COMPETITIVENESS OF THE EUROPEAN FOREST SECTOR
- A CONTRIBUTION TO EFSOS II
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GENEVA TIMBER AND FOREST DISCUSSION PAPER 62

COMPETITIVENESS OF THE EUROPEAN FOREST SECTOR
- A CONTRIBUTION TO EFSOS II

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Abstract
As a contribution to the second European Forest Sector Outlook Study (EFSOS II) this study
analysis the historic and future competitiveness of the European forest sector using the
constant market share (CMS) methodology. The analysis is based on bilateral trade data in
monetary terms. The historic ex-post analysis covers the years from 1993 to 2008, with a
specific focus on the period 2003 to 2008. The scenario analysis is undertaken for the period
2010 to 2030. The basis is given by a reference scenario. It describes a business as usual
development. Additionally, as a policy scenario, the effects of the promotion of wood energy
on trade and competitiveness are examined. The ex-post analysis shows that most countries of
the EFSOS region have had a positive export growth in period 2003-2008. The growth of the
world market can be identified as the main driver of the positive development. But also the
presence with forest products in growing regional markets has had positive effects. The
specific wood products also had further additional positive effects. The results of the
reference scenario show that the world market will constantly increase in period 2010 to 2030,
with benefit also for the countries of the EFSOS region. However, the growth of the world
market will be the only driver which leads to export growth in the EFSOS region. This means
EFSOS countries are expected to be below world average with regard to their presence in
expanding regional markets, in particular, for growing commodity markets and with regard to
their competitiveness.

Keywords
Competitiveness, constant market share (CMS), forest sector, scenario analysis, wood energy, trade, wood
products

ECE/TIM/DP/62

UNITED NATIONS PUBLICATION

ISSN 1020 7228
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1. Introduction

1.1 Background

The analysis of structural trends of the forest sector and the production of studies for its long-term outlook is one of the work areas of the integrated programme of work on timber and forestry of the UNECE Timber Committee and the FAO European Forestry Commission. These outlook studies have been undertaken regularly since 1952. Formerly known as the European Timber Trend Studies (ETTS), for the sixth ETTS the title has been changed into European Forest Sector Outlook Study (EFSOS).

The objectives of the outlook study EFSOS II (UN, 2011) are, among others, to analyse structural developments in the European forest sector, to project trends into the future, and to project possible long term consequences of major policy choices. EFSOS II provides an outlook for the period 2010 to 2030. While the UNECE region comprises 56 member countries also outside Europe, the focus of EFSOS II is on European countries including Turkey, except the Russian Federation and countries of the Caucasus and Central Asia. In addition to the main report, EFSOS II is accompanied by a series of discussion papers which provide more detail on the methods and the outcomes of the study. The present study is one of these papers.

1.2 Methodological approach of EFSOS II

The basic methodological approach of EFSOS II is scenario analysis. The projections of the scenarios were performed by linking different models and tools in order to cover the whole forest sector. A reference scenario and four policy scenarios were developed. The reference scenario describes a business-as-usual development. It provides a picture of the future without changes from the previous situation and trends. Based on the reference scenario, specific changes, e.g., based on a specific policy issue, are introduced to outline a policy scenario. Hence, a policy scenario reflects a uni-directional policy choice. The four policy scenarios in EFSOS II are “Maximising biomass carbon”, “Promoting wood energy”, “Priority to biodiversity” and “Fostering innovation and competitiveness”.

The models used in EFSOS II consist of a forest resource model (EFISCEN) which quantifies the potential wood supply from the forest, econometric projections of production and consumption of forest products, a global forest sector model (EFI-GTM) providing projections of global consumption, production and trade of forest products, and the wood resource balance (WRB) which maps supply and use of the woody biomass streams. The scenario results of EFI-GTM are used to undertake a competitiveness analysis. For specific information regarding the applied models and their linkage in EFSOS II please see the main report (UN, 2011) and accompanying Discussion Papers (Jonsson, 2012; Mantau, in press; Moiseyev et al., in press; Verkerk and Schelhaas, in press).
1.3 Objectives of this study

In the first EFSOS study (UN, 2005) two models were basically interlinked, the forest resources model EFISCEN (Schelhaas et al., 2006) and projections of forest products, consumption and trade (Kangas and Baudin, 2003). As described above, the current approach goes a step further and uses modelling results of the global forest sector model EFI-GTM to assess the competitive situation of the European forest sector on international markets. The objectives of this paper are to provide a deeper insight into the applied methodology and the outcomes of the competitiveness analysis undertaken within EFSOS II.

Not all policy scenarios required the full modelling approach of EFSOS II. Some scenarios affected only parts of the models or are analyzed qualitatively. The full approach – and hence the competitiveness analysis – was applied in two scenarios, the reference scenario and the wood energy promoting scenario.

The following Chapter 2 describes the specific methodological approach of the competitiveness analysis in EFSOS II. Firstly, an introduction is given to the issue of international competitiveness. Subsequently, the specific methodology applied in EFSOS II and its linkages to the modelling framework are explained. In addition, the analyzed scenarios are described in more detail. Chapter 2 concludes with a description of the data requirements and data sources. Chapter 3 provides the outcomes of the ex-post analysis of global trade and competitiveness in the period 1993 to 2008. In Chapter 4 the results of the scenario analysis on trade and competitiveness analysis for the period 2010 to 2030 are presented. This paper closes with a discussion of the results (Chapter 5).

Besides the mere academic exercise of doing a competitiveness analysis of the European forest sector, this paper may also provide help especially for policy and industry stakeholders with a specific evaluation of how energy policies may affect a certain industrial sector; or to which extent these effects will occur, or with conclusions on retaining a sector’s competitiveness. The discussion and interpretation will also have take into account other influencing indicators such as productivity, technological development, exchange rates, per capita income, foreign direct investments, etc.
2. Approach and methodology

The analysis of competitiveness on international markets is often and widely used to describe a country’s performance in a specific sector in a specific period. Additionally to an ex-post analysis, the approach in the actual EFSOS study goes a step further and analyses the competitiveness in a future world, based on the results of the scenario analysis. But what is competitiveness, what are the indicators and determinants. How can it be measured and how is it applied in the current study? An introduction to the subject will be given in the following chapter. The methodological approach for this analysis will be presented subsequently. This chapter closes with a presentation of the data used for the analysis and how the data was dealt with in this study.

2.1 What is international competitiveness?

Competitiveness is a widely and often used term in policy and economy. According to the quantity of scientific papers which were published, it seems that concern about the competitiveness on international markets has increased in the last decades with increased international trade, especially in the 1980s and 1990s. Explanations and definitions of “competitiveness” are numerous, hence implying that a general and agreed definition is lacking. A very basic understanding of what competitiveness could be is given by Balassa who addresses competitiveness as ‘the ability to sell’ (Balassa, 1962). More comprehensive definitions are, e.g., given by the OECD – which describes competitiveness as ‘the degree to which, under free and fair market conditions, a country can produce goods and services which meet the test of foreign competition while simultaneously maintaining and expanding the real income of its people’ (OECD, 1992) – or the business dictionary: Competitiveness is the “ability of a firm or a nation to offer products and services that meet the quality standards of the local and world markets at prices that are competitive and provide adequate returns on the resources employed or consumed in producing them.” These more comprehensive definitions do not only take the aspect of selling into consideration but also the related income of people (Fagerberg, 1996). A slightly different definition of competitiveness – when referring to the competitiveness of whole economies – is given by the authors of the Global Competitiveness Report of the World Economic Forum, who define competitiveness “as the set of institutions, policies, and factors that determine the level of productivity of a country” (WEF, 2011). The authors also refer to a dynamic component when summarizing that “a more competitive economy is one that is likely to grow faster over time” (WEF, 2011).

These definitions outline the complex character of a concept such as competitiveness. It seems appropriate that the competitiveness of a referred subject should be seen relative to comparable subjects, hence its competitors, and also with a dynamic component in a specific period, and not only at a certain point in time. The outlined definitions can similarly be applied not only to economies as a whole, but also to specific industry sectors (Porter, 1990; Reichel, 2002). In this regard competitiveness is interpreted as the aggregated competitiveness of the firms of a specific sector. A firm or an industry sector has to be able to produce its
products cost-efficiently, or produce products with a higher quality standard than its competitors, and to do this sustainably over time. The process which leads to ‘cheaper’ products or high quality products which enables a company or a sector to sell is based on complex interactions of a variety of determining factors. According to Porter (1990) the competitive advantage depends on four determinants and two influencing variables. The determinants – factor conditions, demand conditions, firm strategies, structure and rivalry, and related and supporting industries – as well as the variables – chance and government – are linked with each other and determine the competitiveness situation (Porter, 1990).

Beside this fundamental work provided by Porter (1990), it was also intensely discussed in scientific literature if competitiveness can at all be addressed to a national economy. Such criticism mainly derives from a presumed antagonism of international competitiveness to the classical theories of trade. Following the theory of comparative advantages based on Ricardo (1817), Paul Krugman, a main opponent of the idea of competitiveness between nations, argues, that free trade leads to higher welfare in all participating countries. Attempts to manipulate free trade based on national political or governmental interests will consequently lead to a loss in welfare. It is seen critically if specific political interests try to intervene in a specific area of an economy (Krugman, 1991, 1994, 1996). Since free trade increases the performance of a country or a country’s industry sector, it is in the focus of market analysts and politicians. They also ask whether free trade increases welfare, or globalization increases economic rivalry between countries (Mitschke, 2008, 103). Both sides argue under quite different pre-suppositions. While scientists try to understand why and how markets, countries or industries function, policy makers are mainly interested in the specific development and perspective of the country or region they are representing. The concern of the latter seems obvious.

The policies and interventions to improve national, regional or sectoral competitiveness are discussed controversially among scientists. Krugman (e.g., 1996) critically outlines that the development of the free market will be disturbed due to its complexity and consequently the unpredictability of subsequent interactions. E.g., export subsidies of a country to maintain a non-productive or less-productive industry can lead to export subsidies in other countries. This may lead to a wrong allocation of funds, as limited resource factors should be used where productivity (income) is highest. While other authors also see these negative implications, they do not refute competitiveness of nations as such (see e.g., Boltho, 1996; Fagerberg, 1996). Looking at possibilities to enhance competitiveness, Boltho explains that countries are, of course, aiming to achieve a high level of competitiveness. However, ways to achieve these are difficult. Improvements in productivity are assumed to be the best possibility even if some activities are likely to lead to ‘external frictions’ (Boltho, 1996) in this respect. Fagerberg summarizes the basic idea behind competitiveness as ‘sound and simple: people care about how well they do compared to others, individually as well as collectively’ and concludes that especially the support of research and development and technological innovation is relevant in the long term (Fagerberg, 1996).
Although the debate regarding the international competitiveness of nations was intense, there is no doubt it can be applied on industry sectors, as outlined above. A national economy must not be seen as a homogeneous entity but as the sum of a huge variety of different economic units (Reichel, 2002). The same applies to an industrial sector. International competitiveness is the result of the aggregate performance of the single businesses of the respective industrial sector (Porter, 1990). It has to be considered that the variance of competitiveness of single companies in an industrial sector might be higher than the variance between different sectors. Competitiveness can be seen as the ability of an industrial sector to gain sufficient revenues on foreign markets. The dynamic development of international markets requires the permanent ability of the firms of a sector to react on activities of partner or competitors, to improve or develop technologies and processes, and to meet customers’ demands (Mitschke, 2008). Hence, with regard to the complexity of the subject one could also add to the basic definition of the ‘ability to sell’ given by Balassa, the ability to attract, the ability to adjust or the ability to innovate (e.g., Lachmann, 2001).

Based on the classical theories of production and trade, it can be said that the productivity of a nation largely depends on its factor endowment. The production of goods in a country will take place in sectors with comparative advantage (Krugman and Obstfeld, 2006). In theory not the absolute factor endowment is relevant but the ability to use its comparative advantage in relation to other economies. Hence, large economies with low population density might have comparative advantages in the production of commodities which require high land and capital input but only few human resources such as, e.g., wood (Thoroe, 1998).

Empirical studies of international trade show that the quality of the factor endowment has a significant influence on the ability to compete. And, as many studies show, for prosperity and economic development of a country, the quality of the factor labour (human capital) is more relevant than the quality of the factor land (Thoroe, 1998). Somehow contradictory to the theory of comparative advantage seems that especially trade between countries with similar factor endowment has a significant share on total trade (Lachmann, 2001; Mitschke, 2008). As mentioned above, Porter (1990) describes a complex system of determinants and variables of international competitiveness. One of these is described as the state which shows responsible for, e.g., law and policy (factor related policy). It can be said that an increase in free trade also leads to a competition of regulatory policy between nations. This also influences the allocation of mobile production factors. The mobile production factors move to where the factor income is highest. Immobile factors have to adjust the factor income accordingly. This can be done either by adjusting the complementary input of mobile factors or – if this is not possible – some of the immobile factors will not be used for productivity and will remain unproductive (this is the case if land stays uncultivated or when unemployment occurs). The movement of mobile production factors to a better host can be addressed as an ability to attract. The higher the productivity of the factors of an economy, the higher the total income of the factors will be, and thus the welfare (Krugman and Obstfeld, 2006; Reichel, 2002). So, one can say, if the regulatory laws are a key determinant of competitiveness, an
analysis could give insights to which extent an economy is willing to influence the factor income of a branch.

2.1.1 ...and how to measure?

As already stated in the previous section, no generally accepted definition of what exactly competitiveness is exists. The variety of definitions has to be seen according to the objectives of the respective studies. As a consequence, there are several approaches available how the level of competitiveness could be indicated. Different tools, models and concepts can be used to assess the competitive situation of an industry sector. These different possibilities to quantify competitiveness can be basically distinguished in two groups, the group of indicators and the group of determinants or factors. Indicators can be described as dependent variables whereas determinants can be interpreted as independent variables (Gries and Hentschel, 1994; Mitschke, 2008).

The dependent variables are mainly result-oriented indicators which enable an analysis from an ex-post perspective. Among others, the following indicators can be listed in this respect (Gries and Hentschel, 1994; Mitschke, 2008): factor productivity, current account balance, terms of trade, export market shares, real GDP growth rate, real per capita income, revealed comparative advantage, foreign direct investments, patents, research and development expenditures, employment rate, inflation rate. The determinants or factors as variables of international competitiveness can mainly be analyzed from an ex-ante perspective. This implies a correlation of the respective factor and the competitive performance of an industry sector or an economy. Examples for the group of determinants are, e.g., given by Porter who defined factor conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry in connection with the variables “chance” and “government” as determinants for competitive development (Porter, 1990). In addition to this comprehensive enumeration one could go into more detail and also add determinants such as legal and institutional framework; infrastructure; governmental cost components; currency policy or capital market regulation (Gries and Hentschel, 1994; Mitschke, 2008). In this context it should be mentioned that it might not be able to keep the differentiation into the two groups as stringent as indicated for all indicators and factors. Some results of indicators could also be used as a determinant for future competitiveness, e.g., unit labour costs or real exchange rate (Mitschke, 2008).

2.2 Methodological approach

In this section the methodological approach for this analysis will be presented. Firstly, the applied methodology of the competitiveness analysis will be presented. Secondly, the global trade model EFI-GTM will be explained, and thirdly descriptions of the scenarios are provided.
2.2.1 Constant market share analysis

An often-used concept to analyze the competitiveness of an industry sector is based on the ‘ability to sell’ (Balassa) its products and services on international markets. This ability is reflected in the market shares and – more importantly – the development of market shares of an industry sector of a country. To operationalise this idea, Tyszynski proposed the concept of a constant market shares analysis in 1951 (Tyszynski, 1951).

The constant market share (CMS) methodology is an indicator-based ex-post analysis of international trade based on the exports of the countries. It requires bilateral trade data in monetary values. The analysis compares the exports of a specific country to the world exports. It assumes that the export share of a country compared to the world exports remains constant over time. The difference between the actual export growth of a country and the growth of a country under assumed constancy is attributed to a change in competitiveness. For further analysis, the CMS analysis decomposes a country’s export growth of a given period into different effects. These effects can be defined differently, according to the objectives of the study. The first approach to this regard provided by Tyszynski (1951) was to explain the difference between the expected market share from the previous period and the market share of the actual period as a change in competitiveness. Since this initial study by Tyszynski, numerous applications, as well as further developments of the methodology, were undertaken (see e.g., Leamer and Stern, 1970; Richardson, 1971; Jepma, 1986; Fagerberg and Sollie, 1987). For the analysis in EFSOS II we use the formulation developed by Milana (1988). It differentiates the export growth of a country into four effects, the world growth effect, the commodity-composition effect, the market-distribution effect, and a residual effect which can be interpreted as the competitiveness effect. The mathematical formulation is as follows:

\[
\Delta q = \frac{1}{2} [s^0 + s^1] \Delta Q \\
\text{(World growth effect)}
\]

\[+ \sum_i \frac{1}{2} [s^0_i + s^1_i] \Delta Q_i - \frac{1}{2} [s^0 + s^1] \Delta Q \]

\text{(Commodity-composition effect)}

\[+ \sum_i \sum_j \frac{1}{2} [s^0_{ij} + s^1_{ij}] \Delta Q_{ij} - \sum_i \frac{1}{2} [s^0_i + s^1_i] \Delta Q_i \]

\text{(Market-distribution effect)}

\[+ \sum_i \sum_j \frac{1}{2} [Q^0_{ij} + Q^1_{ij}] \Delta s_{ij} \]

\text{(Residual competitiveness effect)}

where \( q \) = value of exports of the focus country, \( Q \) = value of exports of the world, \( s^{0,1} = (q/Q) \) = export share of the focus country at year 0 and 1, respectively, \( i \) = commodity group, \( j \) = importing country, \( \Delta \) = time derivative of the respective term.
Under this formulation the world growth effect transfers the export growth of the world to the export growth of a country. If global trade increases (decreases) a country reveals a positive (negative) world growth effect. The commodity-composition effect subdivides the global trade into different commodity groups. To reach a positive commodity-composition effect a country has to have increasing exports of predominant commodities with above average global trade growth. The market-distribution effect decomposes the periodical chances of trade growth further as it differentiates the development by countries. A positive market-distribution effect shows that a specific country exports above average to a dynamic country which imports more than the average. As a matter of fact, the export growth of a country deviates from the export growth based on the constant market shares. The remaining effect can be interpreted as a residual competitiveness effect. In terms of theory it expresses cost advantage or changes in currency exchange rates. If positive (negative), the country could (could not) increase its growth additionally to the export growth of the world, by commodity-groups, and by importing countries (Leamer and Stern, 1970; Richardson, 1971; Jepma, 1986; Fagerberg and Sollie 1987; Dieter and Englert, 2007 and 2009). Nonetheless, competitiveness (of a country’s industry sector) comprises all of the three latter effects since the ability to sell, particularly in growing product and regional markets, is an indicator for above average export expansion.

2.2.2 The Global Trade Model EFI-GTM

EFI-GTM is a regionalized partial equilibrium model of the global forest sector with a special emphasis on Europe (Kallio et al., 2004, Moiseyev et al., 2011). The model calculates periodical production, consumption, import and export quantities and product prices for the forest sector products as well as periodical capacity investments of the forest industry for each region. The dynamic changes from year to year are modelled by recursive programming. In each period, the producers are assumed to maximize their profits subject to the production possibility set, while consumers are assumed to maximize their welfare subject to the consumption possibility set. Both producers and consumers are modelled as price takers, i.e., the model assumes competitive markets (Kallio et al., 2004).

The model includes at present 61 regions covering the whole world, but with a special focus on Europe. The currently modelled products include six wood categories, 26 forest industry products and four recycled paper grades (Kallio et al., 2004). Wood energy is included as a separate product in EFI-GTM for purposes of EFSOS II. It is not modelled in the same way as traditional products, and is only included for EFSOS countries, so that competition between traditional wood use and wood for energy is not yet optimally included. Because of the complexity of the model, it may be difficult to identify consequences of particular assumptions needed to initialise the model, and which processes cause differences between scenarios (UN, 2011).

Within the model trade can be considered as a separable activity carried out by trade agents. These agents can, of course, be the initial producers. To maximize the profit from trade, exporters buy goods at the domestic price, pay for the transportation, and sell at the price of
the importing region. Similarly, importers buy at import prices and aim to make profits by selling at domestic prices (Kallio et al., 2004).

It is common in trade models to constrain the inter-temporal changes in inter-regional trade. The fact that the trade patterns in the real world do not seem to change dramatically from one period to another can be caused by various reasons not captured in the models, e.g., heterogeneity of the products of long-term contracts between the trade partners. Such trade inertia can be accounted for in the model by setting lower or upper boundaries for the trade flow of a specific product to a specific region (Kallio et al., 2004).

**2.2.3 Scenarios**

In total, a reference scenario and four policy scenarios have been applied in EFSOS II. The full model framework was only applied for the reference scenario and the promoting wood energy scenario. Hence, the competitiveness analysis was carried out for these two scenarios. A brief description of the scenarios is given below. For further reading, we would like to refer to the main study (UN, 2011).

The reference scenario is based on the B2 storyline of the IPCC (Nakićenović et al., 2000). The storyline provides key parameters such as population growth, economic development and energy prices. It describes a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. The global population increases constantly from 6.9 billion in 2010 to 8.4 billion in 2030. European population remains nearly constant at 500 million people. Developments in the technical sector are moderate. Data for GDP growth were taken from the International Monetary Fund (IMF) for the years 2010 to 2014 (IMF, 2009) and thereafter the original storyline projections with a decline in Europe from a rate of 1.4% in 2015 to 1% in 2030 (UN, 2011). For wood fuel consumption, the historic growth rate of 1.5% per year (Steierer, 2010) was also applied for the reference scenario.

The promoting wood energy scenario analyses what happens if the targets for renewable energy of European countries in 2020 are met and that the proposed trend continues to 2030. The national targets for the share of renewable energy production and consumption are translated to a demand for wood. The scenario shows which impact the need for wood for energy, additional to the demand for wood products, will have on the forests and the production and trade of forest products. Development of population and GDP growth are kept similar to the reference scenario. With regard to a proposed rising share of other renewable sources, the share of wood decreases from about 50% to 40% (UN, 2011).

**2.3 Empirical and modelled data**

The CMS analysis requires bilateral trade data in monetary values. The basic data for the ex-post analysis was taken from the UN Commodity Trade Statistics Database (UN Comtrade). The data for the scenario analysis, the so called “future ex-post”, was derived from modelling results from EFI-GTM.
The UN Comtrade database provides international trade data according to different classifications. The current study uses the classification of the Harmonized System (HS) of 1988 as the time series of the ex-post analysis covers the period 1993 to 2008. Relevant for the analysis are data on the exporting and the importing country, the type of commodity and the value of the bilateral trade in a specific year. For the purpose of this study the values reported in US Dollars were used. Before being operational, the some five million data sets had to be validated. Basically, we preferred information on import values. All data was tested for extreme values. If inconsistencies were detected, data was either replaced with the respective export flow or according to similar data as provided by FAO or Eurostat. The modelled scenario results from EFI-GTM provided bilateral trade data in quantities. For the calculation of monetary values $q$ the traded product quantity $k$ from country $m$ to country $n$ were multiplied with the respective product price $p$ of the importing country: $q_{mn} = k_{mn} \cdot p_n$.

The structure of the products and the commodity groups was kept similar for the ex-post and the scenario analysis. Hence, the products in trade statistics and in EFI-GTM had to be grouped similarly. Five main products groups were identified, comprising various specific products. Beside the wood raw material such as e.g., industrial roundwood or wood chips and particles, the products of the semi-finished product groups sawnwood, panels, pulp and paper and paperboard were taken into account. Table 1 gives an overview of the product groups and the related products analyzed in the study. The respective HS codes are listed in the Annex.

<table>
<thead>
<tr>
<th>Commodity Group</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>Fuel wood</td>
</tr>
<tr>
<td></td>
<td>Industrial roundwood</td>
</tr>
<tr>
<td></td>
<td>Wood chips and particles</td>
</tr>
<tr>
<td></td>
<td>Wood residues</td>
</tr>
<tr>
<td>Sawnwood</td>
<td>Sawnwood coniferous</td>
</tr>
<tr>
<td></td>
<td>Sawnwood non-coniferous</td>
</tr>
<tr>
<td>Panels</td>
<td>Plywood &amp; veneer</td>
</tr>
<tr>
<td></td>
<td>Particle board</td>
</tr>
<tr>
<td></td>
<td>Fibre board</td>
</tr>
<tr>
<td>Pulp</td>
<td>Mechanical wood pulp</td>
</tr>
<tr>
<td></td>
<td>Chemical &amp; semi-chemical wood pulp</td>
</tr>
<tr>
<td></td>
<td>Recovered paper</td>
</tr>
<tr>
<td>Paper and Paperboard</td>
<td>Newsprint</td>
</tr>
<tr>
<td></td>
<td>Printing + writing paper</td>
</tr>
<tr>
<td></td>
<td>Other paper + paperboard</td>
</tr>
</tbody>
</table>
On country level, the data was structured according to the geographical scope of the EFSOS study and the regions covered in EFI-GTM. The following table lists the countries of EFI-GTM and specifies which countries are part of the EFSOS region.

Table 2: Country grouping according to EFI-GTM

<table>
<thead>
<tr>
<th>Continent</th>
<th>Countries/Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>Africa-East, Africa-North, Africa-South, Africa-West</td>
</tr>
<tr>
<td>America</td>
<td>Argentina, Brazil, Canada, Chile, Mexico, USA, Rest of Latin America</td>
</tr>
<tr>
<td>Asia &amp; Oceania</td>
<td>Australia, China, Japan, India, Indonesia, Korea, Malaysia, New Zealand, Thailand, Middle East, Southeast Asia</td>
</tr>
</tbody>
</table>

*) Countries of the EFSOS region

As trade in the UN Comtrade database covers about 200 countries, some countries were grouped to a region. Additional to the 56 regions of EFI-GTM, another region had to be added in order to account for smaller countries and regions not covered in EFI-GTM. In this group named “Rest of the World”, mainly Asian countries and small islands are aggregated. The grouping of the Comtrade data also lead to a reduction of global trade as exports within a country group (e.g., Africa-East) were not considered in the ex-post analysis.
3. **Ex-post analysis of the period 1993 to 2008**

This chapter covers the ex-post analysis of trade and competitiveness in the period 1993 to 2008. It will be shown how the EFSOS region performed, how trade and competitiveness of the countries of the EFSOS region developed. In the first part of this chapter this will be done with regard to all products. In the second part of this chapter the analysis will be undertaken specifically for each commodity group.

3.1 **Global trade and competitiveness in the period 1993 to 2008**

The ex-post analysis covers the time period from 1993 to 2008. In this period global trade of forest products increased constantly, besides smaller drops in a few years. To illustrate this, the following Figure 1 shows the development of world exports by regions.

Figure 1: Development of world exports of forest products by continents in the period 1993 to 2008

Data source: UN Comtrade. See annex for country list.

In the period 1993 to 2008 the world exports increased from 102 billion USD to 257 billion USD. Some 2.5 billion USD in average per year were exported from so-called “unspecified regions”. In the above figure, these quantities are allocated to the region Asia & Pacific.

What can be seen in 2008 is already a slowdown of the development as a starting effect of the global financial and economic crisis. Exports from European countries increased from 41 billion USD to 141 billion USD, which corresponds to a 40 per cent share of world exports in 1993 and a 55 per cent share in 2008 respectively. The share of intra-EFSOS trade was largely stable at about 79% of total exports, in a range of 77.3 to 81.2%. This means that about 10% of the world exports are due to extra trade of the EFSOS countries. The average annual
growth rate of the world exports is about 6.3%. The average annual growth rate of the exports of European countries is about 8.2%.

For the purpose of this study the focus of most of the following figures, tables and analysis will be on the countries of the EFSOS region. In addition, these results will be compared to other major wood producing, processing, and consuming economies; in particular these are Brazil, Canada, China, Russia, and the United States, subsequently also called BRUCC countries.

To illustrate the dynamics of international trade (exports), the following figures show the average annual growth in the first six year period 1993 to 1998 compared to the average annual growth in the last six year period 2003 to 2008. The bubble size indicates the share of a country’s exports on the world exports in average in the period 2003 to 2008. Two base lines are inserted in the figures. The line “world development” reveals which countries developed better than the world. A comparison with the angle bisector reveals the development of a country in the last period compared to the development in the first period. If a country is above the angle bisector it had a higher growth in the last period than in the first period.
Figure 2: Development of average annual growth of export in 1993-1998 compared to 2003-2008, larger countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008. Belgium and Luxembourg are tallied up in this figure (BLX).
Figure 3: Development of average annual growth of export in 1993-1998 compared to 2003-2008, smaller countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008. The bubble of MDA cannot be displayed as values are too small.

The figures illustrate that mainly countries with high forest resources gain a high share of the world exports. Major exporters of wood products in the period 2003 to 2008 are Canada (13.0%), the United States (9.22%), Germany (8.4%), Finland (7.7%), and Sweden (7.1%). In the EFSOS region France (3.6%) and Austria (3.4%) are also among the most important exporters. In total, the countries of the EFSOS region exported 49% of all exports in period 2003-2008. In the first period 1993-1998, the export share of the EFSOS countries summed up to 44%.

Not all countries with high export shares show a development above the world development. Especially Canada developed very slowly in the period 2003-2008 compared to the period 1993-1998. Most EFSOS countries developed more or less according to the world development. Some countries developed less than the world. However, in most cases they still have a higher annual growth than in the period 1993 to 1998. Exclusively the Baltic States and Canada show a slower development in 2003-2008 than in 1993-1998. For the Baltic States, this is not quite surprising as their growth in the early 1990s was very dynamic due to new state independency.
The following figure shows the average annual export growth subdivided into the four effects of the CMS analysis of the period 2003 to 2008. The black line indicates the country’s balance of the four effects which equals their respective average annual export growth in the period 1993-1998. As mentioned above, the results of the CMS analysis will be compared to the BRUCC countries. Additionally, with the EFSOS region as an aggregate the results of these countries are arranged on the right hand side and are also ordered by export share.

**Figure 4: Average annual export growth and CMS effects in the period 2003 to 2008, all products**

Note: Countries are ordered by average annual export growth. EFSOS countries are arranged on the left side, the aggregate of the EFSOS region and BRUCC countries on the right side.

In the EFSOS region, all countries had a positive export growth in period 2003 to 2008. Main driver of this development was the growth of the world market. Also the market distribution affected the growth positively in most European countries. This may due to the increase of intra-European trade. However, export growth in many of the EFSOS countries is affected negatively by the commodity composition and the residual competitiveness effect. The underlying factors and the co-actions of the different effects will be discussed in more detail in the following chapter when looking at trade development and competitiveness by commodity groups.

### 3.2 Global trade and competitiveness by commodity groups

In this chapter, the development of exports will be discussed in detail by the commodity groups. Also a CMS analysis will be conducted on each commodity group level.
When doing a CMS analysis on sub aggregate product level, the commodity-composition effects do not sum up to the value of the higher aggregate level analysis. This becomes obvious when looking on the most extreme sub aggregation of commodities possible: a CMS analysis for each commodity separately. In this case the commodity-composition effect equals zero. However, it can be shown that the world-growth effect compensates the difference. When summing up the specific values of the product sub aggregate CMS analysis to a higher aggregate, the world-growth and the commodity-composition effects equal the sum of the two corresponding values of the higher aggregate CMS analysis. The further two effects market-distribution and the residual competitiveness effect remain unchanged. Each of them sums up discretely from the product sub aggregate CMS effects.

As described in the above section, the world trade of the wood based commodities developed differently. Globally, the most dynamic product groups are pulp and paper and paperboard. Regarding European countries, the product groups of wood, wood-based panels and pulp show the most rapid growth. The following figure shows the world exports of the commodity groups wood, sawnwood, wood-based panels, pulp, and paper and paperboard. The overall development is identical with Figure 1.

**Figure 5: Development of world exports of forest products by commodity groups in the period 1993 to 2008**

![Graph showing world exports of forest products by commodity groups](image)

Data source: UN Comtrade. See annex for country list.

The commodity group of paper and paperboard has the highest share of all commodity groups. Its share increased from 42% in 1993 to 48% in 2008. Also in the EFSOS region the exports of paper and paperboard account for the highest values. The exports increased from...
26 billion USD in 1993 to 78 billion USD in 2008, which is about 64% of all paper and paperboard exports in 2008.

The most dynamic product group in this period is pulp. Its world exports increased on average by 8.9%. The EFSOS countries show an even more dynamic development. Their average growth rate of pulp exports was about 10.2%. Exports of pulp increased from 3.3 billion USD to 14.3 billion USD. The growth rates of the exports of wood and wood based-panels also show double digit growth in the EFSOS region: Exports for wood increased on average by 10.9% to 6.7 billion USD in 2008, exports for wood-based panels increased on average by 10.5% to 16.1 billion USD. The least dynamic development can be stated for sawnwood commodities. World exports increased from 20.5 billion USD in 1993 to 32.8 billion USD in 2008 with an average growth rate of 3.2%. But also in this commodity group, the EFSOS countries show a higher annual growth rate of about 7.3%.

### 3.2.1 Commodity group “wood”

The commodity group “wood” consists of all industrial roundwood, coniferous and non-coniferous, as well as chips, particles, fuel wood and wood residues. Exports of the EFSOS region increased from 2.6 billion USD in 1993-1998 to 5.0 billion USD in 2003-2008. World’s exports increased from 14.0 billion USD to 19.2 USD.

The following figure shows the development of annual growth of trade of the period 1993-1998 compared to period 2003-2008. The bubble size of the listed countries represents the respective share on world exports in the period 2003-2008.

Major exporters of the commodity group wood in period 2003-2008 are countries with large forest areas such as Russia (19.2%), the United States (9.6%), Western Central African countries (7.2%), Malaysia (5.9%), and Australia (5.5%). In Europe, the most important exporters of the commodity group wood are Germany (5.0%), Latvia (2.2%), France (2.1%), Sweden (1.9%), and Estonia (1.3%). The exports of the European countries sum up to 26.3% of global exports. This is a doubling of exports compared to period 1993-1998. Major global exporters in period 1993-1998 were the United States and Malaysia with shares on global exports of 24.7% and 10.6% respectively.
Figure 6: Development of average annual growth of export of the commodity group wood in 1993-1998 compared to 2003-2008, larger countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008.
Figure 7: Development of average annual growth of export of the commodity group wood in 1993-1998 compared to 2003-2008, smaller countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008. Belgium and Luxembourg are tallied up in this figure (BLX). The bubble of MDA cannot be displayed as values are too small.

Most countries showed a better development in the period 2003-2008 than in the first period 1993-1998. Especially Russia, Southeast Asia (without Malaysia), Australia, Germany, and Western Central African countries had a strong increase of export growth in period 2003-2008 (see figure). In Europe also Sweden, Latvia, Portugal, and France had a high export growth. The EFSOS region had an average export growth of 700 million in 2003-2008 which is more than a doubling compared to 1993-1998 (309 million USD).

Major importer of the wood commodities in the period 2003-2008 is China, which imported 21.1% of the world exports, followed by Japan (20.6%), Finland (5.3%), India (5.0%), and Korea (4.5%). In Europe also Austria (3.9%), Sweden (3.9%), Italy (3.7%), and Germany (2.3%) are relevant importers in period 2003-2008. China (with an average annual import growth of 585 million USD), Japan (195 million USD), Finland (192 million USD), India (150 million USD), and Austria (77 million USD) were the most dynamic importing countries regarding the average annual import growth in period 2003-2008.

One of the main drivers of the global development in period 2003-2008 is Russia. Its exports accounted for one fifth (19.2%) of worlds exports in the period 2003-2008. The rapid increase
of demand of the neighbouring countries was mainly responsible for this development. China imported 50% of Russia’s world exports. The next important importing countries are Japan and Finland. Altogether these three countries imported more than 83% of Russia’s exports. Japan as the second large and dynamic importer of wood did not receive relevant quantities from European countries. Finland as the main and most growing importer of wood in Europe receives only about 30% of its wood imports from European countries, mainly from other neighbouring countries such as the Baltic States and Sweden.

The competitiveness of the EFSOS countries regarding the product group wood is illustrated in subsequent figure. It shows the average annual export growth and the CMS effects in the period 2003 to 2008. The results in this figure are solely related to the commodity group wood. The figure shows the results of the countries of the EFSOS region, of the EFSOS region as an aggregate and of five major countries (BRUCC) of the forest sector outside Europe.

Figure 8: Average annual export growth and CMS-effects of the commodity group wood in the period 2003-2008. EFSOS countries are ordered by average annual export growth.

Note: Countries are ordered by average annual export growth. EFSOS countries are arranged on the left side, the aggregate of the EFSOS region and BRUCC countries on the right side.

The positive development of the EFSOS region is mainly due to the positive development of the world market. The world market effect is positive in all countries. The other three effects do not show a uniform pattern for the whole European region. When aggregated, all CMS effects of the EFSOS region have positive signs. About three quarters of the export growth of the EFSOS countries can be attributed to the world growth effect. Market distribution effect
and commodity composition effect only have minor impact on the total development. This indicates a stable diversification of exports, neither with specific focus on exceptional regions nor specific focus on exceptional products.

The highly positive market effect of Russia is mainly due to increasing exports to the increasing import markets of China, Japan and Finland. On the other hand the negative values of the market effect of United States and Canada derive from a prevailing presence in regions with moderate import growth. China’s exports decreased in period 2003-2008 which corresponds with the strongly risen domestic demand for raw materials.

### 3.2.2 Commodity group “sawnwood”


The next figure shows the development of the annual growth of export of the commodity group sawnwood in 1993-1998 compared to 2003-2008. The bubble size of the listed countries represents the respective share on world exports in the period 2003-2008.

As can be seen, the major exporter of sawnwood in period 2003-2008 is Canada. However, Canada’s formerly very dominant position in the 1990s, with a market share of more than 30% of all sawnwood exports decreased to less than 20% in the period 2003-2008. Other relevant exporters are Sweden (9.0%), Russia (7.1%), USA (6.8%), and Finland (5.8%). In Europe also Germany (5.5%) and Austria (5.0%) are important exporters. The EFSOS countries in total exported 26% in the period 2003-2008, while it was 18% in the period 1993-1998. In the first period 1993-1998 Canada was already dominating world’s exports with a share of 35% on global exports. The United States placed second (10.9%). Sweden and Finland had nearly the same market share as in the last period.
Figure 9: Development of average annual growth of export of the commodity group sawnwood in 1993-1998 compared to 2003-2008, larger countries

Data source: UN Comtrade. See annex for country list.
Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008. Belgium and Luxembourg are tallied up in this figure (BLX).
Figure 10: Development of average annual growth of export of the commodity group sawnwood in 1993-1998 compared to 2003-2008, smaller countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008. Belgium and Luxembourg are tallied up in this figure (BLX). The bubble of MDA cannot be displayed as values are too small.

The most dynamic exporters were Russia, Germany, Sweden, Austria, and Western Central African countries (see figure). Few countries showed an annual shrinking in the period 2003-2008. As already explained, Canada’s exports dropped drastically. But also Indonesia, the Baltic States, Belarus, Bulgaria, and Greece, showed a negative export growth. Despite the drop of Indonesia’s exports, it follows Malaysia as the second largest exporter of tropical sawnwood.

Major importer of sawnwood in the whole period is the USA with imports of 6.6 billion USD in the period 1993-1998 and 7.7 billion USD in 2003-2008. However, as the global imports developed more dynamically, its share on global imports decreased from 27% to 23%. Other major demanding regions in the last period were Japan (8%), United Kingdom (7%), Italy (7%), and China (5%). The most dynamic importing regions were Middle East Asia with an average annual import growth of 300 million USD, North Africa (196 million USD), China (187 million USD), France (128 million USD), and the Netherlands (99 million USD). Major imports of sawnwood to the United States are from Canada (76%). Imports from other regions only play a minor role. Canada is also the main exporter to Japan. But European countries
also have significant market shares. The importing regions in Europe mainly receive their quantities from other European countries.

The following figure shows the results of the CMS analysis of the period 2003-2008 of the countries of the ESOS region as well as the aggregated result of the EFSOS region and the BRUCC countries. The line describes the average annual export growth of a country. The CMS effects are shown in columns.

**Figure 11: Average annual export growth and CMS-effects of the commodity group sawnwood in the period 2003-2008. EFSOS countries are ordered by average annual export growth.**

![Average annual export growth and CMS-effects of the commodity group sawnwood](image)

Note: Countries are ordered by average annual export growth. EFSOS countries are arranged on the left side, the aggregate of the EFSOS region and BRUCC countries on the right side.

Most countries of the EFSOS region had a positive export growth in 2003-2008. While countries like Germany, Sweden, and Austria showed a strong development in the period 2003-2008, a few other countries, the Baltic States, Belarus, Bulgaria, and Greece, had a negative development (see figure). Based on the positive global development, all countries show a positive world market effect. Also the market distribution effect has a positive sign in most European countries. In the European countries with high export growth, the commodity composition effect is negative. However, this is by far compensated by the other effects. Interestingly the world market effect does not have the dominant role as it has in other commodity groups. This is the dominant driver for export growth in only a few countries.

In aggregation, the EFSOS countries developed very positively. World market effect, market distribution effect and residual competitiveness effect have positive signs. Only the commodity composition effect aggregates to a negative value. As described for the EFSOS
region, also in the BRUCC states the world market effect does not have a dominant role. In this commodity group the market distribution effect has higher values. Especially Russia and Canada were affected by these market structures, however with different algebraic signs. These specific situations may result from market structures with patterns of high concentration of material flows. Canada is the major exporter to the United States and Japan, which are the main importing markets of sawnwood. However, as these two countries show decreasing imports which are below average in period 2003-2008, this affects the market distribution effect of Canada negatively.

3.2.3 Commodity group “wood-based panels”
The commodity group “wood-based panels” consists of the products: particle board including OSB, fibre board, plywood, and other similar boards. World exports increased from 16.7 billion USD in the period 1993-1998 to 30.8 billion USD in the period 2003-2008. Exports of the EFSOS region increased from 5.6 billion USD to 13.5 billion USD, respectively. The next figure shows the development of annual growth of trade of the commodity groups wood-based panels. The bubble size of the listed countries represents the respective share on world exports in the period 2003-2008.

Major exporting countries in the period 2003-2008 are Canada (10.9%), Germany (9.8%), China (9.6%), Malaysia (8.0%), and Indonesia (7.4%). In the EFSOS region additional important exporters are Belgium (4.5%), Austria (4.0%), Finland (3.1%), and France (3.0%). The exports of the EFSOS countries sum up to 43.8% of world’s exports. In the first period 1993-1998 the share of European panel exports accounted to 3.4%. Important European exporters were Germany (6.1%), Finland (3.7%), Belgium (3.2%), France (3.0%), and Austria (2.9%). Global exports were dominated by the Asian countries Indonesia (24.2%) and Malaysia (11.1%) and the North American countries Canada (9.1%) and United States (7.4%).
Figure 12: Development of average annual growth of export of the commodity group wood-based panels in 1993-1998 compared to 2003-2008, larger countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008.
Figure 13: Development of average annual growth of export of the commodity group wood-based panels in 1993-1998 compared to 2003-2008, smaller countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008. Belgium and Luxembourg are tallied up in this figure (BLX). The bubble of MDA cannot be displayed as values are too small.

The most dynamic exporters in the period 2003-2008 were China, Germany, Malaysia, Austria, and Russia, while Canada and Indonesia had a negative average annual growth of panel exports of 318 million USD and 60 million USD respectively (see figure). Indonesia already had a shrinking of exports of 365 million USD in the period 1993-1998. The EFSOS region showed an overall increase in exports of 628 million USD on average in 1993-1998 and of 1.3 billion USD in average in 2003-2008. All EFSOS countries developed positively in both periods, with Greece and Moldova as exceptions. Exports by Greece decreased 9 million USD on average in 1993-1998. Moldova had a reduction of panel exports of 63,000 USD in 2003-2008.

Major importers of wood-based panels in 2003-2008 are the United States (20.6%), Japan (8.4%), Germany (6.0%), the countries of the Middle East (5.6%), and the United Kingdom (5.1%). In Europe also France (3.6%), Italy (3.4%), and the Netherlands (2.8%) are relevant demanding regions. The region of the Middle East and Germany were the most dynamic importing regions with an increase in average of 286 million USD and 211 million USD respectively in 2003-2008. Also France (121 million USD), the Netherlands (104 million
USD) and Poland (101 million USD) and all other countries had a growth of imports in 2003-2008. In contrast to this, the United States as the major importer of panels and China had a negative growth of imports. Major exporters to the United States are Canada (3.2 billion USD), China (884 million USD) and Brazil (436 million USD). Imports from Europe to the US only play a minor role. The Middle East, as the most dynamic importing region, received mainly panels from countries outside Europe (China, Indonesia, Malaysia, Russia, but also Turkey). The top exporters to Germany and United Kingdom are European countries. Exports to Japan, the second largest import market, are mainly from Asian and Pacific countries. Imports from Europe play only a minor role (e.g. from Austria 33 million USD, Germany 32 million USD).

The CMS results based on the ex-post trade data of the period 2003-2008 are shown in the following figure. Illustrated are the countries of the ESOS region as well as the aggregated result of the EFSOS region and the BRUCC countries. The line describes the average annual export growth of a country. The four CMS effects are presented as columns.

**Figure 14:** Average annual export growth and CMS-effects of the commodity group wood-based panels in the period 2003-2008. EFSOS countries are ordered by average annual export growth.

Note: Countries are ordered by average annual export growth. EFSOS countries are arranged on the left side, the aggregate of the EFSOS region and BRUCC countries on the right side.

The EFSOS countries basically show a positive development of average annual exports, despite Moldova, which had a negative growth of exports in period 2003-2008. In particular, all EFSOS countries show a positive world growth effect and – with the exception of Ireland
– a positive market distribution effect. Commodity composition effect and residual competitiveness effect do not show uniform patterns.

As an aggregate the EFSOS region developed better than the BRUCC countries. Main driver of the development was the growth of the world market. However, also exports to growing market (e.g., the Middle East, Germany, United Kingdom) had a significant effect on this. On the other hand, the residual competitiveness effect shows a negative value, which emphasizes that exports to growing markets were exceptionally successful. This can be seen in contrast to the effects of China, which also had a very positive export growth. Interestingly, the market distribution effect shows a negative sign, as China’s exports to the decreasing panel market of the United States developed far above average. This results in a very positive residual competitiveness effect. Canada’s negative performance can mainly be explained by still large exports to the shrinking market of the US and the disability to export to emerging panel markets.

3.2.4 Commodity group “pulp”

The commodity group pulp consists of the commodities mechanical wood pulp, semi-chemical wood pulp, chemical wood pulp, and recovered paper. Exports of the EFSOS region increased from 5.2 billion USD in the period 1993-1998 to 10.1 billion USD in the period 2003-2008. On the global level exports were about 18.9 billion USD in 1993-1998 and increased to 32.3 billion USD in 2003-2008.

The following figure shows the development of annual growth of trade of the pulp products. The bubble size of the listed countries represents the respective share on world exports in the period 2003-2008.

In the period 2003-2008, major exporters of pulp were Canada (19.2%), the United States (19.1%), Brazil (9.9%), Sweden (7.0%), and Chile (5.2%). In addition to Sweden also the EFSOS countries Finland (4.5%), Germany (2.9%), the Netherlands (2.5%), and Portugal (2.3%) were important exporters of pulp. Total exports of the EFSOS region accounted to 31.5% of global exports. In period 1993-1998 the exports of the European countries had a market share of 27.7% on global exports. For the period 1993-1998, the list of the top exporting countries is identical with the last period. However, the share of the two North American countries on global exports was much higher. Canada exported 28.6% and the United States exported 22.9% of globally trade volumes.
Figure 15: Development of average annual growth of export of the commodity group pulp in 1993-1998 compared to 2003-2008, larger countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008. Belgium and Luxembourg are tallied up in this figure (BLX).
Figure 16: Development of average annual growth of export of the commodity group pulp in 1993-1998 compared to 2003-2008, smaller countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008. Belgium and Luxembourg are tallied up in this figure (BLX). The bubbles of BIH, BLR, LTU, LVA, MDA, TUR centred around the axes of coordinates an only fairly visible as values are too small.

The most dynamic exporters of pulp in Europe in period 2003-2008 were Sweden, the Netherlands, United Kingdom, Germany and Finland (see figure). Despite Moldova, Slovenia and Romania all countries of the EFSOS region showed a positive average export growth in 2003-2008. In addition to this only further two European countries had a slower export growth in 2003-2008 compared to 1993-1998. These countries are Bulgaria and Belarus. In total the countries of the EFSOS region increased their exports about 1.5 billion USD. In period 1993-1998 European exports increased about 306 million USD. Most countries showed a positive development. Only the EFSOS countries Poland, Ukraine, Croatia, and Greece had shrinking exports.

Major importing countries of pulp in period 2003-2008 were China (21.8%), the USA (10.2%), Germany (10.1%), Italy (6.7%), and Korea (5.1%). In the first period, also Japan was a major importer of pulp, but was replaced by China from its top five position. In Europe, also France (4.3%), the Netherlands (3.3%), and United Kingdom (2.6%) are relevant demanding regions. The most dynamic importing region in the period 2003-2008 was China with an average annual import growth of 1.5 billion USD. Also Germany (379 million USD),
the United States (258 million USD), Korea (166 million USD), and Italy (157 million USD) had a rising demand. Mainly countries from outside Europe were relevant exporters of pulp to China, with Canada and the United States being the most important traders. Also European countries exported only minor quantities to the United States. However, Germany, as the second most dynamic region, mainly imported pulp from European countries in 2003-2008. In contrast to this, Italy as the second largest and dynamic European importer mainly received pulp from countries outside Europe.

The subsequent figure illustrates the results of the competitiveness analysis in the period 2003-2008. The figure shows the results of the countries of the EFSOS region, of the EFSOS region as an aggregate and of the BRUCC countries. The structure of the figure is similar to preceding figures.

**Figure 17: Average annual export growth and CMS-effects of the commodity group wood-based panels in the period 2003-2008. EFSOS countries are ordered by average annual export growth.**

Note: Countries are ordered by average annual export growth. EFSOS countries are arranged on the left side, the aggregate of the EFSOS region and BRUCC countries on the right side.

The EFSOS countries basically show a positive development. There are only few countries which had a negative average annual export growth (Moldavia, Slovenia, and Romania). All countries show a positive world market effect. On the other hand, and with only few exceptions (the Netherlands, United Kingdom, Belgium, Portugal, Czech Republic, Bulgaria, and Lithuania), the EFSOS countries show a negative market distribution effect. This might result in the disability to export to China, which is the country with by far the highest import
growth. Commodity composition effect and the residual competitiveness effect do not show a uniform pattern among European countries.

In aggregation the EFSOS region had a higher export growth than the BRUCC countries. The main driver for the positive development was the world market. Also commodity composition and residual competitiveness effect had positive impacts, whereas the market distribution had a negative impact on the overall performance. The United States, Canada, Brazil, Russia, and China also had a positive export growth. The main driver for this was also the growth of the world market. The structure of the other effects is quite different among these countries. Only the United States and Russia showed a positive market distribution effect, which might also result from exports above average to China. The United States is the only country which had a positive effect in commodity composition. Interestingly, Brazil exported neither specifically to developing regions nor with specifically demanded products. As a result the export growth must be explained as a specific competitive ability to sell. China, as the main demander of pulp, does not show any significant structure of the competitiveness effects due to lacking growth of (small) pulp exports.

### 3.2.5 Commodity group “paper and paperboard”

The commodity group paper and paperboard consists of various products such as newsprint, printing and writing paper, and other paper and paperboard. As shown in Figure 5, the product group of paper and paperboard developed very dynamically from 1993 to 2008. Its exports increased from 61.7 billion USD in 1993-1998 to 100.7 billion USD in 2003-2008. Exports of the EFSOS region show a comparable development. Exports increased from 38.3 billion USD in 1993-1998 to 64.4 billion USD in the period 2003-2008.

Subsequent figures illustrate the development of annual growth of trade of the commodity group paper and paperboard. The bubble size of the listed countries represents the respective share of world exports in the period 2003-2008.

In the period 2003-2008 major exporters of paper and paperboard were Finland (12.0%), Germany (11.4%), Canada (9.9%), Sweden (9.4%), and the United States (8.5%). These countries were already in the first period 1993-1998 the five major exporters, however, with a slightly different ranking. Additional important exporters of the EFSOS region are France (5.4%) and Austria (4.0%). The share of the exports of the EFSOS region accounts to 64% of world’s exports in period 2003-2008. In the first period 1993-1998 exports of European countries nearly had the same level (62%).
Figure 18: Development of average annual growth of export of the commodity group paper and paperboard in 1993-1998 compared to 2003-2008, larger countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008. Belgium and Luxembourg are tallied up in this figure (BLX).
Figure 19: Development of average annual growth of export of the commodity group paper and paperboard in 1993-1998 compared to 2003-2008, smaller countries

Data source: UN Comtrade. See annex for country list.

Note: The bubble size indicates the share of a country’s exports on world exports in the period 2003-2008. Shown are the EFSOS countries, top twenty exporters regarding market share in period 2003-2008 and top twenty countries/regions regarding annual export growth in 2003-2008.

The most dynamic exporters of the EFSOS region in period 2003-2008 were Germany, Finland, Sweden, France, and Austria (see figure). In general, the countries of the EFSOS region showed a positive development. Only Moldova, Romania, and Estonia show a negative export growth in period 2003-2008. However, not all countries of the EFSOS region became better in period 2003-2008 compared to period 1993-1998. Estonia, the Netherlands, Norway, Romania and the United Kingdom had a slower export growth in 2003-2008 than in 1993-1998.

Major importers of paper and paperboard products in the period 2003-2008 were the United States (12.7%), Germany (9.9%), United Kingdom (6.7%), France (5.8%) and Italy (4.4%). The most dynamic importers were Germany, the Middle East, France, Poland, and Italy. Main exporter to the United States is Canada, with 64% of all US imports. But also the European countries Finland, Germany, France and Sweden exported relevant quantities of paper and paperboard to the United States. Main exporters to Germany are the Nordic countries Sweden and Finland as well as a lot of other middle European countries (e.g. Austria, Switzerland, France). Main exporters to the other major importing regions in Europe are predominately Germany and Finland, but also Sweden, Austria, France, and Italy are relevant exporters.
Figure 20: Average annual export growth and CMS-effects of the commodity group paper and paperboard in the period 2003-2008. EFSOS countries are ordered by average annual export growth.

Note: Countries are ordered by average annual export growth. EFSOS countries are arranged on the left side, the aggregate of the EFSOS region and BRUCC countries on the right side.

The average annual export growth of the EFSOS countries was mainly positive. Only Moldavia, Romania, and Estonia developed negatively. All countries had a positive world market effect. The commodity composition effect is mainly positive, with an exception for Norway and Slovenia. Also the market distribution effect is in most countries positive. Only few countries did not have a specific growth of exports to specific growing markets. The residual competitiveness effect does not show a clear pattern among European countries.

The EFSOS region had a positive export growth, mainly influenced by the growth of the world market. Also commodity composition and market distribution show positive signs. The residual competitiveness effect is clearly negative, which also implies that there are no further causes to explain export growth. The main driver in most of the BRUCC countries was the world market. As an exception only China shows four positive effects, with the residual competitiveness effect being the most relevant. The United States shows a negative market distribution effect, resulting from exports below average to dynamic regions and/or rising exports to decreasing regions. Canada is only positively affected by the world market. All other effects show negative signs. The export growth of Brazil can be explained as a positive market distribution and a positive commodity composition above world growth. However, a negative residual competitiveness effect implies a smaller export growth on balance. Also the Russian exports are mainly driven by world growth. Additionally, a very positive market distribution leads to the positive export growth.
4. Scenario analysis: Trade in the period 2010 to 2030

In this chapter, the results of trade development and of the competitiveness analysis of the scenarios are presented. The outlook was undertaken for the period 2010 to 2030. A reference scenario was calculated as a basis in order to describe a possible future of the European forest sector based on the assumptions presented in Chapter 2. Results of trade and competitiveness in the period 2010-2030 of the reference scenario are presented in subsequent Chapter 4.1. The structure of Chapter 4.1 is kept similar to previous Chapter 3. Firstly, an overview of the forest products altogether and of the whole period will be given. Thereafter a detailed analysis of the different development of the commodity groups of the reference scenario will be undertaken. In Chapter 4.2 the specific consequences of the policy scenario promoting wood energy are presented in comparison to the development in the reference scenario. The analysis of future competitiveness will mainly focus on a starting period and a final period. The starting period covers the years 2010 to 2015, and the final period covers the years 2025 to 2030.

4.1 Global trade and competitiveness in the reference scenario

The outlook period of the EFSOS study covers the years 2010 to 2030. In this period the world trade shows an increase from 150 billion USD to 310 billion USD. Figure 21 provides an overview on the development of world trade by continents in the reference scenario.

*Figure 21: Development of world exports of forest products by regions*

Exports from EFSOS countries develop from 51 billion USD in 2010 to 68 billion USD in 2030. With regard to the world development the share of European exports on global exports
The competitiveness of the European forest sector decreases from 34% to 22%. The intra-trade of the EFSOS region accounts to 73% of all exports of the EFSOS region in 2010 and it decreases to 66% in 2030. While the growth rate of global exports shows an average growth rate of about 3.7% for the whole period, export of the European region increases only by 1.4% on average.

The regional dynamics of international trade are illustrated in the following figure. It displays the average annual export growth in period 2010-2015 compared to the average annual export growth in period 2025-2030. The share of exports of the EFSOS region and the BRUCC countries on global exports in the period 2025-2030 is indicated by the bubble size.

**Figure 22: Development of average annual growth of exports of all commodity groups in 2010-2015 compared to 2025-2030 and average share on world exports in period 2025-2030 (bubble size)**

Note: The bubble of China is only fairly visible as its export share in period 2025-2030 is below 1%.

Share of exports of the European region on global exports is about 23.5% on average in period 2025-2030. Basically the EFSOS region shows a growth of exports over the whole period. Moreover, export growth is higher in the last period 2025-2030 than in the period 2010-2015. This effect can also be seen in other regions of the world which is illustrated here by the BRUCC countries. The BRUCC countries also show an increase of exports during the outlook period. As their export growth in the last period is much higher than in the EFSOS region their market shares also increase. The only exception is China, which shows only a slight positive export growth in the last period. This is mainly due to the fact that the high domestic demand of the Chinese economy and reduced plantation’s wood fibre supply in the B2 reference scenario limits exports significantly and shows China as a massive importer of basic forest products. This development can also be observed in the next section.
The export growth is further analysed using the CMS analysis. The subdivision of a country’s export growth into four effects by the CMS analysis reveals causes for the export growth. Based on these results it can be analysed what the factors are for export development. The following figure shows the results of the CMS analysis of the EFSOS region and the BRUCC countries in period 2025-2030.

Figure 23: CMS Effects of all commodity groups of the EFSOS region and the BRUCC countries in the period 2025-2030

The growth of the world markets has the biggest effect on export growth. All other effects of the EFSOS region are negative. This means EFSOS countries are expected to be below world average with regard to their presence in expanding regional markets, with regard to their presence in particularly growing commodity markets (innovative products, see non-quantified discussion in the “Fostering innovation and competitiveness” scenario) and with regard to their competitiveness originating from low supply prices. Especially the market distribution effect has a negative impact on export growth of European countries. This is based on the developments of exports predominantly within the EFSOS region, which is a region with import growth below world development.

Brazil, Canada, Russia and the United States show a quite similar average annual export growth. The growth of Chinese exports is only fairly positive in period 2025-2030. A comparison of the four effects shows that Brazil, Russia, and the United States have positive
impacts from exports into growing regions, while only Brazil and the United States also benefit from exports of especially demanded products. Russia, Brazil and Canada show a high residual competitiveness effect which implies that their export growth is based neither on demanded products nor on specific trade to growing regions of demand.

4.1.1 Global trade and competitiveness by commodity groups
As in the ex-post analysis also in the reference future the global trade of the commodity groups of wood, sawnwood, wood based panels, pulp and paper and paperboard show different developments. The development of exports of the products groups is illustrated in the following figure. The overall development is identical with Figure 21.

Figure 24: Development of world exports of forest products by regions in period 2010 to 2030

The commodity group “Paper and Paperboard” has the highest share on world’s exports. Global exports account to 35% in 2010 and 36% in 2030 with an average annual growth rate of 3.9%. However, this is not the most dynamic product group. Here the commodity group of wood-based panels must be noted. Its exports increase from 21 billion USD in 2010 to 58 billion USD in 2030, which equals an average annual growth rate of 5.3%. Also a high growth rate shows the products group of wood. Exports increase from 23 billion USD with an average annual growth rate of 4.3% to 52 billion USD. Exports of pulp more than doubled from 25 billion USD to nearly 52 billion USD. Only moderate growth can be stated for sawnwood. Exports of this product group increased on average 1.1% per year from 29 billion USD to 36 billion USD.
4.1.1.1 The commodity group “wood”

Global trade of the commodity group wood increased constantly from 23.8 billion USD in period 2010-2015 to 47.8 billion USD in period 2025-2030. Exports of the European countries had a value of 6.1 billion USD in 2010-2015 and increased to 10.1 billion USD. This corresponds to a share of global exports of 26% and 21% respectively.

The development of export growth of the EFSOS region is illustrated in next figure. It shows the annual growth of trade of the EFSOS region and the BRUCC countries in the period 2010-2015 compared to the period 2025-2030. The bubble size is related to the share of the country on world’s exports in 2025-2030.

Figure 25: Development of average annual growth of export of the commodity group wood in 2010-2015 compared to 2025-2030 and average share on world exports of the commodity group wood in period 2025-2030 (bubble size)

Note: The bubble of China is only fairly visible as its export share in period 2025-2030 is below 1%.

The major exporter in period 2025-2030 is Russia, with an export share of 23%. Second largest exporters of this commodity group are the countries of the EFSOS region (21%). Most of the trade of these countries takes place within the region. As the third major exporter the United States can be identified with a share of 14% on global exports. Brazil and Canada only have minor shares on global exports (5% and 4% respectively). Other relevant exporters are Australia (7.2%), Argentina (6.6%) and Western Countries of Africa (5.8%). Exports of China do have a share on global exports of less than 1% in period 2025-2030.

In the first period 2010-2015 also Russia and the EFSOS region were the major exporters of wood with a share of 23.9% and 25.5% respectively on global exports. However, the EFSOS
region shows a negative export growth in the period 2010-2015. Russia receives high values of export growth in both periods. Most countries show positive average export growth in period 2025-2030, with the United States being the most dynamic exporter. The only exception is China which has small negative export growths in both periods.

On the other hand, China can be identified as the major importer of the wood commodities. It is not only the largest importer of wood but also the most dynamic importing region. Its import share increases from 49.8% in 2010-2015 to 60.6% in 2025-2030. The EFSOS region can be identified as the second largest importer of wood. China receives most of its wood commodities from Russia and the United States. The EFSOS countries export about 71% in period 2010-2015 within the Europe. In period 2025-2030, about 66% of the exports are traded to other European countries.

The following figure shows the results of the CMS analysis of the aggregate of the EFSOS countries and of the BRUCC countries.

**Figure 26: CMS Effects of commodity group wood of the EFSOS region and the BRUCC countries in the period 2025-2030**

The EFSOS region and all other BRUCC countries apart from China have a positive export development in the period 2025-2030. The only driver for the positive development in Europe is the growth of the world market. In aggregation the European region does not show explicit
growth based on exports to specifically demanding regions or based on exports of specifically demanded products.

The other countries, with the exception of China, show at least one other positive effect in addition to the world growth effect. The commodity composition effect does not have a big impact in most countries. Especially Brazil shows a positive export growth in demanding regions in the last period 2025-2030.

4.1.1.2 The commodity group “sawnwood”

In the reference future the exports of the commodity group sawnwood increased from 29.5 billion USD in period 2010-2015 to 34.4 billion USD in period 2025-2030. Exports of the countries of the EFSOS region show a quite static development. Exports are at a level of 7.8 billion in the first period as well as in the last period. However, as exports recover in the last period from a decrease in the 2020s, export growth show a positive development in period 2025-2030.

Figure 27: Development of average annual growth of export of the commodity group sawnwood in 2010-2015 compared to 2025-2030 and average share on world exports of the commodity group sawnwood in period 2025-2030 (bubble size)

Note: The bubbles of China and the United States are only fairly visible as their export shares in period 2025-2030 are below 1%.

Major exporters of sawnwood in period 2025-2030 are Canada (30.8%), the countries of the EFSOS region (22.7%) and Russia (20.0%). In the starting period, Canada was by far the major exporting country of sawnwood (40.5%), followed by the EFSOS region (25.5%) and
Russia (23.9%). Canada shows negative annual export growth in the starting and the final period. Also China and the United States show a negative growth in both periods, though on a very low level, as their share on global exports is below 1% in both periods. Russia, Brazil and the EFSOS region show a positive growth in both periods, however apart from Russia on a low level.

The United States will remain by far the largest importer of sawnwood although it has a constant decrease of imports. The demand for sawnwood does not develop dynamically throughout the world. The EFSOS region remains the second largest importing market. In contrast to the United States a growth of imports can be stated in most of the European countries.

The figure below illustrates the results of the CMS analysis of the aggregate of the EFSOS countries and of the BRUCC countries.

**Figure 28: CMS Effects of commodity group sawnwood of the EFSOS region and the BRUCC countries in the period 2025-2030**

As discussed above, sawnwood does not have high export growth on global level in the analyzed period. Hence, the export growth on global level and the associated competitiveness effects do not show big amplitudes. However, the EFSOS region shows a positive average annual export growth in period 2025-2030. Also Russia and Brazil reveal a positive export growth. Positive driver for all countries is the growth of the world market. Additionally, the
EFSOS countries show a positive effect of market distribution. This might be due to rising exports of sawnwood to the region of the Middle East, a region with import growth.

### 4.1.1.3 The commodity group “wood-based panels”

The trade of the commodity group wood-based panels developed very dynamically. Exports increased from 22.7 billion USD in the period 2010-2015 to 49.7 billion USD in period 2025-2030. Exports of the European region only increased about 1.7 billion USD from 4.2 billion USD in 2010-2015 to 5.9 billion USD in 2025-2030. As a result, the share of exports of the EFSOS countries on global exports decreased from 18.6% to 12.0%. This moderate growth is also illustrated in the following figure.

**Figure 29: Development of average annual growth of export of the commodity group wood-based panels in 2010-2015 compared to 2025-2030 and average share on world exports of the commodity group wood-based panels in period 2025-2030 (bubble size)**

Note: The bubble of China is only fairly visible as its export share in period 2025-2030 is below 1%.

In the starting period 2010-2015 the major exporters of wood-based panels are Canada (20.8%), the EFSOS region (18.6%), Malaysia (18.4%), Indonesia (13.0%), Brazil (11.7%), and Russia (6.4%). The United States (0.3%) and China (0.1%) only play a minor role. As it can be suggested based on illustrations in above figure, market dynamics lead to a different picture in the final period 2025-2030. Top exporters still are Malaysia (17.6%), Canada (17.5%), Brazil (14.9%), the EFSOS region (12.0%), and Indonesia (9.3%). But also the United States (9.5%) and Russia (8.6%) are gaining market share. Brazil and the United States show the highest average annual export growth in period 2025-2030, while Canada holds a
high level of export share over the whole period. The countries of the EFSOS region lose market share due to below average export growth.

In the reference scenario most wood-based panels will be exported to China. About half of global exports are demanded by Chinese firms. The second largest importing market is Europe. About 25% of the world trade is exported to European countries. Roughly two third of European imports are from countries of the EFSOS region.

Below figure shows the results of the CMS analysis of the aggregate of the EFSOS countries and of the BRUCC countries.

Figure 30: CMS Effects of commodity group wood-based panels of the EFSOS region and the BRUCC countries in the period 2025-2030

The exports of the commodity group wood-based panels show in the EFSOS region as well as in the BRUCC countries a positive average annual growth in period 2025-2030. The only exception is China, which serves as the main importing region and shows only very minor exports.

The driver for the positive development in the EFSOS region again is the world growth. All other effects show negative algebraic signs. All BRUCC countries with positive export growth also reveal a positive residual competitiveness effect. The United States is the only BRUCC country with a positive market-distribution effect. This is mainly due to the fact that
the US, in connection with Malaysia and Indonesia, is the main exporter of panels for the rising demand of China.

4.1.1.4 The commodity group “pulp”

The commodity group of pulp shows an increase from 26.0 billion USD in period 2010-2015 to 45.1 billion USD in 2025-2030 on the global level. Exports of the European countries only increased moderately from 5.9 billion USD in 2010-2015 to 6.1 billion USD in 2025-2030. Accordingly, the share of European exports on global trade decreased from 22.8% to 13.6%.

The next figure illustrates the development of European countries in comparison to the BRUCC countries.

**Figure 31: Development of average annual growth of export of the commodity group pulp in 2010-2015 compared to 2025-2030 and average share on world exports of the commodity group pulp in period 2025-2030 (bubble size)**

![Graph showing the development of exports of pulp](Image)

Note: The bubble of China is only fairly visible as its export share in period 2025-2030 is below 1%.

Major exporters of pulp in period 2025-2030 are Brazil (25.7%), the United States (16.2%), Russia (15.4%), the EFSOS region (13.6%), and Canada (9.9%). This picture changed significantly compared to the starting period 2010-2015 where the EFSOS region was the major exporter of pulp with a market share of 22.8%.

The above figure indicates the development of the listed countries in the reference future. The United States recovers from a negative export growth in the starting period. Brazil and Russia constantly increase their export growth. Canada shows a moderate growth. The EFSOS region slightly raised its level of exports more or less with positive export growth in the starting and
in the final period but also with a few years of negative export developments in the period 2015 to 2025.

Main importing regions in the period 2025-2030 are China (45.3%) and the European countries (20.3%) where China gained and the European countries lost shares on global imports compared to period 2010-2015 (32.5% and 29.6% respectively in period 2010-15). Chinas imports are mainly from Brazil, Russia, the United States, Chile, and Canada. European countries trade most of the demanded pulp from other European countries. A further important importer for the European demand of pulp is Russia.

The next figure illustrates the results of the CMS analysis of the aggregate of the EFSOS countries and of the BRUCC countries.

**Figure 32: CMS Effects of commodity group pulp of the EFSOS region and the BRUCC countries in the period 2025-2030**

The EFSOS region shows a positive export development, mainly based on the world growth. Also a slightly positive commodity composition effect reveals a positive export performance of demanded products. On the other hand, the market distribution of the products has a negative impact on European export. This is mainly based on the large internal trade within (the shrinking demand of) the EFSOS region. Interestingly, all other countries in the above figure show a negative effect of commodity-composition. Brazil and Russia have positive
market-distribution and positive residual competitiveness effects which are based on positive export development in dynamic markets such as China as well as in saturated markets as for example Japan.

### 4.1.1.5 The commodity group “paper and paperboard”

Trade of the commodity group of paper and paperboard develops dynamically on the global level from 55.1 billion USD in 2010-2015 to 99 billion USD in period 2025-2030. The European countries show a slower development than global average. Exports only increase from 27.3 billion USD to 34.8 billion USD in 2025-2030. This is a result of an export growth less dynamic than world exports as illustrated in the following figure.

**Figure 33:** Development of average annual growth of export of the commodity group paper and paperboard in 2010-2015 compared to 2025-2030 and average share on world exports of the commodity group paper and paperboard in period 2025-2030 (bubble size)

Note: The bubble of China is only fairly visible as its export share in period 2025-2030 is below 1%.

The EFSOS region is the major exporter of the commodity group paper and paperboard in the starting period 2010-2015 (49.4%) as well as in the final period 2025-2030 (35.2%). The second largest exporter in the final period is the United States. The US shows a very dynamic development in the whole period. Its export share rises from 8.8% in 2010-2015 to 19.6% in 2025-2030. Especially in the final period Canada gained market shares. However, over the whole period its market share only rose from 16.7% to 18.0%. Also Russia and Brazil gained market shares (from 4.5% to 7.3% and from 2.7% to 6.6% respectively). Export share of China remain at a low level below 1% of global exports.
On the importing side, China is the leading demander for paper and paperboard with high annual import growth over the whole period. Main exporters to China are the United States, Russia, Canada, and the EFSOS region. Europe is a large import market itself. More than 80% of its imports are traded by European countries. The other relevant importing regions like South-East Asia, other countries in Latin America, or the United States are predominantly supplied from countries outside Europe. The only exception is the region of the Middle East which imports most of its paper and paperboard from the EFSOS region.

The effects of these trade structures on the competitiveness of the EFSOS region and of the BRUCC countries are shown in the following figure.

**Figure 34: CMS Effects of commodity group paper and paperboard of the EFSOS region and the BRUCC countries in the period 2025-2030**

As already illustrated in the previous figure on the average annual growth, the EFSOS region as well as the BRUCC countries show a positive export development. Comparable to the CMS effects of other commodity groups, also in the commodity group “paper and paperboard” world growth is the only driver for the development of the European region. However, export growth of the EFSOS region is still on a high level. All BRUCC countries except China profit in addition from exports to the demanding regions such as China, South East Asia, and the Rest of Latin America (positive market-distribution effect).
4.2 Promoting wood energy scenario

The effects of an increased demand for wood energy on the competitiveness of the European forest sector will be analysed in the promoting wood energy scenario. According to the scenario description in Chapter 2.2.3 the national targets for renewable energy in Europe are translated into demand for wood energy. This demand was added to the projected demand for wood products. In a first step EFISCEN was used to calculate the highest possible sustainable supply of wood from European forests. Additionally, the supply outside forests (e.g., landscape care wood, post-consumer wood) was estimated. Secondly, EFI-GTM was then used to calculate the consequences of this development for production, consumption, trade and prices of forest products (UN, 2011). The following table summarizes the basic results of consumption, trade and prices of forest products in the reference scenario and the promoting wood energy scenario.

Table 3: Summary on consumption, trade and price development of roundwood and wood products in the reference scenario and the promoting wood energy scenario, EFSOS region

<table>
<thead>
<tr>
<th>Product category</th>
<th>Unit</th>
<th>2030 Reference scenario</th>
<th>Net trade</th>
<th>2030 Promoting wood energy sc.</th>
<th>Net trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood consumption</td>
<td>mill. m³</td>
<td>1,167.6</td>
<td>-1.3</td>
<td>1,419.1</td>
<td>-32.9</td>
</tr>
<tr>
<td>Sawnwood consumption</td>
<td>mill. m³ RWE</td>
<td>271.5</td>
<td>2.5</td>
<td>269.9</td>
<td>0.4</td>
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<tr>
<td>Wood-based panels consumption</td>
<td>mill. m³ RWE</td>
<td>150.7</td>
<td>-5.0</td>
<td>149.0</td>
<td>-9.0</td>
</tr>
<tr>
<td>Paper &amp; paperboard consumption</td>
<td>mill. m³ RWE</td>
<td>430.7</td>
<td>61.5</td>
<td>429.6</td>
<td>53.3</td>
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<tr>
<td>Sawlog price</td>
<td></td>
<td></td>
<td></td>
<td>1.8% - 2.4%</td>
<td>2.3% - 2.6%</td>
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<tr>
<td>Pulpwood price</td>
<td></td>
<td></td>
<td></td>
<td>2.6% - 2.7%</td>
<td>3.4%</td>
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<tr>
<td>Sawnwood price</td>
<td>average growth rate 2010 - 2030</td>
<td>0.6%</td>
<td></td>
<td>0.8%</td>
<td></td>
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<td></td>
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<td>Paper &amp; paperboard price</td>
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<td></td>
<td></td>
<td>0.7%</td>
<td>0.8%</td>
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</table>

Source: UN (2011)

Note: Negative net trade denotes net imports, positive values denote net exports. Growth rates of sawlog and pulpwood prices vary between coniferous and non-coniferous.
The demand for wood energy in Europe is significantly higher in the promoting wood energy scenario compared to the reference scenario. The demand for other wood products is held at the same level in both scenarios. This has effects on the trade of products. Exports of wood of the EFSOS countries increase substantially in the promoting wood energy scenario, whereas imports for wood products only increase moderately. Countries with high forest resources are able to more easily satisfy their demand for wood in the promoting wood energy scenario and can also export forest biomass. Wood as a raw material will be imported predominantly from other countries of the EFSOS region as demand for energy purposes rises. Also prices for roundwood and for wood products increase in the promoting wood energy scenario. However, prices for roundwood show higher growth rates than prices for wood products.

In the following, the results of trade and competitiveness in the promoting wood energy scenario will be compared to the results of the reference scenario. Firstly, an overview will be given of the global development in the promoting wood energy scenario for all wood products. Secondly, the trade and development of the commodity groups will be analysed in detail. The analyses focus on the changes in development of the promoting wood energy scenario compared to the reference scenario. The regional focus will be mainly on the EFSOS region. Development of competitiveness will only be discussed for the EFSOS region. This is due to the fact that rising demand for wood energy has been modelled with specific focus on the European countries.

### 4.2.1 Global trade

The development of global trade in monetary values is more dynamic in the promoting wood energy scenario than in the reference scenario. Global exports increase from 156 billion USD in period 2010-2015 to 287 billion USD in period 2025-2030. The following figure shows the development of global trade by commodity groups. Additionally, the differences in trade of the commodity groups compared to the reference scenario are illustrated.

In total global exports increase about 11.2 billion USD in period 2025-2030 in the promoting wood energy scenario compared to the reference scenario. The main difference can be attributed to trade in the European region. As can be seen in the figure below, most of the difference in export development is due to an increase of exports of the commodity group wood.
Figure 35: Development of world exports in the promoting wood energy scenario and differences to the reference scenario by commodity groups

Note: (d) equals the difference of the promoting wood energy scenario (e) compared to the reference scenario (r): (e - r = d)

Exports of the commodity group wood increase to 58.6 billion USD in period 2025-2030. This is an increase of exports of about 22.5% compared to the reference scenario. Major share of the additional trade is exported from the countries of the EFSOS region. Exports of this region increased from about 9.1 billion USD in the period 2010-2015, to 19.2 billion USD in period 2025-2030. Accordingly, exports of the other regions grew only moderately.

The commodity group sawnwood only shows an increase of about 75 million USD to a total of 34.5 billion USD in the period 2025-2030. The exports of the EFSOS region show a decrease of about 57 million USD in the last period.

Wood-based panels are the only product group which shows a decrease on global exports in the promoting wood energy scenario. Exports decreased on global average about 618 million USD to 49.1 billion USD in the promoting wood energy scenario compared to the reference scenario in period 2025-2030. This corresponds to a decrease of 1.2%. However, the decrease of exports of the European region in period 2025-2030 is even higher. The export value is 1.1 billion USD below the reference scenario. This implies an increase of exports of the other regions of the world of nearly 500 million USD.
The differences in pulp exports are minor, on global level as well as in the EFSOS region. World exports show an increase of about 457 million USD to global exports of about 45.6 billion USD in the promoting wood energy scenario in period 2025-2030. The changes in the regions vary between minus 0.5% and plus 2.6% or from minus 56 million USD to plus 190 million USD in absolute terms. The exports of EFSOS region decrease about one million USD (0.2%) in period 2025-2030.

Also quite minor are the changes of exports of paper and paperboard on global level. Global exports increase about 505 million USD to 99.5 billion USD in period 2025-2030. On the other hand, exports of the EFSOS region show a decrease of more than 900 million USD in period 2025-2030. These are 2.6% of the export value in the reference scenario.

4.2.2 Competitiveness

The changes in export development inevitably have an effect on the annual export growth of the EFSOS region and hence on competitiveness. As described above, the changes vary between the different commodity groups. The effects on competitiveness in the promoting wood energy scenario are shown in the next figure. Illustrated are the differences in average annual export growth and the four CMS effects of all commodity groups in the promoting wood energy scenario compared to the reference scenario of the EFSOS region in period 2025-2030.

Figure 36: Changes in CMS effects of all commodity groups of the EFSOS region in the promoting wood energy scenario compared to the reference scenario in period 2025-2030

Looking at the aggregate of all commodity groups it can be seen that there is a small positive effect on export growth with a magnitude of 24 million USD which equals an extra growth of
two per cent to the annual growth in the reference scenario. As can be seen, the only driver for the extra growth is the world market. All other effects of the CMS analysis for all products are in most cases affected negatively by the promoting wood energy scenario. Especially the commodity composition effect and the residual competitiveness effect show negative implications (see also Table 4).

**Table 4: Relative changes in average annual export growth and CMS effects of the promoting wood energy scenario compared to the reference scenario in period 2025-2030**

<table>
<thead>
<tr>
<th>Product Group</th>
<th>Average annual export growth</th>
<th>World growth effect</th>
<th>Commodity-composition eff.</th>
<th>Market-distribution eff.</th>
<th>Residual competitiveness effect</th>
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</thead>
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<tr>
<td>All Products</td>
<td>2%</td>
<td>13%</td>
<td>-23%</td>
<td>-4%</td>
<td>-47%</td>
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<tr>
<td>Wood</td>
<td>157%</td>
<td>129%</td>
<td>-135%</td>
<td>-70%</td>
<td>-72%</td>
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<td>Sawnwood</td>
<td>-22%</td>
<td>2%</td>
<td>3%</td>
<td>58%</td>
<td>-47%</td>
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<tr>
<td>Wood-based Panels</td>
<td>-22%</td>
<td>-17%</td>
<td>36%</td>
<td>-18%</td>
<td>110%</td>
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<tr>
<td>Pulp</td>
<td>-31%</td>
<td>1%</td>
<td>9%</td>
<td>-2%</td>
<td>-37%</td>
</tr>
<tr>
<td>Paper &amp; Paperboard</td>
<td>-31%</td>
<td>-6%</td>
<td>11%</td>
<td>-1%</td>
<td>-80%</td>
</tr>
</tbody>
</table>

Wood is the only commodity group which is impacted positively by the promoting wood energy scenario. The high demand for wood energy leads to an additional average annual export growth of the commodity group wood of 366 million USD in period 2025-2030 which is an increase of 157% compared to the reference scenario. The only driver for this development is the world growth effect (+129%). All other effects show negative impacts of the policy scenario.

Also the export growth of all other commodity groups is affected negatively by the promoting wood energy scenario. The changes vary between minus 22% and minus 31%. The commodity group of paper and paperboard shows the highest decrease in export growth in absolute terms. Looking at the CMS analysis, the change in world growth of exports of the commodities sawnwood and pulp has minor positive effects for the export development of the EFSOS region. Global exports of wood-based panels and paper and paperboard are affected negatively by the promoting wood energy scenario, and hence its export growth of the EFSOS region. The commodity composition effect is affected positively in all commodity groups with wood as the only exception. The market distribution effect is positively impacted only in the commodity group sawnwood. All other product groups are affected negatively in the promoting wood energy scenario compared to the reference scenario. The only positive effect of the residual competitiveness effect can be stated for the commodity group of wood based panels. All other product groups show negative developments. Especially for paper and
paperboard a high negative value in absolute terms can be observed. Also for sawnwood and pulp the residual competitiveness effect has the most negative impact.
5. Discussion and Conclusion

The results of the competitiveness analysis were presented in the two previous Chapters 3 and 4. In this chapter, the results of the ex-post analysis of period 2003 to 2008 and the scenario analysis, the so-called future ex-post analysis, are discussed.

The results of the ex-post analysis show that most countries of the EFSOS region have had a positive export growth in the ex-post period 2003-2008. The aggregate of the EFSOS region is mainly driven by the positive development of the world market growth. Additional positive effects can be attributed to the presence with forest products in growing regional markets. Above average exports of specific growing commodities on global scale were not features of the EFSOS region as well as the aggregate of the residual competitiveness effect (see Figure 4). How these effects of the EFSOS region look on commodity group level will be discussed subsequently, using the results of the analysis by commodity groups. For better comparison, the results of the CMS analysis of the EFSOS region are shown in the following table.

Table 5: Algebraic signs of CMS effects for the EFSOS region by commodity groups for the ex-post period 2003-2008

<table>
<thead>
<tr>
<th>Product Group</th>
<th>World growth effect</th>
<th>Commodity-composition effect</th>
<th>Market-distribution effect</th>
<th>Residual competitiveness effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Sawnwood</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Wood-based Panels</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Pulp</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Paper &amp; Paperboard</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>All Products</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
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</table>

What can be seen by looking at all commodity groups is that world market effect is the main driver of export growth in all commodity groups. The development of the world market explains between 50% and 80% of the export growth. The second driver of the positive development is the market distribution of the exports of the countries of the EFSOS region. European exports are aiming specifically at rising markets in this period. The commodity composition of exports of the European countries only had a minor effect on export growth. While wood, pulp and paper and paperboard exports were influenced slightly positively, the product structure was negatively influenced by sawnwood and panels.

Also, the residual competitiveness effect only had a minor influence on the overall development of the EFSOS region. For the product groups wood, sawnwood and pulp it contributed positively to export growth. For these products the EFSOS region competed
successfully in certain regional markets, no matter if the market structure of these commodities or if the receiving markets improved.

Looking at the results of the reference scenario one must say that nearly the only remaining driving force for export growth is the world market. Few exceptions are the market distribution effect of the commodity group sawnwood and the commodity composition effect of the commodity group pulp. The structure of the algebraic signs of the CMS effects in the promoting wood energy scenario is nearly the same. Only the residual competitiveness effect of wood-based panels differs and shows a positive algebraic sign (see table below). While the basic structure of the CMS effects is identical, the magnitudes of the changes in the promoting wood energy scenario show negative implications for the EFSOS region. Especially the industry branches are affected, while the high demand for wood is outbalancing their losses in export growth and leading to a comparable growth as observed in the reference scenario (see also Table 4).

<table>
<thead>
<tr>
<th>Table 6: Algebraic signs of CMS effects for the EFSOS region by commodity groups for the Reference scenario (Ref.) and the Promoting wood energy scenario (Ener.) in period 2025-2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Group</td>
</tr>
<tr>
<td>Wood</td>
</tr>
<tr>
<td>Sawnwood</td>
</tr>
<tr>
<td>Wood-based Panels</td>
</tr>
<tr>
<td>Pulp</td>
</tr>
<tr>
<td>Paper &amp; Paperboard</td>
</tr>
<tr>
<td>All Products</td>
</tr>
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</table>

The analysis of the reference scenario and the promoting wood energy scenario also shows that the structures of the CMS effects look more homogenous than in the ex-post analysis. This may be due to a more generalising effect of the modelling assumptions and a smoothing also of the developments of bilateral trade. Naturally, the modelling assumptions and the outline of the scenarios can have major influence on the results. Based on economic growth in the countries, also global demand, production and trade of forest products increase in the scenarios. And also the EFSOS region benefits from this development, as the results show. However, the CMS results also imply that the EFSOS region generally will be less innovative, e.g., in the development of products or markets. This is mainly due to lower economic
growth, which basically enables investments in innovation, and higher wood fibre costs in the main EFSOS countries. Other regions show higher growth and are hence more competitive mainly due to a lower wood fibre costs (Russia, North and South America).

The structure of the CMS effects of the EFSOS region is basically stable in the scenario period when simply looking at the algebraic signs of the effects. A closer look at the relative importance of the CMS effects shows that the world growth effect has increasing importance on the export growth of the EFSOS region. As it is not likely that in reality in the forthcoming twenty years global exports will constantly increase, a next crisis can possibly cause severe consequences on the export performance of the EFSOS region.

Economic theory explains international competitiveness basically with advantages in supply prices (Leamer and Stern, 1970). However, this can also be seen as a result of other factors that are influencing the export performance such as - among others - factor conditions (e.g., forest growth conditions), legal framework (e.g., subsidies, usability of forest area), or individual firm strategies (see e.g., Porter, 1990). Looking at the latter, it can be assumed that market actors constantly analyse their current situation and try to react to changes in competitiveness. As the scenario results express the aggregated data of all companies of a region, it might be the case that companies are applying changes in their specific competitive situation more dynamically, enhancing, e.g., exports to certain markets or developing innovative products. Of course these potential adaptations to a changing environment are not part of the modelling approach in this study.

Based on the scenario results, the future seems challenging for the forest sector of the EFSOS region, even more so when looking at the results of the promoting wood energy scenario. The additional negative impact of this scenario on all CMS effects with the exception of the world growth effect shows that an already tense situation in the reference future can deteriorate when only focusing on one specific policy. No matter which policy for renewable energy is chosen in the next years, it is already necessary to develop a framework situation for innovation and technological development in the forest sector in the EFSOS region in order to improve competitiveness in the longer term.
6. References


Competitiveness of the European Forest Sector


## Annex

### Annex 1  List of Abreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CMS</td>
<td>Constant Market Share</td>
</tr>
<tr>
<td>COMTRADE</td>
<td>(UN) Commodity Trade Statistics Database</td>
</tr>
<tr>
<td>m³</td>
<td>cubic metres</td>
</tr>
<tr>
<td>ECE</td>
<td>Economic Commission for Europe</td>
</tr>
<tr>
<td>EFI</td>
<td>European Forest Institute</td>
</tr>
<tr>
<td>EFI-GTM</td>
<td>EFI Forest Sector Global Trade Model</td>
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<td>EFISCEN</td>
<td>European Forest Information Scenario Model</td>
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<td>EFSOS</td>
<td>European Forest Sector Outlook Study</td>
</tr>
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<td>ETTS</td>
<td>European Timber Trends Study</td>
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<td>EU</td>
<td>European Union</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<td>FAOSTAT</td>
<td>FAO statistical database</td>
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<tr>
<td>GDP</td>
<td>gross domestic product</td>
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<td>HS</td>
<td>Harmonized System</td>
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<td>IMF</td>
<td>International Monetary Fund</td>
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<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<td>OSB</td>
<td>oriented strand board</td>
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<td>United Nation</td>
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<td>US Dollar</td>
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<td>World Economic Forum</td>
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<td>WRB</td>
<td>Wood resource balance</td>
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<td>RWE</td>
<td>Roundwood equivalent</td>
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Annex 2  Commodity codes used in ex-post analysis

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<td>Countries of the EFSOS region</td>
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SOME FACTS ABOUT THE COMMITTEE ON FORESTS AND THE FOREST INDUSTRY

The UNECE Committee on Forests and the Forest Industries is a principal subsidiary body of the UNECE (United Nations Economic Commission for Europe) based in Geneva. It constitutes a forum for cooperation and consultation between member countries on forestry, the forest industry and forest product matters. All countries of Europe, the Commonwealth of Independent States, the United States of America, Canada and Israel are members of the UNECE and participate in its work.

The UNECE Committee on Forests and the Forest Industries shall, within the context of sustainable development, provide member countries with the information and services needed for policymaking and decision-making with regard to their forest and forest industry sectors, including the trade and use of forest products and, where appropriate, will formulate recommendations addressed to member governments and interested organizations. To this end, it shall:

1. With the active participation of member countries, undertake short-, medium- and long-term analyses of developments in, and having an impact on, the sector, including those developments offering possibilities for the facilitation of international trade and for enhancing the protection of the environment;
2. In support of these analyses, collect, store and disseminate statistics relating to the sector, and carry out activities to improve their quality and comparability;
3. Provide the framework for cooperation e.g. by organising seminars, workshops and ad hoc meetings and setting up time-limited ad hoc groups, for the exchange of economic, environmental and technical information between governments and other institutions of member countries required for the development and implementation of policies leading to the sustainable development of the sector and to the protection of the environment in their respective countries;
4. Carry out tasks identified by the UNECE or the Committee on Forests and the Forest Industries as being of priority, including the facilitation of subregional cooperation and activities in support of the economies in transition of central and eastern Europe and of the countries of the region that are developing from an economic perspective;
5. It should also keep under review its structure and priorities and cooperate with other international and intergovernmental organizations active in the sector, and in particular with the FAO (the Food and Agriculture Organization of the United Nations) and its European Forestry Commission, and with the ILO (the International Labour Organisation), in order to ensure complementarity and to avoid duplication, thereby optimizing the use of resources.

More information about the Committee’s work may be obtained by contacting:

UNECE/FAO Forestry and Timber Section
Forests, Land and Housing Division
United Nations Economic Commission for Europe
Palais des Nations
CH-1211 Geneva 10, Switzerland

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Forest Products Annual Market Review 2012-2013  ECE/TIM/SP/33
The Lviv Forum on Forests in a Green Economy  ECE/TIM/SP/32
Forest and Economic Development: A Driver for the Green Economy in the ECE Region  ECE/TIM/SP/31
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Forest and Forest Products Country Profile: Russian Federation  ECE/TIM/SP/18
(Country profiles also exist on Albania, Armenia, Belarus, Bulgaria, former Czech and Slovak Federal Republic, Estonia, Georgia, Hungary, Lithuania, Poland, Romania, Republic of Moldova, Slovenia and Ukraine)
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Forests, Wood and Energy: Policy Interactions
Outlook for the Development of European Forest Resources
Forest and Forest Products Country Profile: Serbia and Montenegro
Forest Certification Update for the UNECE Region, 2003
Forest and Forest Products Country Profile: Republic of Bulgaria
Forest Legislation in Europe: How 23 Countries Approach the Obligation to Reforest, Public Access and Use of Non-Wood Forest Products
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Markets for secondary processed wood products, 1990-2000
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Forest certification update for the UNECE Region, summer 1999
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Competitiveness of the European Forest Sector - a Contribution to EFSOS II

As a contribution to the second European Forest Sector Outlook Study (EFSOS II) this study analysis the historic and future competitiveness of the European forest sector using the constant market share (CMS) methodology. The analysis is based on bilateral trade data in monetary terms. The historic ex-post analysis covers the years from 1993 to 2008, with a specific focus on the period 2003 to 2008. The scenario analysis is undertaken for the period 2010 to 2030. The basis is given by a reference scenario. It describes a business as usual development. Additionally, as a policy scenario, the effects of the promotion of wood energy on trade and competitiveness are examined. The ex-post analysis shows that most countries of the EFSOS region have had a positive export growth in period 2003-2008. The growth of the world market can be identified as the main driver of the positive development. But also the presence with forest products in growing regional markets has had positive effects. The specific wood products also had further additional positive effects. The results of the reference scenario show that the world market will constantly increase in period 2010 to 2030, with benefit also for the countries of the EFSOS region. However, the growth of the world market will be the only driver which leads to export growth in the EFSOS region. This means EFSOS countries are expected to be below world average with regard to their presence in expanding regional markets, in particular, for growing commodity markets and with regard to their competitiveness.

UNECE Committee on Forests and the Forest Industry and FAO European Forestry Commission

Further information about forests and forest products, as well as information about the UNECE Committee on Forests and the Forest Industry and the FAO European Forestry Commission is available on the website: www.unece.org/forests.html

Information about the UNECE may be found at www.unece.org and information about FAO may be found at www.fao.org

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