use of biomass for renewable energy purposes, in particular the “EU Renewable Energy Directive”2 - between the woodprocessing sector, including its sub-sectors, and the biomass-based, renewable energygenerating industries as regards their respective supplies, demands, prices, costs – and trends thereof - of wood raw materials;

- to analyse and comment the above factors in relation to the price and cost components of wood raw materials as production costs of the EU wood-processing industries and their relevant sub-sectors, vis-à-vis those of direct sectoral and sub-sectoral competitors in other, comparable and competing global (i.e. non-EU) regions for the periods 2001- 2010 and 2012-2016.

- to analyse and comment the above factors in relation to the EU wood-processing industries, including their sub-sectors, current (2011) and near future (2012-2016) and medium future (2017-20) **likely global competitiveness** – including profitability, as a basis for presenting a **strategic outlook** as to how, with regard to wood raw materials, they can try to remain globally competitive;

- to assess **the possibilities and scope to increase wood raw material supply** from domestic sources (EU forests, other trees, agricultural, horticultural and other woody biomass), international sources and through increasing the efficiency.

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