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EIP-AGRI Focus Group

Sustainable mobilisation of forest biomass

MINIPAPER 8: European map of the regional forest-based sector

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Introduction

Forests in Europe play an important role for economy, society and the environment. The demand for forest biomass as a key renewable and climate friendly raw material is likely increasing - not only because of huge range of products made of wood and its use in Europe. Europe is still producing more than 35% of value added forest-based products worldwide, even if it is only covered by 7% of the global forest area. Overall, a high share of harvested EU wood biomass is processed by EU Forest-based Industries, representing about 7% of EU manufacturing GDP. Almost 3.5 million people in Europe earn their living in forestry and forest-based industries. Forest-based biomass, together with non-wood forest products, which are gaining market interest, provide opportunities to maintain or create further jobs and diversify income in a low-carbon, green economy. Wood is still the main source of financial revenue from forests, and an important raw material for bio-based industries.

However, the forest-based sector's future competitiveness requires new resource- and energy-efficient, and environmentally-sound, processes and products. Advanced wood-based materials, wood-based fuels and chemicals are expected to play a major role in the EU bio-economy.



And not to forget the harvested EU wood biomass used for energy, accounting for about 5% of total EU energy consumption. According to the National Renewable Energy Action Plans, biomass will still be the main source of renewable energy in 2020.

Objective of the Minipaper

Referring to the importance of the forest-based sector and the increasing demand for biomass it is of utmost interest to facilitate increased sustainable wood mobilisation and to assess the potential of wood supply.

The objective of this Minipaper is therefore to explain the current forest-based sector and show its value, challenges and importance due to mobilising forest biomass. Around 90% of the initial wood raw material input to forest-based sector comes from sustainable managed EU forest resources. With an steadily increasing overground forest stock, diameters and increasing hardwood in Europe there are possibilities but also challenges for which solutions should be found and showcased in terms of wood mobilisation.

However, the European forest-based sector is very much influenced by the regional diversity and the fact that it has significantly different roles and contributions in different countries.

Thus a one-fits-all-solution to thrive the sector will not be possible and sustainable mobilisation of biomass and wood supply to the sector has to be approached in different regions with different strategies. This can be underlined by the example of land covered with wood, as in Finland about 78% of the land area is covered by forests, compared to less than 9% in the Netherlands; But also forest ownerships differ strongly in Europe, as in Poland over 80% of the forest area is state-owned, whereas in Portugal only 3% are public forests – 97% are Private and Community forests.

Due to these and a number of other differences, it is clear that European countries and regions will contribute in different ways to the forest-based sector and we will have a look on this issue in our Mini Paper.

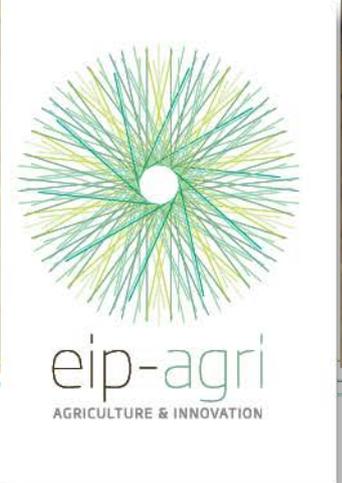
Dissertation

Forest based sector – products – value chains

The forest-based sector can be seen as an important driver for biomass mobilisation. First of all the European sawmill industry is the key driver as first transformer of forest biomass within the forest-based sector followed by pulping industries.

For over a century the forest products sector has been composed by the wood products industries and the pulp and paper industries. Traditionally sawmill and pulp and paper industry was concentrated in Northern Europe whereas furniture industry was and is mostly located in Southern Europe. The Bioenergy sector, particularly pellets industry, can be found in central and northern Europe (e.g. Finland and Austria).

In the coming two decades, the sector will increasingly merge with the construction, energy, chemicals and textile industries to become an essential part of the bioeconomy. It will turn from a very focused sector into a much more diversified one.



a) Definition of the forest-based sector

The forest-based sector can be defined as sector that covers forest resources and the production, trade and consumption of forest products and services. The woodworking and furniture industries, the pulp and paper manufacturing and converting industries and the bioenergy sector as value chains stand for the forest-based sector.

b) Challenges of the forest-based sector

The European forest-based sector is recently facing some challenges and changing processes. Not only the mobilisation of biomass and the supply of biomass as indispensable factor can be seen as a challenge for the sector but also the forest-based sector and structural changes in the sector itself, as well as the economic slump in 2008-2009. The sawmill industry and the pulpwood industry was struggling with these economic problems and in consequence in some cases was leaving Europe as production site.

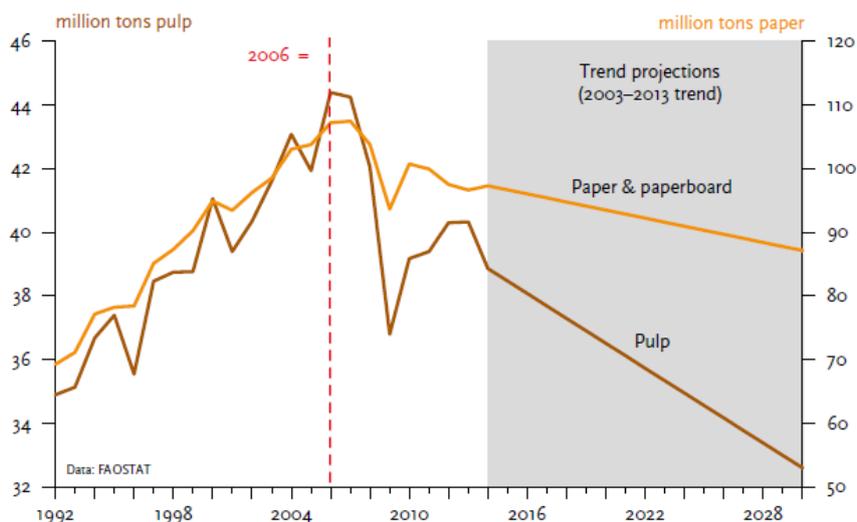


Figure 3. Paper & paperboard and pulp production in Europe 1992–2013 and projections to 2030 (excluding Russia).

Source: Report 'Future of the European Forest-Based Sector', p.23, Lauri Hetemäki

Structural change of forest-based sector

The European forest-based sector is undergoing more significant structural changes than for decades, and the next 20 years are likely to change the sector even more. Fundamental changes have already taken place in forest products markets.

For example, some important forest products face mature or even declining markets, and at the same time see increasing competition from emerging economies. On the other hand, forest products which did not exist in the 20th century are already in production now – not to speak of the possibilities in coming decades.

Structural changes in the European forest industry have pushed on the changes and development of the forest-based sector. In recent years the European paper and paperboard production declined, as you can see exemplarily in the graph below, and changes in the wood products industry have been similar to the



paper industry, although not as big, and probably more due to economic slump rather than structural reasons.

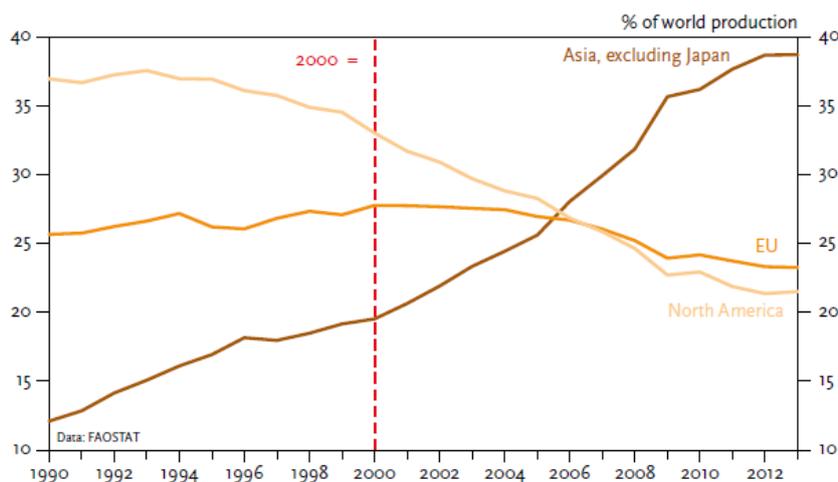


Figure 1a. Market shares of world's paper and paperboard production, 1990–2013.

source: Report 'Future of the

European Forest-Based Sector', p.16, Lauri Hetemäki

However, structural changes have been one important driver for the European forest product industry to renew. Furthermore, the forest sector is becoming more integrated with other industrial sectors, such as construction, energy, chemicals and textile industries.

Creative destruction

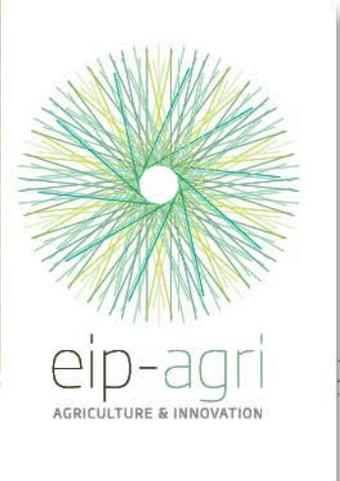
Referring to the undergoing changes in the sector, the current state of the European forest-based sector could be labelled as one of creative destruction*. This destructive process embraces not only the declining demand for communication paper products and stagnating demand for a number of other forest products,

* In the 1940s this concept was mentioned the first time in order to describe a "process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one". It highlights the fact that some economic activities or sectors decline and vanish, while at the same time new technologies, products and business models emerge. Joseph Schumpeter, one of the most influential economists of the 20th century, popularized the term in economics.

as well as the economic slump in the EU in the last years and its impacts, but also the move of some forest industry investments to fast-growing markets in Asia, or low-cost production regions like South America. As the 'creative' side of the development can be seen the changes above which have also been important drivers for the European forest-based sector to renew.

Forest industry consolidation process

Related to the structural changes the forest-based industry was undergoing a consolidation process in the last years. This process has been on-going in the sector for some time and it will most likely continue in the future. Especially the sawmills, the most traditional part of the forest-based industry, were undergoing a centralisation and consolidation process, influenced by a developing overcapacity in the last years



Many investments made during the last decades focused on additional capacities and increasing the economies of scale as well as more efficient process technologies. However, there have been fewer significant investments in recent years as the mills are not operating at their full capacity due to the lack of financial resources in times of economic crisis, and because of the availability of low-cost existing capacities, some companies are going bankrupt. As a result, middle size companies tend to disappear. In this context, several business strategies typically associated with consolidation processes are expected to continue in the future such as diversification, forward integration, outsourcing and technology leadership and supply.

c) Forest-based products

There is a wide range of forest-based products, both traditional forest-based products and innovative products. Forest-based products can be characterised in a way by their different degrees of processing and thus can be classified in categories as for example semi-finished, or finished products.

Many global- and European level drives are creating demand and technological opportunities for new forest-based products and services. Forest industry is changing strategies and business models, investing more and more in new products such as second and third-generation biofuels and bio-chemicals, as well as new engineered and prefabricated wood products.

The need for new forest-based products has been raised since the production of some of the traditional forest products (packaging products in aggregate, sawnwood) has been either low compared to past decades, stagnating, or even declining during the early years of the 21st century. Graphics paper production for example has started to decline in many European countries, mainly because of digital media replacing it.

List of forest-based products/sectors:

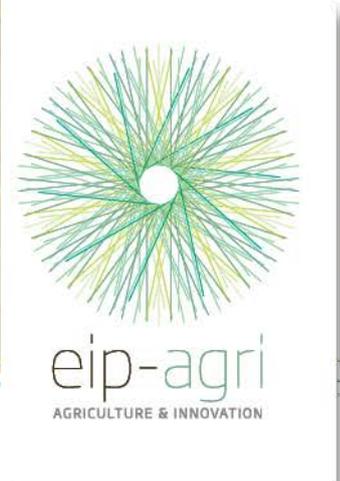
- Bioenergy
- Semi-finished products: saw wood, wood-based panels, (non-graphics) paper and paperboard
- Finished products: construction and furniture
- Biorefining products, chemicals, textile products
- 3D printed products referred on MP3

Changes in markets are also creating new demand for old products, such as dissolving pulp, driven by the need in the textile industry to substitute cotton with more environmentally friendly raw materials.

d) Forest-based markets and value chains

Forest-based markets were undergoing various changes. Impacts and influences on markets often are depending on the regions in Europe facing different challenges related to the prevailing forest sectors and forest-based industries. Existing considerable differences between the different European regions can be seen for example in primary wood and paper products. Europe is a net exporter of primary wood and paper products. The surplus is mostly due to the Nordic countries, which export a considerable share of their local production to other European countries and, increasingly, outside the European Union (e.g. to China). In contrast, Central-West Europe is a net importer of primary wood and paper products.

The European forest-based markets are increasingly affected by global forest product markets and the increasing role of the emerging countries (e.g. China, Brazil, Indonesia and Russia) as forest products producers. The emerging countries and economies are increasing their relative importance while the



European Union and North America are declining. However, the transition to a market economy in Eastern Europe for example also stimulated the production of processed forest products.

Forest-based product's value chains

The forest-based sector is very complex and several following value chains within the sector can be identified: forestry, wood products, pulp & paper products, bioenergy, specialities (including the wood biorefinery concept).

However, the traditional product value chains, in which one company at one geographical location was responsible for the whole production process chain, is changing to "trade in tasks" and disaggregated product value chains. Many different enterprises, possibly in different locations, can be part of the production value chain providing different tasks, many of which are services rather than manufacturing as such. The digitalization, Industrial Internet, and changing competitive advantages are important drivers for this development.

Aligned to the forest-based markets also the forest-based value chains are impacted more and more by some effects of globalisation. All products are traded on the global markets (roundwood, sawn timber, pulp and paper, boards, panels, semi-finished products, non-wood forest products, etc.).

e) "Map" of forest-based sector

The importance of the forest-based sector and its products varies significantly across European countries and entire regions within the countries – also depending on the forest situation, the biomass mobilisation and use of forests in the respective regions. There are not only wide differences in terms of how forested areas in the EU are, but also different types of forests (e.g. boreal, temperate, etc.) and differences in ownership. Additional to that culture, economic significance and utilization of forests can be quite different.

In order to take this diversity into account, which is also reflected in the forest-based sector, Europe can be divided up into **three different main regions** for further consideration. These regions are the **"Northern European", the "Central European" and the "Southern European" region.**

Nevertheless there are exemptions and countries in this outlined regions which does not fit completely in the classification system, but also play a role for the forest-based sector. These countries and regions are among others the Eastern Europe Region and Russia, as well as South-East Europe.

The general importance of countries related to parts of the forest-based sector and the forest sector in general can be seen in the graph below compared to their contribution to GDP. In relative terms, the forest sector is more important to the local economies in North Europe and Central-East Europe compared to the contribution to the regional GDP.

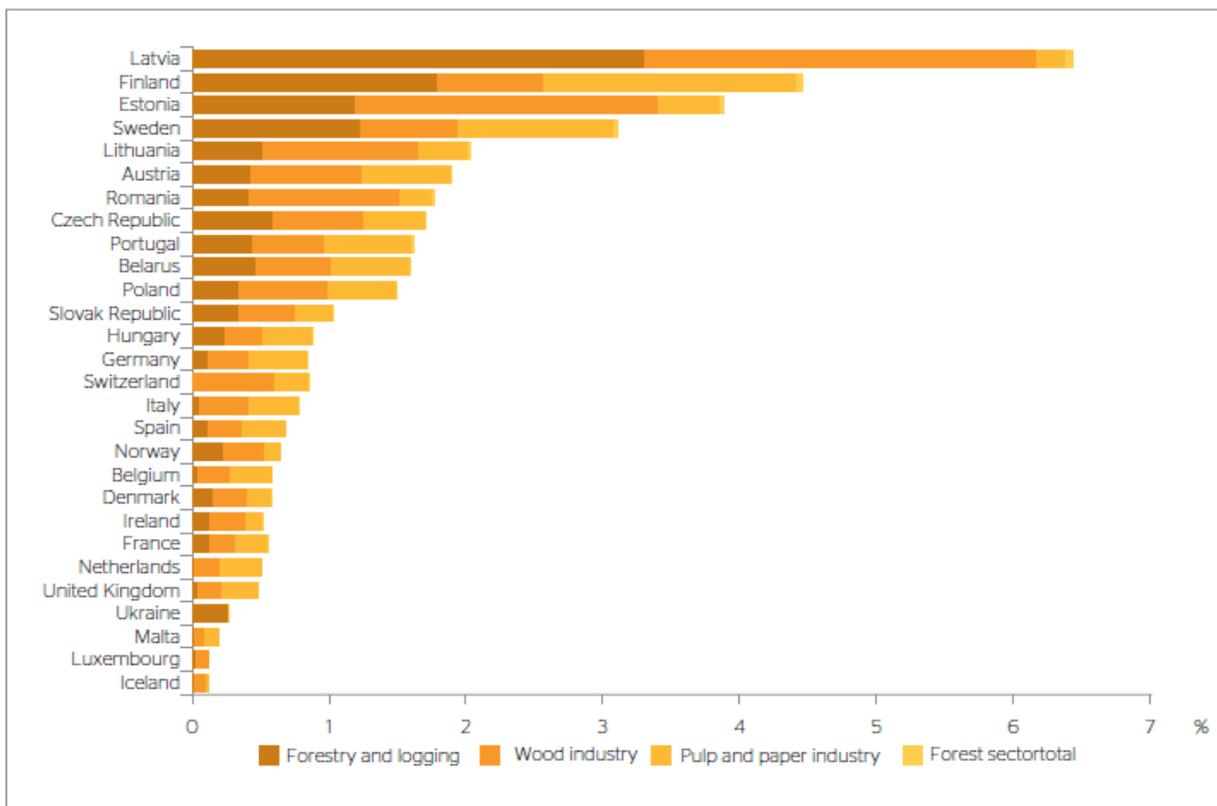


Figure 90. Contribution of the forest sector to GDP in selected countries (percentage of GDP) in 2010

Source: Report 'State of Europe's Forests 2015', p.182, FOREST EUROPE

Northern European region

Particularly in Finland, Sweden, Latvia and Estonia and to some extent Norway the whole forest products play a very important economic role.

These countries can be classified under the "Northern European" region of the forest-based sector and tend to be characterized by many private forest owners, between 60-85%. The forest industry has played an important role in these countries development in the past century. There is a long history of large pulp and paper industry companies, especially in Finland, Norway and Sweden, which have become increasingly multinational since about the 1990s.

The economic significance of forest sectors in the Northern European region are generally high, more than in Europe on average. Indeed, this region has a long history of processing different types of forest products, mainly for exports.

The biggest change is seen in increasing bioenergy production and related forest biomass demand.

The structural changes in the European forest sector seem to be even more striking in this region, with a strong focus on the paper industry, especially the graphics paper industry, in the past. Referring to this the



digital media and the increasing role of emerging economies as producers of forest products are playing an important role.

Both Finland and Norway have concentrated production to communication papers, which is the product group most hard hit by structural change, i.e. substitution by digital media.

Paper and paperboard production has declined by 20% from 2006 to 2013. Sawwood has declined by 17% from 2007 to 2013. Declining production has also been reflected in the decline in pulp and industrial roundwood production. The Finnish forest industry for example has experienced the largest production capacity shutdowns in the paper and wood products sector.

There are now significant efforts to renew the sector and to develop new products and services that answer the needs of bioeconomy in the future.

Many of the countries in the Northern European region seek to develop new forest-based businesses by stimulating research-based innovations as well as supporting the promotion and branding of new and emerging products and materials.

The renewal of the forest based sector is perhaps stronger in this region than anywhere else in Europe. In the Northern European region, particularly Sweden and Finland made some large investments in the forest based sector, as for example SCA made the largest industrial investment in Sweden in one of its pulp mills after the Second World War. Also Södra in Sweden is making large investments in new sawmills. In Äänekoski, Finland Metsä Fibre, part of Metsä Group, is going to build a bioproduct mill, the largest investment of the forest industry in Finland.

Central European region

Germany, Austria, and the Swiss forest sector can be categorized as the “Central European region”.

With regard to forest area, the Central European region has the highest growing stock worldwide – an average of 340 m³/ha, compared to 140 m³/ha in the Nordic countries and 170 m³/ha in Europe as a whole. Also, the annual increment of 10 m³/ha is almost double the European average.

Thus, Central Europe has a high forest resource potential, which allows small-scale, economically feasible and sustainable forest management.

Nevertheless, the relative economic contribution of the forest-based sector to GDP in Central Europe has so far been higher than in Southern Europe, but lower than in the Nordic countries.

Compared to the Nordic countries, the cohesion and integration level of forestry into forest-based industries is very low. Forest owners and industry sometimes view themselves as different branches, rather than one. Improving logistics in the wood supply chain is thus a challenge.

In the Central European region the share of saw logs in total roundwood production is higher while the share of pulpwood is much lower than in other parts of Europe. Although this situation seems to be a general advantage for the sawmill industry, it also constitutes an important limitation: modern technology for large sawmills requires logs of smaller diameter, the supply of which is limited in Central Europe. Due to the mountainous areas of the Alps, timber harvesting in many areas is more costly than in the Nordic countries, for example, which favours the production of large diameter trees and assortments.



Despite this, the availability of raw material resources, high technology know-how, strong tradition-based entrepreneurship and its position close to important markets (relatively low transportation costs) have so far contributed to the success of the Central European forest-based industries.

While Central Europe has been and is strong in the production of semi-finished forest products, it is less competitive in some end-use sectors such as construction and furniture. Compared to the Nordic countries, the share of wood and wood products in construction is much lower. However, wooden construction based on pre-fabricated engineered wood products has significantly increased.

A restructuring of the forest-based sector in the Central European region is expected during the next decades, most likely focusing on diversification, linked to ambitions supporting the development of a bioeconomy.

Southern (South-Western) European region

The South-Western European region can be distinguished in two main forest regions, since this region has two distinct climate influences - the plantation oriented Atlantic rim that borders the gulf of Biscay with higher rates of wood productivity and the low productivity and low management Mediterranean forests that dominate most of central and southern Portugal, southern France and most of Spain and Italy. In general Southern European forests are very diverse.

For historical reasons, the humid and temperate Atlantic forests are dominated by fast growing plantation forests with significant share of exotic species. Maritime pine and eucalyptus are the main species in this region.

The predominance of fragmented, private and aging ownership, lack of or weak producer organisations, and sometimes a lack of infrastructure in rough terrains, results in major wood mobilisation difficulties.

Compared to the European Regions the Southern Region is very important for the furniture producing sector. Nevertheless, higher added-value markets, such as furniture or engineered wood products, are dominated by imported timber.

The sawnwood industry and sector has competitive weakness due to the very small size, old age and inefficiency of the mills, as well as the lack on internationalization and global positioning of the companies.

Compared to the sawnwood industry the development in the wood panel industry has been somewhat different. The wood panels production continued to increase until the economic downturn started in 2008, although the economic slump caused a significant drop in wood panels production mainly in France and Spain.

The development in the bioenergy sector is behind Central European and the Nordic countries. This is partly due to the structure of the energy sector, which is much less reliant on combined heat and power production for district heating.

The forest based sector in the South-Western European region is just the same as the other regions affected by the global trends such as globalisation, the displacement of forest product demand and manufacturing to the East and the emergence of new fibre producing countries in the South (Latin America).

All in all the South-Western European region is in many respects behind the development of the sector in many Northern and Central European countries.



Other countries and regions

The forest-based sector is much too complex than it could be easily described in three main regions. There are countries and regions that does not fit in the classification system in the above outlined regions, but also play a role for the forest-based sector. Exemplary for one of these countries can be mentioned Ireland. In Ireland forests, primarily plantations, account for approximately 11% of the land area of which 54% is in public ownership, mainly the state forestry company. Approximately three-quarters of the forests are less than 30 years old. The annual roundwood harvest in Ireland is forecasted to be doubled by 2028 (3.11 million m³ in 2014) with the increase to come from the private sector. Approximately 80% of timber processor's output and panel board sector were exported mainly to the UK. So far, no paper mill exists in Ireland. Due to demand exceeding supply it is envisaged that by 2020 there will be a roundwood shortfall in excess of 2 million m³. Therefore the mobilisation of forest biomass becomes of utmost importance.

Besides these countries, as for example Ireland, there are entire regions that are gaining more and more importance in the forestbased sector. Especially the Eastern European region and its forest-based sector is developing and increasing their own forest-based industry capacity, as well as using wood more for bioenergy purposes. This can have influences on the availability of imports to other European regions of industrial roundwood from Eastern Europe also with regard to increasing demand for forest biomass and therefore the need for mobilisation of forest biomass in these regions.

Description of key issues

Based on the current situation of the forest-based sector and its challenges, as outlined in in point 2.1.b, following relevant key issues can be summarised and described:

- Changing demands and therewith changing markets for forest-based products, as well as emerging new markets globally, accompanied by competition between traditional and new forest-based products demands for raw material. Likely there will be an increasing demand of forest biomass with the risk of supply shortage of (industrial) roundwood in the future.
- Infrastructure/logistic problems (transport value chains) in certain regions, hampering the mobilisation of forest biomass and the competitiveness of the forest-based sector. Connected with this transportation costs can have an important impact on the sector, particularly in parts of Europe where long-distance transportation due to e.g. limited access to seaways can lead to competitive disadvantages, but in general depending on the location of markets. Not efficient logistics systems and thus high transportation costs can be seen as a major challenge both today and in the future.
- Roundwood prices and product prices, which can have a relevant impact on the forest-based sector and are strongly related to market situations and demand for forest-based products. The volatility of prices and particularly decreasing prices, or at least stable or less increasing prices compared to wood raw material prices and other costs, such as labour, transports and energy, cause the risk for forest-based industries of declining or even negative profits.
- Not sufficiently developed processing technologies for (hard-)wood, as well as not yet sufficiently adapted technologies to changing feedstocks, with regard to e.g. overaging forest stands with high diameter distribution in certain regions of Central Europe.
- Increasing demand for nature conservation, which may lead to competition for land-use and management and thus a decrease of potential Roundwood supply. Some studies state conservation as one of the main reasons for the predicted decline in supply. Whichever view prevails, nature conservation and biodiversity issues will most likely play an increasingly important role in the future.



- Climate change and its impacts on supply of forest feedstock to the forest-based sector in certain regions (amount and kind of biomass, since climate change is impacting for example tree species composition)

Research needs and knowledge gaps

Due to the importance of the forest-based sector, its development and future opportunities, not only for the sector and the sustainable mobilisation of forest biomass, but also to the bioeconomy in general, there is a clear need for research. Research should address and focus on the future of the sector and its markets. Beyond that it should support the sector to renew itself to be globally competitive. Nevertheless it is also of utmost importance to focus on the consumers, their perception and conviction to use forest-based products.

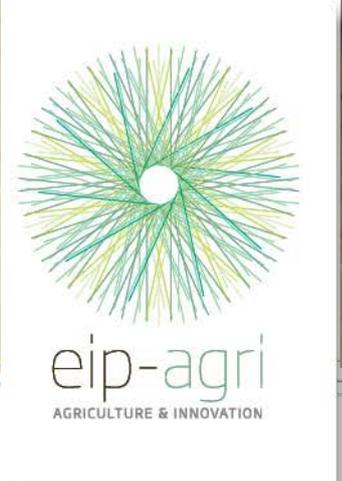
Thus following research needs could be addressed:

- New forest-based products and technologies. As for example sustainable biorefineries, converting biomass into fuels, power, heat, chemicals and materials, food, and other products, as well as new opportunities for the use of (hard-)wood in a wider scope of applications and prefabricated wood construction.
- New services related to forest-based products and to the whole value chain. What does the development of services imply to the European forest-based sector in the future? What are the trade-offs and synergies with other forest services?
- Important market forces and dynamics, regarding the declining production of some current forest products and the emergence of new products and the potential impacts of these on forest biomass/roundwood demand and the synergies and interlinkages between different forest products.
- Impact of international trade and global markets on the European forest based sector. What can be the competitive advantages of the European forest-based sector in a global market?
- Role of the low carbon bioeconomy to support the use of forest-based products.
- Strengthening and development of regional value chains with regard to innovation processes in different value chains. Diffusion of innovation across country boundaries and regions. Driving factors for innovation in different European regions.
- Benefits for forest owners derived from a competitive European forest-based sector and incentives due to supply sustainable forest biomass to the sector. How to ensure a fair distribution of benefits along the entire value-chain?
- Impacts of climate change to the forest based sector in the future and the development of existing value chains.

1. Examples of innovative projects/best practices

Due to structural changes and economic crises the forest-based sector has already started to renew itself and to develop some innovative projects and ideas. Best practices and innovative products, underlining the changes in the forest-based sector, are:

- Renewable energy solutions,
- Wood-based textiles,



- The new bioproduct mill in Äänekoski. The largest investment of the forest industry in Finland. (<http://bioproductmill.com/articles/metsa-group-to-build-next-generation-bioproduct-mill-in-aaekoski>)
- Sustainable biorefineries,
- Wood in construction,
- Paper-based electronics,
- Nano-cellulose products.

Further ideas for innovative projects/solutions and potential operational groups

Ideas for innovative products/solutions have to be developed and could be linked to following ideas:

- New logistic concepts
- New trading concepts
- New marketing concepts for forest-based products
- New services related to forest-based products
- New processing technologies (for high diameter stems)
- New regional storage systems and capacities

Further research needs coming from practice, ideas for EIP AGRI operational groups and other proposals for innovation can be found at the final report of the focus group, available at the FG webpage <https://ec.europa.eu/eip/agriculture/en/focus-groups/sustainable-mobilisation-forest-biomass>

Conclusions

The European forest-based sector has been clearly in a change in Europe and a further restructuring of the forest-based sector can be expected during the next decades, most likely focusing on diversification, and new processes and products.

Nevertheless the forest-based sector in Europe is rather diverse and the importance of the sector, as well as the different impacts and challenges are depending on the respective regions and countries. Thus solutions, innovations and research has to be tackled on regional levels to enhance the forest-based sector and its related value chains, but also on global level with respect to the more and more competing markets in Asia, Latin-America and Russia. The whole forest value chain, will be a big global megatrend in the coming decades.



Most probably there will be a growing demand for EU forest biomass in the future due to increases in the production of traditional and new forest-based products along with forest-based bioenergy. The forest-based sector is also becoming more cross sectoral as other industry sectors and investment groups are starting to produce new products and services based on forest biomass.

Thus future demand of forest biomass and therewith the mobilisation of forest biomass, but as well as the image of wood and forest-based products, linked to the end-consumer, will play a key role. The whole value chain has to be strengthened and in the value chain the potential and benefits of forest biomass as a raw material has to be highlighted.

For a competitive and well-functioning forest-based sector the sustainable mobilisation and supply of forest biomass plays a key role, not only for maintaining and enhancing the competitiveness of the sector, but also for the whole development of the bioeconomy.

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