

The background of the cover is a photograph of a forest with tall, slender trees and a dense canopy. The image is overlaid with several large, semi-transparent geometric shapes, primarily triangles, in shades of purple, blue, and white, creating a modern, abstract design.

# INCREASING THE USE OF WOOD IN THE GLOBAL BIO-ECONOMY

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Proceedings of Scientific Papers



University of Belgrade  
Faculty of Forestry



WoodEMA, i.a.  
International Association for Economics  
and Management in Wood Processing  
and Furniture Manufacturing



University of Belgrade  
Faculty of Forestry



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for Economics and Management in Wood  
Processing and Furniture Manufacturing

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**Proceedings of Scientific Papers**

**Belgrade, Republic of Serbia**

**September 26<sup>th</sup>-28<sup>th</sup>, 2018**

# INCREASING THE USE OF WOOD IN THE GLOBAL BIO-ECONOMY

Proceedings of Scientific Papers

Publishers: University of Belgrade – Faculty of Forestry  
Kneza Višeslava 1, 11030 Belgrade, Republic of Serbia

WoodEMA, i.a. – International Association for Economics and Management in Wood Processing  
and Furniture Manufacturing, Svetošimunska 25, Zagreb, Croatia

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Print: PLANETA print d.o.o., Beograd, 2018

Edition: 50 copies

ISBN: 978-86-7299-277-9

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## **SELECTED ECONOMIC AND MATERIAL ASPECTS BEHIND THE USE OF WOOD BY THE TIMBER INDUSTRY IN POLAND AND IN SELECTED EUROPEAN UNION COUNTRIES**

Katarzyna Mydlarz, Marek Wieruszewski, Zbigniew Malinowski

### **ABSTRACT**

The supply level of wood raw material in the European Union market is mainly driven by the forestry and timber policies of member states, whereas the elasticity of demand is determined by available raw material resources and the ownership structure of forests. In Poland, wood supply is shaped by the requirements of forest management and does not fully address the demand. Therefore, the purpose of this paper is to analyze the impact of a multifunctional forest management concept consistent with sustainable development principles on the harvesting of raw materials and on the price level, and to identify the relationship between forest ownership structure and wood supply in Poland and selected EU countries.

**Keywords:** wood material, forestry, economic aspects, wood industry, market

### **1. INTRODUCTION**

Forest resources are the main source of wood supply for timber companies. In a sustainable economy, the structure of raw material supply and the volume of raw materials generated by forest areas are factors of essential importance in planning the production of timber and wood-based products, whereas a rational raw material policy coupled with technological progress enables the optimum use of materials from available forest resources.

National resources of wood raw material have a significant economic potential which is extended by importing additional volumes of wood from neighboring countries. According to data presented by the State Forests National Forest Holding (*Polskie Gospodarstwo Leśne Lasy Państwowe*, PGL LP), in 2017, ca. 40.5 million m<sup>3</sup> of wood was harvested in Poland which is ca. 1 million m<sup>3</sup> more than in 2016 and ca. 5 million m<sup>3</sup> more than in 2010 ([www.e-drewno.pl](http://www.e-drewno.pl), [www.stat.gov.pl](http://www.stat.gov.pl)). Meanwhile, in 2016, 1,988,379 tons of wood raw material were imported, or ca. 2,658,834 tons (ca. 2.12 million m<sup>3</sup>) if sawn and planed wood is taken into account (Leśnictwo 2017). The ever growing demand for wood and the fact that timber harvesting has increased over the years (and yet it fails to meet the demand of the industry) confirm that the demand for wood products is consistently growing. Also, this reflects the development and competitiveness of Polish timber companies.

Thanks to the European sustainable forest management, Poland keeps experiencing a dynamic growth of raw material resources, too. The ownership structure of



forests is also changing. However, unlike in other European countries such as Germany, Finland or Sweden, the supply of various wood types continues to be largely dominated by state-owned operators. The importance of the private forestry and wood sector for the Polish economy is primarily noticeable in regions where it holds a large market share, i.e. in the eastern part of the country. But even there, the share of the private sector is considerably lower than in European Union countries.

Therefore, a research on the impact of multifunctional forest management principles consistent with the sustainable development concept could significantly contribute to a well-informed understanding of how to plan raw material harvesting from both state-owned and private forests.

## **2. RESEARCH METHODOLOGY**

To meet the objective of this study, the characteristics of forest areas and the raw material potential available to the national timber economy were verified in selected European countries. Attention was paid to raw material harvesting in relation to current increment; the structure of forests; and the volatility of timber prices. Of the countries covered by the analysis, the following were selected: Poland, Germany (as the largest European economy), Finland (as the most wooded country in Europe) and UK (the least wooded country with the smallest forest area per capita in Europe). The basic sources of data for the indirect market analysis included reports from the Central Statistical Office in Poland, Forestry Commission, Forest Report, Food and Agriculture Organization (FAO), and Bundesministerium für Ernährung und Landwirtschaft. The analysis covered the timber harvest volumes as well as timber prices and their impact on the requirements of the timber processing sector in Poland and in selected European Union countries. The study relied on reports delivered by government bodies, specialized units and relevant organizations.

## **3. FOREST AREA AND TIMBER HARVEST VOLUMES IN SELECTED EUROPEAN UNION COUNTRIES**

Land covered by forest management measures was taken into account, and standards used in international assessments were adopted. Currently in Poland, the area of forests is over 9,215,000 ha and represents ca. 29.5% of total land area (Central Statistical Office 2016). In European Union states, the average forest cover is ca. 35%. However, this ratio varies considerably from one country to another; for instance, forest cover is as much as 76% in Finland (the highest level in Europe); over 60% in Sweden and Slovenia; ca. 32% in Germany; 29.5% in Poland; and only 13% in the Netherlands and UK (Ragonnaud 2017, [www.lasy.gov.pl](http://www.lasy.gov.pl)).

A clearly higher forest cover is characteristic mainly of countries with a large share of land unfit for agriculture, including wetlands and mountain areas (Scandinavia, Austria).

Forest policies of European countries are the main determinant of the capacity to supply wood raw material to the markets. The supply of wood as a natural raw material, as it is the case in Poland, is largely determined by forest management requirements and meets the market demand to a certain degree. In Poland, the increased harvesting of raw materials is caused by various factors (including growing tree stands resources) and takes account of the 10-year forest arrangement plans approved by the minister of the environment ([www.lasy.gov.pl](http://www.lasy.gov.pl)).

According to the 2016 Large Inventory of the Forest, the average tree stands resources in Poland in 2011–2015 were 271 m<sup>3</sup>/ha, compared to 191.4 m<sup>3</sup> of large timber per hectare recorded twenty years earlier (<https://www.ibles.pl/documents/10180/63373/32-dowejko>, [www.ibles.pl](http://www.ibles.pl)). Within 20 years, standing timber stock increased by 41% which means a clear growth of tree stands resources accompanied by a consistent increase in timber harvesting (Fig. 1).

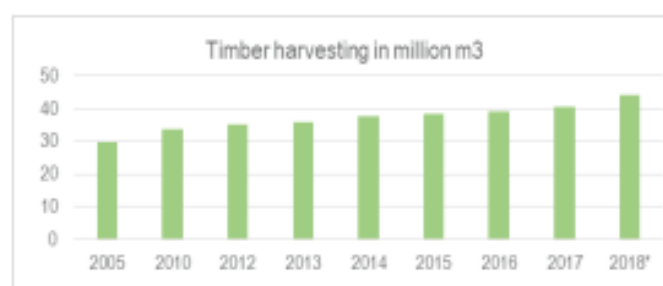


Fig. 1. Large timber harvesting in million m<sup>3</sup> (2018 figures are estimate data).

Source: own elaboration based on Leśnictwo 2017, [www.lasy.gov.pl](http://www.lasy.gov.pl).

In Germany, the volume of harvested wood raw material also keeps increasing every year: in 2012, it was 52.3 million m<sup>3</sup>; in 2013: 53.2 million m<sup>3</sup>; in 2014: 54.4 million m<sup>3</sup>; in 2015: 56.5 million m<sup>3</sup> (data retrieved from Destatis, the Federal Statistical Office of Germany, Holzkurier). In Finland, 62.3 million m<sup>3</sup> of timber was harvested in 2013; the current annual harvest volume is ca. 65 million m<sup>3</sup> (Statistical Yearbook of Forestry 2014, Finnish Forest Research Institute, [www.smy.fi/en/forest-fi](http://www.smy.fi/en/forest-fi)). In turn, in the UK the volume harvested in 2013 was 11.203 million m<sup>3</sup>; in 2014: 11.69 million m<sup>3</sup>; in 2015: 11.043 million m<sup>3</sup> (FAO 2005, 2010, 2013, 2015). The compilation of data suggests that the timber harvest volume varies from one country to another and depends on forest cover and on forest policy targets. Therefore, to address the growing needs of the timber industry and to maintain the proper forest policy, factors that need to be considered include (in addition to harvest volume) the ratio of harvest volume to the growth of resources in forest areas. This is a ratio that allows to determine the development targets for forest management and to find out whether non-economic functions of forests are taken into account.

For many years, Poland has experienced a steady growth of both timber harvesting and tree stands resources. The ratio of timber harvest to current increment has also been

on the increase over the years. According to Figure 2 data, that ratio varies across the countries considered, from 28.5% in Ukraine to 101.8% in Sweden. The level recorded in Poland is 74.8% but as recently as in the 1995–2005 period, it was below 60% ([www.ibles.pl](http://www.ibles.pl)) of current increment (of gross large timber) (2016 Report on the condition of Polish forests); according to other sources, it was even below 50% ([www.forest-monitor.com.eu](http://www.forest-monitor.com.eu)).

The ratio of harvest to annual increment is a widely used index of sustainable, durable development. It is impacted by various circumstances, including the age structure of forests, extreme weather conditions or biotic factors (pest damage); these are the determinants that periodically affect the increased volume of harvested raw material.

The level of wood raw material harvesting—which is moderate compared to the potential and requirements of the timber industry—is consistent with the implementation of the forest cover increase program ("National program for the growth of forest cover in Poland by 2050"), on the one hand, and considerably contributes to high price levels, on the other.

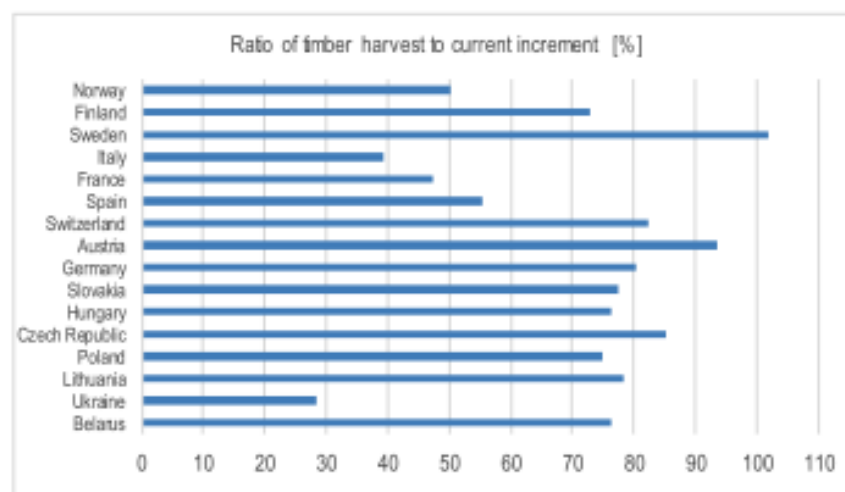


Fig. 2. Ratio of timber harvest to current increment.

Source: own elaboration based on the 2016 Report on the condition of Polish forests.

#### 4. WOOD RAW MATERIAL PRICES IN POLAND AND IN EUROPEAN COUNTRIES

For timber companies, a major determinant of their development potential is the availability of the raw materials base and the price of raw materials. Where demand is growing, the supply has a direct impact on timber prices. Raw materials entering the Polish timber market are valued mainly by State Forests. Figure 3 shows a compilation of average timber prices in Poland within the last fifteen years. According to the diagram, some price



drops were recorded only in 2009 and 2013 on a transitional basis. The greatest increase was reported for non-coniferous sawmill wood (mainly used in sawmilling). Since the last decrease recorded in 2013, timber prices have consistently grown by ca. 4% to 6% per year, depending on the assortment. For timber processing companies, this is a problematic situation which affects their financial stability. The prices grow year by year, causing an increase in material costs which have a high share in total production costs for many manufacturers (often ranging from 70% to 85% of costs, approximately, in the case of sawmills). Thus, raw material prices have a direct effect on production cost-efficiency while also affecting the competitiveness of finished products entering the market.

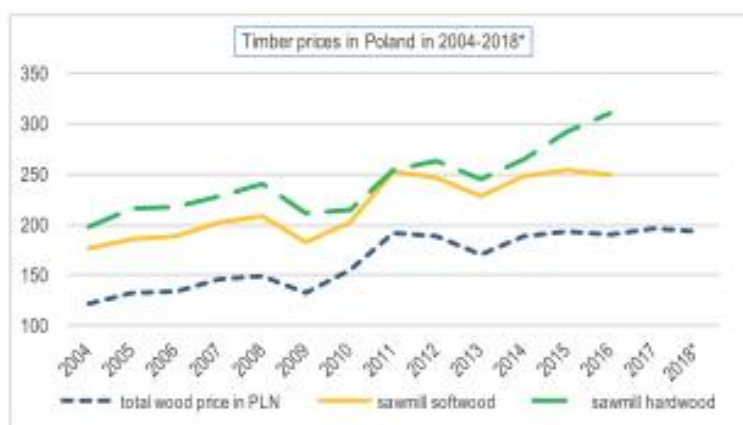


Fig. 3. Timber prices in Poland in 2004–2018\* (data as of 1Q 2018)

Source: own study based on data delivered by the State Forests National Forest Holding, [www.e-drewno.pl](http://www.e-drewno.pl)

An increase in timber prices was also experienced in Germany. In 1H 2017, the prices of sawmill wood for the timber industry (harvested from German forests) reached 83.00–84.00 EUR/m<sup>3</sup> (2a).

Next, Figure 4 presents a compilation of timber prices in Poland and selected European countries, i.e. Germany, Finland and UK (the prices are specified for coniferous sawmill wood). Prices in Figure 4 are specified in PLN; the average exchange rates delivered by the National Bank of Poland were used to convert the amounts expressed in EUR and GBP in the relevant periods. As shown in the diagram, a considerable difference in coniferous wood prices exists between Germany and Poland, Finland and UK. Note that Poland and Finland report a comparable level of wood raw material prices. Even though they differ in forest cover (ca. 29.5% in Poland vs. 76% in Finland), both countries have a comparable ratio of timber harvest to current increment (ca. 74.8% in Poland vs. ca. 73% in Finland) (Fig. 2). In Germany, the forest cover ratio is ca. 32% and the ratio of timber harvest to current increment is ca. 80.3%, a similar proportion to that recorded in Poland (2016 Report on the condition of Polish forests), whereas the average price level is

ca. 50% higher than in Poland. Undoubtedly, the price level is impacted by the economic development level (measured with GDP) and the country's economic orientation. For instance, Germany's nominal GDP in 2017 was USD 3,684,816 million; Poland, Finland and the UK recorded a GDP of USD 524,886 million, USD 253,244 million and USD 2,624,529 million, respectively ([www.wikipedia.pl](http://www.wikipedia.pl), 2017 International Monetary Fund data). The GDP suggests that Germany is the most developed economy which may be a reason for the higher price level of raw materials. Furthermore, Germany is a production and export-oriented economy (the world's second largest exporter, after China) which means extremely high levels of both production and exports ([www.wikipedia.pl](http://www.wikipedia.pl)).

Conversely, in the UK, the variation in timber prices (ca. 0.13%) is surprisingly low considering the country's forest cover ratio.



Figure 4. Timber prices in Poland, Germany, Finland and UK in 2012–2017.

Source: own study based on data delivered by the State Forests National Forest Holding, [www.lasy.gov.pl](http://www.lasy.gov.pl), [www.destatis.de](http://www.destatis.de), [www.woodstat.se](http://www.woodstat.se), [www.forestry.gov.uk](http://www.forestry.gov.uk)

Also contributing to the increase in timber prices is the growing demand for wood products in international markets. This results in a shortage of raw materials available for sale in European countries. As a consequence, the prices of round wood in the Polish market, though growing, become even more attractive to foreign entrepreneurs, especially German.

## 5. OWNERSHIP STRUCTURE OF FORESTS

Poland differs from many other European countries in terms of ownership structure of forests. State Forests (*Lasy Państwowe*, LP), the largest national supplier of wood raw materials, owns 80.8% of resources, including forests managed by PGL LP (77.0%), while the share of private forests is ca. 19.2% as of 2017 ([www.lasy.gov.pl](http://www.lasy.gov.pl)). LP delivers over 90% of raw materials to timber processing companies; the remaining 10% are imported or sourced from private forests ([www.pb.pl](http://www.pb.pl)).

As shown in Figure 5, in Europe, the largest share of private forests is characteristic of Scandinavian countries (Norway, Sweden, Finland) but also of France, Austria and Portugal. In these countries, ca. 80% of forests is held privately (or even 98% in Portugal). Although the share of public forests is not large in that group, forests can be accessed by the public without any stringent restrictions, except for specific local cases. At the other end of the scale, in the European part of Russia, Belarus and Georgia, all forest resources are managed by the state ([www.forest-monitor.com](http://www.forest-monitor.com)).

In turn, the total forest area in Germany is ca. 11.4 million ha, including 48% of private forests, 4% of state-owned forests, 29% of forests managed by Länder, and 19% owned by social players ([www.lasy.gov.pl](http://www.lasy.gov.pl)). For more than 200 years, German forests have been managed in accordance with the sustainable development principle, as set forth in the Forest Act of specific Länder. The act prohibits harvesting more timber than the forest can grow back ([www.ypef.eu](http://www.ypef.eu), [www.bundeswaldinventur.de](http://www.bundeswaldinventur.de), [www.bmel.de](http://www.bmel.de)).



Fig. 5. Share of public forests in the total forest area in selected European countries.  
Source: own elaboration based on the 2016 Report on the condition of Polish forests.

In Finland, the country with the largest forest cover in Europe, forests extend to an area of over 26 million ha, including ca. 35% of state-managed forests, ca. 60% held by private persons and companies, and ca. 5% owned by local government units, churches and other operators ([www.ypef.eu/floraifaunafin](http://www.ypef.eu/floraifaunafin)).

In the UK, in 2017, the forested area was ca. 3.08 million hectares, covering 13% of the national territory (Żaczek 2013). The economic development boosted the growth of British forests. In the UK, forests fall into two categories: woodland and certified woodland (44%) audited by the forestry authority. Certified woodland is managed and must comply with stringent norms set out by the Forestry Commission to which the British, Irish and Welsh forestry authorities (the Forestry Commission and Forest Service, respectively) are subject. The requirements are mainly determined by regulations concerning forest age and forest area management (including forest expansion, deforestation and accessibility to visitors).

The UK has a complex ownership structure of forests; 30% are owned by the state and the remaining part, in various configurations, is held by forest tenants or owners and is therefore referred to as forest areas not owned by Forestry Commission or forestry authorities.

As shown by relevant data, to the extent covered by this analysis, no direct relationship exists between timber prices and the ownership structure of forests. In Finland and UK, even though public forests are in a minority (with a share of ca. 30%), timber prices are comparable to those recorded in Poland where most forests (ca. 80%) are owned by the state, and are lower than in Germany where ca. 50% of forest areas are held privately. However, a relationship may be found between forest structure and raw material supply. For instance, in Poland nearly 75% of round wood raw material grown in State Forests enter the market within a year, whereas in Finland (where the state holds ca. 30% of forests) Metsähallitus (state institution in charge of raw material harvesting) harvests only around 10% of raw material available for harvesting on a countrywide basis ([www.drewno.pl](http://www.drewno.pl)).

## **6. FINAL CONSIDERATIONS ANALYSIS**

The volatile condition of the Central and Western European timber market is determined by growing consumer demand for highly processed products made with renewable raw materials. The ecological aspect of timber harvesting and processing drives the growing popularity of wood. In that context, both the technological level of the timber industry and the abundant resources of raw materials found in different European regions become increasingly important. As regards European countries addressed in this paper, the availability of timber resources largely contributes to the development of the timber industry. At the same time, the ownership structure of woods has a small impact on the volume and potential of timber harvesting. This largely results from the opening of the timber market to external supplies of raw materials, and is related to the forestry policy established by Western and Central European countries.

The price volatility of available timber types is related to the industrial development level and to the market position held by particular countries. Also, the changes in prices are considerably affected by national policies governing the access to forest resources. Countries who restrict the volume of timber harvested from national tree stands resources, considering their capacity to regrow (the increase in timber volume), demonstrate a higher increase in prices of round wood entering the market.

At the same time, this study may confirm that the ownership structure of forests affects the demand; countries with a much greater share of private ownership tend to use the growing raw material resources to a slightly greater degree. This results from the limited impact of monopolies who establish local conditions for the sale of timber in the European market. An open market policy, supported with sustainable development of the forestry and timber sectors, translates into stabilized trade in natural raw resources in European countries. The concept of a collaborative use of forestry resources by countries with different shares of private property may help streamlining the functioning of timber companies.



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Financing from the project "Improvement of process and material efficiency in sawmill industry" financed by the National Center for Research and Development under the BIOSTRATEG program "Natural Environment, Agriculture and Forestry", based on agreement No. BIOSTRATEG3 / 344303/14 /NCBR / 2018.